State of Connecticut
PUBLIC DOCUMENT No. 24

SIXTY-SEVENTH REPORT

OF THE

CONNECTICUT AGRICULTURAL EXPERIMENT STATION

NEW HAVEN

N.H.
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FOR THE YEAR
1943

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LETTER OF TRANSMITTAL

To His Excellency

Raymond E. Baldwin

Governor of Connecticut

The Board of Control of the Connecticut Agricultural Experiment Station herewith respectfully submits its Sixty-seventh Report, for the year ending October 31, 1943. A general review of the work of the Station, together with the report of the Treasurer, will be found in the Report of the Director, pages 39 to 86 herein.

E. C. SCHNEIDER,

Secretary.

Bulletin 476 **November, 1943**

COMMERCIAL FERTILIZERS

REPORT FOR 1943

E. M. BAILEY

Chemist in Charge

Connecticut

Agricultural Experiment Station

New Haven

"Printed under authority of Section 142,
General Statutes of Connecticut,
Revision of 1930,
as amended by Section 45e, Supplement of 1939.

FRED R. ZELLER,
State Comptroller"

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Commercial Fertilizers Report for 1943

E. M. Bailey
Chemist in Charge

LAW AND REGULATIONS REGARDING COMMERCIAL FERTILIZERS

The term "commercial fertilizers" as used in the Connecticut fertilizer statute includes any and every substance imported, manufactured, prepared or sold for fertilizing or manuring or soil amendment purposes, except barnyard manure and stable manure that have not been artificially treated or manipulated, marl and lime.

The seller is responsible for the proper labelling of each package of fertilizer, for the registration of each brand sold or offered for sale, for the payment of the required analysis fee and for the payment of the tonnage tax. If, however, proper labelling, registration and payments of analysis fees and of tonnage tax have been provided for by the manufacturer or by another responsible person, all sellers of such brands are released from the above-mentioned requirements. The retailer, therefore, should assure himself that the requirements of the law have been met by the manufacturer of the brands which he handles, or himself be prepared to meet all these requirements.

It frequently happens that a manufacturer or jobber sells fertilizer materials which are the products of, and which are registered by, another firm or individual. Distributors in such cases should sell such materials by the exact brand names under which they are registered in order that there may be no mistake as to the identity of brands. Any change in the brand names, or failure to make the identity of the brand and its manufacturer clear, makes the distributor liable for the registration of the product as his own brand.

The law exempts from registration, and from other requirements referred to, only (1) fertilizers passing through the State in transit; (2) fertilizers and fertilizer materials shipped to regular fertilizer factories to be used for manufacturing purposes and (3) fertilizers and fertilizer chemicals sold to the Connecticut Agricultural Experiment Station for experimental purposes.

Cottonseed, linseed and soybean meals, when sold or used for fertilizer purposes, must be registered as fertilizers and the specified fees paid thereon. For such products the registration fee is $10.00 for each brand payable annually, and six cents per ton tonnage fee, payable semi-annually.

These fees are entirely apart from those required by the feeding stuffs statute.

Note: Analyses reported in this bulletin were made by Messrs. Nolan, Merwin and Walden; microscopic examinations by Miss Shepard; inspection and sampling by Mr. Stickney and compilations by Mrs. Vosburgh.

Because manufacturers or jobbers do not know how much, if any, of their brands are sold or used as fertilizers, local dealers and purchasers report their sales or purchases to this Station. The information is not for publication but is used to inform manufacturers of the total sales of their brands as fertilizer in this State. It is expected that the fees provided for by statute will be paid by the manufacturer or other party responsible for the brands.

REGISTRATIONS

Late registrations for 1942

To the brands registered for 1942 in our last report should be added:

Independent Mfg. Co., Philadelphia, Pa.
Independent's Bone Meal

National Lead Co., Atlantic Branch, 111 Broadway, New York, N. Y.
Dutch Boy 32% O. P. Linseed Oil Meal

Registrations for 1943

For 1943, 45 firms and individuals registered 216 brands of fertilizers at this Station for sale in the State. As required by statute, the brands are listed as follows:

The Acme Guano Co., Baltimore, Md.
Acme Victory Garden 3–8–7
Acme 3–12–6
Acme 4–9–7
Acme 4–10–10
Acme 4–12–4

Ted Alkire, Lubbock, Tex.
Kireal Cotton Hull Ash

Allied Chemical & Dye Corp., 40 Rector St., New York, N. Y.
Arcadian, The American Nitrate of Soda
Arcadian Sulphate of Ammonia
Sulphate of Ammonia

The American Agricultural Chemical Co., North Weymouth, Mass.
AA Market Garden Fertilizer 4–12–4
AA Potato and Root Crop Fertilizer 4–10–10
AA Potato and Vegetable Fertilizer 4–9–7
AA Sure Crop Fertilizer 3–12–6
Agrico Alkaline 0–14–14
Agrico for Commercial Growers 4–12–4
Agrico for Corn 3–10–6[1]
Agrico for Corn 3–12–6
Agrico for Lawns, Trees and Shrubs 3–10–5[1]
Agrico for New England 4–9–7
Agrico for Potatoes and Vegetables 4–10–10
Agrico for Seeding Down 4–16–20
Agrico for Tobacco 6–3–6
Agrico for Truck 4–12–4
Agrico Victory Garden Fertilizer "For Food Production Only" 3–8–7
Fine Ground Bone
Muriate of Potash—50% Potash
18% Normal Superphosphate
Pulverized Sheep & Goat Manure

American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y.
20.6% "Aero" Cyanamid Granular
21.0% "Aero" Cyanamid Pulverized

American Potash & Chemical Corp., 70 Pine St., New York, N. Y.
Trona 60% Muriate of Potash

Apothecaries Hall Co., Waterbury, Conn.
Bone Meal 2.25%
Castor Pomace
Cotton Hull Ashes—unit basis
Dry Ground Fish
Liberty 0–14–14
Liberty Fertilizer 3–12–6
Liberty Fertilizer 4–9–7
Liberty Fertilizer 4–10–10
Liberty Fertilizer 4–12–4
Liberty Tobacco Mixture 5–3–5
Liberty Tobacco Mixture 6–3–6
Liberty Victory Fertilizer 3–8–7
Muriate Potash 50%
Muriate Potash 60%
Sheep Manure
Sulphate Ammonia
Sulphate Potash
Superphosphate 20%

[1] Sold in accordance with government regulations.

Archer-Daniels-Midland Co., Minneapolis, Minn.
Archer Brand 34% Protein Old Process Linseed Oil Meal
Archer Brand 44% Protein Soybean Oil Meal

Armour Fertilizer Works, 120 Broadway, New York, N. Y.
Armour's Big Crop Fertilizer 3–12–6
Armour's Big Crop Fertilizer 4–9–7
Armour's Big Crop Fertilizer 4–10–10
Armour's Big Crop Fertilizer 4–12–4
Armour's Big Crop Fertilizer 6–15–15
Armour's Big Crop Superphosphate 20%
Armour's Big Crop Tobacco Special 5–3–5
Armour's Big Crop Tobacco Special 6–3–6
Armour's Bone Meal Fertilizer
Armour's Victory Garden Fertilizer 3–8–7[1]

Ashcraft-Wilkinson Co., Atlanta, Ga.
Cow-Eta Brand Prime 41% Protein Cottonseed Meal
Fertilizer Compound 34%

Associated Seed Growers, Inc., New Haven, Conn.
Clark's Tip Top Brand Fertilizer 4–9–7

Atkins & Durbrow, Inc., 165 John St., New York, N. Y.
Driconure 2–1–1

F. A. Bartlett Tree Expert Co., Stamford, Conn.
Bartlett Green Tree Food 4–8–6

The Baugh & Sons Co., 25 South Calvert St., Baltimore, Md.
Baugh's 3–10–10
Baugh's 4–9–7
Baugh's 4–10–10
Baugh's Perfection Brand 3–12–6
Baugh's Victory Garden Fertilizer for Food Production Only 3–8–7
Baughs 20% Superphosphate

Berkshire Chemical Co., Bridgeport, Conn.
Berkshire 0–14–14
Berkshire Victory Garden 3–8–7
Berkshire 3–12–6 Fertilizer
Berkshire 4–9–7 Fertilizer
Berkshire 4–10–10 Fertilizer
Berkshire 4–12–4 Fertilizer
Berkshire 6–3–6 Fertilizer
Fine Ground Bone Meal
Pure Raw Bone
Sheep Manure

The Buckeye Cotton Oil Co., Cincinnati, Ohio
Buckeye 44% Soybean Oil Meal

Chilean Nitrate Sales Corp., 120 Broadway, New York, N. Y.
Chilean Nitrate of Soda—Champion Brand
Chilean Nitrate of Soda—Original Old Style

Consolidated Rendering Co., 178 Atlantic Ave., Boston, Mass.
Corenco 3–8–7 Victory Garden Fertilizer
Corenco 3–10–3 Landscape[2]
Corenco 3–12–6 Animal Brand
Corenco 4–9–7 General Crop Manure
Corenco 4–10–10 Potato Grower
Corenco 4–12–4 Complete Manure
Corenco 6–3–6 Special Tobacco Grower
Corenco Ground Bone
Corenco Sheep Manure
Superphosphate 20%

The Davison Chemical Corp., Baltimore, Md.
Davco Granulated 20% Superphosphate

E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.
"Uramon" Fertilizer Compound

Eastern States Farmers' Exchange, West Springfield, Mass.
Eastern States 0–9–27
Eastern States 0–14–14[3]
Eastern States 3–8–7
Eastern States 3–12–6[4]
Eastern States 4–10–10
Eastern States 4–16–20
Eastern States 5–10–10
Eastern States 5–17–0
Eastern States 6–12–6
Eastern States 6–15–15
Eastern States 6–15–15 Low Chlorine
Eastern States 8–4–8[5]
Eastern States 8–8–8
Eastern States Castor Pomace
Eastern States Ground Steamed Bone
Eastern States Muriate of Potash
Eastern States Sulphate of Ammonia
Eastern States Sulphate of Potash
Eastern States Superphosphate 20%
Eastern States Superphosphate 47%

[1] Substituted for "Armour's Big Crop Fertilizer 3–10–10".
[2] Nitrogen all organic.
[3] Substituted for 0–20–20.
[4] Substituted for 5–20–10.
[5] Substituted for 6–3–6 Tobacco.

Goulard & Olena, Inc., 140 Liberty St., New York, N. Y.
G & O Lawn and Garden Fertilizer 4–12–4

A. H. Hoffman, Inc., Landisville, Pa.
Hoffman's Bone Meal
Hoffman's Cow Manure
Hoffman's Sheep Manure

Humphreys-Godwin Co., Memphis, Tenn.
Dixie Brand 41% Prime Cottonseed Meal

Independent Mfg. Co., Philadelphia, Pa.
Independent's Bone Meal

Spencer Kellogg & Sons, Inc., Buffalo, N. Y.
Castor Pomace

L. B. Lovitt & Co., Memphis, Tenn.
"Lovit Brand" 41% Protein Cottonseed Meal

Mechling Bros. Chemicals, Div. of General Chemical Co., 12 South Twelfth St., Philadelphia, Pa.
Veget-Aid 5–10–5

Norwood Brand Fertilizer Co., North Reading, Mass.
Norwood Brand Sheep Manure

Old Deerfield Fertilizer Co., Inc., South Deerfield, Mass.
Old Deerfield 4–9–7
Old Deerfield 4–10–10
Old Deerfield 6–3–6
Old Deerfield Castor Pomace
Old Deerfield Cotton Hull Ashes, 30%
Old Deerfield Double Sulfate of Potash Magnesia

Olds & Whipple, Inc., Hartford, Conn.
Muriate of Potash
O & W 0–14–14 Fertilizer
O & W 0–20–20 Fertilizer
O & W 3–8–7 Victory Garden Fertilizer
O & W 3–12–6 Corn Fertilizer
O & W 4–9–7 General Purpose Fertilizer
O & W 4–9–7 General Purpose Fertilizer with Sulphate of Potash
O & W 4–10–10 Potato Fertilizer
O & W 4–10–10 Potato Fertilizer with Sulphate of Potash
O & W 4–12–4 Market Garden Fertilizer
O & W 5–3–5 Complete Tobacco Fertilizer
O & W 5–3–5 Complete Tobacco Fertilizer Potash Derived From Cotton Hull Ash
O & W 6–3–6 Blue Label Tobacco Fertilizer
O & W 6–3–6 Blue Label Tobacco Fertilizer Potash Derived From Cotton Hull Ash
O & W 6–15–15 Fertilizer
O & W Bone Meal
O & W Cotton Hull Ash
O & W Sulphate of Ammonia
O & W Sulphate of Potash
O & W Superphosphate 20%

Pittsburgh Plate Glass Co., 2-10 Chester Ave., Newark, N. J.
Red Wing 34% Protein Old Process Linseed Meal

The Pulverized Manure Co., 503 Exchange Bldg., Union Stock Yards, Chicago, Ill.
Wizard Brand Cow Manure
Wizard Brand Pulverized Sheep Manure

The Rogers & Hubbard Co., Portland, Conn.
Gro-Fast Plant Food[1]
Hubbard All Soils Fertilizer 4–12–4
Hubbard Castor Pomace
Hubbard Climax Tobacco Fertilizer 5–3–5
Hubbard Corn and Grain Fertilizer 3–12–6
Hubbard Cotton Hull Ash
Hubbard Cow Manure
Hubbard Domestic Sheep Manure
Hubbard Dry Ground Fish Meal
Hubbard Fine Ground Bone
Hubbard High Potash Fertilizer 4–10–10
Hubbard Muriate of Potash
Hubbard Potato Fertilizer 4–9–7
Hubbard Raw Knuckle Bone Flour
Hubbard Strictly Pure Bone
Hubbard 20% Superphosphate
Hubbard Tobacco Grower 6–3–6
Red H Brand 3–12–6
Red H Brand 4–9–7
Red H Brand 4–10–10
Red H Brand 4–12–4
Victory Garden Fertilizer 3–8–7

Ruhm Phosphate & Chemical Co., Mount Pleasant, Tenn.
Red Seal Brand Ruhm's Phosphate Rock 30%

O. M. Scott & Sons Co., Marysville, Ohio
Scott's Turf Builder 6–8–4[1]

[1] Nitrogen all organic.

Scott's Turf Builder 8–7–3[1]
Scott's Victory Garden Fertilizer 3–8–7

Sears, Roebuck & Co., Chicago, Ill.
Garden Master Plant Food 3–8–7

Sewerage Commission of the City of Milwaukee, Milwaukee, Wis.
Milorganite

M. L. Shoemaker, Div. Wilson & Co., Inc., Philadelphia, Pa.
Shoemaker's "Swift-Sure" 4–10–10
Shoemaker's "Swift-Sure" Victory Garden Fertilizer 3–8–7

Stumpp & Walter Co., 132 Church St., New York, N. Y.
Sawco Bone Fertilizer 2.47–24.00
Sawco Emerald Grass Fertilizer 3–10–2[2]
Sawco General Garden Fertilizer 3–8–5[2]
Sawco Pulverized Sheep Manure 2–1–2
Sawconure 2–1–1
Victory Garden Fertilizer 3–8–7

Swift & Co. Fertilizer Works, Baltimore, Md.
Bone Meal Fertilizer 2.47–23.0
Swift's Red Steer 3–12–6
Swift's Red Steer 4–9–7
Swift's Red Steer 4–10–10
Swift's Red Steer Superphosphate 20%
Swift's Sheep Manure 2–1–2
Vigoro 3–8–7
Vigoro 3–12–6
Vigoro 4–12–4

Tennessee Corp., Lockland, Ohio
Loma 4–12–4
Victory Garden Fertilizer 3–8–7

I. P. Thomas & Son Co., 721 Market St., Camden, N. J.
I. P. Thomas 4–9–7
Soil-Rich Victory Garden Fertilizer 3–8–7 (For Food Production Only)
20% Superphosphate
Tip Top Fertilizer 3–12–6

Walker-Gordon Laboratory Co., Inc., Plainsboro, N. J
Bovung (Dehydrated Cow Manure)

Woodruff Fertilizer Works, Inc., North Haven, Conn.
Woodruff's 3–12–6 Fertilizer
Woodruff's 4–9–7 Fertilizer
Woodruff's 4–10–10 Fertilizer
Woodruff's 4–12–4 Fertilizer
Woodruff's 6–15–15 Fertilizer
Woodruff's Natural Superphosphate 18%
Woodruff's Tobacco Special Fertilizer 6–3–6 (Potash From Sulphate)
Woodruff's Victory Garden Fertilizer 3–8–7

[1] Two per cent organic
[2] Nitrogen all organic.

INSPECTION OF 1943

Due to war demands for nitrogenous materials, the number of grades of fertilizer has been greatly reduced for the current year. A limited number of grades has been established for the various states, such "approved grades" being designed to serve the agricultural needs in the areas of use. The accepted grades for the several states are set forth by the Food Production Administration in Food Production Order 5, January 18, 1943, in a revision of that order dated July 3, 1943, and in interim supplements thereto. These orders provided certain exemptions for the distribution of stocks of unapproved grades on hand prior to certain specified dates in order to relieve manufacturers of the burden of reformulating such goods.

The grades approved for Connecticut (F.P.O 5, January 18, 1943) were: 0–14–14, 0–20–20, 0–9–27, 3–10–10, 3–12–6, 3–12–15, 4–9–7, 4–12–4, 4–10–10, 5–3–5, 6–3–6, 4–16–20, 5–20–10, and 6–15–15. An 8–4–8 grade was approved later.

In addition, the following were approved for all states:

Nitrate of soda	16–0–0
Nitrate of soda-potash	14–0–14
Sulphate of ammonia	20 (or higher)–0–0
Cyanamid	20 (or higher)–0–0
Uramon	42–0–0
Ammonium phosphate	11–48–0, 16–20–0
Superphosphate	0–18 (or higher)–0
Muriate of potash	0–0–50 (or higher)
Sulphate of potash	0–0–48 (or higher)
Manure salts	0–0–22 (or higher)
Sulphate of potash-magnesia	0–0–18 (or higher)
Basic slag	Any grade
Ground phosphate rock	Any grade
Colloidal phosphate	Any grade
Cotton hull ash	Any grade
Wood ash	Any grade
Victory garden fertilizer	3–8–7

Under F.P.O. 5, Revision of July 3, 1943, the following grades were approved for use in 1943-44: 0–14–14, 3–12–6, 4–10–0[1], 5–3–5[1, 2] 5–8–7[2], 5–10–5[3], 5–10–10, 6–3–6[1] and 7–7–7.

To permit greater flexibility in the use of plant food in the materials available to manufacturers multiples of most of the above grades are permitted.

The revised list of materials approved for all states for 1943-44 is as follows:

Nitrate of soda	16–0–0
Nitrate of potash	14–0–14
Sulphate of ammonia	20 (or higher)–0–0
Cyanamid	20 (or higher)–0–0
Uramon	42–0–0
Ammoniated superphosphate	4–16–0 (or higher)
Ammonium phosphate	11–48–0, 16–20–0
Uramon-limestone	20 (or higher)–0–0
Ammonium nitrate-limestone	20 (or higher)–0–0
Ammonium nitrate	30 (or higher)–0–0
Potassium nitrate	14–0–14 (or higher)
Superphosphate	0–18 (or higher)–0
Muriate of potash	0–0–50 (or higher)
Sulphate of potash	0–0–48 (or higher)
Manure salts	0–0–22 (or higher)
Sulphate of potash magnesia	0–0–18 (or higher)
Potash lime	0–0–6
Ground phosphate rock	Any grade
Colloidal phosphate	Any grade
Cotton hull ash	Any grade
Wood ash	Any grade

[1] Tobacco only.

[2] No multiples permitted.

[3] Designated for use on victory gardens but not limited to such use.

Nothing in the orders above cited affect state regulations as to registration, tonnage taxes or other local requirements. The Station has assumed no authority under these orders to the trade but, as a matter of cooperation, has inquired into any apparent inconsistencies that have come to our attention. So far as we can observe, the fertilizer industry has complied fully with both the letter and intent of these orders.

During the 1943 season the Station agent collected 190 samples including all the registered brands that could be found. A summary of official samples and of those submitted by purchasers is given in the following classification, which includes also tonnage data for the year July 1, 1942, to June 30, 1943. Tonnage does not include fertilizer distributed under the Federal Agricultural Conservation Program.

Classification of Fertilizer Materials and Fertilizer Tonnage
(July 1, 1942, to June 30, 1943)

	Page number	Number of samples	Tonnage	
I. *Containing Chiefly Nitrogen*				
Nitrate of soda	17	4	1,401	
Ammonium sulphate	17	4	341	
Castor pomace	18	4	1,052	
Cottonseed meal (C. M.–C. P.)	18	57	7,289	
Linseed meal	18	7	556	
Soybean meal	14	4	870	
Other materials (cyanamid, uramon)	17	3	120	
				11,629
II. *Containing Chiefly Phosphoric Acid*				
Superphosphate	19	17 (16–18%)	512	
		(20%)	3,819	
				4,331
III. *Containing Chiefly Potash*				
Muriate of potash	20	6 (50%)	92	
		(60%)	377	
Sulphate of potash and sulphate potash-magnesia	20	7	230	
Cottonhull ashes	20	18	1,195	
				1,894
IV. *Containing Nitrogen and Phosphoric Acid*				
Dry ground fish	15	7	256	
Ground bone	21	19	1,058	
Other materials (milorganite and tankage)	..[1]	2	338	
				1,652
V. *Mixed fertilizers*				
Commercial mixtures	22	121	52,857[2]	
Special and home mixtures	30	73	201	
				53,058
VI. *Miscellaneous*				
Sheep manure, etc.	33	14	716	
Lime	35	12	....	
Other materials	36	33	....	
Check meals and fertilizers	16	42	....	
				716
Totals		454		73,280

[1] No official samples.
[2] For distribution of this tonnage see next page.

Mixed Fertilizer Tonnage

Grades Approved for Connecticut[1]

Grade	Tons	Grade	Tons
0-9-27	3	4-12-4	1,327
0-14-14	587	4-16-20	59
0-20-20	115	5-3-5	1,929
3-10-10	30	-20-10	0
3-12-6	2,849	6-3-6	11,237
3-12-15	0	6-15-15	1,764
4-9-7	15,058	8-4-8	526
4-10-10	9,792	3-8-7[2]	5,787
		Total	51,061

Left-Over Grades, Miscellaneous

(Over 50 Tons)

Grade	Tons	Grade	Tons
3-10-3	58	4-8-10	90
3-10-4	99	5-8-7	599
3-10-5	69	5-10-5	57
4-8-4	336	7-7-7	54
4-8-7	117	10-6-4	92
		Total	1,571

(Less Than 50 Tons)

Grade	Tons	Grade	Tons
3-8-5, 3-10-2	10	6-5-3	11
3-10-6	17	6-7-4	36
4-4-0, 4-8-5	9	7-3-7, 7-14-21	4
4-8-8, 4-10-4, 4-16-4, 5-5-5	7	7-6-6	12
		7-7-5	11
		8-5-2	16
		8-5-8, 8-6-2	10
5-5-1	7	8-6-4	9
5-7-3, 5-8-6	8	8-8-8, 8-16-8, 8-16-14, 8- 6-16	4
5-8-10, 5-10-4, 5-15-5	10	10-5-5	5
5-10-10	20		
6-3-7, 6-6-5	9	Total	225

[1] F. P. O. 5, January 18, 1943.
[2] Victory Garden Special, all states.

I. RAW MATERIALS CHIEFLY VALUABLE FOR NITROGEN

Chemical Sources

Nitrate of soda, otherwise known as Chile saltpeter, has long been a common source of chemical nitrogen. The commercial products from natural sources are available in both the crystalline and pellet forms, and both are derived from the natural ore, caliche, obtained from Chile. Nitrate of soda is also manufactured on a large scale in the United States from synthetic ammonia and soda ash (sodium carbonate).

Sulphate of ammonia is formed when ammonia is combined with sulphuric acid. Commercially it is made by passing ammonia gas from coke ovens and gas plants into sulphuric acid.

Cyanamid and urea are other considerable sources of chemical nitrogen. Cyanamid is made by passing nitrogen gas through calcium carbide heated to high temperature. Urea is a synthetic product obtained by combining synthetic ammonia and carbon dioxide under high pressure and other suitable conditions.

For fertilizer purposes the nitrogen in both cyanamid and urea is classed as non-protein organic nitrogen, which relates it to the vegetable sources of nitrogen rather than the mineral sources such as nitrate of soda and sulphate of ammonia.

The analyses of official samples of this group of products are given in Table 1. Unofficial samples submitted by purchasers are not included.

Vegetable Sources

The ground pressed cakes of oil seeds, especially cottenseed, have long been used as sources of fertilizer nitrogen. Cottonseed meal imported for fertilizer purposes is denatured with castor pomace to make it unfit for feeding livestock and thereby to gain the advantage of lower import duties.

Analyses of official samples are given in Table 2.

II. RAW MATERIALS CHIEFLY VALUABLE FOR PHOSPHORIC ACID

Superphosphate was first prepared by treating bones with sulphuric acid. This simple process was proposed by Liebig in 1840 and a little later, in 1842, Lawes applied the method to mineral phosphates.

The manufacture of superphosphate in the United States appears to have begun in Baltimore in 1850; and this date may also be said to mark the beginning of the commercial fertilizer industry in this country.

Treatment of phosphate rock with sulphuric acid converts the natural phosphate largely into water-soluble form which is readily available to plants. Superphosphate commonly contains 16 per cent of available phosphoric acid, but in recent years the proportion of available phosphoric acid has been increased by treating the rock with phosphoric acid instead of sulphuric acid.

Official samples analyzed in the past year were guaranteed at 18 or 20 per cent available phosphoric acid, as shown in Table 3.

Another source of phosphoric acid for fertilizer purposes is precipitated bone, which is a by-product in the manufacture of glue from bones. There is a limited use of the slower acting rock phosphate.

III. RAW MATERIALS CHIEFLY VALUABLE FOR POTASH

Muriate of potash, sulphate of potash and cottonhull ashes are the chief sources of potash for fertilizer purposes. Analyses of official samples are given in Table 4.

IV. MATERIAL SUPPLYING NITROGEN AND PHOSPHORIC ACID

Dry Ground Fish

Only two official samples of dry ground fish were examined, but five were analyzed for purchasers.

The official samples were as follows:

Number	Samples from stock of	Per cent nitrogen found	Per cent nitrogen guaranteed	Per cent phosphoric acid found	Per cent phosphoric acid guaranteed
7064	Apothecaries Hall, East Windsor	9.98	9.00	6.89	5.00
7056	The Rogers & Hubbard Co., Portland	10.21	9.46	8.29	5.00

The samples contained, respectively, 0.24 and 0.23 per cent of chlorine.

Ground Bone

Thirteen official samples of ground bone were analyzed, and six were analyzed for purchasers. Analyses of official samples are given in Table 5.

Other Materials

Two samples of horn and hoof meal and one of Ammo Phos were examined for purchasers. The horn and hoof meal was guaranteed 15 per cent nitrogen and samples contained 14.78 and 14.88 per cent respectively. The sample of Ammo Phos was guaranteed 11-48 and we found 11.07 nitrogen and 48.68 available phosphoric acid.

V. MIXED FERTILIZERS

Analyses of 117 official samples of mixed fertilizer are given in Table 6. The results are summarized as follows:

Total number of samples		117
Samples deficient in:		
one item	26	
two items	3	
three items	0	29
Percentage of samples meeting guaranties		75
Total guaranties made		343[1]
Guaranties not met:		
nitrogen	17	
phosphoric acid	6	
potash	9	32
Percentage of guaranties met		91

[1] Eight samples with only two guaranties.

By the usual laboratory methods the quality of the insoluble organic nitrogen appeared to be satisfactory.

Over 90 per cent of the individual guaranties for the major elements of plant food were substantially met or exceeded. Analyses are given in Table 6.

Special and Home Mixtures

Each year a considerable number of special and home-mixed fertilizer, largely or entirely for tobacco, is analyzed for individuals. Seventy-three samples were examined during the past season. Analyses are given in Table 7.

State Purchases of Fertilizer

Raw materials and mixed goods supplied to state institutions on state purchase orders have been included in our regular inspection for several years. Such brands are subject to registration and the tonnage tax; the only exemptions are in the case of fertilizer sold to the Experiment Station for experimental purposes.

Samples of fertilizer sold on state purchase orders are indicated in the several tables of analyses. They are summarized as follows:

Number of samples	Material	Reference
1	Cyanamid	Table 1
3	Superphosphate	Table 3
11	Mixed fertilizer	Table 6

All of these substantially met or exceeded guaranties.

VI. MISCELLANEOUS

Sheep Manure. Fourteen official samples of commercial sheep and other farm manures were analyzed and the results are given in Table 8.

Agricultural Lime. Liming materials are not classed as commercial fertilizer under the fertilizer law, and hence no registration of brands is required and no regular inspection is made. Samples are examined each year for purchasers and others interested. Twelve were analyzed during the past season. The analyses are given in Table 9.

Other Miscellaneous Materials. Other samples of miscellaneous materials, 27 in number, have been examined and some of these are listed, with analyses, for reference purposes in Table 10.

Check Meals and Fertilizers. Thirty samples of cottonseed meal and 12 of fertilizers have been analyzed in the collaborative program sponsored by the American Oil Chemists Society and by the F.S. Royster Guano Co. State, commercial and industrial chemists participate in these programs, the purpose of which is to promote uniformity and accuracy in analytical control work.

TABLE 1. ANALYSES OF NITRATE OF SODA, ETC.

Station No.	Manufacturer or jobber	Sampled from stock of	Per cent nitrogen	
			Found	Guaranteed
	Nitrate of Soda			
7075	Arcadian, The American. Allied Chemical & Dye Corp., New York, N. Y.	East Hartford: Olds & Whipple, Inc.	16.06	16.00
7041	Chilean, Champion Brand. Chilean Nitrate Sales Corp., New York, N. Y.	West Haven: L. T. Frisbie	16.06	16.00
	Cyanamid			
7050	20.6% "Aero" Granular. American Cyanamid Co., New York, N. Y.	Portland: The Rogers & Hubbard Co.	20.82	20.60
7347[1]	20.6% "Aero" Granular. American Cyanamid Co., New York, N. Y.	Meriden: Connecticut School for Boys	20.52	20.60
	Uramon Fertilizer Compound			
7058	E. I. du Pont de Nemours Co., Wilmington, Del.	East Windsor: Apothecaries Hall Co.	42.25	42.00
	Sulphate of Ammonia			
7341	Arcadian. Allied Chemical & Dye Corp., New York, N. Y.	East Windsor: Apothecaries Hall Co.	20.94	20.60
7060	Apothecaries Hall Co., Waterbury, Conn.	East Windsor: Apothecaries Hall Co.	20.80	20.50
7071	O & W. Olds & Whipple, Inc., Hartford, Conn.	East Hartford: Olds & Whipple, Inc.	20.68	20.56

[1] State purchase.

TABLE 2. ANALYSES OF CASTOR POMACE, COTTONSEED MEAL, ETC.

Station No.	Manufacturer or jobber	Sampled from stock of	Per cent nitrogen	
			Found	Guaranteed
	Castor Pomace			
7062	Apothecaries Hall Co., Waterbury, Conn.	East Windsor: Apothecaries Hall Co.	6.00	4.50
7338	Spencer Kellogg & Sons, Inc., Buffalo, N. Y.	East Windsor: Apothecaries Hall Co.	5.94	4.52
7048	Hubbard. The Rogers & Hubbard Co., Portland, Conn.	Portland: The Rogers & Hubbard Co.	5.79	4.50
	Cottonseed Meal			
7078	Dixie Prime 41%. Humphreys-Godwin Co., Memphis, Tenn.	East Hartford: Olds & Whipple, Inc.	6.24	6.58
7339	"Lovit Brand". L. B. Lovitt & Co., Memphis, Tenn.	East Windsor: Apothecaries Hall Co.	6.52	6.56
	Linseed Meal			
7334	Dutch Boy 32% Old Process. National Lead Co., New York, N. Y.	Hazardville: L. B. Haas & Co.	5.50	5.00

TABLE 3. ANALYSES OF SUPERPHOSPHATE

Station No.	Manufacturer or wholesale dealer	Dealer or purchaser	Per cent phosphoric acid			
			Citrate-insoluble	Total	"Available" Found	"Available" Guaranteed
	Superphosphate					
7080	18% Normal. The American Agricultural Chemical Co., North Weymouth, Mass.	West Haven: The American Agricultural Chemical Co.	1.37	20.10	18.73	18.00
7340	20%. Apothecaries Hall Co., Waterbury, Conn.	East Windsor: Apothecaries Hall Co.	1.20	22.42	21.22	20.00
7298	Armour's Big Crop 20%. Armour Fertilizer Works, New York, N. Y.	Norwich: Checkerboard Feed Store	1.01	21.23	20.22	20.00
7046	Baugh's 20%. The Baugh & Sons Co., Baltimore, Md.	Hamden: The Hamden Lehigh Coal Co.	0.21	20.22	20.01	20.00
7040	20%. Consolidated Rendering Co., Boston, Mass.	West Haven: L. T. Frisbie Co.	0.21	21.10	20.89	20.00
7288	Davco Granulated 20%. The Davison Chemical Corp., Baltimore, Md.	Bridgeport: Berkshire Chemical Co.	1.25	22.98	21.73	20.00
7346[1]	Davco Granulated 20%. The Davison Chemical Corp., Baltimore, Md.	Meriden: Connecticut School for Boys	0.84	22.22	21.38	20.00
7045	Eastern States 20%. Eastern States Farmers' Exchange, West Springfield, Mass.	North Haven: Eastern States Farmers' Exchange	1.01	22.13	21.12	20.00
7076	O & W. Olds & Whipple, Inc., Hartford, Conn.	East Hartford: Olds & Whipple, Inc.	0.80	22.10	21.30	20.00
7313[1]	O & W. Olds & Whipple, Inc., Hartford, Conn.	Cheshire: Connecticut Reformatory	0.81	22.46	21.65	20.00
7354[1]	O & W. Olds & Whipple, Inc., Hartford, Conn.	Mansfield: Mansfield State Training School	0.95	21.90	20.95	20.00
7049	Hubbard 20%. The Rogers & Hubbard Co., Portland, Conn.	Portland: The Rogers & Hubbard Co.	0.84	20.50	19.66	20.00
7398	Swift's Red Steer Brand 20%. Swift & Co. Fertilizer Works, Baltimore, Md.	Danbury: H. E. Meeker Co.	0.47	20.08	19.61	20.00
7043	Woodruff's Natural 18%. Woodruff Fertilizer Works, Inc., North Haven, Conn.	North Haven: Woodruff Fertilizer Works, Inc.	0.15	19.90	19.75	18.00

[1] State purchase.

TABLE 4. ANALYSES OF POTASH SALTS, ETC.

Station No.	Manufacturer or jobber	Sampled from stock of	Per cent potash	
			Found	Guaranteed
	Muriate of Potash			
7079	50%. The American Agricultural Chemical Co., North Weymouth, Mass.	West Haven: The American Agricultural Chemical Co.	50.42	50.00
7057	60%. Apothecaries Hall Co., Waterbury, Conn.	East Windsor: Apothecaries Hall Co.	61.26	60.00
7059	50%. Apothecaries Hall Co., Waterbury, Conn.	East Windsor: Apothecaries Hall Co.	50.74	50.00
7299	Eastern States. Eastern States Farmers' Exchange, West Springfield, Mass.	Norwich: Eastern States Farmers' Exchange	60.28	60.00
7074	60%. Olds & Whipple, Inc., Hartford, Conn.	East Hartford: Olds & Whipple, Inc.	60.94	60.00
7047	Hubbard. The Rogers & Hubbard Co., Portland, Conn.	Portland: The Rogers & Hubbard Co.	59.00	60.00
	Sulphate of Potash			
7061	Apothecaries Hall Co., Waterbury, Conn.	East Windsor: Apothecaries Hall Co.	48.44	48.00
7333	Double. Old Deerfield Fertilizer Co., Inc., South Deerfield, Mass.	Hazardville: L. B. Haas & Co.	21.86	22.00
7072	O & W. Olds & Whipple, Inc., Hartford, Conn.	East Hartford: Olds & Whipple, Inc.	49.04	48.00
	Cottonhull Ashes			
7065	Apothecaries Hall Co., Waterbury, Conn.	East Windsor: Apothecaries Hall Co.	38.62	35.40
7077	O & W. Olds & Whipple, Inc., Hartford, Conn.	East Windsor: Olds & Whipple, Inc.	31.74	30.00

TABLE 5. ANALYSES OF GROUND BONE

Station No.	Manufacturer and brand	Sampled from stock of	Per cent nitrogen		Per cent phosphoric acid		Mechanical analysis (in percentage)	
			Total found	Total guaranteed	Total found	Total guaranteed	Finer than 1/50 inch	Coarser than 1/50 inch
7193	The American Agricultural Chemical Co., North Weymouth, Mass.	West Haven: The American Agricultural Chemical Co.	2.90	2.47	24.12	23.00	53.5	46.5
7063	Apothecaries Hall Co., Waterbury, Conn.	East Windsor: Apothecaries Hall Co.	3.50	2.25	21.98	22.00	40.8	59.2
7294	Fine Ground. The Berkshire Chemical Co., Bridgeport, Conn.	Bridgeport: Berkshire Chemical Co.	2.79	2.05	26.70	25.00	53.0	47.0
7295	Pure Raw. The Berkshire Chemical Co., Bridgeport, Conn.	Bridgeport: Berkshire Chemical Co.	3.74	3.70	21.68	20.00	31.7	68.3
7042	Corenco. Consolidated Rendering Co., Boston, Mass.	West Haven: L. T. Frisbie Co.	3.34	2.47	23.02	23.00	57.6	42.4
7044	Eastern States Steamed. Eastern States Farmers' Exchange, West Springfield, Mass.	North Haven: Eastern States Farmers' Exchange	2.29	2.30	27.65	23.00	64.0	36.0
7395	Hoffman's. A. H. Hoffman, Inc., Landisville, Pa.	Middletown: Bacon Bros.	3.85	3.70	26.91	20.00	71.6	28.4
7073	O & W. Olds & Whipple, Inc., Hartford, Conn.	East Hartford: Olds & Whipple, Inc.	2.66	2.47	27.31	22.00	52.5	47.5
7051	Hubbard Strictly Pure. The Rogers & Hubbard Co., Portland, Conn.	Portland: The Rogers & Hubbard Co.	3.83	3.70	21.50	20.00	58.6	41.4
7054	Hubbard Fine Ground. The Rogers & Hubbard Co., Portland, Conn.	Portland: The Rogers & Hubbard Co.	2.31	2.47	28.66	23.00	58.8	41.2
7055	Hubbard Raw Knuckle Bone Flour. The Rogers & Hubbard Co., Portland, Conn.	Portland: The Rogers & Hubbard Co.	4.38	3.70	23.10	24.70	79.4	20.6
7350	Sawco. Stumpp & Walter Co., New York, N. Y.	Stamford: Stumpp & Walter Co.	2.29	2.47	25.81	24.00	64.6	35.4
7348	Swift & Co. Fertilizer Works, Baltimore, Md.	Greenwich: McArdle's Seed Store	2.86	2.47	25.30	23.00	61.0	39.0

TABLE 6. ANALYSES OF MIXED FERTILIZERS

			Per cent nitrogen					Per cent phosphoric acid			Per cent potash		
Station No.	Manufacturer and brand	Place of sampling	In nitrates	In ammonia	Organic water-soluble	Organic water-insoluble	Total	Citrate-insoluble	Total	So-called "available"	As muriate	Total	Station No.
	The Acme Guano Co., Baltimore, Md.												
7311	Acme Victory Garden 3–8–7	Middletown	1.43	0.62	0.62	0.36	3.03	0.81	9.99	9.18	7.32	7.32	**7311**
7332	Acme 3–12–6	Suffield	0.07	2.60	0.28	0.55	3.50	0.35	13.14	12.79	3.52	6.05	**7332**
7331	Acme 4–9–7	Suffield	0.00	3.92	0.13	0.27	4.32	0.50	9.69	9.19	6.14	7.69	**7331**
7310	Acme 4–10–10	Middletown	3.65	0.16	0.09	0.11	4.01	0.20	11.01	10.81	8.22	8.22	**7310**
7309	Acme 4–12–4	Middletown	1.78	0.90	0.78	0.25	3.71	0.78	13.16	12.38	2.72	4.07	**7309**
	The American Agricultural Chemical Co., North Weymouth, Mass.												
7187	AA Market Garden Fertilizer 4–12–4	West Haven	0.24	3.70	....	0.19	4.13	0.77	13.25	12.48	4.29	4.29	**7187**
7189	AA Potato and Root Crop Fertilizer 4–10–10	West Haven	0.49	3.44	0.24	0.11	4.28	1.09	11.56	10.47	10.08	10.08	**7189**
7188	AA Potato and Vegetable Fertilizer 4–9–7	West Haven	0.59	3.24	....	0.15	3.98	0.75	10.28	9.53	7.19	7.19	**7188**
7194	AA Sure Crop Fertilizer 3–12–6	West Haven	0.10	2.72	0.12	0.16	3.10	0.52	13.26	12.74	6.28	6.28	**7194**
7161	Agrico Alkaline 0–14–14	West Haven	....	....	....	....	....	1.06	15.06	14.00	13.09	14.09	**7161**
7210	Agrico for Commercial Growers 4–12–4	West Haven	0.00	2.68	0.14	1.34	4.16	0.91	13.55	12.64	4.11	4.11	**7210**
7184	Agrico for Corn 3–10–6	West Haven	0.48	0.68	0.88	1.07	3.11	1.09	11.86	10.77	0.66	6.14	**7184**
7159	Agrico for Corn 3–12–6	West Haven	0.37	2.24	0.24	0.22	3.07	1.45	13.40	11.95	5.93	5.93	**7159**
7304	Agrico for Lawns, Trees, and Shrubs 3–10–5	East Hartford	0.00	0.31	0.00	2.68	2.99	0.60	11.88	11.28	5.00	5.00	**7304**
7185	Agrico for New England 4–9–7	West Haven	0.64	3.08	0.02	0.12	3.86	0.76	10.00	9.24	7.05	7.05	**7185**
7186	Agrico for Potatoes and Vegetables 4–10–10	West Haven	0.10	3.54	0.26	0.13	4.03	1.44	11.41	9.97	10.40	10.40	**7186**
7190	Agrico for Seeding Down 4–16–20	West Haven	0.88	2.74	0.32	0.11	4.05	0.41	16.31	15.90	20.12	20.12	**7190**
7427	Agrico for Tobacco 6–3–6	East Hartford	0.61	1.22	0.62	3.43	5.88	0.36	3.90	3.54	0.72	6.05	**7427**
7183	Agrico for Truck 4–12–4	West Haven	0.51	3.40	0.04	0.21	4.16	0.69	12.92	12.23	4.08	4.08	**7183**
7160	Agrico Victory Garden Fertilizer "For Food Production Only" 3–8–7	West Haven	0.14	2.22	0.10	0.06	2.52	0.90	9.06	8.16	6.59	6.59	**7160**
7399	Agrico Victory Garden Fertilizer "For Food Production Only" 3–8–7	Danbury	1.00	1.84	0.16	0.04	3.04	0.71	9.45	8.74	7.08	7.08	**7399**
	Apothecaries Hall Co., Waterbury, Conn.												
7151	Liberty Fertilizer 0–14–14	East Windsor	....	....	....	....	....	0.31	14.34	14.03	14.36	14.36	**7151**
7128	Liberty Fertilizer 3–12–6	East Windsor	0.00	2.18	0.47	0.72	3.37	0.34	12.58	12.24	6.26	6.26	**7128**
7129	Liberty Fertilizer 4–9–7	East Windsor	0.68	2.84	0.18	0.58	4.28	0.20	9.70	9.50	7.38	7.38	**7129**
7150	Liberty Fertilizer 4–12–4	East Windsor	0.00	2.88	0.61	0.90	4.39	0.32	12.43	12.11	4.65	4.65	**7150**
7416	Liberty Tobacco Mixture 5–3–5	East Windsor	2.34	0.08	0.60	2.24	5.26	0.05	4.24	4.19	0.48	6.26	**7416**
7268	Liberty Tobacco Mixture 6–3–6	South Windsor	....	....	....	....	6.10	0.14	5.37	5.23	0.36	6.76	**7268**
7127	Liberty Victory Fertilizer 3–8–7	East Windsor	0.00	1.44	0.34	1.50	3.28	0.61	9.30	8.69	7.44	7.44	**7127**
	Armour Fertilizer Works, New York, N. Y.												
7200	Armour's Big Crop Fertilizer 3–12–6	East Windsor Hill	0.56	2.02	0.10	0.39	3.07	0.75	13.31	12.56	6.13	6.13	**7200**
7199	Armour's Big Crop Fertilizer 4–9–7	East Windsor Hill	0.29	2.88	0.26	0.41	3.84	0.65	9.65	9.00	7.72	7.72	**7199**
7198	Armour's Big Crop Fertilizer 4–10–10	East Windsor Hill	0.36	2.92	0.26	0.41	3.95	0.59	10.80	10.21	9.88	9.88	**7198**
7201	Armour's Big Crop Fertilizer 4–12–4	East Windsor Hill	1.03	2.14	0.30	0.42	3.89	0.60	12.94	12.34	4.16	4.16	**7201**
7422	Armour's Big Crop Tobacco Special 5–3–5	East Windsor Hill	1.20	0.26	1.42	2.16	5.04	0.11	3.81	3.70	0.72	4.86	**7422**
7423	Armour's Big Crop Tobacco Special 6–3–6	East Windsor Hill	0.91	0.20	1.76	2.87	5.74	0.15	3.70	3.55	0.88	6.82	**7423**
7202	Armour's Victory Garden Fertilizer 3–8–7	East Windsor Hill	0.00	2.52	0.53	0.35	3.40	0.67	9.44	8.77	7.65	7.65	**7202**

TABLE 6. ANALYSES OF MIXED FERTILIZERS—(*Continued*)

Station No.	Manufacturer and brand	Place of sampling	Per cent nitrogen					Per cent phosphoric acid			Per cent potash		Station No.
			In nitrates	In ammonia	Organic water-soluble	Organic water-insoluble	Total	Citrate-insoluble	Total	So-called "available"	As muriate	Total	
	Associated Seed Growers, Inc., New Haven, Conn.												
7095	Clark's Tip Top Brand Fertilizer 4–9–7	North Haven	0.41	2.60	0.40	0.61	4.02	0.34	9.34	9.00	6.78	6.78	7095
	The Baugh & Sons Co., Baltimore, Md.												
7111	Baugh's 3–10–10	Hamden	0.22	2.44	0.28	0.15	3.09	0.64	10.89	10.25	10.14	10.14	7111
7110	Baugh's 4–9–7	Hamden	0.52	3.20	0.14	0.16	4.02	0.53	9.82	9.29	7.40	7.40	7110
7107	Baugh's 4–10–10	Hamden	0.45	3.06	0.22	0.22	3.95	0.37	10.40	10.03	10.02	10.02	7107
7109	Baugh's Perfection Brand 3–12–6	Hamden	0.00	2.42	0.45	0.21	3.08	0.64	12.70	12.06	6.07	6.07	7109
7108	Baugh's Victory Garden for Food Production Fertilizer 3–8–7	Hamden	0.45	2.42	0.26	0.15	3.28	0.59	8.79	8.20	7.21	7.21	7108
	The Berkshire Chemical Co., Bridgeport, Conn.												
7291	Berkshire 0–14–14 Fertilizer	Bridgeport	....	....	....	....	....	0.68	15.70	15.02	11.50	14.03	7291
7292	Berkshire Victory Garden 3–8–7	Bridgeport	0.00	3.00	0.00	0.19	3.19	0.13	8.63	8.50	7.67	7.67	7292
7297	Berkshire 3–12–6 Fertilizer	Bridgeport	0.40	2.28	0.12	0.19	2.99	0.36	12.66	12.30	6.07	6.07	7297
7365[1]	Berkshire 3–12–6 Fertilizer	Southbury	0.58	2.28	0.12	0.20	3.18	0.40	12.70	12.30	5.99	5.99	7365
7293	Berkshire 4–9–7 Fertilizer	Bridgeport	0.47	3.06	0.10	0.21	3.84	0.43	9.99	9.56	7.02	7.02	7293
7364[1]	Berkshire 4–9–7 Fertilizer	Newtown	0.67	2.96	0.00	0.23	3.86	0.36	9.26	8.90	6.49	7.01	7364
7424[1]	Berkshire 4–10–10 Fertilizer	Somers	0.79	2.98	0.02	0.21	4.00	0.56	10.40	9.84	10.08	10.08	7424
7290	Berkshire 4–10–10 Fertilizer	Bridgeport	0.59	3.22	0.10	0.15	4.06	0.48	10.84	10.36	10.23	10.23	7290
7289	Berkshire 4–12–4 Fertilizer	Bridgeport	0.27	2.88	0.84	0.19	4.18	0.68	13.42	12.74	4.14	4.14	7289
7394	Berkshire 6–3–6 Fertilizer	Bridgeport	0.62	0.20	1.32	3.44	5.58	0.63	4.96	4.36	0.51	5.84	7394
	The Consolidated Rendering Co., Boston, Mass.												
7209	Corenco 3–8–7 Victory Garden Fertilizer	Bethel	0.86	0.90	0.54	0.70	3.00	0.45	8.86	8.41	7.00	7.00	7209
7336	Corenco 3–10–3 Landscape	New Haven	0.00	0.18	0.23	3.12	3.53	0.61	10.69	10.08	2.60	2.60	7336
7088	Corenco 3–12–6 Animal Brand	West Haven	0.96	1.64	0.42	0.12	3.14	0.15	12.47	12.32	6.01	6.01	7088
7081	Corenco 4–9–7 General Crop Manure	West Haven	1.02	2.68	0.44	0.02	4.16	0.35	9.70	9.35	7.07	7.07	7081
7082	Corenco 4–10–10 Potato Grower	West Haven	1.04	2.56	0.44	0.04	4.08	0.44	10.68	10.24	9.54	9.54	7082
7089	Corenco 4–12–4 Complete Manure	West Haven	0.96	2.68	0.38	0.10	4.12	0.40	12.47	12.07	4.45	4.45	7089
7372	Corenco 6–3–6 Special Tobacco Grower	West Suffield	0.55	0.24	2.22	2.83	5.84	0.49	4.91	4.42	0.56	6.05	7372
	Eastern States Farmers' Exchange West Springfield, Mass.												
7206	Eastern States Fertilizer 0–14–14	Bethel	....	....	....	....	....	0.21	15.86	15.65	14.57	14.57	7206
7097	Eastern States 3–8–7	North Haven	0.29	2.52	0.16	0.19	3.16	0.50	8.96	8.46	7.88	7.88	7097
7205	Eastern States Fertilizer 3–12–6	Bethel	0.49	2.08	0.26	0.22	3.05	0.74	12.94	12.20	6.48	6.48	7205
7208	Eastern States 4–10–10	Bethel	1.43	2.30	0.14	0.16	4.03	0.16	10.99	10.83	10.57	10.57	7208
7207	Eastern States 6–15–15	Bethel	0.67	5.00	0.18	0.12	5.97	0.35	16.09	15.74	15.59	15.59	7207

[1] State purchase.

TABLE 6. ANALYSES OF MIXED FERTILIZERS—(*Continued*)

Station No.	Manufacturer and brand	Place of sampling	Per cent nitrogen: In nitrates	Per cent nitrogen: In ammonia	Per cent nitrogen: Organic water-soluble	Per cent nitrogen: Organic water-insoluble	Per cent nitrogen: Total	Per cent phosphoric acid: Citrate-insoluble	Per cent phosphoric acid: Total	Per cent phosphoric acid: So-called "available"	Per cent potash: As muriate	Per cent potash: Total	Station No.
	Goulard & Olena, Inc., New York, N. Y.												
7337	G & O Lawn and Garden Fertilizer 4–12–4	New Haven	0.23	0.32	0.48	2.78	3.81	1.15	13.05	11.90	5.50	5.50	7337
	Mechling Products Division, General Chemical Co., Camden, N. J.												
7308	Veget-Aid 5–10–5	Willimantic	0.00	3.72	0.56	0.97	5.25	1.27	12.78	11.51	5.85	5.85	7308
	Old Deerfield Fertilizer Co., Inc., South Deerfield, Mass.												
7373	Old Deerfield 4–9–7	West Suffield	0.58	2.16	0.62	0.78	4.14	0.45	9.56	9.11	7.15	7.15	7373
7426	Old Deerfield 6–3–6	Somers	1.09	0.34	1.30	3.29	6.02	0.50	4.95	4.45	0.78	6.69	7426
	Olds & Whipple, Inc., Hartford, Conn.												
7158	O & W 0–14–14 Fertilizer	East Hartford	....	....	....	....	....	0.45	14.45	14.00	14.87	14.87	7158
7306	O & W 0–20–20 Fertilizer	East Hartford	....	....	....	....	....	0.41	21.71	21.30	21.21	21.21	7306
7315[1]	O & W 0–20–20 Fertilizer	Cheshire	....	....	....	....	....	0.43	21.67	21.24	20.82	20.82	7315
7353[1]	O & W 0–20–20 Fertilizer	Mansfield	....	....	....	....	....	0.46	20.46	20.00	22.12	22.12	7353
7152	O & W 3–8–7 Victory Garden Fertilizer	East Hartford	0.00	2.24	0.31	0.69	3.24	0.58	9.16	8.58	7.37	7.37	7152
7153	O & W 3–12–6 Corn Fertilizer	East Hartford	0.00	2.40	0.22	0.68	3.30	0.47	12.22	11.75	6.31	7.02	7153
7156	O & W 4–9–7 General Purpose Fertilizer	East Hartford	0.03	2.52	0.52	0.67	3.74	1.00	10.20	9.20	8.08	8.08	7156
7314[1]	O & W 4–9–7 General Purpose Fertilizer	Cheshire	0.00	2.96	0.41	0.66	4.03	0.70	10.23	9.53	7.71	7.71	7314
7154	O & W 4–9–7 General Purpose Fertilizer with Sulphate of Potash	East Hartford	0.00	3.08	0.47	0.70	4.25	0.78	10.14	9.36	2.99	8.60	7154
7155	O & W 4–10–10 Potato Fertilizer	East Hartford	0.30	3.32	0.08	0.61	4.31	0.36	10.39	10.03	10.84	10.84	7155
7312[1]	O & W 4–10–10 Potato Fertilizer	Cheshire	0.61	2.20	0.44	0.61	3.86	0.59	10.67	10.08	10.82	11.90	7312
7345[1]	O & W 4–10–10 Potato Fertilizer	Middletown	0.43	3.04	0.06	0.63	4.16	0.42	10.19	9.77	11.47	11.47	7345
7305	O & W 4–10–10 Potato Fertilizer with Sulphate of Potash	East Hartford	0.67	1.72	0.82	0.71	3.92	0.66	11.49	10.83	1.50	10.17	7305
7157	O & W 4–12–4 Market Garden Fertilizer	East Hartford	0.00	3.32	0.31	0.58	4.21	0.31	12.70	12.39	4.65	4.65	7157
7371	O & W 5–3–5 Complete Tobacco Fertilizer	East Hartford	0.57	0.12	1.26	3.13	5.08	0.31	4.09	3.78	0.60	5.54	7371
7370	O & W Complete Tobacco Fertilizer 5–3–5 (Potash Derived From Cotton Hull Ashes.)	East Hartford	0.72	0.36	0.96	2.96	5.00	0.28	4.24	3.96	0.53	5.77	7370
7369	O & W Blue Label 6–3–6 Tobacco Fertilizer	East Hartford	1.14	0.16	1.30	3.43	6.03	0.22	3.80	3.58	0.74	6.69	7369
7368	O & W 6–3–6 Blue Label Tobacco Fertilizer (Potash Derived From Cotton Hull Ashes)	East Hartford	1.39	0.18	1.40	3.21	6.18	0.22	4.54	4.32	0.51	7.05	7368
7352[1]	O & W 6–15–15 Fertilizer	Mansfield	0.17	2.54	3.26	0.07	6.04	0.40	16.41	16.01	14.46	14.46	7352
	The Rogers & Hubbard Co., Portland, Conn.												
7123	Gro-Fast Plant Food 4–8–4	Portland	0.09	0.12	0.40	3.75	4.36	0.17	8.50	8.33	5.27	5.27	7123
7117	Hubbard All Soils Fertilizer 4–12–4	Portland	0.00	2.64	0.52	1.13	4.29	0.41	12.91	12.50	4.63	4.63	7117
7119	Hubbard Corn and Grain Fertilizer 3–12–6	Portland	0.66	1.66	0.40	0.74	3.46	0.42	12.56	12.14	6.51	6.51	7119
7116	Hubbard High Potash Fertilizer 4–10–10	Portland	0.54	1.92	0.58	1.04	4.08	1.05	11.03	9.98	10.56	10.56	7116

[1] State purchase.

TABLE 6. ANALYSES OF MIXED FERTILIZERS—(*Concluded*)

Station No.	Manufacturer and brand	Place of sampling	Per cent nitrogen					Per cent phosphoric acid			Per cent potash		Station No.
			In nitrates	In ammonia	Organic water-soluble	Organic water-insoluble	Total	Citrate-insoluble	Total	So-called "available"	As muriate	Total	
7114	Hubbard Potato Fertilizer 4–9–7	Portland	0.61	1.96	0.56	1.13	4.26	0.90	10.05	9.15	7.60	7.60	7114
7124	Hubbard Tobacco Grower 6–3–6	Portland	0.61	0.18	1.18	3.98	5.95	0.18	4.36	4.18	0.72	7.09	7124
7118	Red H Brand 3–12–6	Portland	0.27	1.90	0.82	0.45	3.44	0.38	12.52	12.14	6.67	6.67	7118
7366[1]	Red H Brand 3–12–6	Niantic	0.61	2.42	0.08	0.48	3.59	0.43	12.85	12.42	5.81	5.81	7366
7121	Red H Brand 4–9–7	Portland	0.40	2.76	0.58	0.50	4.24	0.11	9.36	9.25	7.40	7.40	7121
7344[1]	Red H Brand 4–9–7	Middletown	1.67	2.20	0.26	0.43	4.56	0.11	9.51	9.40	7.50	7.50	7344
7120	Red H Brand 4–10–10	Portland	0.72	2.70	0.30	0.51	4.23	0.31	10.79	10.48	10.02	10.02	7120
7425[1]	Red H Brand 4–10–10	Somers	0.77	3.06	0.08	0.54	4.45	0.11	10.42	10.31	10.32	10.32	7425
7122	Red H Brand 4–12–4	Portland	0.67	2.56	0.50	0.60	4.33	0.34	12.65	12.31	4.33	4.92	7122
7115	Victory Garden Fertilizer 3–8–7	Portland	0.00	1.60	0.58	1.14	3.32	0.16	8.77	8.61	6.75	6.75	7115
	O. M. Scott & Sons, Marysville, Ohio												
7126	Scott's Turf Builder 6–8–4	Yalesville	0.00	0.02	0.47	5.25	5.74	0.60	8.60	8.00	1.29	3.66	7126
7125	Scott's Victory Garden Fertilizer 3–8–7	Yalesville	0.11	1.50	0.20	1.58	3.39	0.24	8.24	8.00	7.43	7.43	7125
	Stumpp & Walter Co., New York, N. Y.												
7400	Sawco Emerald Grass Fertilizer 3–10–2	Stamford	0.00	0.24	0.51	2.03	2.76	0.79	11.94	11.15	2.35	2.35	7400
7349	Victory Garden Fertilizer 3–8–7	Stamford	0.24	2.06	0.30	0.90	3.50	0.78	9.71	8.93	9.94	9.94	7349
	Swift & Co. Fertilizer Works, Baltimore, Md.												
7335	Vigoro 3–8–7	New Haven	0.11	2.60	0.00	0.29	3.00	0.40	8.83	8.43	7.35	7.35	7335
7417	Vigoro 3–12–6	Rowayton	0.28	2.80	0.04	0.18	3.30	0.31	12.31	12.00	6.10	6.10	7417
7418	Vigoro 4–12–4	Rowayton	0.25	3.44	0.08	0.26	4.03	0.30	12.45	12.15	4.32	4.32	7418
	Tennessee Corp., Lockland, Ohio												
7421	Victory Garden Fertilizer 3–8–7	South Norwalk	0.00	2.40	0.32	0.26	2.98	0.19	8.86	8.67	6.81	6.81	7421
	I. P. Thomas & Son Co , Camden, N. J.												
7099	I.P.Thomas 4–9–7	North Haven	0.23	3.14	0.46	0.36	4.19	0.80	10.06	9.26	7.34	7.34	7099
7098	Soil-Rich Victory Garden Fertilizer 3–8–7 (For Food Production Only)	North Haven	0.21	1.18	0.54	1.31	3.24	0.70	8.79	8.09	7.02	7.02	7098
7106	Tip Top Fertilizer 3–12–6	North Haven	0.25	2.68	0.32	0.36	3.61	0.86	11.99	11.13	6.76	6.76	7106
	Woodruff Fertilizer Works, Inc. North Haven Conn.												
7343	Woodruff's 3–12–6 Fertilizer	North Haven	0.00	2.08	0.22	0.54	2.84	0.29	12.05	11.76	6.03	6.03	7343
7091	Woodruff's 4–9–7 Fertilizer	North Haven	0.32	2.72	0.44	0.58	4.06	0.36	9.55	9.19	6.32	6.32	7091
7096	Woodruff's 4–10–10 Fertilizer	North Haven	0.00	2.94	0.38	0.68	4.00	0.51	10.18	9.67	0.93	10.64	7096
7094	Woodruff's 4–12–4 Fertilizer	North Haven	0.00	3.06	0.42	0.67	4.15	0.36	12.41	12.05	4.02	4.02	7094
7093	Woodruff's 6–15–15 Fertilizer	North Haven	0.17	1.56	4.20	0.16	6.09	0.24	14.90	14.66	15.09	15.09	7093
7092	Woodruff's Victory Garden Fertilizer 3–8–7	North Haven	0.21	0.00	2.60	0.14	2.95	0.20	8.22	8.02	7.41	7.41	7092

[1] State purchase.

TABLE 7. ANALYSES OF SPECIAL AND HOME MIXTURES

Station No.	Name of mixture	Sampled or submitted by	Total nitrogen percentage	Per cent phosphoric acid			Per cent potash		Chlorine	Station No.
				Citrate-insoluble	Total	So-called "available"	As muriate	Total		
5180	Formula A, Block 7, 1943	Bloomfield: American Sumatra Tobacco Co.	5.79	0.33	4.06	3.73	....	6.59	....	5180
6595	1943 Formula B, Hu	Hartford: Consolidated Cigar Corp.	5.61	0.44	4.65	4.21	0.16	7.82	0.12	6595
6594	1943 Formula A, Hu	Hartford: Consolidated Cigar Corp.	5.14	0.46	4.73	4.27	0.31	10.74	0.23	6594
6596	1943 Formula A, Dee	Hartford: Consolidated Cigar Corp.	5.03	0.36	4.45	4.09	0.32	10.40	0.24	6596
6597	1943 Formula B, Dee	Hartford: Consolidated Cigar Corp.	5.50	0.34	4.43	4.09	0.28	8.14	0.21	6597
6697	1943 Formula B, M	Hartford: Consolidated Cigar Corp.	5.60	0.10	2.19	2.09	0.55	9.43	0.42	6697
6835	1943 Formula B, P	Hartford: Consolidated Cigar Corp.	5.48	0.21	4.65	4.44	....	8.35	0.14	6835
6836	1943 Formula A, P	Hartford: Consolidated Cigar Corp.	5.11	0.30	4.29	3.99	....	10.04	0.21	6836
6848	1943 Formula B, M	Hartford: Consolidated Cigar Corp.	4.97	0.26	3.82	3.56	....	9.02	0.53	6848
6638	Lot 4–2–43	Simsbury: Cullman Bros. Inc.	5.97	0.19	4.23	4.04	0.40	6.02	0.30	6638
6639	Lot 4–2–43–X	Simsbury: Cullman Bros. Inc.	5.68	0.41	5.25	4.84	0.36	5.81	0.27	6639
6824	Formula 5–2–43	Simsbury: Cullman Bros. Inc.	5.06	0.51	3.99	3.48	0.29	4.10	0.22	6824
6825	Formula 5–1–43	Simsbury: Cullman Bros. Inc.	5.04	0.42	3.76	3.34	0.57	5.18	0.43	6825
6826	Formula 4–8–43	Simsbury: Cullman Bros. Inc.	4.08	0.63	4.33	3.70	0.64	7.06	0.48	6826
6827	Formula 4–7–43	Simsbury: Cullman Bros. Inc.	5.62	0.52	4.52	4.00	0.44	6.25	0.33	6827
6828	Formula 4–3–43	Simsbury: Cullman Bros. Inc.	5.48	0.40	4.92	4.52	0.45	6.25	0.34	6828
6829	Formula 4–4–43	Simsbury: Cullman Bros. Inc.	5.60	0.41	4.46	4.05	0.53	6.59	0.40	6829
6830	Formula 4–5–43	Simsbury: Cullman Bros. Inc.	5.78	0.40	4.28	3.88	0.47	6.66	0.35	6830
6831	Formula 4–6–43	Simsbury: Cullman Bros. Inc.	5.47	0.47	4.81	4.34	0.45	5.81	0.34	6831
6850	Formula 5–5–43	Simsbury: Cullman Bros. Inc.	4.39	0.44	3.77	3.33	....	6.05	0.44	6850
6851	Formula 5–6–43	Simsbury: Cullman Bros. Inc.	4.53	0.39	3.56	3.17	....	5.01	0.30	6851
6852	Formula 5–7–43	Simsbury: Cullman Bros. Inc.	4.67	0.41	3.65	3.24	....	5.16	0.36	6852
6853	Formula 5–8–43	Simsbury: Cullman Bros. Inc.	4.53	0.55	4.31	3.76	....	5.25	0.36	6853
6854	Formula 5–3–43	Simsbury: Cullman Bros. Inc.	4.66	0.37	3.68	3.31	....	4.91	0.34	6854
6855	Formula 5–4–43	Simsbury: Cullman Bros. Inc.	4.71	0.35	3.68	3.33	....	5.70	0.39	6855
6856	Formula 3–S–3–43	Simsbury: Cullman Bros. Inc.	5.00	0.41	3.77	3.36	....	5.95	0.38	6856
6857	Formula 3–C–13–43	Simsbury: Cullman Bros. Inc.	4.44	0.20	4.59	4.39	....	5.15	0.31	6857
6858	Formula 3 S–1–2–43	Simsbury: Cullman Bros. Inc.	5.08	0.45	3.79	3.34	....	4.65	0.39	6858
6866	Formula 3–B–43	Simsbury: Cullman Bros. Inc.	4.97	0.20	4.75	4.55	....	4.57	0.24	6866
6867	Formula 3–H–1–43	Simsbury: Cullman Bros. Inc.	5.12	0.15	5.05	4.90	....	4.14	0.31	6867
6868	Formula 3–H–2–43	Simsbury: Cullman Bros. Inc.	5.13	0.50	4.55	4.05	....	5.45	0.35	6868
6874	Formula 3–Z–43	Simsbury: Cullman Bros. Inc.	4.72	0.23	6.00	5.77	0.51	4.30	0.38	6874
6875	Formula 3–11–43	Simsbury: Cullman Bros. Inc.	5.25	0.16	5.10	4.94	0.40	4.86	0.30	6875
6876	Formula 3–H–3–43	Simsbury: Cullman Bros. Inc.	4.13	0.51	4.14	3.63	0.39	4.50	0.29	6876
6900	Formula 2–H–1A–43	Simsbury: Cullman Bros. Inc.	4.52	0.15	6.31	6.16	0.39	4.16	0.29	6900
6901	Formula 2–K–1–43	Simsbury: Cullman Bros. Inc.	5.14	0.17	5.02	4.85	0.41	4.82	0.31	6901
6902	Formula 2–K–2–43	Simsbury: Cullman Bros. Inc.	5.35	0.15	4.98	4.83	0.45	5.13	0.34	6902
6903	Formula 2–K–5–43	Simsbury: Cullman Bros. Inc.	5.16	0.20	4.71	4.51	0.40	5.12	0.30	6903
6904	Formula 2–H–3–43	Simsbury: Cullman Bros. Inc.	3.98	0.80	8.36	7.56	0.52	4.62	0.39	6904
6921	Formula 2–N–2–43	Simsbury: Cullman Bros. Inc.	4.74	0.30	4.95	4.65	0.61	4.89	0.44	6921
6922	Formula 2–H–2–43	Simsbury: Cullman Bros. Inc.	4.59	0.20	5.56	5.36	0.44	4.84	0.33	6922
6923	Formula 2–L&B–43	Simsbury: Cullman Bros. Inc.	4.40	0.21	5.64	5.43	0.52	4.82	0.39	6923
6924	Formula 2–H–1–43	Simsbury: Cullman Bros. Inc.	4.68	0.22	4.50	4.28	0.47	6.05	0.35	6924
6925	Formula 2–N–3–43	Simsbury: Cullman Bros. Inc.	4.66	0.24	6.25	6.01	0.47	4.79	0.35	6925
6992	Formula 1–A–5–43	Simsbury: Cullman Bros. Inc.	4.84	0.21	4.80	4.59	0.60	5.99	0.45	6992
6993	Formula 1–A–6–43	Simsbury: Cullman Bros. Inc.	4.96	0.19	4.86	4.67	0.56	5.23	0.42	6993
6994	Formula 1–M–L–3–P–43	Simsbury: Cullman Bros. Inc.	2.58	0.05	1.33	1.28	0.37	3.86	0.28	6994
6995	Formula 1–A–7–43	Simsbury: Cullman Bros. Inc.	4.92	0.11	4.90	4.79	0.37	5.17	0.28	6995
6996	Formula 1–A–8–43	Simsbury: Cullman Bros. Inc.	4.84	0.48	3.75	3.27	0.37	5.34	0.28	6996
6997	Formula 2–K–6–P–43	Simsbury: Cullman Bros. Inc.	2.63	2.52	7.69	5.17	0.05	0.76	0.04	6997
6998	Formula 2–L–2–P–43	Simsbury: Cullman Bros. Inc.	3.18	0.06	1.43	1.37	0.05	1.12	0.04	6998
6999	Formula 2–L–1–P–43	Simsbury: Cullman Bros. Inc.	2.45	0.03	0.91	0.88	0.01	0.72	0.01	6999
7000	Formula 2–S–P–43	Simsbury: Cullman Bros. Inc.	2.09	0.58	1.40	0.82	0.04	0.59	0.03	7000
7001	Formula 1–Sko–P–43	Simsbury: Cullman Bros. Inc.	2.70	0.04	1.67	1.63	0.68	6.68	0.51	7001
7002	Formula 1–Sch–P–43	Simsbury: Cullman Bros. Inc.	1.96	0.08	0.68	0.60	0.04	0.54	0.03	7002
7003	Formula 1–McC–P–P–43	Simsbury: Cullman Bros. Inc.	2.47	0.72	0.76	0.04	0.05	0.92	0.04	7003
7004	Formula 1–McC–2–P–43	Simsbury: Cullman Bros. Inc.	3.00	0.06	1.14	1.08	0.21	2.18	0.16	7004
7005	Formula 1–M–4–P–43	Simsbury: Cullman Bros. Inc.	2.00	0.10	1.16	1.06	0.73	7.48	0.55	7005

TABLE 7. ANALYSES OF SPECIAL AND HOME MIXTURES—(*Concluded*)

Station No.	Name of mixture	Sampled or submitted by	Total nitrogen percentage	Per cent phosphoric acid			Per cent potash			Station No.
				Citrate-insoluble	Total	So-called "available"	As muriate	Total	Chlorine	
7006	Formula 1–McC–1–P-43	Simsbury: Cullman Bros. Inc.	2.17	0.10	0.70	0.60	0.09	0.78	0.07	7006
7013	Formula 1–A-1–43	Simsbury: Cullman Bros. Inc.	4.91	0.27	4.94	4.67	0.41	5.26	0.31	7013
7014	Formula 1–A–2–43	Simsbury: Cullman Bros. Inc.	4.96	0.33	4.72	4.39	0.45	5.93	0.34	7014
7015	Formula 1–A–3–43	Simsbury: Cullman Bros. Inc.	4.61	0.27	6.04	5.77	0.41	4.98	0.31	7015
7016	Formula 1–A–4-43	Simsbury: Cullman Bros. Inc.	5.09	0.78	4.97	4.19	0.40	5.91	0.30	7016
7032	Formula 1–B–1–43	Simsbury: Cullman Bros. Inc.	4.00	0.15	6.11	5.96	0.56	6.29	0.42	7032
7033	Formula 1–B–3–43	Simsbury: Cullman Bros. Inc.	4.36	0.19	6.15	5.96	0.57	5.09	0.43	7033
7034	Formula 1–StJ–1–43	Simsbury: Cullman Bros. Inc.	4.50	0.20	6.10	5.90	0.39	5.07	0.29	7034
7141	Formula 1–McCull–1–43	Simsbury: Cullman Bros. Inc.	4.46	0.21	4.82	4.61	0.62	6.04	0.47	7141
7142	Formula 1–B–4–43	Simsbury: Cullman Bros. Inc.	4.37	0.27	6.75	6.48	0.51	5.64	0.38	7142
7143	Formula 1–S–H–43	Simsbury: Cullman Bros. Inc.	4.56	0.23	5.80	5.57	0.62	6.34	0.47	7143
7144	Formula 1–M–2–43	Simsbury: Cullman Bros. Inc.	4.60	0.23	5.40	5.17	0.56	5.12	0.42	7144
7018	Home Mixture	Hartford: L. B. Haas & Co.	4.11	0.77	5.30	4.53	0.77	10.61	0.58	7018
6699	Home Mixture	Hartford: B. Rapaport & Sons	5.74	0.35	4.86	4.51	0.40	5.13	0.30	6699
5419	Tobacco Mixture-W.C.	Windsor: Dr. T. R. Swanback	5.25	0.14	3.88	3.74	....	7.66	0.38	5419

TABLE 8. ANALYSES OF SHEEP MANURE, ETC.

Station No.	Name of mixture	Sampled or submitted by	Per cent nitrogen		Per cent total phosphoric acid		Per cent potash		Station No.
			Found	Guaranteed	Found	Guaranteed	Found	Guaranteed	
7192	Pulverized Sheep and Goat Manure. The American Agricultural Chemical Co., North Weymouth, Mass.	West Haven: The American Agricultural Chemical Co.	1.24	1.25	1.26	1.00	2.41	2.00	7192
7066	Sheep Manure. Apothecaries Hall Co., Waterbury, Conn.	East Windsor: Apothecaries Hall Co.	1.37	1.00	1.42	0.50	2.91	1.00	7066
7307	Driconure. Atkins & Durbrow, Inc., New York, N. Y.	Willimantic: The Jordan Hardware Co.	2.53	2.00	3.81	....[1]	2.00	1.00	7307
7296	Sheep Manure. The Berkshire Chemical Co., Bridgeport, Conn.	Bridgeport: The Berkshire Chemical Co.	1.88	1.50	1.87	1.00	3.56	2.00	7296
7090	Corenco Sheep Manure. Consolidated Rendering Co., Boston, Mass.	West Haven: L. T. Frisbie Co.	2.00	1.25	1.96	1.00	3.84	2.00	7090
7396	Hoffman's Cow Manure. A. H. Hoffman, Inc., Landisville, Pa.	Middletown: Bacon Bros.	2.02	2.00	2.59	....[2]	2.33	2.00	7396
7397	Hoffman's Sheep Manure. A. H. Hoffman, Inc., Landisville, Pa.	Middletown: Bacon Bros.	2.17	1.85	1.91	....[3]	2.97	2.00	7397
7204	Wizard Brand Pulverized Sheep Manure. The Pulverized Manure Co., Chicago, Ill.	Danbury: H. E. Meeker Co.	2.41	2.00	1.96	....[4]	2.51	2.00	7204
7113	Hubbard Cow Manure. The Rogers & Hubbard Co., Portland, Conn.	Portland: The Rogers & Hubbard Co.	2.06	2.00	1.97	2.00	2.28	2.00	7113
7112	Hubbard Domestic Sheep Manure. The Rogers & Hubbard Co., Portland, Conn.	Portland: The Rogers & Hubbard Co.	1.87	1.50	1.41	1.00	3.24	1.50	7112
7419	Sawconure 2–1–1. Stumpp & Walter Co., New York, N. Y.	Stamford: Stumpp & Walter Co.	3.44	2.00	3.16	....[5]	1.61	1.00	7419

[1] Guaranteed "available" phosphoric acid, 1.00 per cent; found, 3.51 per cent.
[2] Guaranteed "available" phosphoric acid, 2.00 per cent; found, 2.34 per cent.
[3] Guaranteed "available" phosphoric acid, 1.00 per cent; found, 1.70 per cent.
[4] Guaranteed "available" phosphoric acid, 1.00 per cent; found, 1.72 per cent.
[5] Guaranteed "available" phosphoric acid, 1.00 per cent; found, 2.92 per cent.

TABLE 8. ANALYSES OF SHEEP MANURE, ETC.—(*Concluded*)

Station No.	Name of mixture	Sampled or submitted by	Per cent nitrogen		Per cent total phosphoric acid		Per cent potash		Station No.
			Found	Guaranteed	Found	Guaranteed	Found	Guaranteed	
7420	Sawco Pulverized Sheep Manure. Stumpp & Walter Co., New York, N. Y.	Stamford: Stumpp & Walter Co.	1.88	2.00	1.84	1.00	3.76	2.00	7420
7367	Swift's Pulverized Sheep Manure. Swift & Co. Fertilizer Works, Baltimore, Md.	New London: Aben Hardware Co.	2.16	2.00	1.75	....[1]	3.05	2.00	7367
7203	Bovung (Dehydrated Cow Manure). Walker-Gordon Laboratory Co., Inc., Plainsboro, N. J.	Danbury: H. E. Meeker Co.	1.81	2.00	2.96	2.00	1.88	2.00	7203

[1] Guaranteed "available" phosphoric acid, 1.00 per cent; found, 1.49 per cent.

TABLE 9. ANALYSES OF LIMESTONE AND SIMILAR MATERIALS

Station No.	Manufacturer and brand	Samples from stock of, or sent by	Chemical analysis: Per cent lime		Chemical analysis: Per cent magnesia		Total oxides, per cent	Mechanical analysis (in percentage)		Station No.
			Found	Guaranteed	Found	Guaranteed		20 mesh	100 mesh	
	The Connecticut Agstone Co., Danbury, Conn.									
6104	Ground limestone	Hartford: Agricultural Conservation Program	44.81	....	3.94	....	48.75	92.5	54.5	6104
7085	Standard ground limestone	Hartford: Agricultural Conservation Program	39.15	....	6.41	....	45.56	94.8	62.4	7085
6072	Ground limestone	Danbury: The Connecticut Agstone Co	42.10	....	3.84	....	45.94	....	....	6072
	Lee Lime Co., Lee, Mass.									
6522	Lee lime	Simsbury: Cullman Bros., Inc.	47.12	46.00	33.51	31.00	80.63	....	....	6522
	United States Gypsum Co., Falls Village, Conn.									
6336	Ground limestone	Falls Village: U.S. Gypsum Co.	29.58	....	20.26	....	49.84	100.0	39.7	6336
7391	Ground limestone	Hartford: Agricultural Conservation Program	30.43	....	20.36	....	50.79	100.0	....	7391
7392	Ground limestone	Hartford: Agricultural Conservation Program	30.16	....	20.77	....	50.93	99.8	....	7392
	Manufacturer Unknown									
6705	Ground limestone	Hartford: Agricultural Conservation Program	40.01	....	5.90	....	45.91	94.5	63.7	6705
6348	Land Plaster-Car N. H. 70871	Simsbury: Cullman Bros. Inc.	34.10	....	0.13	....	34.23	....	....	6348
6349	Land Plaster-Car Can. Pac. 227490.	Simsbury: Cullman Bros. Inc.	33.54	....	0.16	....	33.70	....	....	6349
6642	Agricultural hydrated lime	Simsbury: Cullman Bros. Inc.	71.55	....	1.29	....	72.84	....	....	6642
7019	Lime	East Hampton: Hyman Gutterman	26.11	....	18.00	....	44.11	....	....	7019

TABLE 10. ANALYSES OF MISCELLANEOUS MATERIALS

Station No.	Material	Per cent moisture	Per cent ash	Per cent organic and volatile	Per cent nitrogen	Per cent phosphoric acid (P_2O_5)	Per cent potash (K_2O)	Remarks
6841	Tobacco waste.....	air-dry	....	....	3.76	0.69	4.58	Nicotine 1.20%
6840	Tobacco stems.....	air-dry	....	....	2.63	0.55	6.41	
6791	Tobacco stems.....	air-dry	....	....	1.36	0.65	5.78	
7027	Garden soil........	air-dry	....	....	....	....	....	Contained 130 p.p.m. lead arsenate—39 lbs. per 1 in. acre (450 lbs. per 1 in. acre not regarded as dangerous for growing vegetables).
7029	Garden soil........	air-dry	....	....	....	....	....	Contained 82 p.p.m. lead arsenate—25 lbs. per 1 in. acre.
7145	Incinerator ashes...	air-dry	....	....	....	2.31	4.67	
7146	Humin............	42.40	10.13	47.47	3.47	0.42	trace	Said to be a by-product of vegetable protein hydrolysis in the manufacture of a food condiment or seasoning. Salt, 8.03 %. Active insoluble organic nitrogen, alkaline method 35%, neutral method 72%.
7147	Humin............	40.80	9.52	49.68	3.55	0.36	trace	Same as above. Salt 7.76%. Active insoluble organic nitrogen, alkaline, 31%, neutral 72%.
6899	Food by-product...	33.60	16.12	50.28	4.04	0.66	0.05	Salt 12.38%. Probably same as above.
6878	Food by-product...	air-dry	....	....	6.26	0.60	....	Salt 11.58%. Probably same as above.
7264	Starfish...........	air-dry	....	....	5.00	....	....	See Conn. Agr. Expt. Sta. Bul. **417**, 1938, for complete analysis.
7362	Charred bone......	air-dry	....	....	1.03	36.91	....	Bone used in heat treatment in manufacturing process.
7437	Spent magnesium flux	air-dry	....	....	....	....	20.14	Calcium oxide 7.54%, magnesium oxide 5.29%, barium oxide 3.60%. Potash is equivalent to 32.2% muriate of potash.
4977	Gypsum..........	air-dry	....	....	....	....	....	Calcium oxide 33.07%, magnesium oxide 0.28%.
4972	Magnesium sulphate	air-dry	....	....	....	....	....	Calcium oxide 4.00%, magnesium oxide 22.52%.

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Bulletin 477 **January, 1944**

REPORT OF THE DIRECTOR

For the Year Ending October 31, 1943

Connecticut
Agricultural Experiment Station
New Haven

OFFICERS AND STAFF

(As of October 31, 1943)

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M. P. Zappe, B.S., *Deputy State Entomologist*
Philip Garman, Ph.D.
B. H. Walden, B.Agr.
Neely Turner, M.A.
J. P. Johnson, B.S. } *Entomologists*
R. L. Beard, Ph.D.
D. E. Greenwood, Ph.D.
J. C. Schread, M.S.
J. T. Ashworth, *Deputy in Charge of Gypsy Moth Control*

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Alphonzo DeCaprio, B.S.[2]
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B. W. McFarland } *Technicians*
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J. F. Townsend, B.S.
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Frances Gillespie, B.S., *Laboratory Helper*
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H. W. Hicock, M.F., *Forester*
A. R. Olson, *Technician*
J. E. Riley, M.F., *In Charge of Blister Rust Control*[3]
A. V. Miller, *Technician*
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Jeanette Lowe, B.A., *Cytologist*
L. M. Roberts, Ph.D.[2]
O. E. Nelson, Jr., M.S. } *Technicians*
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Jeanne E. Emerson, *Secretary*

Plant Pathology and Botany

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E. M. Stoddard, B.S.
G. A. Zentmyer, Ph.D. } *Plant Pathologists*
G. A. Gries, Ph.D.
A. D. McDonnell, *Technician*
Frances J. Barney, M.S., *Seed Tester*
Florence MacWilliam, *Laboratory Helper*
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Soils

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H. A. Lunt, Ph.D. } *Agronomists*
H. G. M. Jacobson, M.S.
D. B. Downs } *Technicians*
Evelyn Smith, B.S.
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Tobacco Substation

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T. R. Swanback, M.S., *Agronomist*
S. B. LeCompte, Jr., Ph.D., *Plant Physiologist*
C. E. Swanson, *Technician*
Jack Yavener, *Technician*
Dorothy Lenard, *Secretary*

[1] On leave [2] On military leave [3] In cooperation with the U.S.D.A.

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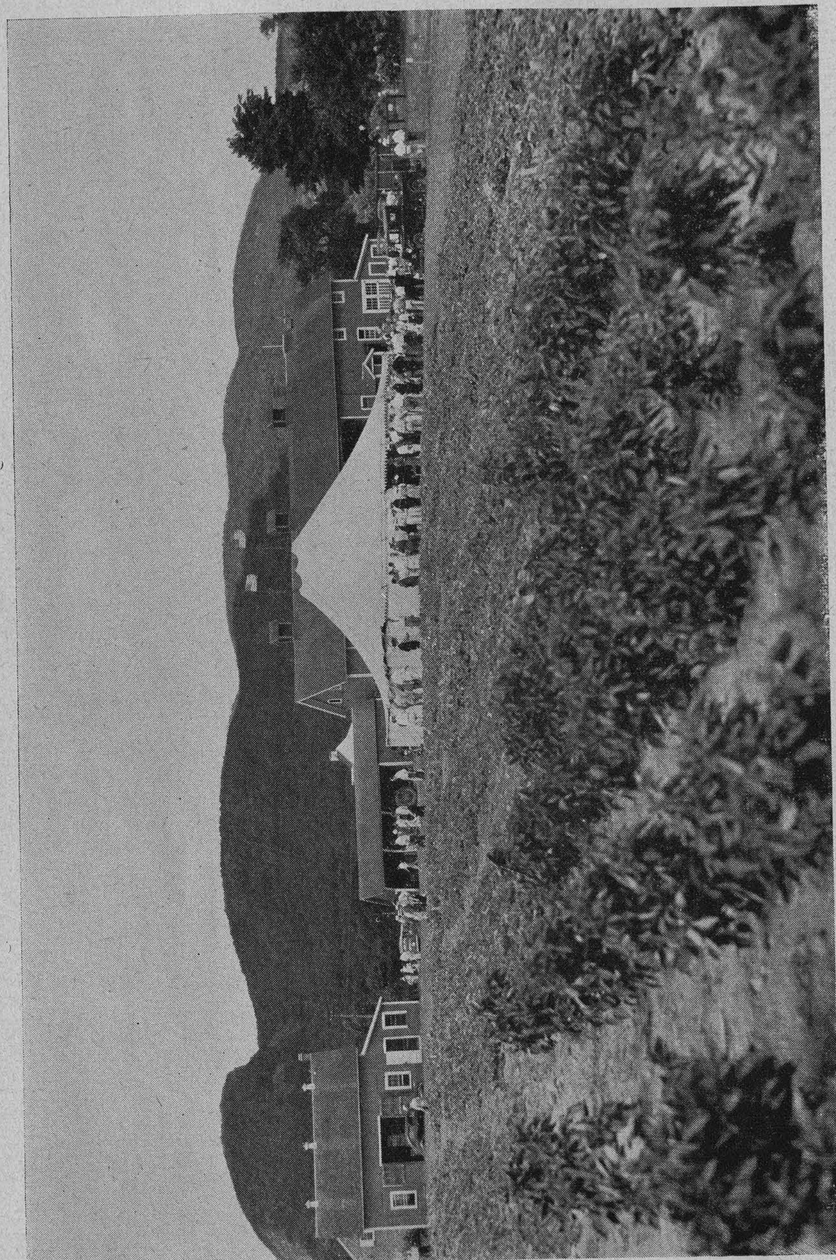

FIGURE 1. Field Day at Mount Carmel Farm.

REPORT OF THE DIRECTOR

FOR THE

YEAR ENDING OCTOBER 31, 1943

To the Board of Control of the
Connecticut Agricultural Experiment Station:

This is written at the end of our second year of war. An undercurrent of optimism on the military situation is widespread—perhaps it may be over-optimism. Whether this is wishful thinking is not for us to say. Our task is to serve agriculture and aid in the solution of its problems. And when one turns to our farms, he finds a confused situation. In some cases, in spite of unavoidable handicaps, farmers have not fared too badly. True, they have worked unbelievably hard. The story of their struggle matches the romantic tales of the pioneers. But in other cases, and in certain types of farming, the returns have been less satisfactory.

However, on all farms, the basic need exists and is magnified by the war—the need for greater efficiency. If four sprays will give the same control of pests as six, much labor is saved. If a new hybrid corn adds five bushels to an acre, all society, as well as the farmer, may count the gain. This, as always, is the Station's guiding principle.

In spite of preoccupation with the day's troubles, farmers like all citizens, are looking ahead to the post-war years. What lies beyond the horizon? How can we plan to meet changes that may come? Here too the Station should be prepared with the best information possible to provide. Without attempting to predict the future, we can, and are making a definite effort to be ready. The State Post-War Planning Commission under President Seymour's leadership is now organized. The Station is represented on the Subcommittee for Agriculture. This offers an ideal road to desirable coordination.

This brief account of the year's effort is not a complete record. That will appear in the bulletins and circulars issued from time to time and later assembled into the complete Report.

EVENTS AT THE STATION

Open House in September

Some 400 visitors attended the Station's Open House on September 8. A departure from the traditional Field Day at the Mount Carmel farm, the event was held on the Station grounds.

Montague Free, Horticulturist of the Brooklyn Botanic Garden, was guest speaker. Both before and after his address in the auditorium of Britton Laboratory, guests had the opportunity to visit Station laboratories and greenhouses where staff members were on hand to answer questions. Many guests brought basket lunches and took advantage of the Station's invitation to gather at the tables and have coffee.

A "Victory Garden Clinic", one of the features of Open House, drew a steady stream of home gardeners with questions on vegetable varieties, plant pests and soil conditioning. Special exhibits included the wood-burning furnace unit, Japanese beetle control, blight resistant chestnuts, new corn and vegetable varieties developed by the Station, and non-parasitic plant diseases. Moving pictures on mosquito control and white pine blister rust were shown.

Registration showed that home gardeners outnumbered other groups at Open House. Next came farmers. Editors, public and park officials, seed firm representatives and other professional gardeners completed the attendance.

New England Vegetable Growers

Growers, plant breeders and county agents attended a two-day conference of New England Vegetable Growers here on February 2 and 3. The first day's program was devoted to a series of technical discussions on vegetable culture. The following morning reports of the discussions were given for the benefit of farmers, seedsmen and others. The total attendance of 65 represented all the New England States but Maine.

Federated Garden Clubs' Day

Because the staff found it necessary to curtail speaking engagements this season, "A Day at Your Experiment Station" was inaugurated by the Federated Garden Clubs of Connecticut. Each club was invited to send two delegates to the event, which was held on March 3 in Britton Laboratory. The morning meeting gave the visitors a chance to catch up on the latest developments in pest control, soil fertilization and other phases of gardening, and to ask questions of the group of staff members who were present. Director Slate addressed the afternoon session which ended in a tour of the laboratories. Although the day broke with a bad snow storm, 84 members attended. The "school" was arranged by Mrs. John B. Wallace, chairman of the Federation's program committee.

Other Station Events

The Station was host to a number of agricultural groups during the year. The Connecticut pest control operators met here on January 26; the State Nurserymen's Association, on March 10.

The Federated Garden Clubs held their annual all-day meeting here on October 8. Louis Bromfield, author and Pulitzer Prize winner,

addressed the group on "Soil Conservation". The morning session was devoted to annual reports and election of officers. Mrs. Charles O. Miller, president, presided at the meetings.

Britton Auditorium was used by the New Haven Garden Club on two occasions—for its annual meeting on June 14, and for its victory garden products show on September 28, in which Station staff members participated as judges.

On January 23 the Connecticut Editorial Association held its annual meeting in Britton Auditorium.

WAR GARDENS

In common with other agencies the Station staff gave largely of its time to this important program. Some served on local and state committees. Many talks were given to town and community groups. Particularly useful was Circular 155, "Controlling Pests of War Gardens". Addressed to home gardeners, this circular was the outcome of our many years of research on commercial food crops. Forty thousand copies were distributed on request.

THE STAFF

Military Leaves

Fifteen members of the staff are now serving in the Armed Forces. During the Station year under review the following leaves have been granted:

Charles Heller, Technician in Biochemistry, January 31, 1943

LeRoy T. Bartholic, Gypsy Moth Scout, January 31, 1943

Bernard L. Poitras, Gypsy Moth Scout, March 15, 1943

Henry J. Bellisario, Gypsy Moth Scout, June 1, 1943

William J. Griesing, Greenhouse Man, July 1, 1943

Resignations and Appointments

Dr. Frances Clark Beard, Cytologist, resigned October 1, 1942. She was succeeded by Miss Jeannette Lowe, B.A., Wellesley, (Oct. 1, 1942).

After 14 years of loyal service, Mrs. Barbara Brezosky Schread resigned on January 16, 1943. In recent years Mrs. Schread handled the purchases. Miss Emily Brough was appointed in her stead on Jan. 11, 1943. Miss Madeline Pepe (Aug. 10, 1942) and Miss Elinor Fitzgerald (Oct. 26, 1942), also, joined the Main Office staff.

Mrs. Viola Farley was transferred from the Main Office to the Department of Entomology to take the place of Miss Betty Scoville, secretary, who resigned on November 21, 1942.

Mrs. Mildred Preston (June 30, 1943) and Mrs. Jane Andrew Wood (Sept. 30, 1943) resigned secretarial positions. They were succeeded by Miss Jeanne E. Emerson (July 1, 1943) and Miss Beverly J. Parker (Oct. 1, 1943).

Mr. Oliver E. Nelson, M.S., Yale, succeeded Louis Roberts as Assistant in Genetics on June 1, 1942.

Dr. C. I. Bliss, who for the past two years has been Consulting Biometrician, was made Station Biometrician on July 1, 1943.

Dr. Douglas E. Greenwood was appointed Assistant Entomologist, May 1, 1943. He is devoting all his time to wireworm investigations.

Mr. George R. Smith was transferred from the Department of Entomology to take the place of Theodore Stickney, Sampling Agent, who resigned July 15, 1943.

Miss Evelyn Smith, B.S., University of Connecticut, was appointed Research Technician in Soils July 1, 1943, to fill the post left by Mr. Edward Rubins, July 1, 1943, and by Miss Margaret MacEwan, December 31, 1942.

Dr. Jane K. Winternitz, Assistant Biochemist, resigned October 15, 1943.

Honors

Dr. H. B. Vickery was elected to membership in the National Academy of Sciences at the spring meeting, 1943.

Progress of the Station's Work

ENTOMOLOGY

Japanese Beetle Still a Major Pest

Since the Japanese beetle was first found in Connecticut in Stamford in 1926, it has spread over much of the State and has become a notorious pest in several towns. The region of heaviest infestation includes roughly the shore towns from Greenwich to Madison and a broad zone from New Haven north through Hartford to the Massachusetts line. There is also a fairly heavy infestation around New London, and the beetle became abundant in 1943 in the Naugatuck Valley up as far as and including Waterbury. In Greenwich the insect is reported to be noticeably less abundant than in previous years.

The adult beetle is a serious pest of many plants, and on some of these its control is still difficult. During the past season we were able to protect grape vines with a single spray of lead arsenate and a sticker applied early in July. This protected the sprayed foliage throughout the season, and although the new growth which developed subsequent to spraying was injured, this did not prevent the development of the fruit. A spray of lead arsenate and bordeaux applied at the same time was not quite so satisfactory, although much better than any other material except the above.

A heavy infestation occurred in several fields of edible soybeans grown for seed in North Haven. The injury was 25 to 50 per cent of the foliage destroyed. Lime-aluminum sulfate sprays and lime dust repelled the beetles, but neither adhered to the foliage satisfactorily and the insects returned to the fields within a few days. Sprays of lead arsenate with safeners and oil injured the foliage. A one per cent rotenone dust protected the plants about one week.

In many localities the beetles were quite injurious to the sweet corn crop, on the silks of which they feed.

We have been distributing the bacteria which cause "milky" disease of the grubs for several years and have studied its effect on the grub population. During 1943, 959 half-acre plots were inoculated, for which about 839 pounds of spore dust were used. Of these plots 33 were in Fairfield County, 354 in New Haven, 173 in Middlesex, 398 in Hartford and one in Tolland. Almost all the heavily infested parts of the State have now been treated. Continued examination of these plots shows not only an increase in the development of the disease in many areas but also a general spread throughout the treated region.

Japanese Long-Horned Weevil

This weevil (*Calomycterus setarius*), of Japanese origin, has been present in certain localities of Connecticut for a number of years and its potentialities as a pest have caused us some concern. The adults feed on a large number of plants, including vegetables, flowers, legumes and field crops, weeds, vines, trees, shrubs and house plants. In 1943, 22 new hosts were added to the already long list.

Our cage experiments show excellent control of the weevil with cryolite dust of as low as 6.25 per cent concentration. A dust containing 25 per cent cryolite was more effective than sprays of either cryolite at 3 and 4 pounds per 100 gallons or lead arsenate at 3 pounds per 100 gallons. Further study is in progress on the spread of the insect and on its control.

Wireworm Investigation Under Way

The control of the eastern field wireworm is a major problem for potato growers in Connecticut. The larvae are seriously injurious to the tubers, and the quality of the crop suffers. Although we have previously studied this pest, particularly in relation to its injury to tobacco, we began an extensive investigation of the insect this year. One member of our staff is devoting his entire time to the problem. Wireworm injury was severe this year in restricted areas in Hartford County and caused the usual loss to the crop. In cooperation with the Department of Agronomy of the Storrs Station the wireworm injury to potatoes grown in rotation with green manures is also being studied.

Insect Pests of Fruits

Investigations aimed at the control of pests of orchard fruits have devoted particular attention to the European red mite, the oriental fruit moth and the apple maggot. The problem of controlling Comstock's mealybug has also been attacked.

Red Mite

Spray tests with new compounds to control the red mite have been carried out in cooperation with the U. S. Rubber Company. Although considerable progress has been made by the company in developing mite control without the use of rotenone, further experiments are needed to establish its usefulness in orchards. The dinitro-cyclohexyl-phenol compound, marketed as DN 111, applied as a spray in apple orchards has given effective red mite control but care must be exercised in using it in order to avoid injury to the foliage. A schedule with fewer applications but including white mineral oil sprays, ending June 9, gave satisfactory mite control, whereas mite populations increased and did considerable damage in plots receiving lead arsenate and flotation sulfur in a five-spray schedule ending July 10.

Oriental Fruit Moth

The distribution of parasites of the oriental fruit moth has been continued. Although no fruit set in most Connecticut peach orchards this year, 59 growers ordered *Macrocentrus ancylivorus*, and 144 colonies containing approximately 37,000 individuals were distributed.

In laboratory experiments it has been found that the hibernating larvae of the fruit moth will withstand zero degrees Fahrenheit, if the temperature is lowered gradually. There has been no survival below that temperature.

Apple Maggot

Attempts to control the apple maggot, and some other orchard pests, with sprays containing cryolite failed this year, probably because of poor adhesion of the material to fruit and foliage. Experiments with stickers, using lead arsenate as a toxicant, showed that three heavy applications in May and June gave better protection against maggot than five applications of sulfur-lead arsenate which included one maggot spray about July 10. Preliminary cage tests with a new insecticide which contains neither arsenic nor rotenone were very promising, and this material may prove valuable in maggot control.

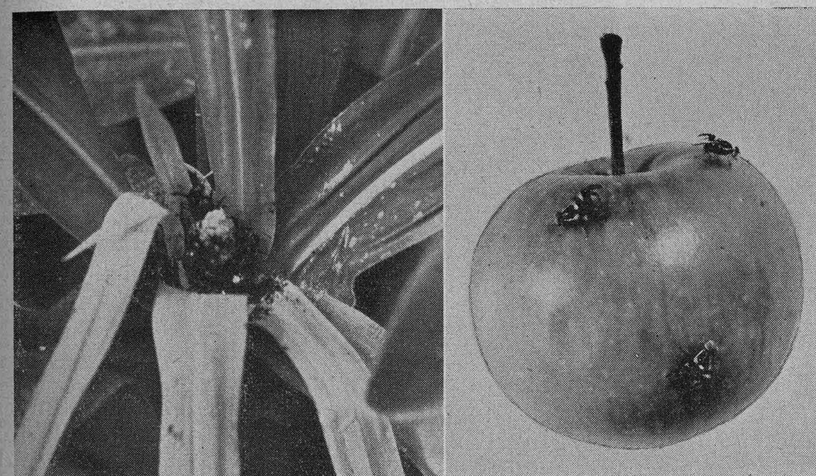

FIGURE 2. Japanese beetles feeding on corn silks. Adult flies of the apple maggot.

Comstock's Mealybug

The infestation of Comstock's mealybug in orchards has declined, but we have started breeding parasites of this pest. During the summer Dr. Clancy of the U. S. Bureau of Entomology and Plant Quarantine sent us two shipments (1,250 individuals) of mealybugs parasitized by *Pseudaphycus* and 11,600 adult parasites of the same species. These were released in three apple orchards where mealybugs appeared to be most abundant.

Survey of Insects of Connecticut

In connection with a continuously operating survey of the insects of Connecticut another bulletin of the Connecticut Geological and Natural History Survey, The Diptera or True Flies of Connecticut, was published this fall. This was written by three well known entomologists and is the first of a projected series of bulletins on the flies of this State.

Inspections and Quarantines

Because of the federal Japanese beetle and gypsy moth quarantines a large amount of plant and other material must be inspected before shipment to uninfested parts of the country. In the past year, 3,237,011 plants were inspected for Japanese beetles, and 4,415 gypsy moth certificates were issued.

Many states quarantine certain plant materials because of the European corn borer. As this insect spreads westward, the amount of plant inspection necessary decreases. In 1943 we issued 420 certificates.

A total of 326 seed inspection certificates were issued for seeds consigned by Connecticut seedsmen to foreign countries, and 310 package certificates were issued for shipments of miscellaneous plant materials.

Nursery and Apiary Inspection

An increased production of honey and beeswax is much to be desired at this time, but the severe weather of the winter of 1942-43 killed about 30 per cent of the bees, so the quantity of honey produced in 1943 was less than in 1942. The quality was a little better. The apiary inspectors examined all known colonies of bees in the State. American foul brood was found to be more serious in Fairfield County than elsewhere.

The number of nurseries in the State declined somewhat during the past year, but 317, involving 4,596 acres, were inspected during the season. The usual number of insect pests and diseases were found.

Gypsy Moth Control

The gypsy moth infestation was generally low throughout the infested part of the State in 1943, due in part at least to the heavy mortality of eggs caused by the low temperatures of last winter. This was fortunate because our staff is greatly reduced by the war. A summer survey of all towns east of the Connecticut River revealed no serious outbreaks.

The Station crews did no spraying, but the federal men sprayed about 41 acres of woodland and 50 trees growing in the open in western Connecticut. The state and federal crews carried on the usual scouting operations. The Bureau of Entomology and Plant Quarantine carries out extensive control operations in western Connecticut to prevent the westward spread of the gypsy moth. The fine cooperation of Mr. R. A. Sheals, in charge of the federal work, and Messrs. Crossman and Blaisdell of his staff is appreciated.

Pine Shoot Moth and White Pine Weevil

These investigations are primarily studies of the effect of insect populations on the development of pine plantations. In the red pine stand in North Guilford the shoot moth population had reached a density that was effecting marked injury to the trees. Low temperatures during the winter of 1942-43 have eliminated the insect, and the pines are now free of infestation. The trees have reached a height where the stand may close before an injurious shoot moth population can build up, and hence the stand may not suffer further from the attack of the insect.

We have finished 10 years of observations of the effect of the white pine weevil on plantations at Rainbow and are analyzing the data.

Shade Tree Pests

The biology and control of the dogwood borer, a serious pest of ornamental and native flowering dogwoods, are under investigation. The insect presumably successfully attacks only injured trees, and a knowledge of the conditions conducive to attack and of methods of controlling its injuriousness may have a broad application.

In relation to the general problem of the effect of insect injury to the health of shade trees, the effect of defoliation on elms is being studied.

Several Ways of "Stretching" Sprays

Good control of plant pests involves the application of materials where and when they are most needed, and in the right quantities. Briefly, this means good coverage of plants and, incidentally, the efficient use of chemicals. Station entomologists and plant pathologists are cooperating on a series of experiments involving techniques of applying sprays and dusts. The progress to date is briefly summed up in the following paragraphs.

Previous work has demonstrated that the toxicity of certain dusts (rotenone in ground derris root) is markedly affected by the type of material used as a diluent, usually termed the "inert" carrier. Further field experiments have shown similar results with other toxic materials. A concentrated nicotine bentonite was mixed with clay and with pyrophyllite and tested on the European corn borer. Approximately 5 per cent nicotine was required in the clay mixture to equal the effectiveness of 3 per cent in the pyrophyllite mixture. When mixed with cryolite and tested on the Mexican bean beetle, the pyrophyllite proved only slightly superior to clay. Free nicotine dust prepared from a powdered concentrate was much more effective with pyrophyllite as a diluent than with hydrated lime. In terms of nicotine required, one per cent nicotine in the pyrophyllite mixture was as effective as 10 per cent in the hydrated lime when used against cabbage aphids.

During the last two years experiments designed to furnish information on the relation of concentration of toxicant and method of application to degree of control of pests, have provided a measure of the degree of coverage attained by different methods of application. Beans and cabbages were dusted with mixtures containing rotenone and cryolite respectively. Increasing the number of nozzles on the duster from one to two per row appeared to improve the coverage more than did use of a larger feed slot or operating at a slower ground speed.

In all cases dusts of higher toxicant concentration applied in smaller quantities were more effective than those of lower concentration in larger quantities. Thus 20 pounds of a one per cent rotenone dust per acre gave better results than 40 pounds of one-half per cent dust.

In studying the effect of combining other insecticides with rotenone dusts it was found that a thiocyanate, marketed as Lethane 60, tested on aphids, when used to replace up to 75 per cent of the rotenone content of the dust, resulted in a more efficient use of the rotenone. Results in the same direction, but less marked, were obtained in tests on the Mexican bean beetle.

Rotenone dusts were compared with cryolite in controlling the potato flea beetle, the European corn borer on potatoes, the Mexican bean beetle, and cabbage worms. A dust containing 25 per cent cryolite was as effective against the flea beetle as one containing one-half per cent rotenone, and 33 per cent cryolite was as effective against the European corn borer on potatoes as one per cent rotenone. Against the Mexican bean beetle 50 per cent cryolite was as effective as one-half per cent rotenone, and against cabbage worms 25 per cent cryolite was more effective than one-half per cent rotenone. There appeared to be no difference in toxicity between natural and synthetic cryolite.

Cryolite is an excellent insecticide that has been used for a number of years to control many insect pests, and in many cases it can be used in place of rotenone with satisfactory results.

As a result of laboratory and field experiments we have obtained information about the value of certain adhesives and safeners in holding in check common insect pests and diseases of orchard fruits with fewer spray applications than commonly used. This year such a reduced schedule on apples gave better scab control, better mite control, less fruit russet, and better foliage at the end of the season. However, the control of curculio and redbug was less effective.

PLANT PATHOLOGY AND BOTANY

Dutch Elm Disease in Connecticut

The federal authorities made a determined fight to wipe out the Dutch elm disease in the United States. Despite their best efforts, Nature won the battle and it now appears that we must learn to live with the Dutch elm disease. The question immediately arises as to what can be done locally toward its control. The Station is doing active research on several phases of the problem, and is cooperating with the U. S. Department of Agriculture on certain control operations.

In the southwestern part of the State the infection of elms is increasing, probably as a result of the cessation of extensive control work by the federal Bureau of Entomology and Plant Quarantine three years ago. This Bureau is at present confining its activities in Connecticut to an effort to prevent the spread of the disease into the eastern half of the State. In the generally infected area in western Connecticut we look upon the actual control of the disease as a local problem and are urging the town authorities and the private citizens to get rid of diseased trees before bark beetles emerge from them, and to keep valuable elms in a healthy condition.

FIGURE 3. Advanced case of Dutch elm disease.

Scientists are now generally agreed that valuable elms in villages and cities can probably be protected by maintaining a zone of disease-free elms around each locality. This can be done by prompt detection and removal of any trees that may contract the disease. Recent research here gives some evidence on the necessary width of this zone.

It shows that the probability of infection falls rapidly with distance. For example, the probability of infection at 500 feet is one in 500, but this probability falls rapidly to one in 10,000 at 1,000 feet.

The elm bark beetle mainly responsible for transmitting the disease to healthy elms has been found quite resistant to low temperatures during the winter, when it is in the larval stage, but the severe cold of the last winter apparently caused a heavy mortality. This bark beetle was less abundant in the State in 1943 than for many years previously.

New Fungicides Show Promise

For some years the Station has been engaged in research on new and improved fungicides for plant disease control. One just announced has a property that has been sought for many years. It is water-soluble so that it gives a film-like cover over a sprayed leaf. On drying, the material is invisible and water-insoluble, hence resistant to removal by rain. It also has some properties of insect repellancy. Known chemically as disodium ethylene bisdithiocarbamate, the new fungicide as yet has no trade name.

The material seems to be promising for use on ornamentals because the residue is wholly invisible. For the same reason it should be useful for harvest applications on such things as tomatoes, peaches and cherries. Onions and other vegetables that are difficult to wet might take this material better than other fungicides.

Another fungicide recently developed here is juglone. This is the substance that is excreted by walnut roots and is known to kill taprooted plants like alfalfa and tomatoes. Laboratory tests with the synthesized form of juglone prove that this material is more toxic than copper oxide, commonly used as a fungicide before the outbreak of the war. Further study will be made on the toxicity of juglone and other substances produced during its synthesis.

Poison Ivy Control

Because it is so very common, poison ivy is sometimes jokingly called the state flower of Connecticut. And ivy poisoning might well be called the state disease of Connecticut in the summer time. As a result there is much interest in the eradication of this pestiferous plant. Several of the common weed killers have gone to war but it now appears that a promising substitute may be had in borax, at 10 pounds per square rod.

Causes of Root Rot Diseases

One of the reasons for the decline of onion production in Connecticut is that pink root and smut diseases have so infested the many soils as to make onion production unprofitable. Several other economic crops, such as strawberries, tobacco, peas, cabbage and potatoes, suffer from diseases of the below-ground parts. These troubles are exceedingly difficult to get at and, except in isolated cases, it has been difficult if not impossible to control them by treating the soil. Potato scab and club root of cabbage are outstanding exceptions.

The answer to most of the root troubles has been to stop growing the crops. But if land is first taken out of production because of strawberry black root, and then because of pea root rot, and then because of onion pink root and, finally, if cabbage and potatoes cannot be grown on the same land, the farmer finds himself limited in the possibilities of earning a living.

We have embarked on the investigation of root rot as an interrelated, although complex, field rather than as a collection of isolated maladies. One of the new developments is that decomposition, especially the decomposition of the preceding crop residue, may be related to root rot development. It is well known that timothy sod encourages tobacco brown root, for instance. Another potent possibility may be that root rot in many cases is really a mineral deficiency rather than a result of the action of pathogenic microbes. These factors are currently under investigation.

Shading Reduces Defoliation of Tomatoes

Fifty years ago Dr. B. D. Halsted in New Jersey wrote that shaded tomatoes on the farm at Rutgers University did not lose their leaves as much as those grown in the open sun. This fact was confirmed experimentally here in Connecticut last year. It offers promise especially to victory gardeners as a means of reducing the effects of this disease. Shading also markedly reduces the cracking of tomato fruits.

Injury to Potatoes From Bordeaux Mixture

For 60 years bordeaux mixture has been a standard treatment in the control of plant diseases. Except in rare cases, it has no peer so far as efficiency in disease control is concerned. But it does produce considerable injury in some crops. For this reason it began to lose its preeminence on fruit as early as 1906-08 when sulphur materials were introduced. And in the early nineteen-thirties, when the fixed coppers were introduced, its use on vegetables began to wane.

Bordeaux mixture has retained its popularity for use on potatoes chiefly because bordeaux-sprayed potatoes usually outyield those not sprayed. Where, therefore, lies any injury to this crop? Sprayed potatoes do not look injured; in fact, they look superior to unsprayed potatoes.

The answer is that the injury is masked by the pest control. Earlier, we thought that flea beetles, for example, probably reduced the yield of Cobblers by only 10 or 15 per cent because bordeaux mixture controlled the pest and increased the yield by approximately that figure. By proper experimental designs it has been possible to demonstrate that flea beetles reduce the yield by about 40 per cent, while bordeaux mixture reduces the yield by about 25 per cent. The difference of 15 per cent justifies spraying the potatoes.

Search will be continued for a material which will equal bordeaux mixture in the control of pests but which, at the same time, will not reduce yield. In the meantime, injury to potatoes by bordeaux mixture can be reduced somewhat by lowering the proportion of lime in the mixture to half that of the copper sulphate. It is additionally helpful to use dolomitic lime rather than hydrated lime.

Another way to avoid bordeaux injury is to use the material only when necessary. In Connecticut, potatoes seldom need protection before July 1. Cobblers planted early for the early crop need not be sprayed at all with bordeaux mixture. The attack of flea beetles on the crop in June can be controlled with dust of barium fluosilicate or cryolite rather than with bordeaux.

GENETICS (Plant Breeding)

Sweet Corn for a Month From One Planting

A succession of sweet corn varieties can now be planted at one time and sweet corn picked over a period of a month. The most popular succession is: Spancross, Marcross, Carmelcross, Lincoln, Golden Cross Bantam and Wilson. These varieties will mature in the order listed. If they are planted about May 15 to 30, and a repeat planting of Golden Cross Bantam and Wilson is made three weeks later, one may have sweet corn maturing from July until September. This type of succession is particularly valuable for growers who want to market sweet corn continuously, and it appeals to many home gardeners. Breeding work now in progress is expected to provide an even better succession. Another variety is needed between Carmelcross and Lincoln to bridge the six-day interval between these varieties.

Special emphasis is being given to improving the quality of sweet corn. In the past, this has received little attention. New hybrids of superior quality are being substituted for the originals. The production of inbred lines of similar maturity is a very important phase of the work. Such inbreds are easier to handle for seed production and should reduce the cost of production of hybrid seed.

Selection of Corn for Grain and Ensilage

The selection of a satisfactory variety of corn for grain or ensilage must take into consideration adaptation to local conditions and proper maturity. These differ with the soil, fertilization, length of growing season and time of planting, as well as seasonal conditions. An observation field of 200 new hybrids was grown on the Station farm last summer to survey the available material in a preliminary way. Replicated yield tests of the commercial and experimental hybrids most promising for Connecticut were also made. A recommended list of varieties, which is revised and brought up to date each year, is available to growers.

Farmers' trials were made in different parts of the State. A number of these were made in cooperation with the New Haven County Farm Bureau, the corn being grown by 4–H Club boys. Record high yields, well over 100 bushels per acre, were obtained from many of these trials.

A selected group of 55 yellow dent inbreds were grown in 1943 and crossed in all combinations for further testing. Measurements were taken for yield, moisture in the ears at harvest, stalk breakage and erectness of stalks. From these results the most promising double crosses can be predicted.

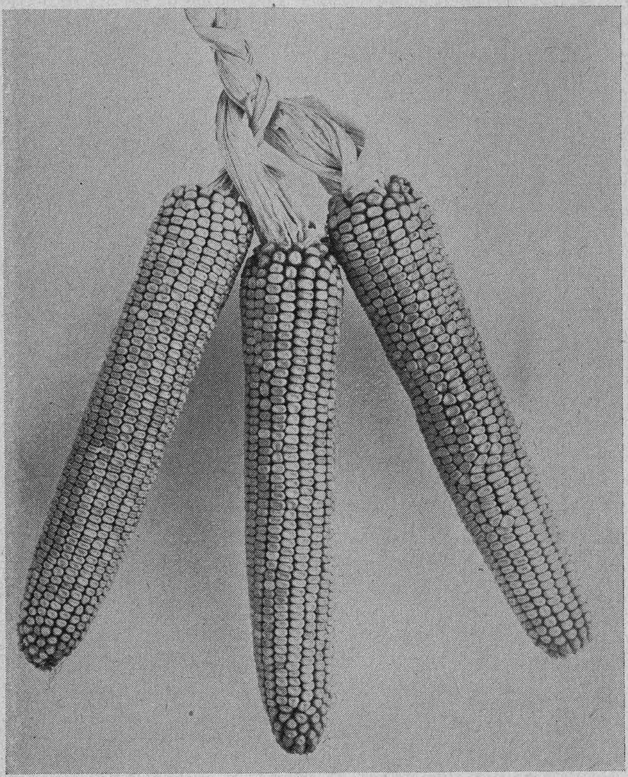

FIGURE 4. Experimental hybrid yielded 99.8 bushels per acre at Guilford, Conn., in 1943.

Corn and Genetic Principles

For several years all of the long-inbred strains of corn have been examined carefully for changes that may persist. So far, none has been found that improves the plants permanently in their ability to grow and reproduce. A number of small changes have been found that reduce the plants in various ways. These appear to be degenerative changes, all of which either delay development or lower reproductive ability.

When these degenerate lines were crossed back with the original line from which they came, a surprising hybrid vigor effect was noted in several cases. It is thought these reduced lines may have importance in the study of the phenomenon of hybrid vigor.

A study of variation was made in sweet corn inbred lines under continuous self pollination. Considerable variation was found in Purdue 39 (P39), the most widely used sweet corn inbred and parent of Carmelcross and Golden Cross Bantam. Connecticut 30 (C30), a sub-strain, is in every respect very similar to P39 except that it is much smaller. Tests made in 1943 showed an increase in yield of 25 per cent of the P39 x C30 cross over that of the P39 inbred. If such an increase persists in future tests, it will have practical applications of considerable value to commercial seed producers.

A further study of spontaneous chromosome aberrations in the endosperm of the corn kernel has shown growth changes accompanying breaks and realignments in the *bt* and *pr* region of chromosome 5. In this study a total of 14,505 seeds were examined under a low power microscope. Nineteen cases of spontaneous growth changes were found associated with the loss of known gene markers. They illustrate the control that nuclear substances have upon growth processes.

Strawberry Breeding Project Completed

Several named varieties—Shelton, Hebron, Bristol and Branford—have been turned over to nurseries and are being grown in the Northeast. It will take some time to determine their usefulness. This completes the strawberry breeding project begun in 1923. A recommended list of strawberry varieties that have been tested under Connecticut conditions will be sent to all interested. This gives the time of ripening and yields over a six-year period for the varieties that have the most promise for market and home gardening.

New Connecticut Vegetable Varieties

Squash

The present objective of the summer squash breeding is to develop inbred lines that can be used to produce better first-generation hybrids. Yankee Hybrid, released some time ago, has some undesirable features, despite its superior production of early fruit. Our inbreds that give the best combinations for earliness and high production have an undesirable dominant two-toned or striped color character. Many crosses have been made and some inbred lines have been selected which do not have this character. These lines will be hybridized with Early Prolific Straightneck and other inbred lines to determine their usefulness in the production of first-generation hybrids.

Many inbred lines of squash were lost in 1942 and 1943 when our plantings were attacked by the foot rot disease. As yet no lines have been found that are resistant to this disease.

Cucumbers

Downy mildew is the most serious limiting factor of production of cucumbers in southern New England. Two lines of cucumbers have been found that are resistant to this disease but they lack quality and productivity. These have been hybridized with other varieties, and selections are being made for high quality, productivity and mildew resistance.

Tomatoes

In 1943 one of our new tomatoes, known as Connecticut No. 3, was distributed to a limited number of growers. Reports from these trials have been enthusiastic concerning its uniformity, size, color and productivity. Connecticut No. 3 results from the hybridization of several varieties followed by five generations of selection. It has a slightly larger than standard vine growth. The fruit ranges in size from 4 to 8 ounces, is spherical, smooth, has few cracks and a small core. It ripens uniformly to a deep red color. The ripe fruit has another good quality—it is easily peeled. It has been acclaimed by all who tried it as an ideal home garden tomato for canning, juice and salads. Connecticut No. 3 gave yields of early and total fruits comparable to those of Pritchard, Rutgers and Stokesdale. One victory gardener reported a yield of 897 marketable fruits of good size from five plants. This number of fruits would be equivalent to 5 bushels.

More extensive trials will be conducted in 1944 to determine the adaptability of Connecticut No. 3 to commercial production.

Peppers

A new pepper, that has been named Charter Oak, would seem to attain the goal set in our breeding program. Charter Oak is an early thick-fleshed, dark green pepper of the California Wonder type. In production and quality it is outstanding. Several lines will be available for testing by growers in 1944.

A new series of hybrids has been started to incorporate mosaic resistance in Charter Oak. Second-generation resistant lines have already been selected and these will be back-crossed to Charter Oak.

SOILS

Fertility Losses in Sandy Soils

The Connecticut River Valley is planted extensively to tobacco, potatoes and vegetables. Valuable as it is in many respects, this sandy soil presents one serious problem, that of loss of fertilizers by leaching. This is particularly true of nitrogen. Hence growers must practice methods of fertilization that provide adequate nutrients for crops but at the same time avoid fertilizer losses through soil drainage.

Experiments were conducted from 1931-41 at Windsor, in the Connecticut Valley, in an effort to solve the leaching problem. Results of one of the experiments, known as Windsor lysimeter series C, have been published in Station Bulletin **466**. Briefly, the more essential findings are these.

(1) Cover crops, of which rye was most effective, greatly reduced losses of nitrogen by leaching. There was very little loss under grass sod, even where fertilization was liberal. (2) Soil organic matter losses averaged 15 to 18 per cent on fallow soils, but were much less on cropped soils. Cover cropping resulted in some gain. Under grass sod where no nitrogen was applied, organic matter decreased; but with fertilzer there was a gain.

(3) Cover crops had but little effect on tobacco yields but they tended to favor nitrogen utilization by the crop. (4) Comparison of leaching losses and crop removals with the amounts of nutrients added showed a net gain over the 10-year period for all constituents except nitrogen and calcium.

(5) Nitrogen fertilization favored depletion of soil bases. Cover crops tended to stabilize the soil against losses.

Boron and Magnesium

That crops show marked differences in their requirements for certain elements was illustrated when radishes and celery were grown on a soil originally deficient in boron, magnesium and phosphorus. Radishes were not sensitive to boron deficiency but yields were increased by the application of magnesium and phosphorus separately or together. The application of boron (as borax) increased celery yields some 60 per cent and decreased susceptibility to blight. This crop was sensitive to magnesium deficiency, to high acidity, and especially to acidity and phosphorus deficiency together.

Soil Testing a Regular Service

During the 12 months ending October 31, 1943, a total of 3,600 soil samples were received and tested at New Haven and Windsor, the number being about equally divided between the two laboratories. The proportion of farm samples to home or victory garden samples varied widely, however. On a percentage basis the comparative figures are as follows:

	New Haven	Windsor
Farm soils	18.6 per cent	87.5 per cent
Market garden soils	2.9	9.0
Home garden soils	51.5	1.9
Miscellaneous	27.0	1.6

Digested Sludge as a Substitute for Manure

Digested sludge from sewage disposal plants contains 35 to 50 per cent organic matter. It compares favorably with manure in nitrogen and phosphorus content but is very low in potash. Greenhouse experiments are being conducted to determine its value when applied to the soil, always in conjunction with a complete fertilizer.

Tests were made during the spring and summer of 1943 on tobacco and snap beans. Sludge was used at the rate of 10, 20 and 40 tons per acre, plus a 3–8–7 fertilizer at 1,200 pounds. The first crops were planted immediately and gave a small increase for the 10 and 20-ton rates, but not the 40. The second crop on the same soil without further sludge additions showed gains of 50 to 90 per cent over the no-sludge soil.

The inference is that sludge is a good material, but acts slowly, and that too much may be applied immediately before planting. Continued use of sludge would require a 5–10–10 or similar high potash mixed fertilizer as supplementary treatment. To obtain satisfactory yields for the first crop immediately following the application of sludge, additional nitrogen would be necessary.

Earthworm Castings Are Rich in Plant Nutrients

That earthworms are beneficial to the soil is a fact well established many years ago. The specific ways in which they are beneficial, however, are still a subject for study. During the past year the physical and chemical properties of castings in a cultivated field and in four forested areas were compared with those of the surrounding soil mass. There was no difference in clay or in total colloid content, but in all cases the castings were markedly higher in nitrate nitrogen, total nitrogen, total calcium, and available or exchangeable phosphorus, potassium, calcium and magnesium, organic matter, base capacity, base saturation, and moisture equivalent.

The total weight of castings in the cultivated field at the time of sampling was estimated at 16,300 pounds per acre, or a little less than 1 per cent of the total soil mass to the plow depth. This field is probably above the average in earthworm population. Inasmuch as the production of castings is a continual process, a considerably larger portion of the total soil mass is affected than is indicated by the figures.

Plant Tissue Testing

In some cases, crops do not grow as well as our standard soil tests predict. Obviously when other factors such as water, temperature and light are unfavorable, growth will be restricted irrespective of the plant food supply. What is the effect of variations in these factors on the composition of the plant?

In a greenhouse experiment with corn and potatoes some plants received only a minimum amount of water, some were kept under cool, partially shaded conditions with an abundance of water and others were grown under normal conditions of light, heat, and moisture. Concentrations of nitrates, phosphorus, potassium, calcium, and magnesium were determined in the plant tissues, and correlated with growth.

The yield of corn stover was lowest under cool, partially shaded conditions with abundant moisture; intermediate where light and heat were ample but where moisture was deficient; and highest under normal conditions of light, heat and moisture. The concentration of nitrates and potassium in the leaves varied inversely as the yield, while phosphorus varied more or less directly with the yield.

In the case of potatoes, yield of tops was lowest under "dry" conditions and highest under "normal", but the tuber yield was highest in the "cool" pots. Analysis of the basal portion of the stems showed that the concentration of nitrates, potassium and phosphorus varied inversely with the size of the tops.

FIGURE 5. Effect of environment on growth.

In the hybrid poplar experiment described below, plant tissue tests of the leaf petioles showed that a high content of available phosphorus and exchangeable potassium in the soil is reflected in the composition of the petioles irrespective of the growth response of the plant.

Results to date indicate that with fertile soil, an unfavorable growing season results in fair growth and medium to high concentration of nutrients in the plant. Low tissue tests indicate a deficiency in plant food supply and even though growth may be fairly good, a higher level of soil fertility would result in greater yields, provided other conditions were favorable.

Hybrid Poplars Need Nitrogen, Phosphorus and Lime

The new hybrid poplars of the U. S. Forest Service have possibilities for pulp wood production. They grow very rapidly and, unlike most forest trees, respond readily to differences in soil fertility levels. A series of soils in "frames" about to be discarded offered an opportunity to measure these responses.

The soils were acid and low in fertility. Additions of nitrogen increased growth 250 per cent, phosphorus 30 per cent and potassium none. In combination with nitrogen or nitrogen and lime, phosphorus added as much as 50 per cent to the nitrogen effect. Lime increased growth, whether added alone, or in combination.

These results are in striking contrast to those obtained in previous years on conifers and maples.

FORESTRY

Forest Composition in Relation to Soil-Site Conditions

In a small state like Connecticut with its relatively uniform soil and climatic conditions, soil type is not necessarily the controlling factor in forest composition except where it is based on differences in moisture and depth. Other factors of site, such as degree and direction of slope, moisture supply and specific qualities of the soil profile, also enter into the picture.

Last summer the Soils Department conducted a survey on three tracts in Meshomasic and one in Cockaponset State Forests to learn what factors of site were related to distribution and size of trees of the several species. Total basal area, i.e., the sum of the cross-sectional areas of the trunks of each species, was used as a basis for comparison.

Fifteen species comprised 88 per cent of the timber. These were, in descending order, red oak, black birch, red maple, white oak, yellow birch, chestnut oak, black oak, scarlet oak, white ash, tulip, gray birch, pignut hickory, aspen, sugar maple and blue beech.

On the drier soils chestnut and black oak had significantly higher basal areas; on moist to wet sites, red maple, yellow birch, aspen and blue beech excelled. Comparing shallow with deep soils, black birch, red maple, white oak, black oak, scarlet oak, tulip, gray birch and pignut hickory had significantly higher basal areas on the deeper soils. White oak was the only species with greater basal area on steep north slopes. South slopes were too infrequent on these tracts to warrant a separate classification. The effect of three other important factors of site—soil texture, permeability of the subsoil and degree of stocking—were not measured because of their uniformity in the areas surveyed.

Forest Trees Distributed for Thirty-Five Years

Thirty-five years ago the Station undertook to interest Connecticut land owners in reforestation of idle land and to assist them in securing forest planting stock at reasonable cost. This was a form of service which no other agency was in a position to render at that time. In recent years other agencies have more or less duplicated Station activities in this field, so the Station is discontinuing the service. The following is a brief resume of the work and its accomplishments.

Since 1906, the Station has shipped over 19,000,000 trees, mostly conifers. The acreage planted is not definitely known but, on the basis of 1,000 trees per acre, may be estimated as 19,000 acres. Taking into account failures due to fire, insects and diseases, changes in use of land, storms and neglect, 10,000 acres would be a fair estimate of the successful plantations. In addition, there have been many plantations established with stock from other sources for which the Station may claim indirect credit. These include several large plantings by municipal water companies and water departments, as well as those for which stock was furnished by commercial nurseries and the Agricultural Conservation Program. Probably 15,000 acres of planted forest throughout the State is a fair estimate.

FIGURE 6. Fifty-year-old stand of white pine after thinning.

All orders for the Station's remaining planting stock are now placed through the State Forester's office in Hartford, although deliveries are still made from the Windsor nursery. However, the Station will continue to aid woodlot owners on problems they may have regarding the care and maintenance of plantations, as well as the mobilization and marketing of the products. And it is in this field, rather than in the planting of trees, that the Station is expected to be most helpful in future years.

White Pine Blister Rust

Wood lot owners in sections of the hurricane area have an exceptional opportunity to improve their holdings at no ultimate expense. This observation was made by the blister rust control agents now remapping the "blow down" areas in Killingly. The same conditions

probably hold in other towns in the State. A good white pine reproduction was discovered in forest areas that have been thinned by the hurricane. Most of it had developed from seed in the ground at the time of the storm, or previous to that time. If properly managed, this should result in a mixed stand of oak and white pine growing under the most favorable conditions for quality timber. The partial cover of oaks would minimize danger to the pines from weevil.

In cooperation with the U. S. Department of Agriculture and the several towns, the Station carried on its usual blister rust control work in Canaan, North Canaan, Cornwall and Norfolk. Approximately 90,000 wild currant and gooseberry bushes were destroyed on approximately 18,000 acres of control area, giving protection to 6,000 acres of pine. In addition, seven nurseries growing white pine were rechecked, and 20 wild currants and five cultivated currants were destroyed, giving protection to 1,353,500 white pines grown for reforestation purposes.

New Ways of Utilizing Wood for Heating

Bulletin **463**, describing a wood-burning conversion unit for household furnaces designed in cooperation with the Yale School of Engineering, was ready for distribution in November, 1942. Within six months practically the entire issue of 6,000 copies had been mailed out. Requests were received from nearly every state in the Union and from a number of foreign countries.

Some half-dozen conversion units have been installed and are in operation in Connecticut but there is no means of knowing what further application has been made of the principles described. One of the most encouraging reactions to the bulletin was the very large number of follow-up requests for additional information of various kinds. Many of these indicate that the writers have given a great deal of thought to their fuel problems. If the only result of the experiment is to stimulate a demand on the part of the public for manufactured equipment to burn solid fuel more efficiently, it will have been worth while.

Research on combustion of wood is being continued, special attention being given to improvement of the now available stoves, such as the Charwood. Another promising field is the production of fuel gas from wood. The White Memorial Foundation of Litchfield has made a gift of $250 to the Station in furtherance of these experiments.

A Charcoal Kiln of Non-Metallic Materials

Owing to the increasing demand for charcoal, it was decided to attempt the development of a non-metal charcoal kiln. Work was started in the early fall of 1943, in cooperation with the White Memorial Foundation of Litchfield. The type of kiln built was the same as the portable steel one described in Bulletin **448**, and now impossible to construct because of priorities.

The materials chosen for the kiln are cinder concrete blocks (hollow type). Only stock sizes of the blocks have been used. The cost of materials is somewhat less than for a metal kiln of the same size. No prefabrication is necessary. The preliminary runs show a good deal of promise.

TOBACCO SUBSTATION AT WINDSOR

A Wilt Disease of Tobacco, New to Connecticut

A disease that causes plants in the field to wilt and finally die, was found for the first time in this State in August 1943. The wilting is caused by a parasitic fungus (*Fusarium oxysporum* var. *nicotianae*) which enters the plant from the soil and grows up through the vascular tubes. Affected plants never recover and seldom are worth harvesting.

First reported from Maryland some 25 years ago, Fusarium wilt has been found since in most of the southern tobacco states, Canada, South Africa and Russia. In most of these regions it is not considered a major disease because the proportion of plants affected is small. In some counties of North Carolina, however, it has caused serious losses, and from Maryland come reports that fields have suffered as high as 60 to 80 per cent in plant mortality.

No method of controlling or avoiding wilt has been found except through the breeding or selection of resistant types. Fortunately, the three types we grow in Connecticut are said to be quite resistant. In the cases observed here only a few plants in any field were affected and the loss was negligible. It does not seem likely that the disease will become destructive here, but it should be watched.

Control of Tobacco Mildew

Experiments on control of mildew by spraying with Fermate were continued with good results. In the seed beds at the Station farm—where all sections of the bed were inoculated with spores—the unsprayed plots had 98 per cent infected plants while the plots sprayed twice a week with Fermate had less than one per cent. Repeated greenhouse experiments during the winter gave almost 100 per cent control. Fermate was used by many growers in the spring of 1943 and most of them reported excellent results—although some said mildew came into the beds at a late stage when the plants were large enough to set out.

Two other chemicals, bismuth subsalicylate and benzyl salicylate, were compared with Fermate. These materials gave good control of mildew, but both caused injury to the tobacco plants. Being more expensive and more trouble to prepare, they offer no advantages over Fermate. Neither seems to give the plants resistance to mildew after the spray is discontinued for a few days; this is also true of Fermate.

Further tests with paradichlorobenzene gave excellent control when the beds were fumigated by distributing the crystals on a strip of cheesecloth stretched longitudinally over the center of the bed.

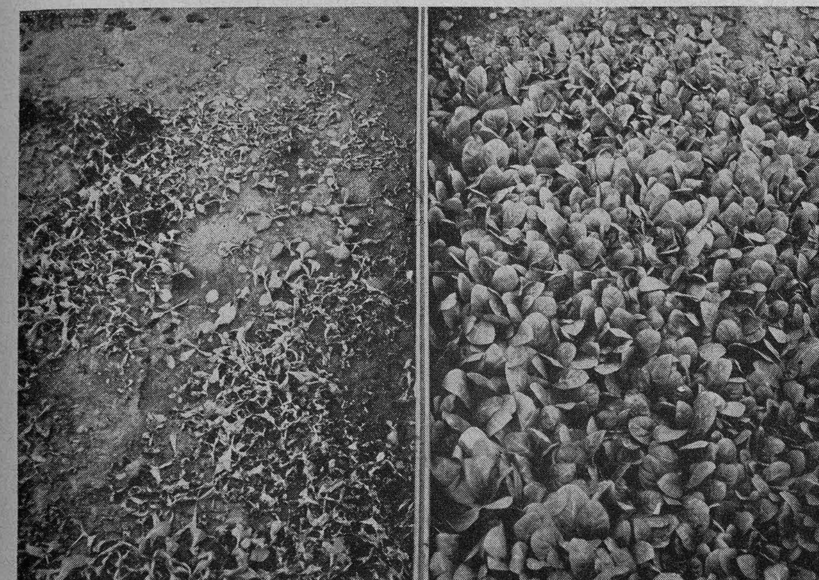

FIGURE 7. Control of tobacco mildew in seed bed. Right, sprayed with "Fermate". Left, untreated.

Methods of Applying Tobacco Fertilizers

In Connecticut the time-honored and standard method of fertilizing tobacco is to broadcast and harrow in the fertilizer on the plowed and levelled field, a week or two before setting the plants. Results of recent experiments at Windsor indicate that some changes in time, place and depth of application might be advantageous.

Time: Four years' records on 24 test plots showed an increase of 7.5 per cent in yield and 5 per cent in grading when the fertilizer was applied the same day the plants were set, instead of 10 days earlier.

Place: Four years' records on 48 plots showed an increase of 3 per cent yield and 13 per cent in grading when the fertilizer was applied in narrow bands on either side of the row instead of distributed uniformly in the soil by broadcasting.

Depth: One years' results on 12 plots showed an increase of 5 per cent in yield, but a reduction of 4.3 per cent in grading when the fertilizer was spread on the land, and plowed under. Although the computed acre value of the crop was about the same, the "plow under" method gave a more uniform stand of plants and less restocking was necessary.

Shade Tobacco Breeding

This project, conducted for four years in cooperation with the Genetics Department and with the Shade Tobacco Growers Association, is yielding promising results. The object is to develop a higher yielding strain that will produce a greater percentage of the best grades of wrapper.

The early years of the experiment were devoted to extensive breeding and selection work, with the elimination of all but the most promising types. Attention is now narrowed down to two or three strains which appear to be quite superior to the ordinary Shade type. They develop more leaves to the plant and make a higher yield per acre. The leaves have a better shape, and grade out better than ordinary Shade, especially in the upper primings.

For testing on a somewhat larger scale and under a variety of conditions, a small amount of seed of the best strain will be supplied to Shade growers who wish to make a limited trial in 1944.

Relative Efficiency of Nitrogen in Oil Meals

Cottonseed meal has been used as a source of nitrogen in tobacco fertilization for at least two generations in the Connecticut Valley. Castor pomace is another nitrogen carrier and in more recent years soybean oil meal has come into use.

Castor pomace is usually second choice to cottonseed meal. Growers have observed that it frequently produces too great a percentage of "darks" and that it delays maturity of the crop. Soybean oil meal is a newcomer, having been introduced about a decade ago. This has received the same criticism as castor pomace, though to a lesser extent.

In an attempt to explain the behavior of tobacco fertilized with different oil meals, experiments have been carried on at Windsor using the three meals as single sources of nitrogen in the fertilizer. In four tests, crop yields and quality produced by 200 pounds of nitrogen in cottonseed meal were equal to those produced by 160 pounds of nitrogen in the form of castor pomace, or by 180 pounds from soybean oil meal.

The explanation for this is that a greater part of the nitrogen in castor and soybean meals becomes active at the critical growth period, than of that in cottonseed meal. This is confirmed by the nitrate levels found in the soil. In previous experiments, when 200 pounds of total nitrogen were applied, the nitrate nitrogen levels were as follows: for cottonseed meal, 26 pounds per acre; for castor pomace, 42 pounds; and for soybean meal, 35 pounds. In the recent trials the same relationship was found.

Thus it would appear that castor pomace and soybean meal will produce tobacco equal to that grown with cottonseed meal, if properly used. In these experiments castor pomace, pound for pound, was found equivalent to cottonseed meal, in spite of the fact that castor pomace contains only 4.5 to 5 per cent of nitrogen and cottonseed meal 6.5 to 7 per cent. Soybean meal analyses 7 per cent of nitrogen or better, slightly higher than cottonseed. Because of this and its somewhat higher activity, 1,700 pounds of soybean meal gave results equal to a ton of cottonseed meal.

ANALYTICAL CHEMISTRY

Fertilizer Grades Reduced in Number

Tonnage returns indicate that about 73,000 tons of fertilizer were used in the State, as compared with 65,000 tons in 1942. Both figures are exclusive of fertilizer distributed in connection with the federal Agricultural Adjustment Program. Nearly 6,000 tons of 3–8–7, the grade especially designated for victory gardens, was sold in Connecticut. The inspection for the current year shows that guaranties were well maintained and regulations complied with.

By order of the Food Production Administration, the number of grades of fertilizer was greatly reduced. Instead of the normal 60 to 65 grades, only 15 were permitted. The purpose of the order was to effect a more economical use of fertilizer chemicals available for crop production and to conserve chemical nitrogen vitally needed for the manufacture of munitions. Within the limits imposed by shortages of materials, the grades permitted were adapted to Connecticut crops and conditions.

Commercial Feeding Stuffs

Based on the livestock and poultry population it has been estimated that the annual grain consumption in the State is about 460,000 tons, of which 210,000 is for dairy herds, beef cattle and other livestock, and 250,000 for poultry.

Feed grain shortages and the uncertain supply of ingredients for mixed feeds have created a difficult problem for feed manufacturers. It has been impossible for them to maintain fixed formulas, and frequent revisions have been necessary. So far as this situation was reflected in the 1942 inspection year, guaranties were well sustained. About 1,000 samples, including vitamin D carriers, were examined and over 95 per cent of guaranties made were substantially met or exceeded. The grain shortage has been more acute in the current year, 1943, for which inspection data are not yet available.

Sixty-one biological specimens were examined in connection with cases of suspected poisoning of livestock and poultry. In about one-third of these, poisonous substances were found that suggested probable causes of mortality. Arsenic, lead, cyanide, strychnine and yellow phosphorus were the poisons found. Commercial feeds were not involved in any of these cases; mortality was the result of failure to prevent animals from gaining access to insecticides or other poisons used on the farm, or in some cases probably due to malicious distribution of poisoned bait.

Food and Drug Products Tested

Of over 1,800 samples of foods, drugs and cosmetics examined in the past year, olive oil showed the greatest percentage of adulteration and misbranding. Fifty-one of 64 official samples submitted by the Dairy and Food Commissioner were illegal, mainly because they were sold as olive oil but contained substitutes of common vegetable oils, such as corn, cottonseed and peanut oils. Coffee was not found to be adulterated notwithstanding the imminence of rationing at the time the survey was made. Mixtures of coffee with chicory, or other non-coffee material, were properly labelled. Ninety per cent of the samples of vitamin D milk examined fully or substantially met the unitages of vitamin D claimed for them.

The appearance of horse meat on the market in some sections of the State raised the question of its detection in comminuted meat products such as hamburg steak and frankfurt sausage. A chemical method which distinguishes horse fat from the fats of beef, mutton and pork has diagnostic possibilities. So far as it has been applied to market samples suspected of containing horse meat, no evidence was found to justify the suspicion.

BIOCHEMISTRY

Metabolism of Asparagine

Research on asparagine has been continued with the object of demonstrating that asparagine can be economically prepared from the seedlings of species of lupines available from an American grown crop. A blue lupine, *Lupinus angustifolius*, now being produced in substantial quantities in Florida has been shown to provide a suitable source. After being sprouted in darkness for 12 days, the seedling tissue yields a quantity of pure asparagine the equivalent of about 9 per cent of the weight of dry seed taken. This species thus compares favorably with the imported *L. albus* which, although it yields a somewhat higher proportion, requires a longer culture period to do so.

The unexpected observation was made that the asparagine in *L. angustifolius* seedlings reaches a maximum concentration at about 12 days and then rapidly decreases, the nitrogen previously combined in the form of asparagine being liberated in the form of ammonia. The possibility that this was due to invasion of the tissues by micro-organisms was ruled out by examinations kindly carried out by the Botanical Department, and the inference drawn that synthesis of asparagine in this species depends upon the supply not only of ammonia derived from protein decomposition but also on a supply of some other component or metabolite. At a certain stage of development, namely that reached in about 12 days of culture, the supply of this component becomes exhausted. Asparagine synthesis therefore ceases and the mechanisms which provide for asparagine decomposition assume dominance. The effect is an apparent reversal of the general course of the metabolism.

This observation was confirmed upon seeds of American origin from both 1942 and 1943 crops. It is a type of behavior not previously recorded for lupine species in general, nor for seeds of this species studied in Europe and in Australia. The phenomenon provides an opportunity for more detailed study of the mechanism of amide synthesis.

The asparagine metabolism of a typical species of vetch, *Vicia atropurpurea*, has also been investigated. The seeds of this plant were found to be less satisfactory for asparagine production than the lupines.

Sources of Glutamine

Inasmuch as glutamine, the next higher homologue of asparagine, has in recent years assumed considerable importance as an essential component of certain culture media used in bacteriological investigations, the search for possible sources of this extremely rare substance has been renewed. Convenient methods to prepare it from beet root tissue were developed here about eight years ago but, since beet plants in which the glutamine content has been increased by treatment with ammonium salts are available only seasonally, it seemed desirable to study the possible use of seedlings for preparation purposes. Such tissues could be prepared in the laboratory at any time.

The glutamine metabolism of several species has been investigated and it has been found that seedlings of the common squash become notably enriched in glutamine when sprouted in darkness. This confirms observations of Schulze made many years ago. Unfortunately, however, the isolation of glutamine in pure form from this material has turned out to be unexpectedly difficult. This problem is receiving continued attention.

Methods of Determining Histidine

The development of an analytical method to determine the proportion of histidine yielded by proteins has been continued. With minor modification, the method that has previously been applied to the histidine-rich blood protein hemoglobin has been found applicable to the case of proteins of low histidine content.

The present purpose is to establish the histidine content of a number of common proteins in order to furnish fundamental data for comparison. Modern amino acid research is tending inevitably in the direction of the development of methods that can be applied to very small quantities of protein. This arises from the fact that although many protein hormones and enzymes can be prepared today in pure crystalline form, the total amount available at any one time is usually small when laboratory methods only are applied because of the great expense and difficulty of the preparation. A well known example is the case of insulin. The ultimate aim of amino acid analysis is the attempt to discover the nature of the unique chemical structures in these rare proteins to which their high physiological activity may be due. Micro-analytical methods only can be applied to them. But the accuracy of micro-analytical methods must be established before the results they yield are acceptable. Thus it is essential to provide standards for comparison by methods of demonstrated accuracy, so that control of micro-methods shall be possible. It is this phase of the general problem of amino acid analysis concerning which the new method for the determination of histidine is designed to provide information.

Plant Metabolism—Organic Acids

The general problem of the metabolism of the organic acids of plants involves both qualitative and quantitative studies of a variety of plant tissues. The observation that optically active isocitric acid, a substance so rare that samples have been hitherto available in only one or two laboratories in the world, makes up about 11 per cent of the dry weight of the leaves of the common plant *Bryophyllum calycinum* was reported last year. Attention has accordingly been paid to the acid composition of allied species and especially to the accumulation of substantial quantities of leaves for the preparation of this substance in amounts that will permit a detailed study of its properties. In addition, a series of experiments designed to establish the major factors concerned with the metabolism of isocitric acid in *Bryophyllum* leaves has been planned and in part completed. Reports on this material may, however, be delayed until normal conditions in the laboratory have been reestablished.

Standardizing the Rat Colony

A summary has been made of the growth and reproductive performance of rats of the Experiment Station colony in recent years in comparison with similar surveys made previously. An examination of the colony at the present time was prompted in part by reports from other laboratories that indicated poor breeding records which might be attributed to the difficulty of maintaining normal food supplies for the stock colonies.

Our records over a long period indicated that fluctuations in growth and in reproductive performance may be expected and are not necessarily associated with any change in food supply. Smith, Anderson and Hubbell (Bulletin **406**) reported a marked decline in fertility in the third generation of rats in one group. In subsequent generations members of this group showed great improvement. A similar observation has been made with the rats of our regular stock colony. In 1938, 84 per cent of mated female rats cast litters and 95 per cent of these litters were weaned. In 1939 the record was essentially the same. However, in 1940, with no change in food or in colony management, only 65 per cent of the mated females cast litters and the number of litters weaned was slightly lower than normal. The records for 1941 and for 1942 were similar to those of 1938 and 1939 and it is evident that reproduction will be "normal" for 1943.

Growth curves for both male and female rats in the breeding stock during 1942-43 agree closely with those reported in 1935. Male rats

were somewhat lighter during the period of growth from 40 days to 110 days. This may be associated with a slight change that has been made in the stock diet during the past year, in order to conserve food.

Citric Acid and Bone Growth

Work on the relation of citric acid to bone calcification has been continued. Reports that have appeared from other laboratories have made it essential to establish normal values for the citric acid content of bones and for other organs and tissues as well. Determinations of citric acid have been made using bones from normal rats of both sexes at weaning and for several other weight groups. From approximately 250 analyses thus far completed it is evident that there are wide variations in citric acid content of bones of animals of the same weight, age and dietary history.

BIOMETRY

Observations in agricultural research are subject to the unavoidable variations of living plants and animals and their environment. Quantitative results must be evaluated against the background of this variation. The earlier an investigator can identify and characterize those factors which are significant, the more efficiently he can conduct his research. In the past decade new methods for coping with the problem have become of inestimable value to the investigator, but their complexity calls for the aid of a specialist. For this purpose, Dr. C. I. Bliss was brought to the Station in 1940 on a part-time basis as consulting biometrician. His aid has been sought by staff members in all departments to the benefit of the quality of our research. In July he was appointed to the newly-established position of Station Biometrician, which at present continues on a part-time basis.

The duties of Station Biometrician also include research for developing and improving techniques. During 1943 attention was centered on the design and analysis of experiments with insecticides and fungicides based on the relation between dosage and effect. In February a conference of phytopathologists, entomologists and biometricians was held in Columbus to discuss collaborative studies in this field with special reference to the conservation of war-scarce materials. A mimeographed statement on the research methods discussed at the conference was prepared at the Station and distributed widely to various investigators on request. Methods of statistical analysis especially adapted for this type of research have been developed from a study of data submitted by entomologists and phytopathologists at the Station. When they have been tested on further experiments, they will be described in a Station bulletin.

THE LIBRARY

The Station Library now contains 27,400 volumes, largely bound journals and bulletins. Some 90 scientific journals are received regularly, in addition to 20 agricultural papers.

During the year there were the following additions:

U. S. Department of Agriculture publications	573
State Agricultural Experiment Station publications	1,306
Scientific and agricultural domestic and foreign journals	1,464
Single books	82
Total	3,425

Within its field, the Station has an unusually good collection, some of the older journals being rare.

A film reader makes possible the use of the film service now provided by many large libraries.

LIST OF PROJECTS

active in 1943-44

Analytical Chemistry

1. Inspection of fertilizers.
2. Inspection of feeding stuffs. (Including biological assays of vitamin D supplements for poultry feeds.)
3. Inspection of foods and drugs. (Including biological assays of vitamin D milk.)
4. Calibration of Babcock glassware and thermometers.
5. Analyses of insecticides and fungicides.
7. Analyses of special and miscellaneous foods.
8. Collaborative studies on analytical methods.
9. Examination of biological specimens in connection with suspected poisoning of livestock.

(Nos. 2, 3, 4 and 5 are in coöperation with the Dairy and Food Commissioner.)

Biochemistry

1. Cell chemistry.
   a. A detailed examination of the chemical composition of plant tissues with special reference to the changes that occur during culture under various conditions, and to the metabolism of the various components. The development of methods suitable for the accurate determination of the components of plant tissues.
   e. Investigation of the organic acids of plants with special reference to their detection, analytical determination and to their metabolism.
2. Protein chemistry.
   Investigation of the properties of proteins and amino acids with special reference to the development of methods for their preparation and analytical determination.
3. Nutrition investigations.
   Investigations of the relation of certain constituents of the diet, especially the mineral salts, to growth.

Entomology

9. Insect survey of Connecticut.
17. Studies on the control of the Oriental fruit moth, including parasites. (In coöperation with the U. S. Dept. of Agr.)
31. Studies on the biology and control of the European pine shoot moth.
37. Substitutes for lead arsenate in orchard sprays in apple maggot control.
38. The relation of rate of growth and pruning methods to the recovery of white pine to weevil injury.
40. Studies on the control of the European corn borer. (In coöperation with the U. S. Dept. of Agr.)
43. The spruce gall aphid.
44. Bark beetles of the elm.
45. Investigation of parasites of the Japanese beetle.
49. Adhesives for standard spray mixtures.
51. Soil and grassland insect investigations.
52. Study of wireworm injury to potatoes and tobacco.
53. Rodent control. (In coöperation with the U. S. Fish and Wildlife Service.)
55. The biology and control of *Calomycterus setarius* Roelofs.
56. Studies of dusts. (In coöperation with the Dept. of Plant Pathology and Botany.)
57. The biology and control of Comstock's mealybug on pears and apples.
58. Investigations of diseases affecting scarabaeid larvae.
59. The biology and control of the dogwood borer.
60. The biology of the codling moth in Connecticut.

Control and Service

10. Inspection of orchards and nurseries.
11. Control of the gypsy moth. (In coöperation with the U. S. Dept. Agr.)
13. Inspection of apiaries.
19. European corn borer and Japanese beetle inspection. (In coöperation with the U. S. Dept. Agr.)
27. Rearing and distributing parasites of the oriental fruit moth. (In coöperation with the Conn. Pomological Society.)
29. Dutch elm disease control. (In coöperation with the U. S. Dept. Agr.)

Forestry

1. Experimental plantations on a sandy tract at Rainbow.
   a. Comparison of many species of conifers and hardwoods, in pure stands and in combinations, as to growth and habits.
   b. Methods of management for those species that have survived.
   c. The properties of the wood of several of the important species. (In coöperation with the Yale Forestry School.)
6. Studies of forest plantations throughout the State.
   a. Growth and yield of several species in relation to site. (The present studies are on red pine, in coöperation with the State Forester and the Yale Forestry School.)
12. The utilization of native woods. (In coöperation with the State Forester, State Highway Dept., Conn. Forest & Park Assoc., Yale Forestry School, and U. S. Forestry Service.)
   c. The use of hogged wood as a fuel.
   d. Problems involved in the combustion of wood. (In coöperation with the Dept. of Mech. Eng., Yale University.)

Control and Service

7. Control of white pine blister rust. (In coöperation with the U. S. Dept. Agr.)

Genetics (Plant Breeding)

1. A genetic and cytological study of hereditary characters in plants.
2. The effect of inbreeding and crossing upon seed and vegetatively propagated plants.
3. Methods for the improvement of naturally cross-fertilized plants by selection in inbred lines.
4. Methods for the improvement of naturally self-fertilized plants.
5. A genetic and physiological study of variation and the effects of selection in vegetables and fruits

Plant Pathology and Botany

5. Plant disease survey of Connecticut.
20. Diseases of shade trees.
27. The Dutch elm disease and related diseases.
28. Studies on the identification of apple varieties by seed characters. (Inactive)
30. Diseases of vegetable crops and their control.
   a. Downy mildew of muskmelons and cucumbers.
   b. Defoliation and related diseases of tomatoes.
   d. Wilt diseases of tomatoes and eggplant.
31. Investigation of the X-disease of peach.
33. Diseases of ornamental plants.
   Rose diseases—powdery mildew, black spot.
34. Fungicides, new and old.
35. Apple spraying.
36. Antidoting phytotoxins and viruses by chemotherapy.
37. Root rot diseases of plants.

Control and Service

12. Seed testing. (In coöperation with the Commissioner of Agriculture.)
25. Spray service. (In coöperation with Extension Service, University of Conn.)

Soils

3. Nutrient requirements of vegetable crops on important soil types used for market gardening in Connecticut.
4. The relation of soil conditions to growth and composition of natural and planted forests.
5. Lysimeter studies of the drainage losses and other changes that occur in soils under heavy fertilization as practised for tobacco and vegetables.
7. The improvement of the nutritional status of unproductive forest soils.
8. The agronomic application of rapid chemical tests for estimating the nutritional factors of soil fertility.
9. The evaluation of various soil factors in terms of land use and types of farming.
10. Nitrogen relationships in soil maintenance by green manures in vegetable cropping systems.

Tobacco Substation

1. Fertilizer experiments.
   bb. The relative efficiency of nitrogen from castor pomace, soybean oil meal and cottonseed meal.
   e. Comparison of various single sources of nitrogen.
   fa. Comparison of sources of phosphorus.
   qa. Fertilizer placement tests.
   r. Plowing under the fertilizer.
4. Tobacco nutrition studies.
   b. Boron experiments.
   d. Symptoms of food element deficiency.
   h. Ammonification and nitrification of fertilizer materials.

7aa. Improvement of Shade tobacco by selection and breeding. (With Genetics Dept. and in coöperation with the Shade Tobacco Growers Agricultural Association, Inc.)

17aa. Study of tobacco pigments.

17b. The study of the cause of black Shade tobacco.

19. Investigation of various tobacco diseases.
   a. Damping-off.
   c. Pole rot.
   e. Breeding for mosaic resistant Broadleaf.
   f. Control of downy mildew.
   i. Sclerotinia and Botrytis diseases of tobacco.
20. The biology and control of insects that attack tobacco. (See also Entomology No. 52.)
22. Irrigation of tobacco.
26. Chlorpicrin for sterilization of tobacco bed soil.
31. Breeding for low nicotine content of leaf.

PUBLICATIONS

July, 1942 to July, 1943

BULLETINS OF THE STATION

No. **459**. Commercial Feeding Stuffs. Report of Inspection, 1941. E. M. Bailey.

No. **460**. Report on Food Products and Drugs for 1941. E. M. Bailey.

No. **461**. Connecticut State Entomologist. Forty-first Report, 1941. R. B. Friend.

No. **462**. Investigations on the Control of the European Corn Borer. Raimon L. Beard and Neely Turner.

No. **463**. A Wood-Burning Conversion Unit for Household Furnaces. Henry W. Hicock, A. Richard Olson and Lauren E. Seeley.

No. **464**. The Rainbow Forest Plantations. Report of Progress, 1942. Henry W. Hicock.

No. **465**. Cytological and Genetic Studies of Sterility in Inbred and Hybrid Maize. Frances J. Clark.

No. **466**. Drainage Water Losses from a Sandy Soil as Affected by Cropping and Cover Crops. Windsor Lysimeter Series C. M. F. Morgan, H. G. M. Jacobson and S. B. LeCompte, Jr.

No. **467**. Commercial Fertilizers. Report for 1942. E. M. Bailey.

No. **468**. Annual Report for the Year Ending October 31, 1942.

No. **469**. Tobacco Substation at Windsor. Report for 1942. P. J. Anderson, T. R. Swanback and S. B. LeCompte, Jr.

No. **470**. Notes on Livestock Poisoning in Connecticut. C. E. Shepard, E. M. Bailey and D. C. Walden.

No. **471**. The Significance of Growth Stages of Sweet Corn as Related to Infestation by the European Corn Borer. Raimon L. Beard.

No. **472**. Connecticut State Entomologist. Forty-Second Report, 1942. R. B. Friend.

No. **473**. Commercial Feeding Stuffs. Report on Inspection, 1942. E. M. Bailey.

CIRCULARS OF THE STATION

No. **154**. How Connecticut Nurserymen Can Aid in Food Production.

No. **155**. Controlling Pests of War Gardens. Neely Turner and James G. Horsfall.

No. **156**. Growing Potatoes in War Time.

No. **157**. Control of the Japanese Beetle. J. Peter Johnson.

JOURNAL PAPERS

Bliss, C. I., and Cattell, McKeen. Biological assay. Annual Review of Physiology, **5**:479-539. 1943.

Bliss, C. I., and Dearborn, R. B. The efficiency of lattice squares in corn selection tests in New England and Pennsylvania. Proc. Amer. Soc. Hort. Science, **41**:324-342. 1942.

Bliss, C. I., and Moore, William. A method for determining insecticidal effectiveness using *Aphis rumicis* and certain organic compounds. Jour. Econ. Ent., **35**:544. 1942.

Bliss, C. I., and Whitlock, J. H. A bioassay technique for anthelmintics. Journal of Parasitology, **29**:48-58. 1943.

Curtis, Lawrence C. The effect of storage on the betanin and sucrose content of garden beets (*Beta vulgaris*) and its importance in a breeding program with this crop. Amer. Soc. Hort. Sci., **41**:370-374. 1942.

Dimond, A. E., Heuberger, J. W., and Horsfall, J. G. Copper spray substitutes. Amer. Potato Jour., **20**:142-153. 1943.

Dimond, A. E., and Horsfall, J. G. Preventing the bacterial oxidation of rubber. Science, **97**:144-145. 1943.

Jones, D. F. Chinese chestnuts. Rural New Yorker, **102**:365. 1943.

————. Growth changes associated with chromosome aberrations. Genetics, **28**:78. 1943.

————. New potatoes for the Northeast. Rural New Yorker, **102**:288. 1943.

————. Vegetables for winter use. Rural New Yorker, **102**:147, 262. 1943.

Fisher, H. J. Xanthone 2,7-dinitrile. Jour. Amer. Chem. Soc., **65**:991. 1943.

Friend, Roger B. Entomology. Amer. Year Book, pp. 769-771. 1942.

Garman, Philip. Insect control and the insecticide situation for 1943. Conn. Pomol. Soc. Proc., **45**:27-31. 1943.

————. The insect outlook. Pomol. Pointers for Conn. Fruit Growers. April, 1943.

————. Looking ahead to insect outbreaks and insecticide supplies in 1943. Pomol. Pointers for Conn. Fruit Growers. Jan., 1943.

————. Problems in fruit insect control. The Rural New Yorker, **102**:288. 1943.

————. Report on parasite breeding and distribution for 1942. Conn. Pomol. Soc. Proc., **45**:74-75. 1943.

————. Seasonal insect notes. Pomol. Pointers for Conn. Fruit Growers. May, 1943.

————. Studies of reduced schedules for control of apple insects in Connecticut. Jour. Econ. Ent., **36**:211-214. 1943.

Garman, Philip, Friend, R. B., Davidson, H. W., and Bishop, J. H. R. Report of committee on injurious insects. Conn. Pomol. Soc. Proc., **45**:66-67. 1943.

Hubbell, R. B., Vickery, H. B., and Nolan, L. S. Cucurbit seed globulins. II. Use as substitutes for edestin in experimental diets. Jour. Nutrition, **25**:99-101. 1943.

Johnson, J. P. Cutworms—gardeners' perennial enemies. Horticulture, **21**:80-81. 1943.

————. The effect of hot water treatment for cyclamen mite upon cyclamen plants. Jour. Econ. Ent., **36**:286-289. 1943.

————. Vegetables in poisoned lawns. Horticulture, **21**:166. 1943.

Morgan, M. F., Jacobson, H. G. M., and Street, O. E. The neutralization of acid-forming nitrogenous fertilizers in relation to nitrogen availability and soil bases. Soil Science, **54**:127-148. 1942.

PUCHER, GEORGE W. The organic acids of the leaves of *Bryophyllum calycinum*. Jour. Biol. Chem., **145**:511-523. 1942.

PUCHER, G. W., and VICKERY, H. B. On the identity of the so-called crassulacean malic acid with isocitric acid. Jour. Biol. Chem., **145**:525-532. 1942.

ROBERTS, L. M. The effects of translocation on growth in *Zea mays*. Genetics, **27**: 584-603. 1942.

SINGLETON, W. R. Breeding behavior of C30 a diminutive P39 mutant whose hybrids show increased vigor. Genetics, **28**:89. 1943.

STODDARD, E. M. Can we change our spray schedule? Rural New Yorker, **102**:142. 1943.

————. Report of committee on fruit diseases. Conn. Pomol. Soc. Proc., **44**:68-70. 1943.

TURNER, NEELY. The effect of diluents on the toxicity of pure ground derris root in dusts. Jour. Econ. Ent., **36**:266-272. 1943.

VICKERY, H. B. The histidine content of the hemoglobin of man and of the horse and sheep determined with the aid of 3,4-dichlorobenzene-sulfonic acid. Jour. Biol. Chem., **144**:719-730. 1942.

VICKERY, H. B., and PUCHER, G. W. Amide metabolism in etiolated seedlings. I. Asparagine and glutamine formation in *Lupinus angustifolius, Vicia atropurpurea,* and *Cucurbita pepo*. Jour. Biol. Chem., **150**:197-207. 1943.

VICKERY, H. B., PUCHER, G. W., and DEUBER, C. G. The preparation of asparagine. Jour. Biol. Chem., **145**:45-53. 1942.

All of which is respectfully submitted.

WILLIAM L. SLATE,

Director.

REPORT OF THE TREASURER

July 1, 1942 to June 30, 1943

Income

STATE APPROPRIATIONS:	
Regular	$243,642.00
Special:	
Construction and Plant Improvements	2,638.42
FEED FEES	17,000.00
FERTILIZER FEES	12,720.00
MISCELLANEOUS	262.64
TRUST FUNDS AND GRANTS	22,807.89
FEDERAL APPROPRIATIONS:	
Adams	7,500.00
Hatch	7,500.00
Bankhead-Jones	11,253.66
Purnell	30,000.00
	$355,324.61
UNEXPENDED BALANCE	47,921.64
NET INCOME	$307,402.97

July 1, 1942 to June 30, 1943

Expenditures

	Personal Services	Contractual Services	Supplies and Materials	Capital Outlay	Totals
State Appropriations:					
Station General Fund	$75,689.08	5,108.73	8,149.07	2,180.90	91,127.78
Bee Diseases (Inspection)	1,740.00	1,038.80	6.50	......	2,785.30
Food and Drug Analyses	7,782.50	308.50	532.03	162.60	8,785.63
Gypsy Moth Suppression	23,968.01	1,297.91	808.11	35.60	26,109.63
Insect Pest Control and Research	50,975.85	2,318.34	1,749.62	555.56	55,599.37
Tobacco Substation	16,151.33	464.49	1,410.39	850.59	18,876.80
White Pine Blister Rust Control	4,082.70	536.39	209.20	......	4,828.29
Construction and Plant Improvements	......	......	......	2,155.85	2,155.85
Federal Funds	49,036.95	1,803.55	2,727.32	2,087.47	55,655.29
Feed Inspection	15,119.20	457.14	616.64	81.25	16,274.23
Fertilizer Inspection	11,013.07	455.87	551.92	122.80	12,143.66
Trust Funds and Grants	10,763.66	296.05	1,681.32	320.11	13,061.14
Net Expenditures	$266,322.35	14,085.77	18,442.12	8,552.73	307,402.97

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TOBACCO SUBSTATION AT WINDSOR

REPORT FOR 1943

P. J. Anderson

T. R. Swanback and S. B. LeCompte, Jr.

Connecticut

Agricultural Experiment Station

New Haven

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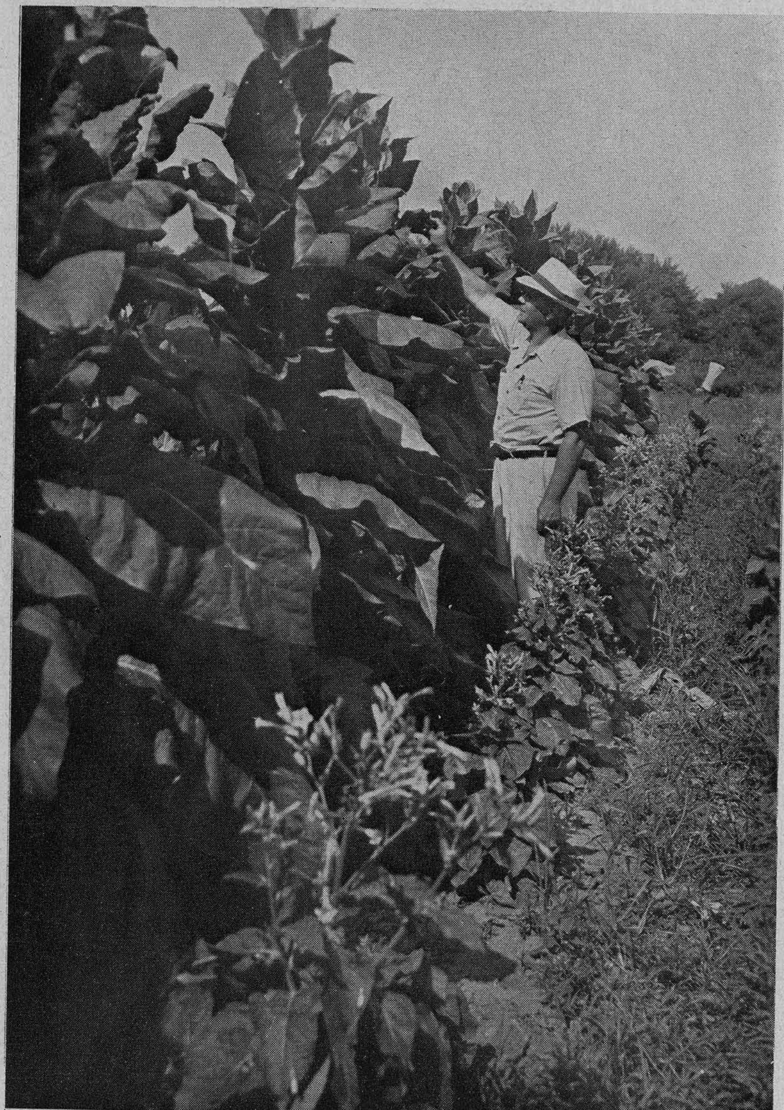


Tobacco breeding. Giant Broadleaf on left; Dwarf Shade on right.

Tobacco Substation at Windsor

REPORT FOR 1943

P. J. Anderson, T. R. Swanback and S. B. LeCompte, Jr.

The Twenty-Second Annual Report of the Tobacco Substation at Windsor, is presented according to statute, to acquaint growers with the progress of experimental work on tobacco during the calendar year of 1943. In this, our second year of the war, tobacco growers have had to contend with many difficulties and restrictions.

Located in one of the most congested war implement centers of America, with the able young men in the armed services, with the older men and many women lured away by high wages of war industries, the grower could hardly find laborers enough to grow and harvest the tobacco crop. He paid high wages for inexperienced help, and the cost of all materials and tools he needed increased enormously. For example, Shade growers paid as high as $95 a ton for charcoal—four or five times the usual price. Then a ceiling price at which he could sell tobacco was set by the Office of Price Administration at Washington. This price was 40 cents a pound for Havana Seed and Broadleaf tobacco in the bundle, with a top price of 49 cents for sorted Broadleaf. Most of the tobacco was sold at, or near, the ceiling price. Most of the Broadleaf was sold in the field before it was harvested, for the first time since World War I days.

The increased cost of production and the scarcity of labor resulted in a reduction in acreage, as shown in Table 1, where the production of 1943 is compared with that of 1942 and also with that of the decade, 1932—41.

Table 1. Acreage and Production of Tobacco in the Connecticut Valley for 1943 and 1942, and a Ten Year Average [1]

Type	Acreage			Production in pounds		
	Average 1932-41	1942	1943	Average 1932-41	1942	(Estimated) 1943
Broadleaf......	7,690	6,800	6,300	11,937,000	10,344,000	10,028,000
Havana Seed...	6,860	7,600	6,700	10,941,000	12,716,000	11,335,000
Shade.........	6,170	6,100	6,300	5,941,000	5,644,000	6,340,000
Total......	20,720	20,500	19,300	28,819,000	28,704,000	27,703,000

[1] Data supplied by the New England Crop Reporting Service, December 24, 1943.

The war has cut off the supply of cigar wrappers grown in Sumatra and Java—formerly used to wrap a third or more of our cigars—and the supply that was stored in this country is now almost exhausted. This has resulted in an increased demand for domestic wrappers. All grades of Shade tobacco are in good demand at satisfactory prices. Another result of the wrapper shortage has been the revival of "priming" Havana Seed, a former practice which had become all but obsolete in the Connecticut Valley. How many acres were primed in 1943 has not been determined, but there were at least some hundreds. Also, some fields were planted to Roundtip tobacco to be primed for wrappers. This type had not been grown here for about 20 years. Finally, this effort to get more wrappers has developed some demand for the "light wrapper" grade of stalk-cut Havana Seed. In recent years this grade had been used entirely for binders.

A cold late spring delayed the starting of plant beds at least two weeks. The transplanting season was also delayed, but favorable weather in the early part of the summer pushed the plants ahead so fast that they were about up to the normal stage of development by the middle of the summer. Rainfall (see Table 2) was adequate, but with no serious leaching rains, up to the middle of July. From that date on, however, it became very dry and continued so throughout the summer. The fall was the driest in recent years. Some late crops of the open field tobacco and the late primings of Shade suffered from this drouth. The curing season was so dry that there was practically no pole rot in the sheds and very little charcoal was used in the curing of Havana Seed or Broadleaf. However, the dry curing season caused much of the tobacco to cure with white or prominent veins. A number of local hail storms caused damage to the open field tobacco, but except in a few small areas, the damage did not result in complete loss of the crop.

Table 2. Distribution of Rainfall in Inches at the Tobacco Substation, Windsor, 1943

		By 10-day periods	By months	Average for preceding 21 years
May	1–10	1.61	4.89	3.46
	11–20	1.77		
	21–31	1.51		
June	1–10	1.06	3.53	3.89
	11–20	1.49		
	21–30	.98		
July	1–10	.46	2.94	3.70
	11–20	.86		
	21–31	1.62		
August	1–10	.62	1.61	3.99
	11–20	.84		
	21–31	.15		

Work at the Station was curtailed somewhat by the war stringency and lack of help. Satisfactory progress was recorded, however, in most of the experiments. Very few new projects were started but all the old ones were continued as far as it was advisable to do so. Progress reports on some of them are given in the following pages.

One addition was made to our research staff. In our report for 1942, it was explained that the U. S. Department of Agriculture found it necessary to transfer Mr. Morrill, the entomologist who was assigned to investigate tobacco insects at Windsor, to another branch of the Department. This left us without an entomologist in 1942. In the spring of 1943 Dr. Douglas E. Greenwood, formerly of the New York Agricultural Experiment Station, was employed by the Entomological Department of the Station and assigned to the investigation of wire worms of both tobacco and potatoes. He is devoting all his time to this project.

The project on breeding of Shade tobacco has been actively continued in cooperation with the Shade Growers' Association. The field tests were located again on the plantation of the Imperial Agricultural Corporation in Windsor and the writers take this opportunity to express their appreciation for the splendid, efficient and generous cooperation of this company. The object of this project has been to develop a better type of Shade tobacco. After extensive breeding and selection trials in the first years and elimination of all but the most promising types, tests have now been narrowed down to two or three strains which appear to be quite superior to the ordinary Shade type. For testing on a somewhat larger scale, seed of the most promising type will be distributed in small amount to all Shade growers who wish to try it in 1944.

The phosphorus field tests are being continued now in the fourth year and are furnishing strong evidence that we will no longer be dependent on European supplies of this element.

In the following pages will be found a further report on the organic meal field tests, the results of which are giving an unexpected explanation of the differences in appearance of tobacco grown on different meals.

The articles on "plowing the fertilizer under" and on "timing the fertilizer application" present some data that may upset our long-standing ideas on these subjects. Further experiments on successful control of downy mildew are recorded. Fusarium Wilt, a disease of tobacco new to Connecticut is described. Finally the reader will find an article describing further evidence on the cause of "black" color in Shade tobacco.

THE RELATIVE EFFICIENCY OF NITROGEN IN OIL SEED MEALS

T. R. Swanback

"Cottonseed base" is the popular term used to describe most of the tobacco fertilizer mixtures sold or used in Connecticut. This term means that the bulk of the mixture is cottonseed meal, which also furnishes the greater part of the nitrogen. This has been the standard formula for over two generations, has given satisfactory results and undoubtedly has contributed much to the excellent reputation which Connecticut Valley wrappers and binders enjoy in the cigar trade.

From time to time vegetable residues from the manufacture of other kinds of oil have been tried as fertilizer substitutes for cottonseed oil residue. Castor pomace, residue of castor oil extraction, appeared as a competitor soon after cottonseed meal became popular. Linseed meal, from the linseed oil industry, has given satisfactory results but has not been used so extensively as a fertilizer because of its scarcity, high price, and its popularity as an animal feed. Most recent of all is soybean oil meal which is now produced domestically in enormous quantities.

These other meals were substituted on the assumption that a specified quantity of nitrogen in the fertilizer, regardless of which organic meal it is derived from, should produce the same quantity and quality of tobacco. This assumption, however, was not vindicated either by the experience of growers or by a ten-year field plot trial, at the Windsor Experiment Station. In other words, these meals when used to furnish the same amount of nitrogen, produce effects on the tobacco different from those of cottonseed meal. For example, most growers believe that castor pomace produces tobacco of a darker cast and heavier texture. This effect is particularly evident on the heavier types of soil but is not so noticeable on the sandy fields where nitrogen leaches more easily. The same effect, but less pronounced, has been reported for soybean meal.

Why these puzzling differences? The first hint of an explanation was furnished by a series of soil nitrate tests conducted here from 1932 to 1937 on plots where single sources of nitrogen were compared.[1] On each plot a single material furnished nitrogen at the rate of 200 pounds to the acre. Once a week during the growing season, the amount of nitrate in the soil of each plot was chemically measured in order to determine the rate at which each nitrogenous material broke down into a form which the tobacco plant could absorb. Averaging all weekly tests between June 1 and August 25 for the six years it was found that castor pomace maintained 39 per cent more nitrate in the soil than cottonseed meal during the growing season. A similar computation for soybean oil meal for three years, 1935—37, showed that this maintained 37 per cent more nitrate in the soil than did cottonseed meal. Since the greater part of the nitrogen that enters the tobacco plant is absorbed as nitrate, it is apparent from the soil tests that the tobacco on the castor pomace and soybean oil plots was fed at least a third more nitrogen than the tobacco on the cottonseed meal plots. Such luxury feeding of nitrogen could readily account for the darker color and heavier texture of the castor pomace and soybean plots. Thus, in other experiments here[2] it has been shown that an excess nitrogen ration, even though mostly from cottonseed meal, produces darker leaves of heavier texture. In other words, castor pomace and soybean oil meal are more efficient in making their nitrogen available to the tobacco crop. This extra efficiency has been disregarded in making up formulas and here was a possible explanation of the undesirable effects of these meals.

[1] Street, O. E. Nitrate nitrogen and soil acidity production by nitrogenous fertilizers. Conn. Agr. Expt. Sta. Bul. 386:552-578. 1936, and Bul. 410:360-364. 1938.

[2] Conn. Sta. Bul. 410:335-353. 1938.

To test the validity of this hypothesis, a series of plots was started four years ago to compare these three meals applied more nearly on an "efficiency" basis; that is, less nitrogen (as determined by the chemist) applied on the castor pomace and soybean meal plots than on the cottonseed plots. For reasons explained in a preliminary report[3] the quantities of castor pomace and soybean oil meal were not reduced as much as the computation from the experiment mentioned above indicated to be theoretically possible. Castor pomace was applied in sufficient amount to supply 160 pounds (chemically determined) of nitrogen, and soybean meal 170 pounds, while cottonseed meal supplied 200 pounds of nitrogen.

The other nutrient elements—phosphorus, potash, calcium and magnesium were supplied in equal amounts for all plots.

The experiments have been conducted now for four years in the same location with minor adjustments. The Havana Seed type of tobacco was used in all tests. Soybean oil meal nitrogen was used at the rate of 180 pounds per acre for the last two years, instead of the original 170 pounds. Furthermore, one more plot was added to each treatment in 1943 to allow quadruplicate plots of the three oil meals.

The results in terms of yield and grade of the 1943 crop in this experiment are found in Table 3. There is a remarkably close agreement for the three sources of nitrogen, since the differences in yield and grade are not statistically significant. The results obtained by 200 pounds of cottonseed meal nitrogen are no better than those of 160 pounds of nitrogen in castor pomace.[4] The use of 180 pounds of nitrogen in soybean oil meal resulted in considerably higher yield and grading than was obtained by cottonseed meal. Thus, 170 pounds might have been sufficient. The reason for the uncertainty about the quantity of nitrogen to be used in the form of soybean oil meal is that in years of excessive rainfall the lower rate does not seem to be quite sufficient, while in drier years the higher rate would be more than enough. It is safe, however, to conclude that the nitrogen in the soybean meal is at least 10 per cent more efficient than that in cottonseed meal. Castor pomace nitrogen is over 20 per cent more efficient.

More complete evidence in support of the conclusions stated above is presented in Table 4, containing a four-year summary of yield and grading. With the exception of a somewhat lower average yield produced by soybean oil meal, the results are quite uniform for the three oil meals. The small differences shown in the table are not statistically significant. Two years, 1940 and 1942, were relatively wet, while the other two were quite dry. In the wet years the yields were considerably lower than in the dry ones, especially for the soybean meal plots. This explains the slight decrease in average yield for the latter treatment.

Conn. Agr. Exp. Sta. Bul. 444:238-244. 1941.

Theoretically, 153 pounds might have been sufficient to match the results from cottonseed meal.

TABLE 3. YIELD AND GRADING RECORDS OF ORGANIC NITROGEN PLOTS, CROP OF 1943

Source and quantity of nitrogen	Plot No.	Yield Lbs. per A Plot	Yield Lbs. per A Ave.	Percentages of grades L	M	LS	SS	LD	DS	F	B	Grade Index Plot	Grade Index Ave.	Crop index	Relative crop value
Cottonseed meal—200 lbs. N per acre	N11A	2018	1964	7	6	29	9	40	3	6	—	.431	.435	854.3	100
	N11B	1875		7	6	28	9	40	3	7	—	.434			
	N11C	1992		5	2	27	10	46	2	8	—	.404			
	N11D	1969		9	3	37	5	40	1	5	—	.472			
Castor pomace—160 lbs. N per acre	N31A	2013	2054	5	3	30	8	43	4	7	—	.416	.437	897.6	105.1
	N31B	1948		8	7	23	10	43	2	7	—	.430			
	N31C	1850		6	4	28	9	44	2	7	—	.422			
	N31D	2403		10	6	35	5	36	4	4	—	.481			
Soybean oil meal—180 lbs. N per acre	N66A	2073	2070	6	2	29	10	45	2	6	—	.421	.444	919.1	107.6
	N66B	2000		6	3	29	10	46	1	5	—	.427			
	N66C	1935		13	7	21	10	40	2	7	—	.459			
	N66D	2273		10	6	31	6	40	2	5	—	.469			

TABLE 4. ORGANIC NITROGEN PLOTS, FOUR-YEAR SUMMARY ON YIELD AND GRADING

Source of nitrogen	Plot No.	Yields pounds per acre 1940	1941	1942	1943	Ave.	Grade index 1940	1941	1942	1943	Ave.	Relative crop value
Cottonseed meal	N11A	1610	1954	1770	2018		.388	.360	.413	.431		
	N11B	1620	1694	1698	1875		.369	.321	.404	.434		
	N11C	1729	1908	1825	1992	1820	.378	.378	.422	.404	.398	100.
	N11D	....	....	....	1969		.....	.....	.....	.472		
Castor pomace	N31A	1813	1906	1697	2013		.389	.372	.393	.416		
	N31B	1657	1675	1643	1948		.396	.351	.440	.430		
	N31C	1776	2094	1680	1850	1858	.354	.369	.420	.422	.403	103.4
	N31D	....	....	....	2403		.....	.....	.....	.481		
Soybean oil meal	N66A	1613	1938	1883	2073		.385	.370	.387	.421		
	N66B	1598	1672	1520	2000		.390	.356	.338	.427		
	N66C	1582	1798	1543	1935	1802	.395	.394	.388	.459	.398	99.0
	N66D	....	....	....	2273		.....	.....	.....	.469		

Soil nitrate determinations. Organic nitrogen carriers are preferred in our tobacco fertilization, because they furnish available nitrogen (nitrates) at desirable rates, concurrent with growth and development of the plant. In an attempt to follow the development of nitrates produced by the three meals, nitrates were determined on soil samples collected from the field plots of this experiment at weekly intervals the first two years and at ten-day intervals in the remaining two years. Nitrates were determined according to the phenol disulphonic acid method.

The graphs in Figure 1 indicate the nitrate levels produced by the three oil meals during four growing seasons. With minor exceptions, castor pomace and soybean oil meal developed nitrates at a higher rate than cottonseed meal, although the first two supplied less nitrogen in the original applications.

An important feature is that in each instance the three sources of nitrogen terminated their nitrate-producing activities almost simultaneously at the end of the season. Thus there would be a minimum of available nitrogen in the soil at the time the crop should mature. This removes the objection to the use of castor pomace and soybean oil meal that these materials furnish an excess of nitrogen at the end of the growing seasons. Any resulting delay in the maturity of tobacco may be avoided when the oil meals in question are used as suggested above.

TABLE 5. FOUR-YEAR SUMMARY OF NITRATE LEVELS IN SOILS OF ORGANIC NITROGEN PLOTS

Source of nitrogen	Average nitrate nitrogen levels, ppm, in the season of 1940	1941	1942	1943	Ave.
Cottonseed meal..........	55.3	20.3	27.8	57.1	40.1
Castor pomace...........	45.0	22.6	35.1	88.5	47.8
Soybean oil meal.........	43.2	22.9	28.0	67.6	40.4

As a final criterion of the activity or behavior of the three sources of nitrogen applied at the suggested rates of nitrogen per acre, the four-year seasonal average of nitrate levels may be taken, as given in Table 5. This shows that cottonseed meal and soybean oil meal both developed similar levels, about 80 pounds of nitrate nitrogen per acre, while castor pomace reached a somewhat higher level, 90 pounds per acre.

Reasons for the differences. The reason for the different behaviors of the three oil meals may be found in their composition. Recently Rubins and Bear[5], working with carbon-nitrogen ratios in organic

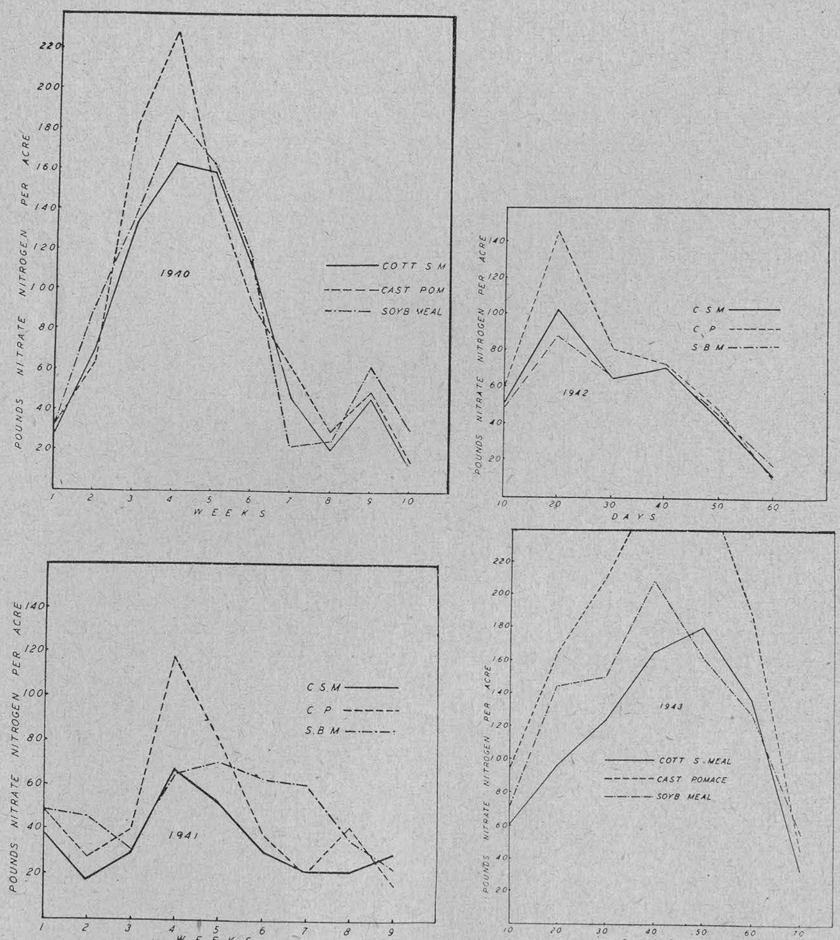


FIGURE 1. Soil nitrate levels during 1940, 1941, 1942 and 1943 growing seasons, on plots treated with different oil meals.

[5] Rubins, Edward J. and Firman E. Bear. Carbon-nitrogen ratio in organic fertilizer materials in relation to the availability of their nitrogen. Soil Science 54 (6):411-423, 1942.

fertilizer materials, found the ratio-values for cottonseed meal, soybean oil meal and castor pomace to be 5.4, 5.9 and 9.4, respectively. They also found that 54 per cent of the nitrogen in cottonseed meal, 65 per cent of that in soybean oil meal and 67 per cent of the nitrogen in castor pomace were recovered in nitrification tests. The "gap" between cottonseed meal and castor pomace corresponds rather well with the results of the present experiments, i. e., 160 pounds of castor pomace nitrogen matched the performance of 200 pounds of nitrogen in cottonseed meal. While the nitrogen in soybean oil meal is practically as available as that in castor pomace, its efficiency does not measure up to the results from the latter material. The fact remains that the performance of castor pomace is quite unique.

The investigators, quoted above, further report that castor pomace contains over 32 per cent lignin, while the cottonseed and soybean products contain only 5.4 and 1.6 per cent, respectively. The high percentage of lignin accounts for the high carbon:nitrogen ratio, mentioned above. However, they found that lignin had *no adverse* effect on nitrification. On the other hand, it is possible that the high percentage of lignin indirectly may have a *favorable* influence on the usability of the nitrogen in castor pomace, on the assumption that lignin would not be a suitable substratum for denitrifying bacteria.

Summary

1. The chemically determined percentages of nitrogen in cottonseed meal (6.5 per cent), castor pomace (5.5 per cent) and soybean oil meal (7.2 per cent) do not reflect correctly the relative crop producing value of these meals.

2. Field soil tests showed that when each of the three meals was used to furnish equal amounts of nitrogen, there was actually more than a third more nitrate in the soil during the growing season where castor pomace or soybean oil meal was used in comparison with cottonseed meal.

3. Crop producing capacities of the three meals (measured by yield and grading) also showed large differences in the same direction but not exactly proportional to the nitrate production.

4. On field plots, an attempt was made to establish the relative efficiency of the three meals by reducing the quantity of nitrogen supplied by castor pomace or soybean oil meal.

5. Compared with 200 pounds of nitrogen in cottonseed meal, equal crop results (measured by yield and grading) were produced by 160 pounds in castor pomace, and by 170 to 180 pounds in soybean oil meal. Thus, castor pomace is rated as at least 20 per cent more efficient than cottonseed meal. Soybean oil meal is 10 to 15 per cent more efficient.

6. Undesirable effects of castor pomace and soybean oil meal, sometimes observed by growers are thus readily explained as due to a too generous supply of nitrate in the soil. This also explains the difference in behavior of these meals on light and heavy soils.

Practical Application

In making the fertilizer mixture, castor pomace and soybean oil meal should not be calculated on the chemical basis but on the "efficiency basis" if one wishes to avoid the ill effect sometimes observed from their use. Thus if the guaranteed analysis of the castor pomace is 5.5 per cent, it should be calculated at 20 per cent greater, or 6.6 per cent. Since this brings it up to about the average analysis of cottonseed meal, one may substitute castor pomace, pound for pound, for cottonseed meal. Similarly, if the soybean oil meal analyzes 7.2 per cent it should be calculated at about 8 per cent or slightly higher (increase of 10 to 15 per cent). Thus 1600 pounds of soybean oil meal could be substituted for a ton of cottonseed meal.

TIMING THE FERTILIZER APPLICATION

It has long been the practice of tobacco growers here to distribute the complete fertilizer on the field a week to two weeks before transplanting the seedlings. Later additional applications, especially of nitrogenous compounds during wet seasons may be made during the early growth of the plants. The origin or basis of this custom of applying all, or the bulk of, the fertilizer so far in advance of setting has not been recorded in the literature of tobacco culture, so far as the writers are aware. Among the reasons that might be advanced for the practice are:

(1) It allows time for the organic materials in the mixture to decay and nitrify to a point where there will be a sufficient supply of available nitrate in the soil for the transplants as soon as they are set. In the early stages of growth, however, the young seedlings require very little nitrogen.

(2) It allows time for soluble salts to become better diffused through the soil, and thus less concentrated in spots where direct contact might injure plants (set directly in contact).

(3) It allows time for chemical and physical reactions which occur between the soil complex and the incorporated fertilizer components, such as base exchanges.

The principal objection to such early applications of fertilizer is that heavy rains, which may occur at that time, may leach out not only the soluble nitrates in the original mixture but also any that have been formed by nitrification of the original non-soluble compounds. To a less extent, potash and calcium may be leached out.

Another objection is that often the farmer who has been delayed by unfavorable weather in plowing and fitting his land, does not have time to let the fertilizer "work" for ten days before his plants become too large for proper transplanting. Often in these circumstances he spreads his fertilizer at the same time he sets the plants.

Renewed interest in methods of fertilizer application and results of a great deal of investigation in recent years have shaken our faith in many accepted fertilizer practices. This has lead us to a re-examination of the reasons and the experimental bases of some customary practices. Among others is the practice of applying fertilizer a week or two previous to setting.

In connection with a series of tests on fertilizer placement during the last four years, we have accumulated considerable data which should help to answer the question of the most favorable time for applying the fertilizer. For purposes of this discussion we shall consider only the 24 plots where the fertilizer was broadcast, leaving out of consideration 24 others where the fertilizer was applied in bands.

In a two-acre field there were 12 plots of one-twenty-fourth acre area on which the fertilizer was broadcast one week ahead of setting in 1941 and 1943, and 10 days ahead of setting in 1940 and 1942. Distributed on the same field were 12 similar plots to which the fertilizer was applied on the same day as setting. All plots were randomized.

A standard 8-4-8 fertilizer mixture was used on all plots. At the beginning of the experiment it was planned to keep the composition of this mixture exactly the same throughout the years of the test. Scarcity of some materials, due to the war situation, made substitutions necessary. However it is unlikely that these had any effect on the results. Composition of the fertilizer was as follows:

	Pounds of ingredients per ton			
	1940	1941	1942	1943
Cottonseed meal	500	400	400	400
Soybean oil meal	800	700	700	700
Urea	130	210	220	220
Nitrate of potash	150	...	...	...
Sulfate of potash	150	150	150	150
Bone meal	220	130	...	...
Precipitated bone	...	...	80	80
Triple superphosphate	...	100	70	70
Cottonhull ashes	...	160	160	160
Magnesian limestone	...	150	220	220
Landplaster	50	...	...	...

The standard rate of application of this 8-4-8 mixture was 2,500 pounds to the acre. This rate was used on one-third of the plots; on another third the amount was reduced to seven-eighths of the standard; on the other third it was reduced to three-quarters of the standard.

Treatment of all plots was identical throughout the season with respect to dates of setting, culture, topping, harvesting and curing. Accurate records of the yield and grading were made on the cured tobacco from the middle rows of the plots. The yield and grading of these 24 plots for four years is shown in Table 6.

The data in this table show that at least as good results were obtained by applying the fertilizer on the day the tobacco was transplanted, as a week or 10 days ahead of transplanting. The average yield increased from 1,872 to 1,907 pounds to the acre, or about 2 per cent.

TABLE 6. COMPARISON OF LATE AND EARLY APPLICATION OF FERTILIZER, YIELD AND GRADING FOR FOUR YEARS

Time of fertilizer application	Pounds of fertilizer per acre	Yield in pounds per acre					Grade index					Crop index	Relative crop value
		1940	1941	1942	1943	Ave.	1940	1941	1942	1943	Ave.		
Early	1,875	1,748 1,697 1,526 1,861	2,041 1,983 1,983 2,250	1,828 1,664 1,551 1,519	1,971 1,954 2,068 1,923	1,848	.319 .334 .290 .423	.456 .378 .389 .431	.370 .287 .320 .274	.426 .400 .396 .385	.367	678.2	95.6
	2,188	1,781 1,681 1,500 1,771	2,250 1,895 2,267 2,130	1,708 1,818 1,755 1,478	2,045 1,988 2,135 2,052	1,891	.366 .363 .343 .359	.428 .385 .425 .395	.347 .375 .401 .295	.390 .404 .405 .368	.378	714.8	100.8
	2,500	1,505 1,749 1,754 1,669	1,998 2,250 1,906 2,361	1,765 1,624 1,661 1,683	1,946 2,148 1,922 2,077	1,876	.322 .332 .386 .347	.369 .434 .355 .448	.356 .358 .370 .368	.415 .416 .386 .385	.378	709.1	100
	Average of all early applications					**1,872**					**.374**	700.1	98.7
Late	1,875	1,742 1,733 1,805 1,765	2,169 2,108 2,218 2,182	1,661 1,638 1,743 1,512	1,866 2,096 1,957 1,924	1,882	.309 .374 .422 .309	.413 .380 .429 .429	.366 .353 .374 .304	.391 .410 .418 .425	.382	718.9	101.4
	2,188	1,913 1,560 1,625 1,505	2,155 1,890 2,154 2,346	1,940 1,624 1,872 1,645	1,905 1,866 2,181 2,002	1,887	.408 .312 .350 .300	.458 .380 .399 .432	.384 .302 .383 .383	.430 .397 .412 .428	.385	726.5	102.4
	2,500	1,762 1,882 1,734 1,791	2,085 2,284 2,216 2,265	1,811 1,933 1,683 1,700	1,848 2,041 2,233 1,975	1,953	.391 .418 .390 .370	.480 .426 .424 .420	.373 .433 .367 .375	.442 .419 .417 .424	.410	800.7	112.9
	Average of all late applications					**1,907**					**.392**	747.5	105.4

The grade index increased from .374 to .392, or about 5 per cent. These differences are not statistically significant.

These results are contrary to the accepted belief that it is better to apply fertilizer prior to transplanting. Though only one fertilizer combination was used, this was a common tobacco formula, and there is no reason for believing that the results would have been reversed through the use of some other mixture.

The weather records show that in 1940 and 1942 there were heavy rains between the time the fertilizer was applied and the plants were set, and leaching occurred. During the other two years, on the other hand, rainfall was less than one-half inch in this period, and no leaching occurred. An analysis of yields for the four years shows that differences in plants receiving early and late applications were no larger in wet planting seasons than in dry seasons. Therefore, the leaching of fertilizer elements between the time of fertilizer application and the setting of plants could hardly have influenced the results.

Other explanations, such as the better co-incidence of the time curve of availability of the fertilizer elements with the time curve of the needs of growing plants for such elements, might be advanced. But as yet we have not obtained sufficient evidence to support these.

Regardless of the final explanation, the practical implication from this experiment is that fertilizer need not be applied to the soil a week or two in advance of setting the plants. As good or better results may be expected by applying it at the time of transplanting.

PLOWING UNDER THE FERTILIZER

For tobacco, the customary method of incorporating fertilizer in the soil is to broadcast it on the surface after the land has been plowed and levelled, and then work it into the surface with a disc harrow. Several objections to this method might be: (1) It encourages the feeding roots to develop near the surface. Shallow rooted plants have less resistance to drouth and wind storms. (2) During a dry season, too much of the fertilizer would stay in the surface dust mulch or loose dry soil, stirred by repeated cultivation. Consequently the roots could not penetrate it to absorb the plant food. (3) When the young seedlings are planted near the surface, as is customary, the salt concentration from the fertilizer may be so high as to injure the roots. This results in a poor start, or even death of seedlings, and a consequent uneven stand of plants.

It is possible that these objections might be overcome by distributing the fertilizer on the ground before the land is plowed. In this way it would be incorporated deeper in the soil, away from immediate contact with the transplants and below the dust mulch, and should encourage deeper rooting.

In a preliminary test, a comparison of the two methods was made on a field of Merrimac coarse sandy loam. This soil is inclined to be too dry for optimum results in a dry year, and to allow leaching of fertilizer in a wet year. An 8–4–8 fertilizer was used at the rate of 2,500 pounds to the acre, on all plots. The composition of this fertilizer was:

400	pounds	Cottonseed meal
700	"	Soybean oil meal
220	"	Urea
80	"	Precipitated bone
70	"	Triple superphosphate
160	"	Cottonhull ashes (40% K_2O)
150	"	Sulfate of potash
220	"	Magnesian limestone
2,000	pounds	

On some of the plots the fertilizer was broadcast and worked into the top soil with a disc harrow in the customary way after plowing and fitting the land. On an equal number of plots the fertilizer was broadcast on the ground before plowing. In this way it was incorporated more deeply in the soil and was probably disturbed little if any by the harrow or cultivator. The whole field was set uniformly with Havana Seed tobacco on June 8. There were no leaching rains, but rainfall was sufficient for good growth up to the middle of July. The rest of the season was excessively dry.

During the early part of the season, there was quite a noticeable difference in "stand" between the plots. Many transplants died early on the disc-in plots and it was necessary to restock several times, with consequent uneveness in size of plants. On the plow-under plots, in contrast, the plants were uniform in size and appearance, and much less restocking was required. Apparently the concentration of fertilizer in the upper soil of the disc-in plots was sufficiently injurious to the roots of the seedlings to keep many of them from establishing themselves in such a season. In the plow-under plots, on the other hand, the transplants did well because the roots did not come in contact at once with the fertilizer.

A uniform number of plants from each plot was harvested, cured and sorted in the usual way for comparative data. The yield and grade indexes are shown in Table 7.

The most obvious difference between the two treatments, as reflected in this table, is the difference in yield of 112 pounds to the acre in favor of the plow-under plots. Since our method of sampling makes no allowance for "skips" or under-developed "set-overs", it is probable that this difference was even greater between the two treatments. On the other hand, the grade index was higher on the disc-in plots, due to a somewhat greater percentage of the higher grades of leaves. An adequate explanation for this difference is not apparent.

TABLE 7. METHODS OF INCORPORATING THE FERTILIZER. YIELD AND GRADE INDEX FOR CROP OF 1943

Fertilizer	Plot No.	Acre Yield		Grade Index		Crop Index
		Plot	Ave.	Plot	Ave.	
Plowed under	A1	2,325		.404		
	A2	2,363		.382		
	A3	2,325		.370		
	B1	2,175	**2,206**	.405	**.400**	882
	B2	2,100		.417		
	B3	1,950		.420		
Disced in surface	A1	2,100		.438		
	A2	2,213		.433		
	A3	2,025		.383		
	B1	2,100	**2,094**	.401	**.417**	871
	B2	2,100		.439		
	B3	2,025		.407		

Obviously, a one-year test does not give conclusive evidence. Different weather conditions might produce different results. We can only state that under the prevailing conditions of 1943 on this field, the "plow-under" method of incorporating the fertilizer gave a decided increase in yield—with some reduction in grade—and that it had the distinct advantage of producing a more uniform stand of plants. The differences are striking enough to warrant a more thorough trial of this method of applying fertilizer.

DISEASES OF TOBACCO IN 1943

P. J. ANDERSON

As in most dry seasons, diseases of tobacco were not particularly destructive in 1943. Many ordinarily common diseases were not found at all or were found in such small amount that they caused no concern. This was true of bed rots and damping-off, black and brown rootrot, blackfire, sore shin, hollow stalk and ring spot. The Sclerotinia and Botrytis diseases so prevalent in 1942 did not occur at all in 1943. None of the various forms of pole rot caused any concern, due apparently, to the extremely dry weather during the curing season.

The following notes on diseases are based on personal observations of crops and information submitted by growers. Investigations were continued on mildew, damping-off and mosaic. One new disease was found and investigated, as reported in the following pages.

Wildfire. This bacterial disease has practically disappeared from our beds and fields in recent years. On July 13, 1943, however, we visited a Broadleaf farm in Glastonbury on which all the fields had plants badly spotted with wildfire. The plants were about a foot high. The grower reported later that the disease did not spread much in the dry weather that followed but that he suffered considerable loss in grading of the infected leaves. The source of the infection was an infected seed bed from which the plants were taken to all the fields. Wildfire was not observed on any other fields in the State this year.

Frenching in seed beds. This disease, of unknown cause, distinguished by numerous narrow strap-shaped leaves[1] is rather uncommon in Connecticut. When found at all it is usually in the field. However, one grower reported this year that a large proportion of the plants in his seed beds were affected. The specimens he submitted had all the typical symptoms of frenching. When these plants were set in the field they quickly recovered and all new leaves that developed were normal. From this, it is apparent that the trouble was due to some abnormal condition of the soil in his seed bed.

Calico or mosaic. This virus disease seemed to be more prevalent than usual. One very badly affected farm in Suffield was visited on July 6. Plants in the field were about a foot high. More than 50 per cent of them had mosaic. Examination of the seed beds showed numerous mosaic plants and indicated plainly that this was the source of the field infection. Another farm, in East Windsor, had some fields where more than half of the plants were infected and the loss was very heavy. The trouble apparently originated from unsterilized ground tobacco stems used in the fertilizer mixture. Most farms, however, showed less than 2 per cent of infected plants.

Experiments on the breeding of mosaic-resistant Broadleaf have been continued and have reached the stage where we are ready to test the strains commercially on a small scale with the growers.

Control of Mildew and Damping-off with Fermate

Our experiments for the season of 1942[2] showed ferric dimethyl dithiocarbamate (Fermate) to be the most promising spray material that we have yet found for controlling mildew in the seed beds. Before drawing final conclusions about the effectiveness of any spray remedy, however, it is first necessary to test it through several seasons because different weather conditions may influence the degree of control. Therefore the tests of 1942 were repeated and extended in 1943.

Spray tests in 1943 were made (1) in the greenhouse during the winter and early spring, (2) in the seed beds on the Experiment Station farm and (3) in the seed beds of, and in cooperation with, commercial growers.

Greenhouse tests in mildew control. Tobacco seed was sowed in 10-inch porous crocks. Six to eight crocks were used in each experiment. As soon as the seedlings had developed about four leaves, half of the crocks were sprayed with Fermate at the rate of two pounds of Fermate powder stirred into 100 gallons of water. This treatment was repeated twice a week until the plants were large enough to transplant to the field. No lime or "wetting" or "sticking" material was added. The other half of the crocks were not sprayed but otherwise were submitted to the same conditions as the sprayed crocks.

[1] Conn. Agr. Expt. Sta. Bul. 335:256.
[2] Conn. Agr. Expt. Sta. Bul. 469:107.

After the second application of spray, all crocks were inoculated by atomizing them with a water suspension of fresh mildew spores. The crocks were kept in a moist chamber for several days to offer favorable conditions for infection. This type of inoculation was repeated weekly until the conclusion of each series. The whole experiment was repeated three times in the greenhouse with essentially the same results.

In every experiment, mildew appeared first on the unsprayed plants six to eight days after inoculation. It continued to spread in these crocks until practically all of the plants were infected. Most of the plants died in the early stages but a few recovered later. When the experiments were terminated at the end of six weeks and the plants counted, the average number of living plants for each unsprayed crock was only nine.

Most of the sprayed crocks remained entirely free from mildew. In one sprayed crock of one experiment, a half-dozen leaves showed mildew but the plants recovered. The average number of healthy plants per sprayed crock was 322 at the close of the experiments. The Fermate-sprayed plants were greener and larger than unsprayed plants at all times. No spray injury was observed.

The experiments of 1943 confirm the results of the previous year and show that under greenhouse conditions Fermate gives perfect control of mildew.

Damping-off. In these experiments, as in previous tests, it has been observed that many of the plants in the unsprayed crocks were attacked by damping-off fungi, and sometimes it was not possible to determine how many of the plants died from damping-off and how many from mildew attack. Both diseases affected the same plants and usually killed them. Plants treated with Fermate, however, never were affected by damping-off. Although no experiments were undertaken to test Fermate for damping-off alone, the results clearly show that Fermate may also be used to control damping-off.

Spray tests in seed beds. It is not safe to draw conclusions from greenhouse tests alone. Conditions of temperature, water, humidity, etc., are more easily controlled in the greenhouse than in seed beds. Variables might affect the results of any spray program. Hence, although results with Fermate were quite satisfactory in the greenhouse, it was necessary to compare them with spray tests in seed beds.

A 6-foot bed, 75 feet long, was divided into 15-foot sections by board partitions. Beginning on May 13, when the plants were mostly in the four-leaf stage, alternate sections were sprayed twice a week with Fermate at the rates used in the previous greenhouse tests. The twice-a-week schedule was continued regularly, regardless of weather, until June 11. The only lapse was on June 7 when it was necessary, on account of continuous rain, to postpone the application one day. Since no mildew had appeared naturally in our beds when the experiment was started, all the sections, sprayed and checks, were inoculated on May 18 by sprinkling them with a water suspension of fresh spores from a sprinkling can. They were inoculated a second time on June 1.

Mildew first appeared in the unsprayed sections eight days after the first inoculation. For the most part, the weather was clear and warm, conditions under which mildew would not spread rapidly. It spread slowly throughout the unsprayed sections, however, until most of the plants were infected. A low percentage of them died. No mildew at all was found on any of the sprayed plots until the plants were ready to set in the field (June 12), on which date a few infected leaves were found but no dead plants. On June 14 sample areas of 4 square feet each were pulled up, inspected and counted. All plants from each sample area were examined for mildew symptoms. The average percentage of plants showing infection in the unsprayed areas was 98. In the Fermate areas, only a small fraction of one per cent of the plants showed mildew.

All the other beds (300 feet) at the Experiment Station farm were also sprayed with Fermate. They were not inoculated with mildew spores, and no mildew occurred on any plants in these beds.

Thus, the results in the seed beds confirmed in every way the greenhouse results and show that mildew may be controlled by spraying regularly twice a week, beginning before the disease makes its appearance in the beds.

Experience of commercial growers. On the recommendation of the Experiment Station, a large number of growers sprayed their beds with Fermate in 1943. No attempt was made by the Station staff to supervise or even keep in close touch with these operations by growers except in a very limited number of cases. Conclusions drawn from grower spraying operations are of limited value because few if any of them left unsprayed beds or parts of beds as checks.

Most of the growers reported satisfactory results. Letters came from several of the large corporations that grow hundreds of acres of tobacco reporting excellent results with Fermate. We had opportunity to watch carefully throughout the spring the spraying operations of two of these companies that are growing over a thousand acres of tobacco and had the seed beds widely distributed in a half-dozen towns. No mildew was found at any time on any of their beds.

Some growers reported that Fermate controlled the disease perfectly in the early stages, but that mildew started in the beds after the plants were full grown and ready to set in the field. On only a few farms did growers report failure. It is natural to expect that there would be some failures since most growers are unfamiliar with this new remedy. Some delayed applications until too late, or failed to apply the spray at regular intervals, or made the applications too weak. It is true that 1943 was not a very bad mildew year. Nevertheless, we had occasion to visit many infected beds, and in most cases such beds had been either left unsprayed or incorrectly or insufficiently sprayed.

The weight of evidence from two years of controlled experiments at the Station and from grower experience seems sufficiently favorable to warrant the general use of Fermate for control of mildew.

Experiments with Salicylates for Control of Mildew

In cooperation with Dr. E. E. Clayton, Pathologist of the Division of Tobacco Investigations, U. S. Department of Agriculture, spraying experiments were conducted with bismuth subsalicylate and benzel salicylate. Dr. Clayton and his associates had found that these salicylates had promising fungicidal value for control of mildew and wished to have them tested in other regions. Both of these chemicals were therefore tested, in the Station greenhouse and seed beds at the same time as the Fermate experiments described above. Additional crocks of seedlings and additional seed bed sections were treated at the same twice-a-week intervals as previously described.

Bismuth subsalicylate, three-quarters of a pound, was mixed with one-half pound of Vatsol (a "wetting" agent) and stirred in 50 gallons of water.

For the benzel mixture, a concentrated emulsion was made up by using one-quarter of a pint of benzel salicylate, one-tenth of a gallon of an emulsifier (B1956) and nine-tenths of a gallon of cottonseed oil. This standard concentrate was diluted with water at the rate of 1 to 100 when applied to the plants.

Bismuth subsalicylate gave complete control of mildew in the greenhouse. However, it caused some injury to the plants. The leaves faded somewhat and sustained burned tips. Many of the plants died either from the chemical injury or from a damping-off which was not controlled. When the plants were finally pulled and examined there were less than one-half as many living plants as in the Fermate crocks. Most of the plants had brown lesions at the base of the stalk.

In the seed bed tests, however, injury from the bismuth salts did not appear. Control of mildew was good but it could be found on a few plants when they were large enough to set in the field. When sample areas were pulled finally for examination on June 14, about 3 per cent of the plants had mildew but none of them died. After the last spray on June 11, the bed was left unmolested for two weeks to see whether the mildew would spread from the adjacent check plots into the sprayed sections or whether some of the spray materials might give a residual protection. The weather was very warm and unfavorable to development of mildew but there was some spread over the previously treated sections.

The fact that there developed slightly more mildew on the bismuth sections than on the others showed that bismuth did not have a longer protective aftereffect than did Fermate or the benzel salt. None of the salts appear to make the plants resistant to attack longer than a few days. Hence the necessity of frequent applications.

Benzel salicylate also gave excellent protection against mildew. But in the greenhouse it caused considerable plant injury. The plants became pale and were retarded in growth. Many of them died. When the plants were finally pulled for examination, the roots were brown and there were brown lesions at the base of the stem. Less than half as many plants were alive as on the Fermate crocks. In the seed beds the injury was less pronounced but the plants were plainly paler and more retarded. Control of mildew, however, was almost as complete as in the Fermate sections.

So far as we can decide from tests to date, neither of the salicylates seems to offer any advantages over Fermate. They give no more complete control, are not as simple to prepare and are more expensive. They do give good control of mildew, however, and they should be subjected to further investigation to see whether the methods of application or preparation can be changed or improved sufficiently to make them more desirable than Fermate.

Paradichlorobenzene for Mildew

The value of paradichlorobenzene (PDB) for fumigating the beds to control mildew has been thoroughly established by experiments here and elsewhere, as well as by the experience of growers. Such experiments have been described fully in our previous reports and bulletins. Continuation of PDB experiments on a large scale seems unnecessary. It may be worth recording, however, that in the seed bed experiments described above, one 15-foot section was treated with PDB as a check on results with Fermate and the salicylates. The PDB crystals were distributed every second night on two 3 by 5½-foot cloth frames over the plants. This gave complete control as long as the treatment was continued. All these sections had been inoculated with mildew spores. When the fumigation practice was omitted after the plants were large enough to set, mildew appeared in about 10 days, possibly spreading from the adjacent unsprayed sections.

Since mildew can be controlled either by fumigation with PDB or by spraying with Fermate (or salicylates), the question arises, "which should the grower use?" This will depend on the grower's preference and on the condition of the beds. Many growers have beds of such loose construction, or leaky sash, that they cannot hope to fumigate successfully because the PDB gas escapes too rapidly. For such growers, the Fermate spray is best—in fact the only remedy. Many growers who have tried both methods think the Fermate spray is less trouble than the fumigation method. They also consider it less expensive. Others, however, find the fumigation method less trouble.

Many large growers are prepared to play safe and use both methods if necessary. They spray with Fermate when the seedlings are small and then use PDB if mildew appears in the later stages. Very few of them, however, had to resort to fumigation in 1943. Under unfavorable weather conditions, however, it might be necessary. Since Fermate is a preventive spray, and PDB a curative practice, the two naturally complement each other. The grower who is prepared to use either or both, as conditions require, has a well-rounded program and should have no fear of losing his plants.

FUSARIUM WILT, A NEW STALK DISEASE IN CONNECTICUT

During the harvesting period, Fusarium wilt was found on a few plants on the Experiment Station farm. This is the first record of its appearance in this State though it may have been present for some time. It is not a common disease, but has been found in most of the southern tobacco states, in Canada, South Africa and Russia. Only in a few counties of North Carolina and in Maryland[1] has it reached destructive proportions. Elsewhere it is not considered a major disease. We do not anticipate that it will become destructive here.

The general appearance of a Fusarium wilt plant is so similar to that of a plant affected with the common "sore shin" disease that one might see it many times in the field without recognizing it as a new disease. The Fusarium wilt plant, however, lacks the distinct, sunken canker at the base of the stalk that is always present in sore shin. The following description is presented to enable growers to recognize the disease and in the hope that if it is found elsewhere, it will be reported to us so that we may determine the extent of its distribution in this State.

Symptoms. The first sign of Fusarium wilt is the gradual fading of the leaves on one side of the plant, followed by slow but complete yellowing and drooping. Characteristically, this is confined to one side of the plant, the affected leaves being vertically disposed. The leaves on the opposite side appear perfectly normal. In some few plants, however, the leaves wilt on all sides. The drooping wilted leaves then begin to die. Irregular brown patches appear and increase in size and number until the whole leaf is dead and brown. The color changes in an affected leaf remind one of the changes that occur in the curing of a leaf in the shed. The affected stalk curves or bends over toward the stricken side, probably due to arrested growth of that side while the normal side is still elongating. As a result, the top leaves, as they wilt, bend over the bud and hang down over the affected side. This appearance (See Figure 2) has suggested the name "crook-neck", commonly used for this wilt by growers in South Africa. The entire plant may finally die or the non-affected side may remain green until harvest. However, there is probably little salvage in any of the infected plants.

The outside of the stalk remains a normal green and appears no different from the other stalks until a late stage of wilt. Then a black dead streak may run the length of the stalk on the affected side. When the green cortex, or bark, is peeled off, the underlying woody part of the stalk is found to be dark brown or black—not white, as in a normal stalk. This dark discoloration is confined to the affected side and extends to the top of the plant. It also runs out into the midribs of the leaves, and if the midribs are split open the dark streak can be traced well out through the central vascular bundle. The dark color goes through the woody cylinder of the stalk and causes some

[1] It was reported (Plant Disease Reporter 27:541) in ome fields of Maryland to have affected 60 to 80 per cent of the plants.

slight darkening of the pith inside it. This dark color of the woody cylinder under the bark is the best diagnostic symptom of the disease and definitely identifies Fusarium wilt.

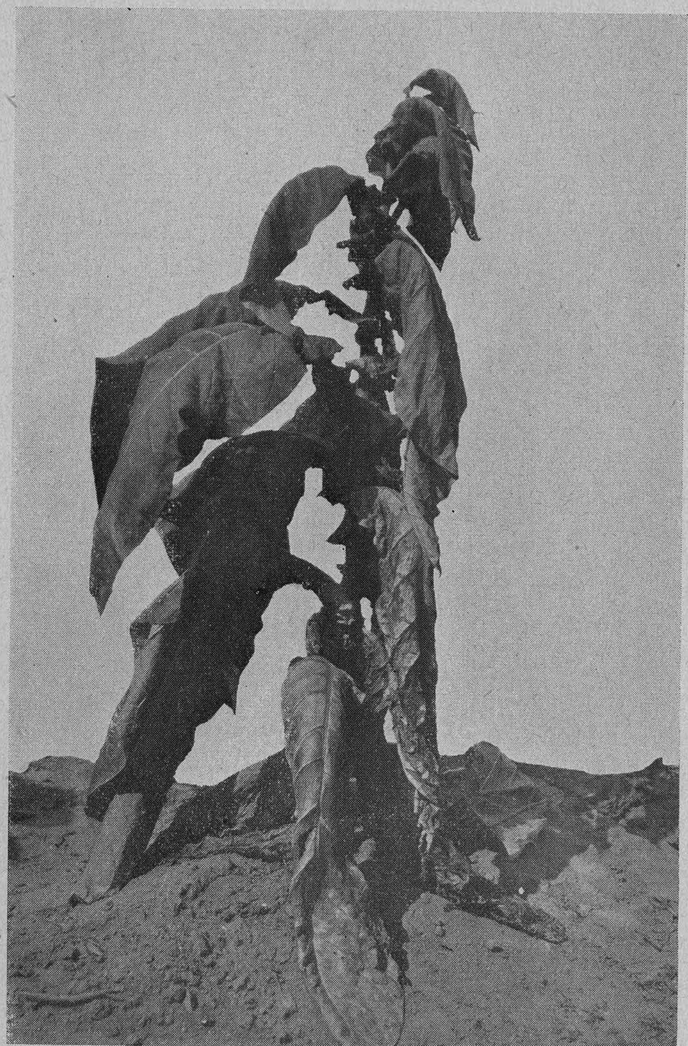


FIGURE 2. Fusarium wilt on Broadleaf. Only one side of the plant is affected at this stage.

The infected parts of the plant do not rot or undergo any watery disintegration. This is distinctly a wilt or drying-up disease in all its manifestations. Neither do the leaves rot—they merely cure on the stalk.

Examination of the roots of infected plants shows that sometimes they appear quite normal and healthy, while on other plants some of the roots are dead and the larger ones show a blue-black discoloration when split open.

The causal agent. When a thin section of the woody part of the stalk is examined under a microscope, the water tubes and all the other cells of this tissue are found to be infected and permeated with numerous threads, or mycelium, of a fungus. Johnson[1], who first investigated Fusarium wilt, and to whom we owe most of our knowledge of the disease, called this fungus *Fusarium oxysporum*, variety *nicotianae*. *Fusarium oxysporum* causes similar wilt diseases on potatoes and various other plants, but since the fungus on tobacco showed some constant morphological differences from the causal organism on other plants, it was considered a distinct variety. He believed that the death of the plant, or parts of it, is due to the action of a toxin produced by the fungus rather than to a clogging of the water vessels (thrombosis) which would deprive the affected leaves of their water supply. The fungus lives in the soil and apparently invades the stalk or roots through wounds beneath the surface of the soil.

In order to identify more certainly the disease and to study the causal fungus, the writer made numerous isolations from the plants found in Windsor. Small bits of affected tissues from roots, leaf, midribs and stalks at various heights were transferred under sterile conditions to potato dextrose agar slants. All gave pure cultures of a typical Fusarium, white cottony growth that covered the surfaces of the slants in five days. The agar took on a faint pink color.

At the end of three days, hyaline spores of two kinds were found in great abundance. The smaller spores (microconidia) were quite variable in shape and size. (Average size 8.8 x 3.2 microns). These little spores are usually oblong and straight but often oval or ovate and inaequilateral or slightly curved, usually unicellular but rarely uniseptate. The other, larger spores (conidia) are fusiform, sickle-shaped and pointed at both ends, but one being slightly blunter than the other. (See Figure 3). Most of them are three-septate but many are five-septate and occasionally four-septate. Some, possibly young stages, are non-septate. In some of the spores, individual cells are swollen almost globose and constricted at the septa. The average

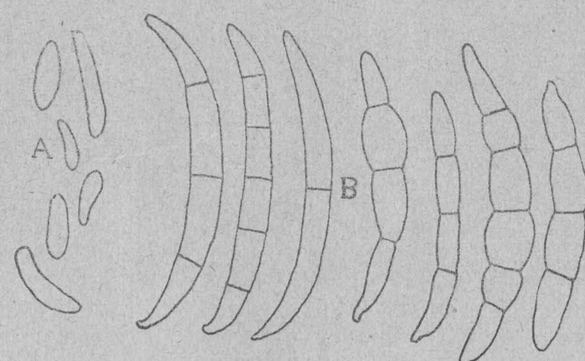


FIGURE 3. Spores of the Fusarium wilt fungus, magnified 1,400 times natural size. A, microconidia; B, conidia.

[1] Johnson, James. Fusarium wilt of tobacco. Jour. Agr. Res. 20:515-535, 1931.

size of these spores is 30 x 5 microns. This length is slightly less (but probably not significantly so) than the measurements recorded by Johnson. In all other respects, the characteristics of this fungus were so similar to the descriptions of other writers that there can be no doubt that the organism is the same.

It has been shown recently by Smith and Shaw[1] that the Fusarium which causes wilt of tobacco is the same as the fungus that causes stem rot of sweet potatoes. On the Windsor plots where this tobacco wilt was found in 1943, sweet potatoes had been grown within the last three years - one plot the previous year. All the crops of sweet potatoes grown here in previous years suffered somewhat from stem rot. This suggested that the prevalence of the disease now may be connected with the sweet potato crop. In order to get further evidence on this, sweet potato runners in the field in 1943 were inoculated with cultures of the Fusarium which had been isolated from tobacco. All inoculations caused typical blackening of the vascular bundles of the vines. Isolations made from these runners two feet or more from the point of inoculation produced pure cultures of Fusarium identical with the tobacco pathogen.

Sweet potatoes are not grown extensively in the Connecticut Valley and therefore this does not suggest a serious menace. If, however, they should be at any time grown more commonly here it might be well to avoid rotating them with tobacco.

Inoculation experiments by Johnson indicate that different varieties of tobacco vary in their susceptibility to Fusarium wilt. He listed all of our Connecticut varieties as highly resistant. The first diseased plants found here were in the Havana Seed variety but the greatest number were on a row of a Giant Broadleaf mutant which the writer discovered last season and described in our Annual Report for 1942. Some were also found on the ordinary Broadleaf but the fact that most of them were on the Giant Broadleaf row indicates that we are dealing here with varietal susceptibility.

It has been observed by other investigators that the disease is favored by high temperatures. The fact that it was first observed here in 1943 which was an extremely hot season is possibly a further indication of the influence of heat.

No method of controlling the disease is known except through breeding and selecting resistant strains. Unless Wilt becomes more prevalent, no control efforts seem warranted here.

STUDIES ON BLACK TOBACCO

III. Statistical Analysis of a Field Crop

STUART B. LECOMPTE, JR.

Certain data of Field A, 1941 reported previously (7) have been re-examined, statistically.[2] The limitations of this experiment are kept in mind. Different environmental conditions in another year may not yield the same results, so that the material should be viewed in the light of other work on black tobacco. The term "significant" in the following discussion refers in every case to statistical significance, which may discriminate smaller differences than are of practical significance.

[1] Smith, T. E. and K. J. Shaw. Pathogenicity studies with Fusaria isolated from tobacco, sweet potato and cotton. Phytopathology 33:469-483. 1943.

[2] Grateful appreciation is extended to Dr. C. I. Bliss, Biometrician, for much help and guidance in the computations.

The percentages of sorted weight of black tobacco grades (KV2+KVB) and of merely dark grades (V+V2+KV) have been considered in their relationship to soil tests of phosphorus, aluminum and calcium for each of the four pickings of 1941 by analysis of co-variance (4).

As has been noted elsewhere[1] criteria for separating black and dark grades were not constant at all pickings and all plots. However, the usual commercial sorting methods were employed as the simplest means of evaluating Shade tobacco leaf.

Apart from fertilizer treatments, the proportion of black tobacco (KV2+KVB) increased very significantly with the aluminum in the soil in the first and second pickings. This effect was not apparent in the third and fourth pickings. Also exclusive of the fertilizer treatment, calcium and phosphorus exerted an effect approaching significance upon the first picking, the former increasing black tobacco and the latter reducing black tobacco.

The effect of fertilizer upon percentage of black leaf (KV2+KVB) was divided into two parts: (a) the effect of phosphorus and (b) that of all other fertilizers. Adjustments for the constituents phosphorus, aluminum and calcium in the soil exclusive of treatment were made where necessary by the analysis of co-variance. From this, phosphorus applied as fertilizer reduced black tobacco significantly in the first and fourth pickings, but not in the second and third pickings. At the same time other fertilizer constituents showed no significant effect on black tobacco in any picking.

The percentage of dark grades (V+V2+KV) in the second and third pickings increased significantly with the aluminum in the soil, exclusive of fertilizer treatments; calcium and phosphorus had no significance, exclusive of treatments.

In the study of the effect of fertilizer on the percentage of dark tobacco, calcium increased the amount of dark grades significantly in the fourth picking but no constituent appeared to have any effect in the first picking. When adjusted by co-variance for the aluminum in the soil, phosphorus reduced the amount of dark leaf in the third picking significantly. No such significance was shown for the second picking.

The evidence that the amounts of grades V, V2 and KV in the second and third pickings varied with soil aluminum and were reduced in the third picking as fertilizer phosphorus was greater suggests that the leaves graded V, V2 and KV in this study are "better quality" black tobacco—less extreme manifestations of the true black or blue-black type (KVB). This idea has been noted elsewhere[2] and is supported by analysis of cured leaf for iron and manganese.

[1] Conn. Agr. Expt. Sta. Bul. **469**:152.

[2] Conn. Agr. Expt. Sta. Bul. **469**:153.

Some of the data on analysis of fresh tissue[1] have been examined statistically. The constituents potasium, calcium, magnesium, manganese, phosphorus, nitrogen as ammonia and nitrate in the midrib of the fifteenth leaf showed no significant relationship to phosphorus, calcium or aluminum in the soil tests. Phosphorus in the fertilizer showed a significant effect in reducing the amount of aluminum in the midrib tissue of the fifteenth leaf. However, the data on fresh tissue content of aluminum obtained by rapid analysis are not wholly satisfactory in these midrib tests, because the values for single plots have only one significant figure and only about a two-fold range.

Discussion

It is emphasized again (6, 7) that no single factor should be regarded as the only cause of black tobacco. The statement which was made in the statistical section of this article to the effect that black tobacco increased very significantly with soil aluminum in the first and second pickings does not mean that soil aluminum was the unique cause of a greater yield of black-curing leaf. It means merely that of the three soil constituents measured, namely, aluminum, calcium and phosphorus, the aluminum varied directly with the percentage of black tobacco. Other soil factors which remained unmeasured might have shown even more intimate relationship.

For the analysis of variance, aluminum soil tests were chosen from the data which formed the averages of Table 4, Bulletin **469**, because the spot plate estimates seemed more reliable than those for iron or manganese. It is not unreasonable to expect that soil iron and soil manganese might have revealed in statistical analysis a variation similar to that shown by aluminum. Phosphorus and calcium were selected for the statistical treatment because they were the main ingredients of the experimental fertilizer, viz., 48 per cent superphosphate and hydrated lime.

The effect of phosphorus in significantly reducing the amount of black or dark tobacco appears at first thought to be mainly that of a soil amendment, not raising the phosphorus content of the leaf, on a dry weight basis. Anderson, Morgan and Nelson (1) have discussed the functions of phosphorus as a fertilizer. Phosphorus content of leaf tissue from Field A, 1941, of comparable age or picking was about the same, irrespective of leaf grade or soil phosphorus/aluminum ratio, on both good plots with little black tobacco and on poor plots with much black tobacco.[2] All the leaf samples tested show a normal phosphorus content (0.40 to 0.71 per cent phosphorus pentoxide, dry weight basis), comparable with earlier analyses of Connecticut tobacco (5, 1, 2, 3). In this sense, then, it is illogical to speak of any leaves of this experiment as being phosphorus-deficient. The untreated soil of Field A undoubtedly had but low amounts of phosphorus readily soluble in 0.5 N acetic acid; this is shown in Table 4, Bulletin **469**.

[1] Bul. 469:146, Table 13.
[2] Unpublished data of Dr. E. M. Bailey.

The untreated soil of Field A, but not the unit weight of leaves grown upon it, may be termed phosphorus-deficient. However, total phosphorus per average entire plant was probably below normal on untreated plots because of the limited plant development on such plots. In this sense, such whole plants were phosphorus-deficient. Although the benefit of phosphorus to tobacco quality may lie largely in chemical action with iron, manganese, aluminum or other metals among the soil particles, there are probably within the plant unknown vital effects of phosphorus upon leaf quality.

LITERATURE CITED

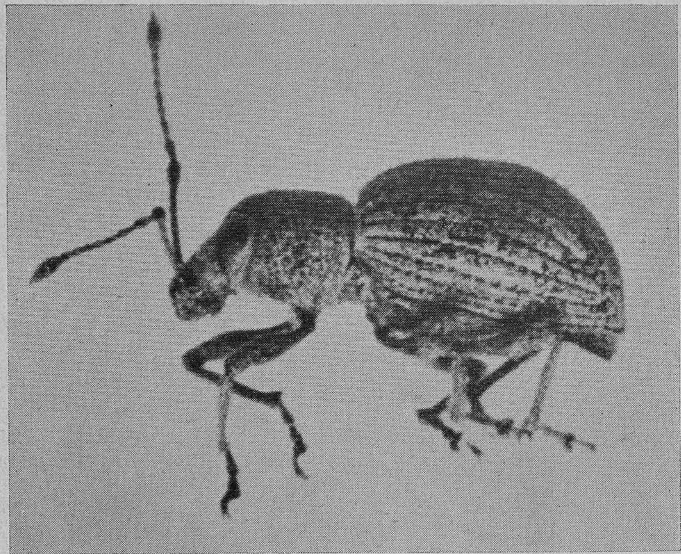
1. Anderson, P. J., M. F. Morgan and N. T. Nelson. The phosphorus requirements of old tobacco soils. Conn. Agr. Expt. Sta., Tobacco Substation, Bul. **7**, 1927.
2. Anderson, P. J., T. R. Swanback and O. E. Street. Further experiments with phosphatic materials in the fertilizer. Conn. Agr. Expt. Sta. Bul. **367**:108-113, 1935.
3. Anderson, P. J., T. R. Swanback and O. E. Street. Malnutrition symptoms due to deficiencies or excesses of plant food elements. Conn. Agr. Expt. Sta. Bul. **410**:393-406, 1938.
4. Fisher, R. A. Statistical methods for research workers. Sixth Ed., Oliver and Boyd, London, 1936.
5. Jenkins, E. H. The effects of fertilizers on the composition of wrapper leaf tobacco. Conn. Agr. Expt. Sta. Report for 1896, 322-333.
6. LeCompte, S. B., Jr. Studies on black tobacco. Conn. Agr. Expt. Sta. Bul. **444**: 270-278, 1941.
7. LeCompte, S. B., Jr. Studies on black tobacco II. Field crop response to phosphate and lime fertilization. Conn. Agr. Expt. Sta. Bul. **469**:130-155, 1943.

Bulletin 479 July, 1944

THE IMPORTED LONG-HORNED WEEVIL,

Calomycterus setarius Roelofs

J. Peter Johnson



Connecticut
Agricultural Experiment Station
New Haven

THE IMPORTED LONG-HORNFD WEEVIL,

Calomycterus setarius Roelofs

J. Peter Johnson

The imported long-horned weevil has been present in Connecticut (5) since 1932, when specimens were received from Lakeville for identification. Since then it has been reported from or found in 17 widely separated towns in the State. It is now known to occur in the towns of Brookfield, Canaan[1], Danbury (10), Fairfield (26), Farmington (27), Greenwich (25), Groton (11), New Canaan (27), New Haven (11), New Milford (10), Norwich, Salisbury (5), Sharon (25), Stratford (25), Washington (10), West Hartford (27) and Westport (6).

This insect is a general feeder, eating the foliage and blooms of certain grasses, legumes, flowering garden plants, vegetables, field crops, ornamental shrubs, house plants, bedding plants, weeds, vines and tree sprouts. It is also a house pest, wandering into dwellings and other occupied buildings, and crawling over the walls, ceilings or furniture. As a result, the economic potentiality of this weevil is twofold, as a plant pest and as a general nuisance.

Historical Information and Distribution

The imported long-horned weevil is indigenous to Japan and was described by Roelofs (18), from that country in 1873, as *Calomycterus setarius*. Kono (13) lists *C. setarius* as occurring in Japan on the Island of Honshu, at Tokio, Sanjodake and Gifu, and on the Island of Kiushu, at Kumamoto. He also listed its Japanese name, Chibi-menagazô, which would indicate that the insect was not uncommon.

C. setarius was not known to occur in the United States until 1929 when it was reported from Yonkers, N. Y. (16). In that year thousands of the weevils were present in a localized area, indicating that the weevil had become established there a few years before. Since its discovery at Yonkers in 1929, it has been reported not only from Connecticut and other locations in New York, but also from numerous places in six other states, listed on the following page:

From the evidence at hand, it is very possible that this insect may be present in many other places not yet known or reported.

Very little information has been published in foreign papers about *C. setarius,* and that mainly of a systematic nature. Weigel (23) published a memorandum in 1935, reviewing the existing literature and bringing together the information given in notes and reports concerning infestations in the United States.

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[1] Reported by letter, with specimens, July 31, 1940.

STATE	PLACE	YEAR
Illinois	Arlington Heights[1]	1940
Iowa	Cedar Rapids[1]	1943
Maryland	Baltimore (8)	1937
	Towson (7)	1935
Massachusetts	Holyoke (3)	1938
	Great Barrington[1]	1942
New York[2]	Poughkeepsie[1]	1941
	Amenia	1942
	Millerton (22)	1939
	Montauk Point, L. I. (20)	1941
	Wingdale (24)	1939
Pennsylvania	Downington[1]	1935
	Mechanicsburg (9)	1935
	Philadelphia[1]	1935
Rhode Island	Middletown[3]	1943
	Newport[1]	1943

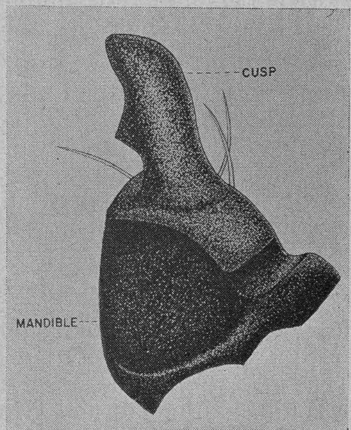


FIGURE 1. Right mandible with cusp attached, inner aspect. Greatly enlarged.

Systematic Position

Roelofs placed the genus *Calomycterus* in the group Cyphicérides by virtue of the width of the beak. This character would not place it in the tribe Cyphicerini Pierce (17), as the beak is narrower than the head at the base. According to the key for the family Curculionidae in Bradley's (4) Manual of Coleoptera, the genus *Calomycterus* belongs to the tribe Eremnini of the subfamily Otiorhynchinae. The Otiorhynchinae (2) are characterized by a scar on each mandible which marks the place where a deciduous cusp is attached. These cusps are lost shortly after the adult becomes active. A cusp of *C. setarius* is shown in Figure 1[4].

[1] Hyslop, J. A., Nov. 26, 1943, by letter. Insect Pest Survey and Information, U. S. D. A., Bur. Ent. Pl. Quar.

[2] Places not listed before.

[3] Jennings, C. C., Dec. 10, 1943, by letter. R. I. Dept. of Agr. and Conservation.

[4] Figures 3, 4 and 8 were prepared by Elizabeth Kaston, Figure 13 a, b and c by Dietrich Bodenstein; all others are by the author. The author also wishes to acknowledge the assistance of Benjamin W. McFarland in preparing the photographs.

Kono described *C. variabilis* (13), native to Japan, in 1930, but renamed it *Platymycterus variabilis* (14) in 1938. In 1934, Marshall (15) described *C. strigiceps*, a weevil found in China, and placed it in the subfamily Ereminae. As a result, there are only two species described in the genus *Calomycterus*. *C. setarius* is the only representative known to occur in the United States.

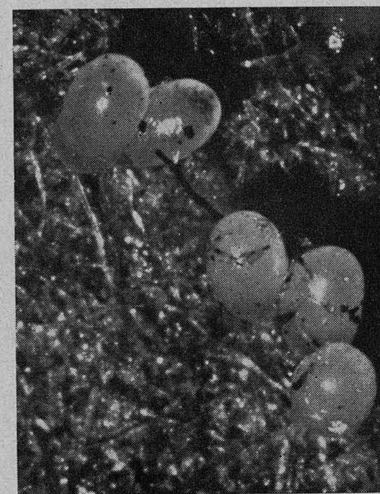


FIGURE 2. Eggs of *C. setarius*. Actual size about 0.6 mm. in length.

Description

Egg

The egg is smooth, glossy white in color and very delicate. It is elliptical in form, with the sides nearly parallel and the ends bluntly rounded, Figure 2. The average length of 18 newly deposited eggs was 0.59 mm. and the breadth 0.38 mm.

Larva

When first hatched, the larva is white in color, becoming a soiled or greyish white after ingesting food. The larva may have a faint pink cast midway dorsally on the body. This may be restricted to a small area on some individuals and may embrace most of the body on others, especially the younger larvae. Newly hatched larvae are less than a millimeter in length, while the fully grown larvae, Figure 3, are about 5 mm. long.

The average width of the head capsules of 10 newly hatched larvae was 0.22 mm., and that of 98 large and nearly full-grown larvae was 0.79 mm. The head, Figure 4, is light yellow in color without hyaline areas, and the mandibles are reddish brown. There are 16 setae present on the head: 10 epicranial setae, two sutural (near the base of the frontal sutures) setae and four frontal setae. A row of short setae is borne dorsally along the apical edge of the clypeus with four longer setae posteriorly. There are two setae located dorsally and posteriorly on each mandible. The maxilla, Figure 5, bears three long setae laterally and 10 short setae along the apical edge of the lacinia. Each maxillary palpus bears four to eight conical setae on the apex of the last segment.

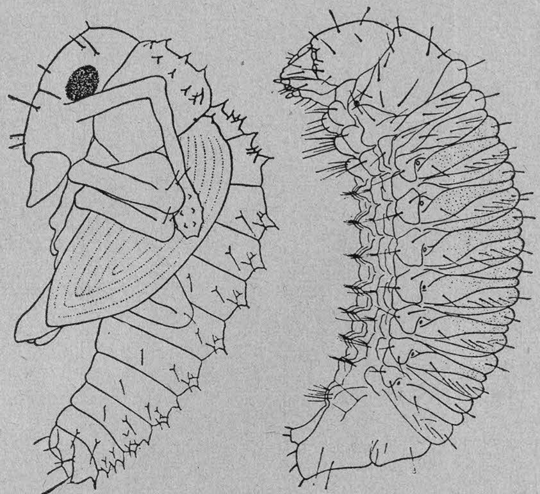


FIGURE 3. Pupa (left) and larva (right). About 15 times natural size.

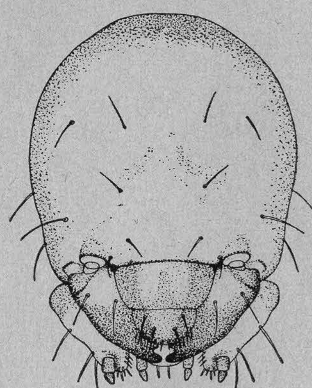


FIGURE 4. Head of larva, frontal aspect.

Ventrally on the body there are six longitudinal rows of trifid setae, Figure 6, and a row of plates on either side, each bearing one long slender seta and one shorter trifid seta. Long slender setae are borne dorsally and laterally on the body while spinulae are present on most of the body.

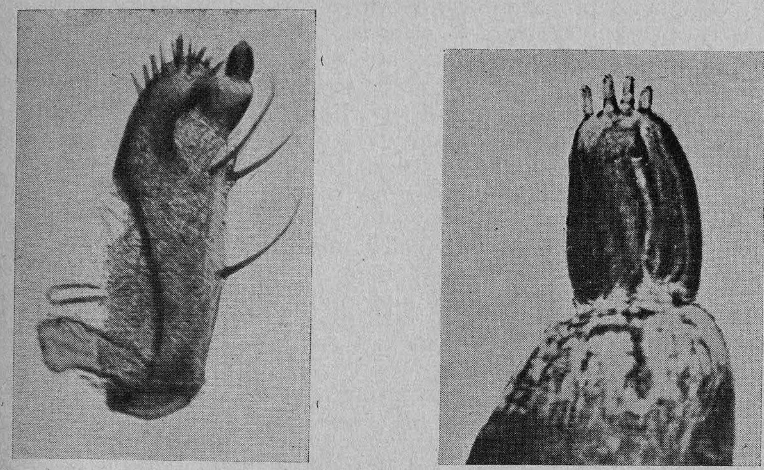


FIGURE 5. left, Right maxilla of larva, dorsal aspect. right, Palpus with conical setae, dorsal aspect. Greatly enlarged.

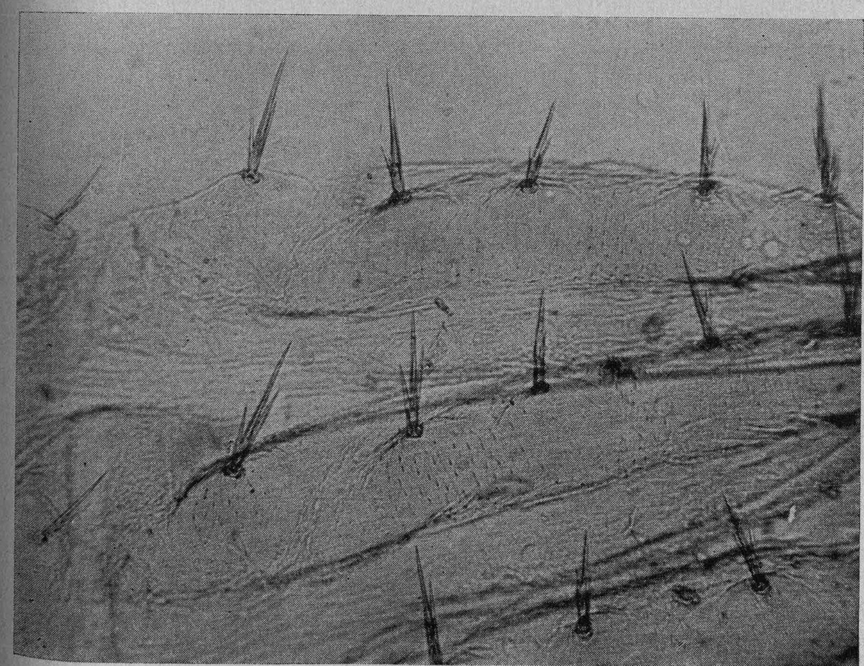


FIGURE 6. Trifid setae and spinulae of larva, ventral aspect. Greatly enlarged.

In Connecticut, the larvae of *Brachyrhinus ovatus* Linn. often are found in the presence of *C. setarius*. *B. ovatus* is usually about the same or larger in size and whiter in color. However, the caudal end of *C. setarius* is bifurcate laterally, Figure 3, a character by which it is easily separated from *B. ovatus* (12). The anal plates, Figure 7, of fully grown *C. setarius* larvae may be heavily sclerotized and brownish or yellow brown in color. The dorsal anal plate is serrated dorsally and bears six short stiff bifid setae while the ventral anal plate is narrower and bears four similar setae. Four long setae are borne on the last abdominal segment dorsally and anteriorly to the dorsal anal plate. There are four intra-anal setae within and anterior to the anal plates, consisting of one long and one very short, borne laterally toward each side.

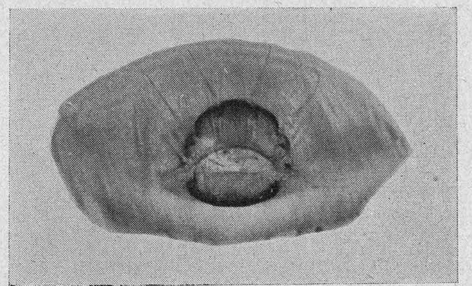


FIGURE 7. Caudal view of larva, last abdominal segment distended. Greatly enlarged.

Pupa

The pupa, Figure 3, is white in color, very fragile and crushes easily. The average length of 11 field-collected specimens was 4.27 mm. When newly pupated the eyes are white, becoming darker with age and black before the pupa transforms into the adult weevil. Reddish brown setae are present on the head, Figure 8, and along the back and sides of the body. All the setae arise from tubercles with those supporting the short, stiff, slightly curved setae usually the most prominent. There are 12 setae on the head: two short setae near the center of the vertex, one long seta above each eye, two short setae on the front between the eyes, two slender setae near and between the bases of the antennae, and two slender setae on each side near the apex of the epistomal suture. There are 18 short setae on the prothorax, with five along each side, four anterodorsal, two median and two posterior. Dorsally between the wings are two short setae anteriorly and four posteriorly. The dorsal abdominal setae are short and form four longitudinal rows from the thorax to the last abdominal segment. The last segment terminates in two long, straight, stiff setae. Dorsad, along the sides, are two rows of slender setae.

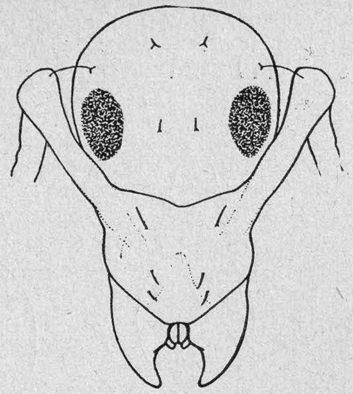


FIGURE 8. Head of pupa, frontal aspect.

Adult

The adult, frontispiece, is black in color but clothed with greyish white scales having a greenish yellow or coppery metallic cast. These scales cause the insect to appear grey. Brown scales are often present on the elytra, pronotum and head, causing some specimens to appear darker in color. The antennae are reddish brown or brown with scape slightly curved and extending just beyond the apex of the prothorax. The funicle is as long as the scape. In *C. strigiceps*, described by Marshall, the scape reaches the middle of the prothorax and the funicle is 1.25 times the length of the scape. The legs of *C. setarius* are reddish brown or brown. Each femur is armed ventrally at the widest part with a small sharp tooth (see Figure 9). The elytra have 10 striae with each interval containing a row of stiff erect setae. Each emanates individually from a puncture. Shorter erect setae also proceed from the head, pronotum and ventral portions of the body. The antennae and legs are clothed with finer reclining setae.

The average length of 41 field collected adults was 4.12 mm., the minimum being 3.59 mm. and the maximum, 4.66 mm.

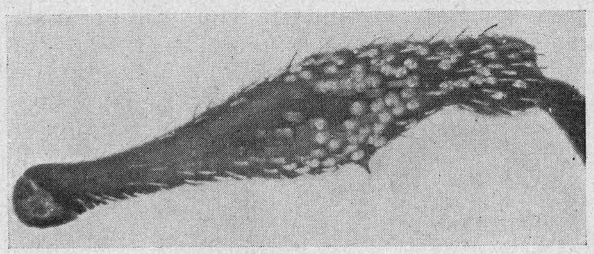


FIGURE 9. Femoral tooth on right mesothoracic leg, lateral aspect. Greatly enlarged.

Mutchler (16) gives an excellent description of the adult which is more complete than the original one given by Roelofs. Roelofs overlooked the femoral teeth which were described from a "cotype" (16) by Buchanan in 1930, and from "typical specimens" by Marshall in 1934.

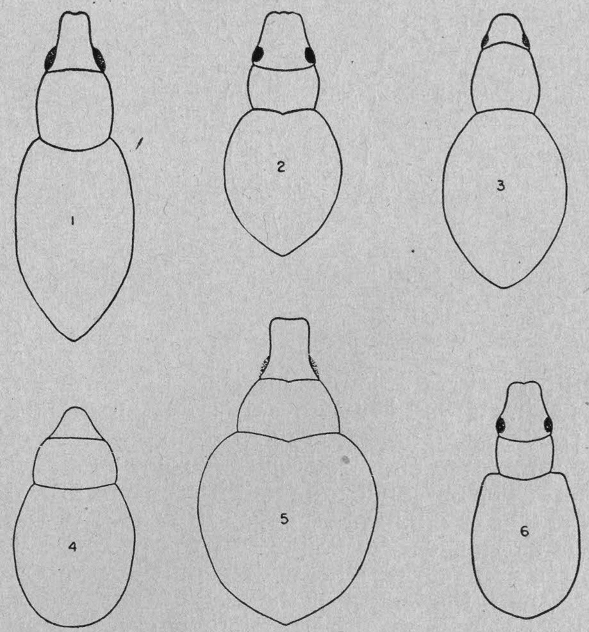


FIGURE 10. Outline drawings of: 1. *Aphrastus taeniatus* Gyll., 3. *Brachyrhinus ovatus* Linn., 4, *Phyxelis rigidus* Say, 5. *Pseudocneorrhinus setosus* Roelofs and 6. *Myllocerus* sp. which may be mistaken for 2. *Calomycterus setarius* Roelofs. Enlarged about seven times.

An outline drawing of *C. setarius* is given in Figure 10 with those of five other relatively small weevils which might be mistaken for it. The figures given are in proportion to one another for size but enlarged about seven times. The actual sizes of the weevils illustrated were *Aphrastus taeniatus* Gyllenhal, 6.20 mm.; *Pseudocneorrhinus setosus* Roelofs, 5.82 mm.; *Brachyrhinus ovatus* Linn., 5.14 mm.; *C. setarius* Roelofs, 4.56 mm.; *Myllocerus* sp., 4.56 mm., and *Phyxelis rigidus* Say, 4.17 mm. *A. taeniatus* is larger, more elongate, elytra striped and without coarse setae, and browner or lighter in color. *P. setosus,* a Japanese species found in Connecticut, is larger. The depth and breadth are greater in proportion to length, and the weevil is more robust and brown or dark in color. *B. ovatus* is larger, generally a smooth shiny black in color, with the length of the thorax greater than the breadth, and in general more elongate. *Myllocerus* sp., another Japanese weevil found in Connecticut, is approximately the same size, more red brown in color, bearing setae similar to *C. setarius*,

elytra with definite humeral angles, and with each leg armed with a femoral tooth. *Phyxelis rigidus* is smaller, darker in color, with the head and eyes less prominent and the abdomen more rounded.

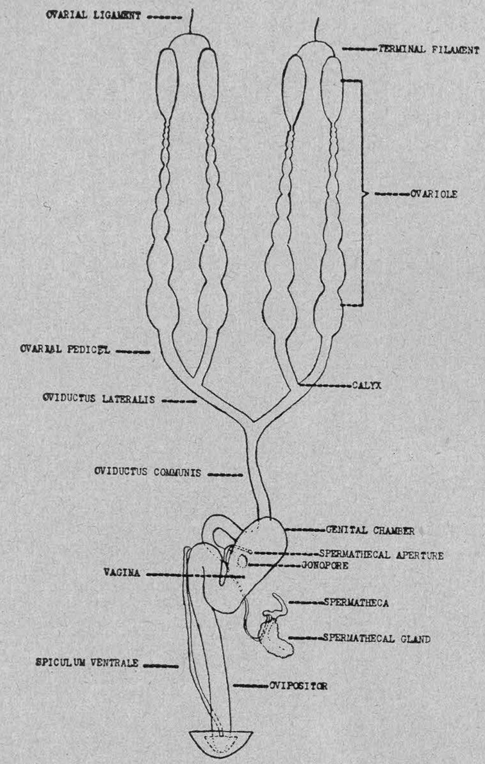


FIGURE 11. Reproductive organs, diagramatic.

Reproductive Organs (19)

C. setarius, although parthenogenetic in habit, has most of the usual organs forming the female reproductive system, with the accessory glands absent. The organs, in general, are similar to those of the pecan weevil, *Curculio caryae* Horn, described by Bissell (1), and the white fringed beetle, *Naupactus leucoloma* Boh., described by Tissot (21). The main differences found in the three species are the spermatheca which are characteristically different in shape, and the terminals of the ovipositors. The terminal of *C. setarius* is devoid of styli, that of *Curculio caryae* devoid of setae, while two oval chitinous plates are present in *N. leucoloma.*

All of the organs of *C. setarius* are embedded in fatty tissue. There are two ovaries, Figure 11, each composed of two ovarioles. Each ovary arises from the oviduct which is located ventrally to the digestive system. The ovaries loop dorsally on each side of the alimentary tract and then anteriorly. The two ovarioles of each ovary are connected distally, their terminal filaments uniting to form the suspensory ligaments, which proceed anteriorly toward the dorsal diaphragm. The ovarian ducts or pedicels of the paired ovarioles unite at the calyx to form the lateral oviducts. These in turn unite, forming the common or median oviduct which terminates at the gonopore located midway in the genital chamber.

The genital chamber lies ventrally to the right of the posterior organs of the alimentary canal. As the vagina narrows posteriorly, it makes a loop to the left and sharply forward, reversing immediately into the ovipositor.

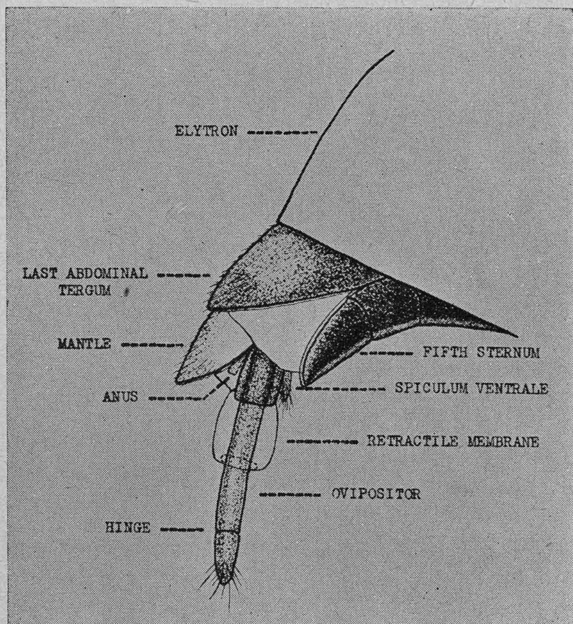
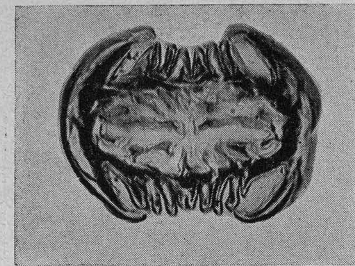
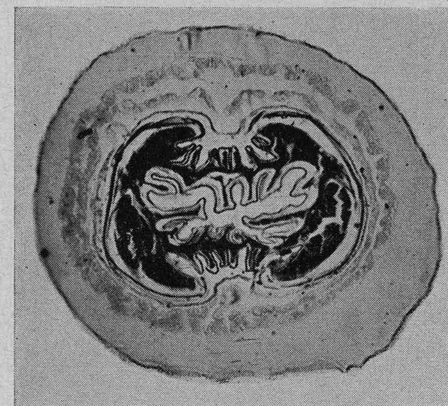


FIGURE 12. Ovipositor and last abdominal segments of adult, lateral aspect. Greatly enlarged.

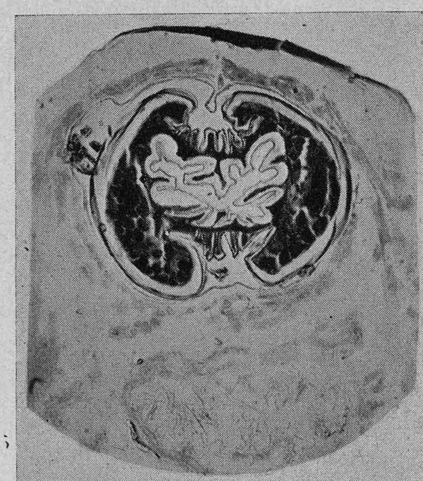
The ovipositor, Figure 12, which, when retracted, is wholly within the body, is about 1.5 mm. in length and slightly curved ventrally. It is enveloped in a membranous sheath, Figure 13-2. Upon projection, the distal portion of the ovipositor extends beyond this membrane. The main tube is strigate, membranous dorsally and ventrally, and heavily sclerotized laterally for rigidity. When the tube is contracted the membranous parts lie in folds, Figure 13-1, protected by the sclerotized sides which form a longitudinal groove both dorsally and ventrally. The tube terminates in two smooth clasper-like structures, Figure 14, hinged laterally, and bearing setae apically and laterally. Expansion occurs laterally along the dorsal



1. Between hinge and apex.



2. Medial area encased in membrane.



3. Near base of ovipositor.

FIGURE 13. Ovipositor, cross sections illustrating structural detail. Greatly enlarged.

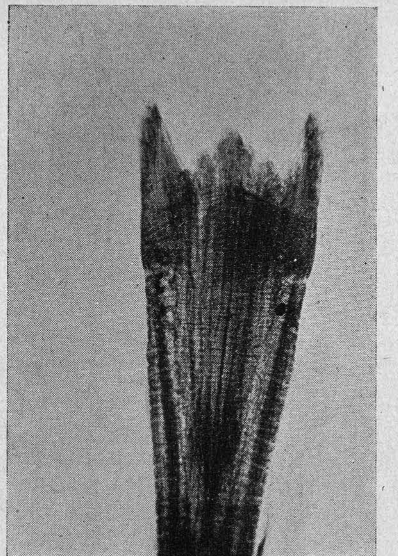


FIGURE 14. Ovipositor expanded laterally, illustrating hinged terminals, heavily sclerotized strigate sides and the folding membrane. Dorsal aspect. Greatly enlarged.

and ventral grooves, exposing the unfolding membranous sections of the tube wall.

The spiculum ventrale is a brownish red, irregularly curved rod, ventral and parallel to, and as long as or slightly longer than the ovipositor in its retracted position. It is attached to the body wall, ovipositor and genital chamber by large muscles, stiffening and giving support for extruding and retracting the ovipositor. The posterior end of the spiculum ventrale terminates in a spade-like sclerite, setiferous externally and apically. This structure may be seen externally when the ovipositor is extruded.

The spermatheca is a small sickle-shaped sclerotized organ lying to the right of the vagina. It is reddish brown in color and the blade-like portion lies anteriorly. The spermathecal duct loops ventrally under the vagina and dorsally over the oviduct, entering the genital chamber wall anterior to the oviduct with its aperture adjacent to the gonopore. The spermathecal gland is membranous and sponge-like with one duct which enters the spermatheca anterior to the spermathecal duct.

Life History

Egg Stage

The eggs have not been collected under normal conditions in the field, although numerous examinations of plants and soil have been made with the aid of a hand lens in areas of infestation. However, eggs have been recovered from the soil in field and laboratory cages. The soil from the field cages was washed through 20-, 40- and 60-mesh sieves and the material withheld on each sieve was examined under binoculars. Eggs were found in the material withheld by the 40- and 60-mesh sieves. Only a small amount of soil was used in the laboratory cages and this was examined without washing or screening.

The eggs in the field cages, recovered by washing and screening, were found in the first inch of soil. The soil used in the laboratory was loose in texture and the eggs were found in the first one-half inch. Individual eggs as well as small clusters were found. Two or three eggs were usually found in a cluster and five was the maximum. Freshly hardened adults removed from the soil in the field have deposited eggs within seven days in the laboratory. Newly emerged adults captured by sweeping on July 2, 1943, deposited eggs in four days.

At room temperature, the average hatching time for 178 eggs, laid on four consecutive days beginning July 21, was nine days. Approximately 40 per cent of the eggs hatched on the ninth day. The minimum hatching period was eight days and the maximum, 12 days. The specific data are given in Table 1.

TABLE 1. EGG HATCHING RECORD AT ROOM TEMPERATURE

		Number hatching				
No. of eggs	Date deposited	8 days	9 days	10 days	11 days	12 days
56	7-21-42	5	20	19	9	3
18	7-22-42	3	11	3	1	0
80	7-23-42	57	21	2	0	0
24	7-24-42	0	19	3	2	0
178		65	71	27	12	3

Larva

The larvae are present in the soil from midsummer until June of the following year. The young larvae begin to feed immediately after hatching, continuing until cold weather occurs in October. The larvae are usually found feeding in the upper three inches of soil, with the majority in the first two inches. Very few larvae are found in the zero to two-inch level after the soil temperature begins to decline in the fall of the year. They hibernate at various depths in the soil. The results of two diggings made in the fall of 1942 after several killing frosts had occurred are given in Table 2. A number of very small larvae were found at the six- to seven-inch level in the digging made on October 23. During miscellaneous diggings in the late fall or early spring, occasional larvae have been found as deep as 11 inches. The larvae respond to rising soil temperatures in the spring and may be found feeding in the upper few inches of soil in early April. The spring feeding period continues until the larvae are fully grown, usually about mid-June.

TABLE 2. DEPTH OF LARVAE IN THE FALL OF 1942

October 23, 1942		October 30, 1942	
Depth	No. of larvae	Depth	No. of larvae
1″—3″	3	0 —2″	0
3″—5″	26	2″—3″	11
5″—6″	42	3″—4″	10
6″—7″	26	4″—5″	5
7″—8″	6	5″—6″	0
Total	103	Total	26

Young larvae have been recovered from the field in late July, but no newly hatched grubs have been recovered except from caged material. The caged material was not disturbed until August 4, and newly hatched larvae were recovered when washing and screening the soil for eggs. The larvae were found in the material passing through the 20- and 40-mesh sieves.

While the evidence obtained to date indicates that the larva has three instars, sufficient factual evidence has not been secured to be conclusive on this point.

The larvae apparently feed upon the small roots of plants and organic matter. Large numbers may be found in the soil about the roots of native aster, bush clover and tick clover, which are among the favorite host plants of the adult insect. The larvae have also been found under alfalfa, red clover, goldenrod, and in turf. On June 9, 1942, a total of 214 larvae and six pupae were obtained from an area 15 by 15 inches, in which a clump of native aster was growing. On October 23, 1942, 103 larvae were obtained from an area less than one square foot in extent where native aster was predominant. No evidence of visual injury to plants by the larvae has been observed in any of the various infestations studied.

Pupa

The pupae may be found in the field during the first week in June but are most abundant during the third and fourth week of that month. They are found in the upper inch of soil, usually very close to the surface. As the pupae are very fragile, they are easily injured when the soil is disturbed.

At room temperature, the average length of the pupal period for 11 specimens was seven days, the minimum being five days and the maximum, eight days.

There is a comparatively short prepupal period, varying with the individual insects. In some rearing experiments, small salve tins containing an individual larva and soil were used. Usually inaction for one or two days on the surface of the soil indicated the length of the prepupal period. However, some individuals were active continuously and would not remain on the surface of the soil in the container. Such larvae would burrow into the soil less than 24 hours before pupation.

Adult

The first adults begin to emerge from the soil about June 25. They are most abundant during July and early August. After the first week in August they disappear rapidly, although a few may be found until frosts occur in late September or early October.

The adults are wingless, and as a result, the natural spread of the insect is slow. The weevils are, however, capable of running or crawling a considerable distance.

All of the weevils examined to date were found to be females. The fact that only females occurred was not considered unusual as other otiorhynchids are known to be parthenogenetic. Four *C. setarius* adults were reared from pupae which had been isolated in individual containers. These adults were placed singly in cages containing a potted chrysanthemum. Two of the weevils died in a few days. The soil in the four pots was examined one month after the adults were introduced. No eggs or larvae were found in the two pots originally containing the females which died in a few days. There were three young larvae in the soil of the third pot. The fourth pot contained only the adult weevil which was sluggish in action and died a few days later. This trial indicated that the weevil may function parthenogenetically.

Numerous trials have been made to obtain the total number of eggs deposited by individual females. All have resulted in the females dying before egg deposition was begun or shortly thereafter. In midseason an examination of the ovarioles of 13 adults was made. The reproductive systems were developed in all of the insects and eggs were present in 10 of them. The number of fully developed and partially formed eggs in the individual insects varied from three to 37.

Feeding Habits

The adult feeds in the sunlight or shade, usually on the upper surface or edge of the foliage, Figure 15. When abundant, the adults may be seen readily on the uppermost foliage or blooms of low-growing plants. *C. setarius* is gregarious and may be found in large numbers upon individual leaves and plants. Its feeding habits are characteristic, Figure 16, and similar to those of several other leaf-feeding weevils. At first the edges are notched, and with continuous heavy feeding the foliage or flowers are left in a very ragged state or entirely consumed. As the insect is small, about one-eighth of an inch in length, a large localized population must be present before serious defoliation occurs. The host plants to date include annuals, perennials, shrubs, deciduous trees and evergreens, as follows. The preferred plants are marked with an asterisk.

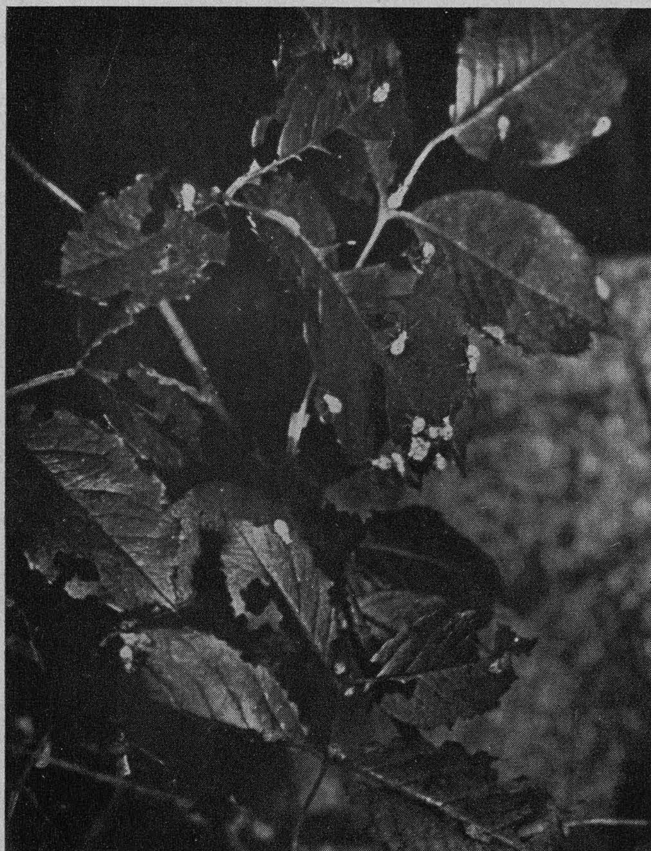


FIGURE 15. Adults feeding on the edges and surface of the foliage of the Dorothy Perkins climbing rose. Slightly reduced.

FIGURE 16. Foliage of a native aster illustrating characteristic feeding of the adult. Reduced.

Host Plants

FIELD, FORAGE AND VEGETABLE CROPS

Alfalfa*	*Medicago sativa*	Potato	*Solanum tuberosum*
Beet	*Beta vulgaris*	Radish	*Raphanus sativus*
Bush lima	*Phaseolus lunatus macrocarpus* (hort. var.)	Red clover*	*Trifolium pratense*
Celery	*Apium graveolens*	Sheep's grass	*Andropogon virginana*
Corn, sweet	*Zea mays*	Snapbean	*Phaseolus vulgaris* (hort. var.)
Cucumber	*Cucumis sativus*	Strawberry	*Fragaria chiloensis*
Kentucky blue grass	*Poa pratensis*	Sweet clover	*Melilotus* sp.
Kohl-rabi	*Brassica oleracea caulo-rapa*	Sweet potato	*Ipomoea batatus*
Parsley	*Petroselinum hortense*	Swiss chard*	*Beta vulgaris* (hort. var.)
Pea, garden	*Pisum sativum*	Tomato	*Lycopersicum esculentum*
Pole lima	*Phaseolus lunatus macrocarpus* (hort. var.)	Turnip	*Brassica rapa*
		White clover	*Trifolium repens*

FLOWERING PLANTS

Ageratum	*Ageratum latifolium*	Hollyhock*	*Althea rosea*
Aster*	*Callistephus chinensis*	Iris	*Iris*
Aster, native*	*Aster puniceus* var. *lucidulus*	Joseph's-coat	*Amaranthus gangeticus melancholius*
Beebalm	*Monarda didyma*	Kalanchoe	*Kalanchoe flammea*
Begonia, wax*	*Begonia* sp.	Lily-of-the-valley	*Convallaria majalis*
Chinese lantern*	*Physalis francheti*	Lupine	*Lupinus perennis*
Chrysanthemum*	*Chrysanthemum* (hort. var.)	Marigold*	*Tagetes erecta*
Columbine*	*Aquilegia* (hort. var.)	Phlox	*Phlox paniculata*
Daylily, lemon*	*Hemerocallis flava*	Rose, hybrid and perpetuals	*Rosa* sp.
Dorothy Perkins rose*	*Rosa* sp.	Scarlet runner	*Phaseolus coccineus*
Dwarf marigold	*Tagetes signata pumila*	Tuberous begonia	*Begonia tuberosa*
Fever few	*Matricaria parthenoides*	Violet (greenhouse)	*Viola* (hort. var.)
Geranium*	*Pelargonium* sp.	Wild rose*	*Rosa* sp.
Gladiolus	*Gladiolus*	Zinnia*	
Gloxinia	*Sinningia speciosa*		

ORNAMENTAL PLANTS, TREES, SHRUBS AND VINES

Abutilon*	*Abutilon* sp.	Mockorange	*Philadelphus* sp.
Allegheny vine	*Adlumia fungosa*	Morning glory (cultivated)	*Ipomoea* sp.
Alligator palm (water plant)		Oak sprouts	*Quercus* sp.
Althea	*Althea anemonaeflorus*	Philodendron	*Philodendron* sp.
Barberry	*Berberis thunbergi*	Poplar	*Populus* sp.
Bigleaf wintercreeper	*Euonymus vegetus*	Porcelain ampelopsis	*Ampelopsis brevipedunculata* var. *maximowiczi*
Boston ivy	*Ampelopsis tricuspidata veitchi*	Pride of Marion ivy	*Hedera* sp.
Bridalwreath	*Spirea prunifolia*	Shrimp plant	*Beloperone guttata*
Coleus*	*Coleus blumei*	Raspberry	*Rubus* sp.
Elderberry	*Sambucus canadensis*	Virginia creeper	*Ampelopsis quinquefolia*
English ivy*	*Hedera helix*	Walnut sprouts	*Juglans* sp.
Deutzia	*Deutzia* sp.	Wild cherry	*Prunus* sp.
Firethorn	*Pyracantha* sp.	Yew	*Taxus cuspidata capitata*
Grape	*Vitis* sp.		
Maple sprouts	*Acer* sp.		
Miniature pepper	*Capsicum* sp.		

WEEDS

Bindweed	*Polygonum* sp.	Morning glory	*Convolvulus tricolor*
Bush clover*	*Lespedeza capitata*	Partridge pea	*Cassia chamaecrista*
Clear weed	*Pilea pumila*	Plantain	*Plantago lanceolata*
———	*Chenopodium urbicum*	Ragweed	*Artemisia ambrosifolia*
Dock	*Rumex* sp.	Smartweed*	*Polygonum* sp.
Hog peanut	*Apios tuberosa*	Sneezeweed	*Helenium* sp.
Knotweed	*Polygonum neglectum*	Sorrel	*Rumex acetosella*
Lamb's-quarters*	*Chenopodium alba*	Tick clover*	*Desmodium canadense*
Meadow sweet	*Filipendula* sp.	Wild mustard	*Brassica* sp.
Milkweed	*Asclepias syriaca*	Yarrow	*Archillea millefolium*

General Habits

C. setarius is very active and its habit of dispersing from areas in which it emerged as an adult is an important factor in its distribution. This dispersion, when from an area of light infestation, may be minor in nature and, when from an area of heavy infestation, may be likened to a migration. One eye-witness in another state describes a dispersal from a field of alfalfa and clover: "The adjoining roadway was covered with thousands of the insects and in the next few days hundreds of them were feeding upon the ornamental plants around the nearby stone dwelling. In addition, many of the insects had found their way into the dwelling and were crawling on the walls, ceilings and furniture."

Numerous other reports have been received of the weevils finding their way into screened buildings and making themselves a nuisance by falling into food containers, crawling on dining tables, getting into beds or eating the foliage of house plants. The only damage observed or reported inside of dwellings has been to house plants, and the nuisance of the insects' presence. Large numbers have been observed dead around a drum of kerosene in a garage, killed by contact with the waste kerosene on the floor. As many as 2,400 of the weevils were collected from a single, deep window well of a hospital located adjacent to an infested field. The insects have been observed crawling on people seated out of doors, on tractors, automobiles, chairs and other movable objects. When disturbed, the insect may become immobile, or fall off the object or plant upon which it was located and remain inactive for a short time. All the various habits of this insect as enumerated are important factors in its potential spread through artificial means.

Control Experiments with Insecticides

All tests with insecticides were limited to the adult stage and were made in laboratory greenhouses having a temperature range of 75 to 85° F. Small cages, 14 inches in height and four inches in diameter, made of 16-mesh wire cloth, were used. A flat, round, wooden plug, with a ⅜-inch hole in the center, was fitted into and fastened to a wire cylinder three inches above the bottom edge to form a tight-fitting floor in each cage. The wire cloth extending below the floor gave stability to the cage when placed over a jar of water. Muslin, held in place with a rubber band, formed the top or roof. Branches or shoots of chrysanthemum foliage, a favorite host plant, were used in the cages. The stem of the branch was wrapped in cotton, inserted from above through the hole in the floor of the cage so as to extend into the water contained in the jar on which the cage was placed. These cages were tight and easily handled. The small weevils could not escape or avoid detection and the chrysanthemum branches would live as long as water was available to them.

The technique followed was to spray or dust the branches and place them in individual cages. Twenty-five field-collected weevils were then placed in each cage. Each test consisted of four units totaling 100 weevils, treated and infested simultaneously.

Preliminary tests were conducted with 3 pounds of lead arsenate plus 3 pounds of white wheat flour to 100 gallons of water, pyrethrum (Red Arrow) 1 part to 200 parts of water, cryolite at 2 and 4 pounds concentration plus 1 pint of soybean oil and 1 ounce of Ultrawet to

100 gallons of water, and cryolite dust (25 per cent) with pyrophyllite as a diluent. The results obtained are given in Table 3.

TABLE 3. PRELIMINARY INSECTICIDE TESTS

Insecticide	Day Treated	Day of Reading	Mortality Treated	Mortality Check
Lead arsenate	7-14-43	7-19-43	43%	0
Pyrethrum	7-22-43	7-26-43	70%	0
Cryolite 2 lbs.	7-14-43	7-19-43	61%	0
Cryolite 4 lbs.	7-29-43	8- 2-43	82%	24%
Cryolite dust 25%	7-22-43	7-26-43	100%	0

As 25 per cent cryolite dust gave the best results in the preliminary tests, further experiments were conducted in the same manner with 25, 12½ and 6¼ per cent cryolite dusts containing pyrophyllite as a diluent. The results are given in Table 4.

TABLE 4. LABORATORY INSECTICIDE TESTS WITH CRYOLITE DUSTS

Insecticide	Day Treated	Day of Reading	Mortality Treated	Mortality Check
Cryolite 25%	7-29-43	8- 2-43	100%	24%
Cryolite 25%	8- 7-43	8-11-43	100%[1]	40%
Cryolite 12½%	8- 7-43	8-10-43	100%	40%
Cryolite 12½%	8-11-43	8-14-43	100%	56%
Cryolite 6¼%	8- 5-43	8-11-43	100%[1]	12%
Cryolite 6¼%	8-11-43	8-14-43	100%	56%

[1] All weevils, except one, were dead on 8-10-43.

Mortality in the treated units was high during the first 24 hours of each test, whereas mortality did not develop as rapidly in the untreated cages. It was evident from the observations made and the results obtained that cryolite dusts were lethal to *C. setarius*. It was also evident that the mortality in the checks was high, and corresponded to the conditions in the field where the insects became less numerous in the fifth and sixth weeks of the adult season.

Summary

The imported long-horned weevil, *Calomycterus setarius* Roelofs, a small insect, native to Japan, has become established in the states of Connecticut, Illinois, Iowa, Maryland, Massachusetts, New York, Pennsylvania and Rhode Island. It is parthenogenetic in habit and has a one-year life cycle. The adults emerge from the soil about June 25, and are most abundant during July and early August. They deposit their eggs in soil or debris. The larvae are present in the soil from July until the following June, pupating in June or early July.

The adults are primarily foliage feeders and may be found feeding upon the leaves and blooms of numerous host plants. They are general feeders and more than 100 host plants have been recorded. These include annuals, perennials, shrubs, deciduous trees and evergreens.

These insects are wingless and their natural spread is slow. However, they crawl upon people, into dwellings, vehicles and many unusual places. This habit, together with the fact that they are parthenogenetic, increases the possibility of artificial spread through the transportation of the adult insect or soil-inhabiting stages.

Though the larvae probably feed upon the small roots of plants and organic matter and may be very numerous in a localized area, no visible damage to plants by this stage has been observed.

Experiments with insecticides for the control of the adult insect have been conducted in the laboratory. Cryolite dust, 25 per cent, gave the best results in the experiments conducted to date.

Bibliography

1. BISSELL, THEO. L., 1937. Structure of the reproductive system of the pecan weevil (Curculionidae). Ann. Ent. Soc. Amer., Vol. 30, pp. 242-251.
2. BLATCHLEY, W. S. and C. W. LENG, 1916. Rhynchophora or weevils of North Eastern America, p. 10. The Nature Publ. Co., Indianapolis, Ind.
3. BOURNE, A. I., 1938. The Insect Pest Survey Bul., U. S. D. A., Bur. Ent. Pl. Quar., Vol. 18, No. 7, pp. 445 and 453.
4. BRADLEY, J. C., 1930. A manual of the genera of beetles of America north of Mexico, p. 267. Dow, Illston and Co., Ithaca, N. Y.
5. BRITTON, W. E., 1933. Another Japanese weevil pest. Conn. Agr. Expt. Sta. Bul. 349, p. 448.
6. ——————, 1939. Insect record for 1938. Conn. Agr. Expt. Sta. Bul. 428, p. 16.
7. CORY, E. N., 1935. The Insect Pest Survey Bul., U. S. D. A., Bur. Ent. Pl. Quar., Vol. 15, No. 6, p. 315.
8. ——————, 1937. The Insect Pest Survey Bul., U. S. D. A., Bur. Ent. Pl. Quar., Vol. 17, No. 5, p. 216.
9. GUYTON, T. L. and A. B. Champlain, 1935. The Insect Pest Survey Bul., U. S. D. A., Bur. Ent. Pl. Quar., Vol. 15, No. 5, p. 251.
10. JOHNSON, J. P., 1942. The imported long-horned weevil. Conn. Agr. Expt. Sta. Bul. 461, pp. 541-542.
11. ——————, 1943. The imported long-horned weevil, *Calomycterus setarius* Roelofs. Conn. Agr. Expt. Sta. Bul. 472, pp. 308-309.
12. KEIFER, H. H., 1932. Some Pacific Coast otiorhynchid weevil larvae. Ent. Amer., Vol. xiii, No. 2, pp. 45-85.
13. KONO, H., 1930. Kyrzrüssler aus dem japanischen Reich. Jour. Fac. Agr., Hokkaido Imperial Univ., Sapporo, Japan, Vol. xxiv, Pt. 5, pp. 224-225.
14. ——————, 1938. Zumpt. Ent. Bl., Vol. 34, p. 88. Not read. (Reference from Insecta, Imp. Inst. Ent., Vol. lxxv, p. 268.)
15. MARSHALL, SIR Guy A. K., 1934. Arkiv för Zoologi, Band 27 A, No. 29, pp. 10-11.
16. MUTCHLER, A. J., 1930. A Japanese weevil, *Calomycterus setarius* Roelofs, which may become a pest in the United States. Amer. Mus. Novitates, No. 418, pp. 1-3.
17. PIERCE, D. W., 1913. Miscellaneous contributions to the knowledge of the weevils of the families Attelabidae and Brachyrhinidae. Proc. U. S. Nat. Mus., No. 1988, Vol. 45, p. 373.
18. ROELOFS, W., 1873. Curculionides Recueillis au Japon par M. G. Lewis. Annales de la Société Entomologique de Belgique, Vol. 16, pp. 154-192. *Calomycterus setarius* p. 175.)
19. SNODGRASS, R. E., 1935. Principles of insect morphology. McGraw-Hill Book Co., Inc., New York and London.
20. ST. GEORGE, R., 1941. The Insect Pest Survey Bul., U. S. D. A., Bur. Ent. Pl. Quar., Vol. 21, No. 7, p. 501.
21. TISSOT, A. N., 1938. The gross anatomy of the digestive and reproductive systems of *Naupactus leucoloma* Boh. (Curculionidae, Coleoptera). The Florida Ent., Vol. xxi, No. 2.
22. TRAVIS, A. S., 1939. The Insect Pest Survey Bul., U. S. D. A., Bur. Ent. Pl. Quar., Vol. 19, No. 8, p. 487.
23. WEIGEL, C. A., 1935. Memorandum regarding a weevil native to Japan now known to occur in the United States. U. S. D. A., Bur. Ent. Pl. Quar., E-360.
24. ——————, 1939. The Insect Pest Survey Bul., U. S. D. A., Bur. Ent. Pl. Quar., Vol. 19, No. 7, p. 427.
25. ZAPPE, M. P., 1936. Further infestations of *Calomycterus setarius* Roelofs. Conn. Agr. Expt. Sta. Bul. 383, pp. 329-330.
26. ——————, 1937. Further notes on *Calomycterus setarius* Roelofs. Conn. Agr. Expt. Sta. Bul. 396, pp. 367-370.
27. ——————, 1941. *Calomycterus setarius* Roelofs. Conn. Agr. Expt. Sta. Bul. 445, pp. 376-377.

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COMMERCIAL FEEDING STUFFS

REPORT ON INSPECTION

1943

E. M. BAILEY
Chemist in Charge

Connecticut
Agricultural Experiment Station
New Haven

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COMMERCIAL FEEDING STUFFS

REPORT ON INSPECTION

1943

E. M. BAILEY[1]

THE FEED LAW

The statute relating to concentrated commercial feeding stuffs imposes upon the Station (1) all duties incidental to the annual registration of feeds offered for sale in the State; (2) the collection of samples for inspection and analysis; (3) the examination of all samples so collected; (4) the preparation and publication of a bulletin summarizing the results of inspection and giving other pertinent information; and (5) joint responsibility with the Dairy and Food Commissioner for rules and regulations for carrying out the provisions of the law.

The enforcement provisions of the statute are delegated to the Dairy and Food Commissioner.

The following regulations were issued by the Director of this Station and the Dairy and Food Commissioner in May, 1939, superseding those issued in Bulletin of Immediate Information No. 60, dated June, 1927.

REGULATION I. FEEDS NOT CLASSED AS CONCENTRATED COMMERCIAL FEEDING STUFFS (SEC. 4717)

It is held that the law exempts from classification as concentrated commercial feeding stuffs, and therefore from registration: (1) roughages such as hays, straws, corn stover and ensilage; (2) whole grains and mixtures thereof; (3) meals made from whole grains when not mixed with other materials or with each other; (4) feed ground from whole grain and sold by the manufacturer directly to the consumer; and (5) feed mixed according to a formula furnished by the consumer, for his own use.

Clause (4), above, refers to feed ground from materials furnished by the consumer. Under clause (5), above, feed is regarded as "mixed to order" and it must be so labelled together with a statement of net weight, the name of manufacturer and the name of the customer. The formula must be stated; the analysis *need not* be given. Such feed

[1] Analyses are by Messrs. Nolan, Walden and Merwin; biological assays under direction of Dr. R. B. Hubbell; examinations for poisons by Mr. C. E. Shepard; microscopic examination by Miss Janetha Shepard; and sampling by Mr. George Smith. Compilations are largely by Mrs. M. B. Vosburgh.

must be sold only to the customer for whom it was mixed; if sold to others it becomes a regular brand subject to registration and other provisions pertaining to feeds in general. The suggested form of label for feed sold under clause (5) is:

(1) Net weight

(2) Kind of feed (State kind of feed, e.g., "horse feed", "dairy feed", "poultry mash", without private brand name or trademark)

(3) Mixed to order for ....
(Name of customer)

(4) Formula (give open formula)

(5) Name of manufacturer

Regulation 2. Method of Labelling (Sec. 4718)

All concentrated commercial feeding stuffs, other than vitamin D carriers, must be labelled either by a statement printed on the bag or upon a properly attached tag; in the case of concentrated feeding stuff sold in bulk, a certificate which shall contain the information otherwise required to appear upon the bag or upon the tag, may be issued by the dealer in lieu thereof.

The use of wire or any metal in affixing tags is prohibited by law.

The law requires a statement of (1) the net weight of the feed contained in the package; (2) the name, brand or trademark under which the feed is sold; (3) name and address of the manufacturer or importer; (4) the minimum percentages of (a) crude protein and (b) crude fat, and the maximum percentage of (c) crude fiber contained in the feed; (5) the separate ingredients of which the food is composed.

While the law requires only a statement of the items enumerated above, no objection will be raised to more complete statements of chemical composition or formula.

Regulation 3. Concerning Vitamin D Carriers

Vitamin D carriers are required to be registered in the same manner and under the same conditions as obtain for feeds in general.

Information to be given on labels and in applications for registrations is (1) name of product; (2) vitamin D potency in terms of A.O.A.C. chick units per gram; (3) name and address of manufacturer, distributor or other person responsible for the product, and, (4) on the label, a statement of net weight or volume.

The A.O.A.C. chick units is the Vitamin D activity produced by one U. S. Pharmacopoeia unit of vitamin D from the U.S.P. "Reference Cod Liver Oil", determined by the method of assay adopted by the Association of Official Agricultural Chemists.

Cod liver oils containing less than 85 A.O.A.C. chick units of vitamin D per gram are not acceptable for registration.

Regulation 4. Concerning Cottonseed Meal, etc.

Cottonseed meal, linseed meal, soybean meal, and other vegetable feeds that are sold as fertilizer, are required to be registered under the provisions of the fertilizer law in addition to registration as feeds. If sold exclusively for one or the other of these purposes, the articles may be registered only under the law which applies.

For such of these articles as are used for fertilizer purposes chiefly or entirely as sources of nitrogen, only nitrogen (or protein) need be declared in the application for registration as fertilizer; and the tags or labels generally attached to such articles when intended for feeding purposes will be acceptable for them when sold as fertilizer.

Regulation 5. Duties of Manufacturers, Jobbers and Dealers with Reference to Registration (Sec. 4719)

All concentrated commercial feeding stuffs, including vitamin D carriers, must be registered with the Connecticut Agricultural Experiment Station annually on January 1, or before they are offered for sale. Registration blank forms are supplied by the Station.

Manufacturers, jobbers or individuals shipping feeds into Connecticut will be expected to register their brands and pay the necessary fees thereon. Connecticut dealers should assure themselves that the brands they handle are properly registered and labelled. In case the manufacturer or jobber outside the State neglects or refuses to register, the dealer who handles such feeds will be held responsible for such registrations, registration fees and other legal requirements.

Dealers within the State who mix their own brands are responsible for the registration and proper labelling thereof.

Regulation 6. Definitions of Terms Used in the Law and of Other Terms

Person. The term "person" is accepted as defined in General Statutes, Section 2432; it imports the singular or the plural as the case demands; and includes corporations, companies, societies and associations.

Importer. The term "importer" is defined in the act.

Brand. It is held that a distinct brand name, or a distinct analysis, constitutes a distinct brand.

Definitions for Feeding Stuffs. The definitions and standards for feeding stuffs adopted from time to time by the Association of Feed Control Officials of the United States are accepted as official in carrying out the provisions of this law; and the rules and regulations as adopted by that association are accepted as far as possible and when not inconsistent with the Connecticut statutes.

Regulation 7. Methods of Analysis (Sec. 4718)

The methods of analysis employed shall be those prescribed by the Association of Official Agricultural Chemists, wherever such methods have been adopted for the determinations desired.

Regulation 8. Concerning Medicated Feeds and Mineral Mixtures

The law does not include medicated products used as "conditioners" for stock and poultry, and which consist essentially of substances possessing or claimed to possess, medicinal or condimental properties; nor does it include products consisting of supplemental minerals.

Emergency Measures

Under war conditions the uncertainty of supply of ingredient materials for feed mixtures makes it necessary for manufacturers to change their formulas from time to time as government regulations or available supply of ingredients may require.

To cooperate with the trade so far as possible in such circumstances we have advised manufacturers that registrations may list, in addition to the regular ingredients, such alternate ingredients as may be used during the registration period. It will then not be necessary to notify this Station of changes in ingredients unless some ingredient not listed in the registration is used.

Tags must, however, show the ingredients actually present in the feed as offered for sale. Manufacturers having printing facilities that enable them to print new tags quickly will have no difficulty in meeting this legal requirement. For smaller manufacturers without such facilities we have suggested tags bearing a master list of ingredients corresponding with registrations. For any given lot or batch of feed such tags can be adapted by striking out the names of ingredients not present.

The general policy of the Station to accept revisions of registrations during the registration period without extra registration fee or other charge still holds.

REGISTRATIONS

For the period January 1, 1943, to December 31, 1943, 166 firms registered 1,191 brands of feeding stuffs, and 10 firms registered 30 brands of vitamin D carriers.

As required by statute the registrations are listed as follows:

C. L. Adams Co. (By Park & Pollard Co.)

Albers Milling Co., Seattle, Wash.
Proven Calf Manna

Allied Mills, Inc., Chicago, Ill.
Economy 16 Dairy Feed
Economy 20% Dairy Feed
Economy Laying Mash with Fortified Sardine Oil
Red Feather Scratch Feed
Screened Cracked Corn
Wayne All Mash Breeder
Wayne All Mash Egg
Wayne Breeder Mash with Fortified Sardine Oil
Wayne Broiler Mash
Wayne Calf Meal
Wayne Chick and Broiler Ration
Wayne Chick Feed
Wayne Chick Starter
Wayne Complete Calf Feed
Wayne 16% Dairy Feed
Wayne 20% Dairy Feed[1]
Wayne 24% Dairy Feed
Wayne Egg Mash with Fortified Sardine Oil
Wayne Fitting Ration
Wayne Flushing Mash
Wayne Growing Mash with Fortified Sardine Oil
Wayne Horse Feed
Wayne Intermediate Scratch Feed
Wayne 26% Mash Supplement with Fortified Sardine Oil
Wayne Pork Maker
Wayne Poultry Fattener
Wayne Turkey Growing Mash with Fortified Sardine Oil
Wayne Turkey Starting Mash

American Maize-Products Co., 100 E. 42nd St., New York, N.Y.
Amaizo Gluten Meal
Amaizo Sweetened Gluten Feed
Cream of Corn Gluten Feed

Anchor Mills, Inc., (By D. A. Stickell & Sons, Inc.)

Apothecaries Hall Co., Waterbury, Conn.
Liberty Special Steamed Bone Meal

Archer-Daniels-Midland Co., Minneapolis, Minn.
Archer All Mash Starter and Broiler Ration
Archer Brand 32% Protein Old Process Linseed Oil Meal
Archer Brand 34% Protein Old Process Linseed Oil Meal
Archer Brand 41% Protein Soybean Oil Meal
Archer Brand 44% Protein Soybean Oil Meal
Archer Growing Scratch

Ashcraft-Wilkinson Co., Atlanta, Ga.
Cow-Eta Brand 41% Protein Cottonseed Meal, Prime Quality

The Atlantic Supply Co., 1000 Hull St., Baltimore 30, Md.
Atlantic Di-Gra-Sol
Atlantic Ferm-E-Sol

E. W. Bailey & Co., Montpelier, Vt.
Bailey's Pennant Brand C-16 Dairy Ration
Bailey's Pennant Brand 18% Dairy Ration
Bailey's Pennant Brand Fine Chick Scratch
Bailey's Pennant Brand Growing Mash
Bailey's Pennant Brand Horse Feed
Bailey's Pennant Brand Laying Mash
Bailey's Pennant Brand Pig Feed
Bailey's Pennant Brand Turkey Grower
Bailey's Pennant Brand Turkey Starter

Barber & Bennett, Inc., P.O.Box 430, Albany 1, N.Y.
B & B Laying Mash

Bay State Milling Co., Winona, Minn.
Wingold Fancy Hard Wheat Mixed Feed and Wheat Screenings
Wingold G Pure Hard Wheat Red Dog
Wingold Pure Hard Wheat Bran
Wingold Standard Hard Wheat Middlings and Wheat Screenings

The Beacon Milling Co., Inc., Cayuga, N.Y.
Auburn "16"
Auburn Dairy Feed
Beacon "16"
Beacon "24" (For mixing with home grains)
Beacon Battery Growing Ration
Beacon Battery Laying Ration
Beacon Breeders Mash
Beacon Broiler Feed (For range and floor use only)[2]
Beacon Bulky Developer Grains
Beacon Calf Grain
Beacon Calf Starter
Beacon's Cayuga Horse Feed
Beacon's Cayuga Scratch Feed
Beacon C-C Pellets (Mfr'd under U. S. Patent 2056107)
Beacon Chick Feed
Beacon Complete Rabbit Ration
Beacon Complete Starting Ration
Beacon Developer Feed
Beacon Duck Fattener
Beacon Duck Grower
Beacon Duck Starter
Beacon "22" Egg Mash[3]
Beacon Fitting Ration
Beacon Fleshing Pellets
Beacon Goat Ration
Beacon "16" Growing Mash
Beacon "18" Growing Mash[4]
Beacon Hog Feed
Beacon "20" Laying Mash
Beacon Pasture Ration
Beacon Pheasant Grower (1/8 inch Pellets)
Beacon Pheasant Starter
Beacon Poultry Fitting Ration
Beacon Special "18"
Beacon Special "20"
Beacon Special Scratch Grains
Beacon Steer Fattener
Beacon Steer Supplement
Beacon Test Cow Ration[5]
Beacon Turkey Fitting Ration
Beacon Turkey Flushing Feed
Beacon Turkey and Game Bird Breeder Mash
Beacon Turkey Growing Mash
Beacon Turkey Starter
Be-Co-Las
Cayuga "16"
Corn and Oats Chop

Berkman Grain & Coal Co., North Franklin, Conn.
Nibco Breeder Mash with Fortified Cod Liver Oil
Nibco Chick Starter with Fortified Cod Liver Oil
Nibco 20% Dairy Ration[6]
Nibco 24% Dairy Ration
Nibco Fine Chick Feed

Berkman Grain & Coal Co., North Franklin, Conn.—(*Continued*)
Nibco Flushing Mash
Nibco Fitting Ration
Nibco Growing Mash with Fortified Cod Liver Oil
Nibco Horse Feed
Nibco Intermediate Chick Feed
Nibco Laying Mash with Fortified Cod Liver Oil
Nibco Scratch Feed
Nibco Starter and Broiler Mash with Fortified Cod Liver Oil
Nibco Stock Feed

Best Foods, Inc., Division of Hecker Products Corp., Buffalo, N.Y.
Oat Mill Feed

Bisbee Linseed Co., Inc., Amsterdam, N.Y.
"K & M" Brand 32% Protein Old Process Linseed Meal
"K & M" Brand 34% Protein Old Process Linseed Meal

Black Rock Milling Corp. (By Park & Pollard Co.)

Blatchford Calf Meal Co., Waukegan, Ill.
Blatchford's Calf Pellets and Blatchford's Calf Meal
Blatchford's Complete Calf Ration
V-D

Blatchley & Ballard, Inc., Middletown, Conn.
Bee Brand 16% Dairy Ration
Bee Brand 18% Dairy Ration
Bee Brand 85% Grain Horse Feed
Bee Brand Growing Mash
Bee Brand Hog Ration
Bee Brand Special 18% Dairy Ration
Bee Brand Starter and Broiler Mash
Bee Brand Super 18% Dairy Ration
Bee Brand Sure Lay Mash
Bee Brand Sure Lay Scratch Grains
Victory Mash-Starter-Grower-Layer

C. W. Brister & Son, Auburn, N. Y.
Prize Mixed Feed

L. Broder & Co., Colchester, Conn.
L. B. Diamond Starter and Broiler
L. B. 16% Milk Ration
L. B. Milk Ration 20%

Brooklawn Grain & Feed Co., 321 Sylvan Ave., Bridgeport, Conn.
Brooklawn 20% Dairy Ration
Brooklawn Egg Mash
Brooklawn Growing Mash

The Buckeye Cotton Oil Co., Cincinnati, Ohio
Buckeye 41% Protein Cottonseed Meal, Prime Quality
Buckeye 41% Protein Soybean Oil Meal
Buckeye 44% Protein Soybean Oil Meal

The C. W. Campbell Co., Pawcatuck, Conn.
Best Pig and Hog Ration
Camco Calf Meal
Camco Grower
Camco Horse Feed
Camco Laying Mash

The C. W. Campbell Co., Pawcatuck, Conn.—*(Continued)*
Campbell's 16% Dairy Ration
Campbell's 20% Dairy Ration[1]
Egg-O Chick Grain
Egg-O Chick Starter and Broiler Ration
Egg-O Growing Mash
Egg-O Laying and Breeding Mash
Egg-O Scratch Grains
Egg-O Turkey Grower
12% Fitting Ration
14% Fitting Ration
Lassagras
Milky Dairy Ration
Provender
Supreme Scratch Grains

The A. B. Caple Co., Toledo, Ohio
Capex Dehydrated Alfalfa Meal—17%

Center Milk Products Co., Middlebury Center, Pa.
"Center" Dried Skim Milk

Central Soya Co., Inc., Fort Wayne, Ind.
Central Soybean Oil Meal
Central Star Brand Soybean Oil Meal

Cerophyl Laboratories, Inc., Kansas City, Mo.
Condensed Greenmelk

Checkerboard Feed Store (By Ralston Purina Co.)

Clinton Co., Clinton, Iowa
Clinton Corn Gluten Feed
Clinton Corn Gluten Meal

Coatsworth & Cooper, Ltd., 67 Yonge St., Toronto, Canada
"C & C" Wheat Bran
"C & C" Wheat Shorts

Commander-Larabee Milling Co., Minneapolis, Minn.
Sunfed Red Dog, Pure Wheat Product
Sunfed Wheat Bran with Ground Screenings
Sunfed Wheat Standard Middlings with Ground Screenings

Community Service, Inc., Canaan, Conn.
Community Complete Pig Feed
Community 16% Dairy Ration
Community Fitting Ration
Community Poultry Mash
Community Scratch Feed
Community Starter and Grower Mash
Cornell Calf Starter

Connecticut Dried Grains, Colchester, Conn.
Connecticut Dried Grains

Consolidated Products Co., Danville, Ill.
Semi-Solid "E" Emulsion
Semi-Solid Mulsion

Consolidated Rendering Co., 178 Atlantic Ave., Boston, Mass.
Corenco Bone Meal
Corenco Cod and Haddock Meal[7]
Corenco Fish Meal 55%
45% Corenco Meat and Bone Scrap
47% Corenco Meat and Bone Scrap
Corenco 50% Meat and Bone Scrap
Corenco 55% Meat Scrap

Continental Distilling Corp., 1429 Walnut St., Philadelphia, Pa.
Wheat Distillers Dried Grains

The O. A. Cooper Co., Humboldt, Nebraska
Cooper's Best Lay and Gro Mash

Corn Products Refining Co., 17 Battery Place, New York, N. Y.
Buffalo Corn Gluten Feed
Buffalo Corn Gluten Feed (Sweetened)
Diamond Corn Gluten Meal

C. A. Cowles, Inc., Plantsville, Conn.
Blue C Hog and Pig Feed
Cowles B. C. Turkey Starting and Growing Mash
Cowles Blue C Broiler and Starting Mash
Cowles Blue C Dairy Ration 16%
Cowles Blue C Dairy Ration 18%
Cowles Blue C Fitting and Calf Ration
Cowles Blue C Growing Mash
Cowles Blue C Horse Feed with Molasses
Cowles Blue C Laying and Breeder Mash
Cowles Blue C Starting Mash
Cowles Plantsville Dairy Ration
Cowles Red C Laying Mash
Cowles Red C Starting and Growing Mash
Cowles Special 16% Dairy Ration

Chas. M. Cox Co., 177 Milk St., Boston, Mass.
Brewers Dried Grains
Commercial Mixed Grains with Cracked Corn[8]
Du-Ration 12% Dairy Feed
Du-Ration 16% Dairy Feed
Du-Ration Poultry Mash
Du-Ration Stock Feed
Pilgrim Scratch
Wirthmore Baby Chick Scratch
Wirthmore Breeder Mash (or Pellets)
Wirthmore Calf Starter Meal (or Pellets)
Wirthmore Complete Breeder Ration (or Pellets)
Wirthmore Complete Egg Ration (or Pellets)
Wirthmore Complete Growing Ration (or Pellets)
Wirthmore 20 Dairy Ration
Wirthmore Finishing Pellets
Wirthmore 14 Fitting Ration
Wirthmore Fodder Greens
Wirthmore Growing Mash (or Pellets)
Wirthmore Horse Feed
Wirthmore Laying Mash (or Pellets)
Wirthmore Pig and Hog Feed
Wirthmore Poultry Flush
Wirthmore Rabbit Pellets
Wirthmore Rabbit Ration
Wirthmore 16 Record Ration
Wirthmore 20 Record Ration
Wirthmore Scratch Feed
Wirthmore Standard 16 Dairy Ration
Wirthmore Standard 18 Dairy Ration
Wirthmore Standard 12 Fitting Ration
Wirthmore Standard Horse Feed
Wirthmore Starter and Broiler Ration
Wirthmore Stock Feed
Wirthmore Super Pellets
Wirthmore Turkey Breeder Ration (or Pellets)
Wirthmore Turkey Fattening Ration (or Pellets)
Wirthmore Turkey Growing Ration (or Pellets)
Wirthmore Turkey Starting Ration
Wirthmore Twin-Mix Calf Ration

Crawford Bros., Inc., Walton, N. Y.
Crawford's Broiler and Growing Mash
Crawford's Complete Calf Ration
Crawford's Dry and Freshening Ration
Crawford's Fitting Ration
Crawford's Flushing Mash
Crawford's Hog Feed
Crawford's Horse Feed
Crawford's Laying and Breeding Mash
Crawford's Special Test Ration
Crawford's Starting and Growing Mash
Crawford's Turkey Starter and Grower
Economy Growing
Economy Laying Mash
Economy Starting and Growing Mash
Producer
20% Producer
U V C Feed
Victory Ration
Wallkill Sweet Dairy Ration

P. Cutler, Inc., Colchester, Conn.
Prosperity 20% Dairy Feed[9]
Prosperity Laying Mash
Prosperity Pig Ration
Prosperity Scratch Feed
Prosperity Stock Feed

Dailey Mills, Inc., Binghamton, N. Y.
Dailey's All Mash Grower
Dailey's Egg Producer Mash
Dailey's Fitting Ration (with Crimped Heavy Oats)
Dailey's Horse Feed
Dailey's 20% Milk Producer[10]
Dailey's Pork Producer
Dailey's Revitalizer Mash
Dailey's Scratch Grains[11]
Dailey's Special Pig and Hog Ration (with Digester Tankage and Distilled Fish Solubles)
Dailey's Straight 18% Money Maker
Dailey's Super All Mash Layer
Dailey's Super 18% Dairy Ration (with Beet Pulp and Crimped Heavy Oats)
Dailey's Super 20% Dairy Ration (with Molasses, Beet Pulp and Crimped Heavy Oats)[12]
Dailey's Super Hatch Producer
Dailey's Super Laying Mash
Dailey's Turkey Growing Mash

Dairy Farmers' Union Feed, Plattsburg, N. Y.
Union Broiler Mash
Union 16% Dairy Ration
Union Dairy Feed
Union Laying and Growing Mash

Dairymen's League Co-op. Assoc., Inc., 11 West 42nd St., New York, N. Y.
Dairylea Choice Feed Grade Dried Skim Milk

R. G. Davis & Sons, Inc., New Haven, Conn.
Basic Sixteen
Davis Complete Chick Starter
Davis 20% Dairy Ration[9]
Davis 18% Dairy Ration
Davis Egg Mash with Buttermilk and Cod Liver Oil
Davis Growing Mash with Buttermilk and Cod Liver Oil
Davis Horse Feed
Davis Scratch Feed
Ground Grain Base Feed

Dawe's Products Co., 4800 S.Richmond St., Chicago, Ill.
Flavonne Ribo-D

Decatur Milling Co., Inc., Decatur, Ill.
Homco Hominy Feed

Delaware Mills, Inc., Deposit, N. Y.
Delaware Broiler Mash
Delaware Egg Mash
Delaware Fitting Ration
Delaware 16% Growing Mash[13]
Delaware Grow Mash
Delaware Horse Feed
Delaware Intermediate Chick Grains
Delaware 19% Laying Mash[14]
Delaware Pig and Hog Feed
Delaware Scratch Grains
Delaware Starter and Broiler Ration
Delaware Sweet 20% Dairy Feed[1]
Indian Scratch Grains
Indian Sweet 16 Dairy Feed
Indian Sweet 20% Dairy Feed[1]

The Denver Alfalfa Milling & Products Co., Lamar, Colo.
Alfalfa Leaf Meal
Dehydrated Alfalfa Leaf Meal
13% Protein Dehydrated Alfalfa Meal
17% Protein Dehydrated Alfalfa Meal
20% Protein Dehydrated Alfalfa Meal
13% Triple XXX Alfalfa Meal

Derby Feed Store, Derby, Conn.
Litsky's Laying Mash with Cod Liver Oil

Deitrich & Gambrill, Inc., Frederick, Md.
All Mash Grower
All Mash Layer
All Mash Starter
All Purpose Complete Ration
Canton Laying Mash
D & G All Mash Turkey Starter
D & G Breeder Mash
D & G Calf Meal
D & G Fleshing Mash (or Pellets)
D & G Growing and Fitting Ration
D & G Rabbit Feed (Pelleted)
D & G Turkey Growing Mash
Frederick 16% Dairy
Frederick 20% Dairy[1]
Frederick Laying Mash
Frederick Stock Feed
Gambrill's Chick Grains
Gambrill's Chick Starter
Gambrill's Growing Mash
Gambrill's Horse Feed
Gambrill's Laying Mash
Gambrill Scratch Feed
Pen Mar 20% Dairy[1]
Pen Mar Stock Feed
Pig and Hog Meal
Poultry Conditioning Ration

The Drackett Products Co., 5020 Spring Grove Ave., Cincinnati, Ohio
Drackett Soybean Oil Meal

Eastern States Farmers' Exchange, West Springfield, Mass.

Eastern States All-Mash Developer (Mash and Pellets)
Eastern States All-Mash Egg (Mash and Pellets)
Eastern States Breeder Concentrate Pellets
Eastern States Calf Starter (Mash and Pellets)
Eastern States Calving Ration
Eastern States Developer (Mash and Pellets)
Eastern States Egg Mash (Mash and Pellets)
Eastern States Fitting Ration 14%
Eastern States Finishing (Mash and Pellets)
Eastern States Flushing (Mash and Pellets)
Eastern States Fulpail Dairy Ration
Eastern States Horse Feed
Eastern States Pig Starter and Breeder
Eastern States Pork Builder
Eastern States Scratch Grains
Eastern States Sheep and Goat
Eastern States Sixteen
Eastern States Starting and Broiler (Mash and Pellets)
Eastern States Stock Feed
Eastern States 32% Supplement Feed[15]
Eastern States Turkey-Grower (Mash and Pellets)
Eastern States Turkey-Start (Mash and Pellets)

B. A. Eckhart Milling Co., 1300 Carroll Ave., Chicago, Ill.

Ecko Pure Wheat Bran

Elmore Milling Co., Inc., Oneonta, N. Y.

Elmore Breeder Mash
Elmore Calf Grain Ration
Elmore Chick Feed
Elmore Chixsaver
Elmore Complete Growing Ration
Elmore Complete Layer and Breeder
Elmore Complete Market Egg Mash
Elmore Complete Starter-Broiler
Elmore Egg Mash
Elmore Fitting Ration
Elmore Fleshing Pellets
Elmore Game Bird Grower
Elmore Goat Ration
Elmore Growing Mash
Elmore Hog Ration
Elmore Horse Feed with Molasses
Elmore Improved Calf Starter
Elmore M. A. C. Laying Mash
Elmore's Makegrow Little Pig Ration
Elmore Milk Flushing Mash
Elmore Milk Grains "Sixteen"
Elmore Milk Grains "Twenty"[16]
Elmore Milk Grains "Twenty-Four"
Elmore Rabbit Ration
Elmore Scratch Feed
Elmore's Sweet Digesto Dairy
Elmore Test Ration
Elmore Turkey Breeder Mash
Elmore Turkey Finisher (Fattener)
Elmore Turkey Fitting Ration
Elmore Turkey Growing Mash
Elmore Turkey Starting Mash
E-M-C-O Horse Feed
Emco Scratch Feed
Granger 16% Dairy Ration
Granger 20% Dairy Ration[17]

Elmore Milling Co., Inc., Oneonta, N. Y.—*(Continued)*

Granger 24% Dairy Ration
Intermediate Chick Feed
Marti Manamar Starting Mash
Marti Producer Mash
Waldorf 20% Dairy Ration

John W. Eshelman & Sons, Lancaster, Pa.

Eshelman Certified 20% Dairy Ration
Eshelman Conestoga 20 Dairy Feed
Eshelman Garden Spot Horse Feed
Eshelman Lancaster 60 Horse Feed
Eshelman Lancaster Scratch Grains
Eshelman Pennsy 16 Dairy Feed
Eshelman Pennsy Laying Mash (with A & D Oil)
Eshelman Red Rose All-Mash Starter (with A & D Oil)
Eshelman Red Rose All-Mash Starter and Grower (with A & D Oil)[18]
Eshelman Red Rose Breeder Mash
Eshelman Red Rose Broiler Ration (with A & D Oil)
Eshelman Red Rose Calf Starter
Eshelman Red Rose Chick Grains
Eshelman Red Rose Complete Calf Grower
Eshelman Red Rose Complete Laying Mash (with A & D Oil)
Eshelman Red Rose Complete Rabbit Pellets
Eshelman Red Rose 16 Dairy Feed
Eshelman Red Rose 18 Dairy Feed
Eshelman Red Rose 20 Dairy Feed
Eshelman Red Rose 24 Dairy Feed
Eshelman Red Rose Fattening Mash
Eshelman Red Rose Fitting Ration
Eshelman Red Rose Ground Corn and Oats
Eshelman Red Rose Growing Mash (with A & D Oil)
Eshelman Red Rose 85 Horse Feed
Eshelman Red Rose Intermediate Chick Grains
Eshelman Red Rose Laying Mash (with A & D Oil)
Eshelman Red Rose Pig and Hog Feed
Eshelman Red Rose Rabbit Feed
Eshelman Red Rose Scratch Grains
Eshelman Red Rose Steer Feed
Eshelman Red Rose Turkey Starter (with A & D Oil)
Eshelman S-O-S
Eshelman Wheat and Cracked Corn
Red Rose Turkey Grower (with A & D Oil)

Evans Milling Co., Indianapolis, Ind.

Emco Hominy Feed
Evans 41% Protein Soybean Oil Meal

Excelsior Milling Co., Minneapolis, Minn.

Camel Wheat Mixed Feed

Farmers Feed Co., 532 East 76th St., New York, N. Y.

"Bull Brand" Dried Brewers Grains

Ferneau Grain Co., Blanchester, Ohio

F Distillers Dried Grains

Finger Lakes & Hudson Flour Mills, Inc., 7 Madison St., Troy, N. Y.

Rye Feed

Finger Lakes & Hudson Flour Mills, Inc., Geneva, N. Y.

Kangaroo Standard Wheat Bran

First National Stores, Inc., 5 Middlesex Ave., Somerville, Mass.
Henfield Egg Mash
Henfield Scratch Grains

Flory Milling Co., Inc., Bangor, Pa.
Blue Mountain Horse Feed—60% Grain
Flory All-Mash Egg and Breeder Ration
Flory Battery Broiler Ration
Flory Battery Growing Ration
Flory Battery Laying Ration
Flory Broiler Mash
Flory Calf Meal
Flory Complete All-Mash Ration
Flory Corn, Wheat and Oats Scratch Feed
Flory Corn and Wheat Scratch Feed
Flory 16% Dairy Feed
Flory 18% Dairy Feed
Flory Egg and Breeder Mash
Flory Fattener and Flesher Pellets
Flory Fitting Ration
Flory 16% Growing Mash
Flory 18% Growing Mash
Flory Health-Tonic Mash
Flory Hog Meal
Flory Horse Feed—85% Grain
Flory Laying Mash
Flory Pig and Hog Meal
Flory Rabbit Pellets
Flory Scratch Feed
Flory Scratch Feed (Chick Size)
Flory Scratch Feed (Intermediate)
Flory Starter Mash
Flory Stock Feed
Flory Sweet 20% Dairy Feed
Flory Turkey Grower
Flory Turkey Starter
Golden Egg Growing Mash
Golden Egg Laying Mash
Golden Egg Scratch Feed
Golden Egg Starter and Broiler
National 16% Dairy Feed
National 20% Dairy Feed[1]

J. B. Garland & Son, Inc., Worcester, Mass.
Garland Chick Starter
Garland 20% Dairy Ration[9]
Garland Fitting Ration
Garland Growing Mash
Garland Horse Feed
Garland Laying Mash
Garland Pig and Hog Ration
Garland Scratch Feed
Royal 20% Dairy Ration
Royal Laying Mash
Royal Worcester Complete Dairy Ration

General Foods Corp., Corn Mill Div., Kankakee, Ill.
Burt's Hominy Feed

General Mills, Inc., Larrowe Div., Detroit, Mich.
41% Protein Cottonseed Meal Prime Quality
Larro Breeder Mash
Larro 18% Broiler Feed
Larro Broiler Feed

General Mills, Inc., Larrowe Div., Detroit, Mich.—*(Continued)*
Larro Calf Builder
Larro Chick Builder
Larro Chick Grains
Larro 16% Dairy Feed
Larro 20% Dairy Feed[1]
Larro 32% Dairy Concentrate
Larro Egg Mash
Larro Growing Grains
Larro 30% Hog Concentrate
Larro Mash Concentrate (32% Protein)
Larro Scratch Grains
Larro Scratch Grains ((No Corn)
Larro Sow and Pig Builder
Larro Turkey Breeder Mash
Larro Turkey Builder
Larro Turkey Finisher

General Mills, Inc., Minneapolis, Minn.
Red Star Wheat Bran with Ground Wheat Screenings
Washburn's Gold Medal Fancy Wheat Mixed Feed
Washburn's Gold Medal Hard Wheat Adrian Red Dog
Washburn's Gold Medal Hard Wheat Bran and Wheat Screenings
Washburn's Gold Medal Hard Wheat Flour Middlings and Wheat Screenings
Washburn's Gold Medal Hard Wheat Standard Middlings and Wheat Screenings

The Glidden Co., Soya Products Div., 5165 W. Moffat St., Chicago, Ill.
Glidden 4-Hi Brand 44% Soybean Oil Meal

D. H. Grandin Milling Co., Jamestown. N. Y.
Grandin's Baby Chick Grains
Grandin's Breeder Mash
Grandin's Complete Breeder and Layer Ration
Grandin's Complete Rabbit Feed
Grandin's 14 Fitting Ration
Grandin's Fleshing Pellets
Grandin's Growing Mash
Grandin's Hi-Pro Pellets
Grandin's Horse Feed
Grandin's Intermediate Chick Grains
Grandin's Laying Mash
Grandin's 16 Milk Maker
Grandin's 18 Milk Maker
Grandin's 20 Milk Maker[19]
Grandin's Pig and Hog Ration
Grandin's Scratch Grains
Grandin's Special 20 Dairy Feed[9]
Grandin's Special 18 Dairy Feed[20]
Grandin's Special Horse Feed[21]
Grandin's Special Scratch Grains
Grandin's Starter and Broiler Ration
Grandin's Start-To-Finish Mash
Grandin's Stock Feed
Grandin's 18% Test Cow Ration[9]
Grandin's Turkey Finishing Mash
Grandin's Turkey Grower
Grandin's Turkey Starter
Money Saver Egg Mash[22]
Money Saver Scratch Grains[23]

The Great Atlantic & Pacific Tea Co., 711 West Lake St., Minneapolis, Minn.
Daily-Egg Laying Mash
Daily-Egg Scratch Feed
Daily-Growth Broiler Mash
Daily-Growth Calf Meal
Daily-Growth Chick Starter
Daily-Growth Developing Feed
Daily-Growth Fine Chick Feed
Daily-Growth Growing Mash
Daily-Growth Turkey Grower
Daily Horse Feed
Daily-Milk Dairy Feed 16%
Milky-Way Dairy Feed 20%
Milky-Way Dairy Feed 24%
Talco Scratch Feed

Hales & Hunter Co., 166 W. Jackson Blvd., Chicago, Ill.
College Horse Feed
Kingfalfa Horse Feed
Morning Glory Egg Mash
Pioneer Calf Starter
Pioneer 14 Dairy Feed
Pioneer 20 Dairy Feed[1]
Pioneer Dry and Freshening Feed
Pioneer Hog Fattener
Pioneer Pig and Hog Feed 20%
Red Comb Breeder Mash
Red Comb Broiler Mash
Red Comb C Flakes
Red Comb Chick Starter
Red Comb Crate Fattener
Red Comb Egg Mash
Red Comb Fine Chick
Red Comb Fleshing Pellets
Red Comb Growing Mash
Red Comb Scratch Feed
Victoria Rabbit Feed

A. E. Hall, Wallingford, Conn.
Hall's Chick Starter
Hall's Growing Mash
Hall's Laying Mash

Harper Feed Mills, Inc., Pittsburgh, Pa.
Harco Starting and Growing Mash

The Henkel Flour Mills, Div. of International Milling Co., 323 E. Atwater St., Detroit, Mich.
Henkel's Extra Fancy Comco Wheat Middlings with Ground Screenings
Henkel's Extra Fancy Flour Wheat Middlings with Ground Screenings
Henkel's Extra Fancy Pure Spring Wheat Bran

Hercules Powder Co., Dairy Products Div., Chicago, Ill.
Hercules Dried Whey

The Hubinger Co., Keokuk, Iowa
Ke-Ok-Uk Corn Gluten Feed

Humphreys-Godwin Co., Memphis. Tenn.
Dixie Brand Prime 41% Cottonseed Meal

International Milling Co., Minneapolis, Minn.
Blackhawk Wheat Bran with Ground Wheat Screenings
Blackhawk Wheat Red Dog
Blackhawk Wheat Standard Middlings with Ground Screenings

Interstate Farmers' Cooperative Exchange, Inc., Moosup, Conn.
Interstate Dairy Feed
Interstate Laying Mash

Kansas Flour Mills Co. of Flour Mills of America, Inc., Kansas City, Mo.
Big Flake Pure Wheat Bran

Kasco Mills, Inc., Waverly, N. Y.
Apex 20% Dairy Ration
Beatsall Milk Grains[24]
Kasco All Mash Grower
Kasco All Mash Laying and Breeding Ration
Kasco Beatsall 16% Ration
Kasco Broiler-Starter Ration
Kasco Complete Rabbit Ration
Kasco Egg Producer
Kasco Fitting Ration
Kasco Pig Hog Feed
Kasco Poultry Flushing Mash
Kasco Scratch Grains

Kellogg Sales Co., Battle Creek, Mich.
Kellogg's Hominy Feed

Spencer Kellogg & Sons, Inc., Buffalo, N. Y.
Kellogg's 32% Protein Old Process Linseed Oil Meal
Kellogg's 34% Protein Old Process Linseed Oil Meal
Kellogg's 41% Protein Soybean Oil Meal

Kinsey Distilling Corp., 1429 Walnut St., Philadelphia, Pa.
Wheat Distillers Dried Grains

Chas. A. Krause Milling Co., Milwaukee, Wis.
Badger White Hominy Feed

H. P. Kysor Feed & Grain Co., Plainville, Conn.
Kysor's A-1 Laying Mash with Cod Liver Oil

Laakso & Laakso, Plainfield, Conn.
L & L Breeder Mash
L & L Fattening Mash
L & L Growing Mash
L & L Layer Mash
L & L Starter and Broiler Mash

The Laden Bros. Co., Inc., Wallingford, Conn.
Laden's Dairy
Laden's Growing Mash
Laden's Laying Mash
Laden's Starter and Broiler Mash

Lake of the Woods Milling Co. Ltd., Montreal, Canada
Lakewoods Wheat Bran
Lakewoods Wheat Shorts

The Larabee Flour Mills Co., Kansas City, Mo.
"Sunfed" Winter Wheat Bran with Ground Wheat Screenings
"Sunfed" Winter Wheat Bran (without Screenings)

Larrowe Milling Co., of General Mills, Inc., Detroit, Mich.
Dried Beet Pulp
Dried Molasses-Beet Pulp

E. W. Latimer, So. Coventry, Conn.
College 16% Dairy Ration
College Fitting Ration
College Growing Mash
College Mash with Oil
College Scratch
College Starter and Broiler

Libner Grain Co., Inc., 25 Commerce St., Norwalk, Conn.
12% Libner's Blue Ribbon Fitting Ration
Libner's Blue Ribbon Growing Mash (with Cod Liver Oil)
Libner's Blue Ribbon Horse and Calf Ration
Libner's Blue Ribbon Hog Ration (with Cod Liver Oil)
Libner's Blue Ribbon Milk Egg Mash (with Cod Liver Oil)
Libner's Blue Ribbon Scratch Feed
Libner's Blue Ribbon Starter and Broiler Ration (with Cod Liver Oil)
20% Milkflow Dairy Ration

The C. W. Lines Co., 173 Chestnut St., New Britain, Conn.
Mill Pride Dairy Ration
Mill Pride Fancy Scratch Feed
Mill Pride Milk Mash

Litchfield County Co-op. Assoc., Inc., Torrington, Conn.
"Common Sense" Dairy Ration 16%
"Common Sense" Dairy Ration 20%[1]
"Common Sense" Horse Feed Coarse
"Common Sense" Horse Ration
"Common Sense" Laying Mash
"Common Sense" Pig and Hog Ration
"Common Sense" Scratch
"Common Sense" Starting and Growing Mash

Long Hill Feed Store, Long Hill, Conn.
Improved Square Deal Dairy Ration
Square Deal Buttermilk Laying Mash

L. B. Lovitt & Co., Memphis, Tenn.
"Lovit Brand" 41% Protein Cottonseed Meal, Prime Quality

E. Manchester & Sons, Winsted, Conn.
Huntington Red Star Egg Mash
Red Star Horse Feed with Molasses
Red Star Pig Feed
Red Star Scratch Feed
Red Star Special Dairy Feed
Red Star Starting and Growing Mash
Red Star Sweet Sixteen Dairy Feed

Maritime Milling Co., Inc., Buffalo 20, N. Y.
B-B 18% Broiler Ration
B-B Broiler Ration
B-B Bull Brand Dry and Fresh Cow Fitting Ration
B-B Bull Brand Special Dairy Feed 20% Protein[1]
B-B Calf Meal
B-B Calf Starter Ration
B-B Chick Feed
B-B Complete Chick Starter Ration
B-B Complete Laying Ration
B-B Complete Turkey Starter Ration
B-B Conditioning Mash
B-B Developing Feed
B-B Egg Mash
B-B Growing Mash

Maritime Milling Co., Inc., Buffalo 20, N. Y.—*(Continued)*
B-B Horse Feed
B-B Layer and Breeder Mash
B-B Pig and Hog Feed
B-B Starter and Broiler Ration
B-B Starter and Growing Ration
B-B Supplemental Pellets for Layers and Breeders
B-B Turkey Fitting Ration
B-B Turkey Growing Mash
Daisy Chick Starter Ration
Daisy Growing Mash
Daisy Scratch Feed
Dollar Maker Egg Mash
Hi-Test Dairy Feed 20% Protein, Sweetened[1]
Maritime Special Scratch
Marmico 16% Protein Dairy Feed with Molasses
Sweetened B-B Bull Brand "16" Dairy Ration
Sweetened B-B Bull Brand "20" Dairy Ration[1]

Meadow Brook Farms, Nazareth, Pa.
Meadow Brook Farms Superior Brand Dehydrated Alfalfa Meal

Meech & Stoddard, Inc., 76 N. Main St., Middletown, Conn.
M & S 16% Dairy Feed
M & S Laying Mash
Red Wing 16% Dairy Feed
Red Wing Growing Mash
Red Wing Horse Feed
Red Wing Laying Mash
Red Wing Starting Mash

Miner-Hillard Milling Co., Wilkes-Barre, Pa.
Steam Cooked Hominy Feed

Geo. Q. Moon & Co., Inc., Binghamton, N. Y.
Complete Starter and Broiler Mash
Crescent Laying Mash
Fitting Ration
Goat Ration (or Pellets)
Hog Feed
Moon's Baby Chick Grains
Moon's Baby Chick Starter Mash
Moon's Complete Growing Mash
Moon's Complete Laying Mash
Moon's Developing Grains
Moon's Growing Mash
Moon's 90 Horse Feed with Molasses
Moon's Laying Mash
Moon's Scratch Feed
Moon's Special A Laying Mash
Moon's Stock Feed
Moon's Turkey Growing Mash
Special A 16% Dairy Ration
Special A Dairy 20% Ration[1]

Fred C. Morse & Son, Guilford, Conn.
Breeding Mash
Old Mill Broiler Mash
Old Mill 16% Dairy Ration
Old Mill 20% Dairy Feed[1]
Old Mill Fitting Feed
Old Mill Green Label Laying Mash
Old Mill Growing Mash
Old Mill Horse Feed
Old Mill Intermediate Chick Feed
Old Mill Red Label Laying Mash
Old Mill Scratch Feed
Old Mill Starting Mash

Moses Bros. Co., Inc., Eaton, N. Y.
Moco Competitive Scratch Feed
Moco Eggetter Mash
Moco Hog Ration
Moco Perfection Laying Mash
Moco Perfection Starting and Growing Mash
Moco Streamline Eighteen Percent Dairy Ration
Moco "Superior" Eighteen Dairy Ration

Mutual Products Co., Minneapolis, Minn.
Mutual Dairyade Compound

National Distillers Products Corp., 120 Broadway, New York, N. Y.
Produlac Brand Dried Corn Distillers Grains with Solubles[25]

National Lead Co., 111 Broadway, New York 6, N. Y.
Dutch Boy 32% Old Process Linseed Oil Meal
Dutch Boy 34% Old Process Linseed Oil Meal

National Milling Branch of National Biscuit Co., 2221 Front St., Toledo, Ohio
Namico
Pure Wheat Bran

Nebraska Consolidated Mills Co., Omaha, Neb.
Pure Wheat Bran

New England Dairies, Inc., 142 Cambridge St., Charlestown, Mass.
New England Dairies Dried Skim Milk Powder

New England Retail Grain Dealers Co-op. Assoc., Springfield, Mass.
New England Quality 16% Dairy Feed
New England Quality 20% Dairy Feed
New England Quality Fitting Ration
New England Quality Horse Feed
New England Yankee 20% Dairy Ration
New England Yankee Egg Mash
New England Yankee Growing Mash

Ogden Grain Co., Utica, N. Y.
"Biddy" Laying Mash
Cloverbloom 18% Dairy Feed
Pilgrim 16% Dairy Feed
Pilgrim Growing Mash
Pilgrim Layer and Breeder
Pilgrim Pig Feed

S. V. Osborn Estate, Branford, Conn.
Osborn Scratch

Pabst Brewing Co., Milwaukee, Wis.
Pabst Hominy Feed

The Park & Pollard Co., Buffalo, N. Y.
Bidwell Growing Feed
Bidwell Laying Mash
Bulky Sweet Dairy Feed
Claco Dairy Ration (C. L. Adams Co.)
Corn and Oats Half and Half
Doublex 16% Dairy Ration
Doublex 20% Dairy Ration[1]
Go To It Pig and Hog Ration
Hi-Valu Scratch Feed (Pellets) (A Lay or Bust Feed)
Intermediate Chick Feed (A Lay or Bust Feed)
Lay or Bust Dry Mash[1]

The Park & Pollard Co., Buffalo, N. Y.—*(Continued)*
Manamar Doublex 20% Dairy Ration[1]
Manamar Life Cycle Mash (A Lay or Bust Feed)
Milkade Calf Meal
Milkade Calf Starter (Pelleted)
Milkmaid 16% Dairy Ration
Milkmaid 20% Dairy Ration[1]
Milkmaid 20% Dairy Ration with Manamar[1]
Milkmaid Test Cow Ration
Nine to One Scratch
Paramount Dairy Ration (Black-Rock Milling Corp.)
Paramount Scratch Feed
Park & Pollard Breeder Mash (A Lay or Bust Feed)
Park & Pollard Chick Scratch (A Lay or Bust Feed)
Park & Pollard Chick Starter (A Lay or Bust Feed)
Park & Pollard Chick Starter Pellets
Park & Pollard Economy Scratch
Park & Pollard Fitting Ration
Park & Pollard Fleshing Pellets (A Lay or Bust Feed)
Park & Pollard Growing Feed (A Lay or Bust Feed)
Park & Pollard Growing Pellets
Park & Pollard Horse Feed
Park & Pollard Layer and Breeder Pellets
Park & Pollard Manamar Fitting Ration
Park & Pollard Starter and Broiler Mash (A Lay or Bust Feed)
Park & Pollard Stock Feed
Park & Pollard Turkey Grower (A Lay or Bust Feed)
Park & Pollard Turkey Starter (A Lay or Bust Feed)
Rabbit Pellets
Red Ribbon Scratch Feed (A Lay or Bust Feed)
Yankee Horse Feed

The Patent Cereals Co., Geneva, N. Y.
Hominy Feed

Penick & Ford Ltd., Inc., Cedar Rapids, Iowa
Douglas Corn Gluten Feed

Louis Perillo Coal Co., Southington, Conn.
Perillo's Wellworth 20% Dairy Ration
Perillo's Wellworth Laying Mash
Perillo's Wellworth Starting and Growing Mash

The George S. Phelps Co., Thompsonville, Conn.
Laying Mash

A. D. Pierce, Brooklyn, Conn.
Pierce Growing Mash
Pierce Laying Mash
Pierce Starter and Broiler

Pierce Grain Corp., 1035 Seneca St., Buffalo 10, N. Y.
18% Reliance Dairy Ration

Frank Pilley & Sons, Inc., 108 So. 9th St., Omaha, Neb.
Farmland Condensed Buttermilk

Pillsbury Flour Mills Co., Minneapolis, Minn.
Pillsbury's Fancy Wheat Mixed Feed with Ground Wheat Screenings
Pillsbury's Hard Wheat A. Middlings with Ground Wheat Screenings
Pillsbury's Hard Wheat Bran with Ground Wheat Screenings
Pillsbury's Hard Wheat Standard B. Middlings with Ground Wheat Screenings
Pillsbury's Rye Middlings with Ground Rye Screenings
Pillsbury's Wheat Bran with Ground Wheat Screenings
Pillsbury's XX Daisy

Pittsburgh Plate Glass Co., Linseed Oil Div., 210 Chester Ave., Newark, N. J.
Red Wing 32% Protein Old Process Linseed Meal
Red Wing 34% Protein Old Process Linseed Meal

Pratt Food Co., 69 Leddy St., Buffalo, N. Y.
Pratt's All Mash Laying Ration
Pratt's Broiler Finishing Feed
Pratt's Broiler Mash
Pratt's Calf Meal
Pratt's Chick Starter
Pratt's C-Ka-Gene Ration
Pratt's Complete Rabbit Pellets
Pratt's Dry and Freshening Feed
Pratt's Goat Ration
Pratt's Growing Mash
Pratt's Laying Mash
Pratt's Pig and Hog Meal
Pratt's Starter and Grower
Pratt's Sweet 16% Dairy Feed 16-3-12[26]
Pratt's Sweet 16% Dairy Feed 16-4-9
Pratt's Sweet 20% Dairy Feed[1]
Pratt's Turkey Growing and Finishing Mash
Utility Growing Mash
Utility Horse Feed
Utility Laying Mash
Utility Sweet 20% Dairy Feed[1]

Publicker Commercial Alcohol Co., 1429 Walnut St., Philadelphia, Pa.
Wheat Distillers Dried Grains

Publicker, Inc., 1429 Walnut St., Philadelphia, Pa.
Paco Riboflavin Supplement

H. C. Puffer Co., Springfield, Mass.
Producer 24% Dairy Feed

The Quaker Oats Co., 141 W. Jackson Blvd., Chicago, Ill.
Big Egg Laying Mash
Big Egg Scratch Grains
Early Bird Coarse Chick Feed
Early Bird Fine Chick Feed
Feeding Oat Groats or Feeding Steel Cut Oat Groats
Ful-O-Pep Broiler Mash
Ful-O-Pep Calf Meal[27]
Ful-O-Pep Chick Starter
Ful-O-Pep Coarse Chick Feed
Ful-O-Pep Crate Fattener
Ful-O-Pep 16% Dairy Ration
Ful-O-Pep 20% Dairy Ration[1]
Ful-O-Pep Dry and Fitting Ration[28]
Ful-O-Pep Egg-Breeder Mash
Ful-O-Pep Growing Mash
Ful-O-Pep Horse Feed
Ful-O-Pep Laying Mash
Ful-O-Pep Pig-N-Sow Feed
Ful-O-Pep Scratch Grains
Ful-O-Pep Super Greens
Ful-O-Pep Turkey Grower
Ful-O-Pep Turkey Starter
Peterborough Oat Feed
Quaker 16% Protein Dairy Ration
Quaker 20% Protein Dairy Ration[1]
Quaker Green Cross Horse Feed
Quaker Schumacher Feed

The Quaker Oats Co., 141 W. Jackson Blvd., Chicago, Ill.—(*Continued*)
Quaker Sugared Schumacher Feed
Victor Feeding Rolled Oats
Vim Oat Mill Feed
White Hominy Feed
Yellow Hominy Feed

The Ralston Purina Co., St. Louis, Mo.
Chowmix Hog Feed B
Corn Feed Meal
Corn and Oat Provender
Ontario 20% Dairy Feed (Checkerboard Feed Store)[1]
Oswego Growing Feed (Checkerboard Feed Store)
Protena 20% Dairy Feed
Protena Laying Mash (Checkerboard Feed Store)
Purina B and M Cow Chow
Purina Breeder Lay Chow
Purina Breeder Layena (Complete Ration)
Purina Broiler Chow
Purina Calf Chow
Purina Calf Startena
Purina Chick Chow (Coarse)
Purina Chick Chow (Fine)
Purina Chick Fatena Checkers
Purina Chick Growena
Purina Chick Growing Chow
Purina Chick Startena
Purina Chicken Fatena
Purina 20% Cow Chow[1]
Purina 24% Cow Chow
Purina Dry and Freshening Chow
Purina Eggena (Complete Ration)
Purina Game Bird Breeder Chow
Purina Game Bird Growing Chow
Purina Game Bird Startena
Purina Goat Chow
Purina Hen Chow
Purina Hog Fatena
Purina 18% Lay Chow
Purina 22% Lay Chow
Purina Layena (Complete Ration)
Purina Milk Chow (16%)
Purina Milk Chow (16%) A
Purina Milk Chow (20%)
Purina Milk Chow (30%)
Purina Omolene
Purina Rabbit Chow (Entire Ration)
Purina Rabbit Chow Checkers (Entire Ration)
Purina Rabbit Chow Supplement
Purina Turkey Breeder Chow
Purina Turkey Fatena Checkers
Purina Turkey Growena
Purina Turkey Growing Chow
Purina Turkey Layena (Complete Ration)
Purina Turkey Startena
Purina War Time Bulky Las
Special Scratch (St. Johnsbury, Vt.)
Wheat Middlings (Standard)

John Reardon & Sons, Div. of Wilson & Co., Inc., Cambridge, Mass.
Register Brand 45% Protein Meat and Bone Scraps
Register Brand 50% Protein Meat and Bone Scraps

Reliable Grain & Fuel Co., Ansonia, Conn.
Reliable Chick Starter with Buttermilk and Cod Liver Oil
Reliable Growing Feed with Buttermilk and Cod Liver Oil
Reliable Laying Mash with Buttermilk and Cod Liver Oil
Reliable Stock Feed

E. H. Rollins & Sons, Inc., East Granby, Conn.
Connecticut's Best Broiler Ration
Connecticut's Best Dairy Feed
Connecticut's Best Growing Mash
Connecticut's Best Horse Feed
Connecticut's Best Laying Mash
Connecticut's Best Starting Mash
Scratch Feed

H. M. Rubin Co., 9-19 38th Ave., Long Island City, N. Y.
Rubco Meat Bone Scrap 50%
Rubco Meat Bone Scrap 55%
Rubco Meat Bone Scrap 60%

Russell-Miller Milling Co., Minneapolis, Minn.
Alta Hard Wheat Middlings
Hard Wheat Occident Bran
Hard Wheat Occident Flour Middlings
Hard Wheat Occident Mixed Feed
Hard Wheat Occident Standard Middlings
Occident Barley Base Mix

Schenley Distilleries, Inc., 350 Fifth Ave., New York, N. Y.
Schenley Mark of Merit Corn Distillers Dried Grains, 28%
Schenley Mark of Merit Wheat Distillers Dried Grains, 22%
Schenley Mark of Merit Wheat Distillers Dried Grains, 28%

Schoeneck Farms, Inc., Nazareth, Pa.
Schoeneck's Super Green Dehydrated Alfalfa Meal

Sea Board Supply Co., Inc., Meadow & McKean St., Philadelphia, Pa.
Crab Meal

Joseph E. Seagram & Sons, Inc., Louisville, Ky.
Seagram's Corn Distillers Dried Grains 24%
Seagram's Corn Distillers Dried Grains 28%[29]

Seymour Grain & Coal Co., Seymour, Conn.
Miracle Chick Starter and Broiler Ration
16% Miracle Dairy
Miracle Fitting Ration
Miracle Grower
Miracle Horse Feed
Miracle Mash
Miracle Scratch Feed
New England Mash
See-More Milk Dairy Ration

The A. E. Shedd Co., 567 Main St., Norwich, Conn.
Shedd's 20% Dairy Ration with Vitamin D[1]
Shedd's Fitting Ration with Vitamin D
Shedd's Laying Mash
Shedd's Special Broiler Mix Ration
Shedd's Special Grower Mix

The Shellabarger Mill & Elevator Co., Salina, Kansas
Wheat Bran and Ground Wheat Screenings

The Sherwin-Williams Co., 101 Prospect Ave., N. W., Cleveland, Ohio
Sherwin-Williams Pure Old Process 34% Linseed Oil Meal

The W. J. Small Co., Inc., Neodesha, Kansas
Small's 15% Dehydrated Alfalfa Meal
Small's 20% Dehydrated Alfalfa Meal

A. E. Staley Mfg. Co., Decatur, Ill.
Staley's Corn Gluten Feed
Staley's 41% Protein Soybean Oil Meal

Standard Milling Co., 309 W. Jackson Blvd., Chicago, Ill.
Hecker's Choice Wheat Bran with Ground Wheat Screenings
Hecker's Wheat Red Dog
Hecker's Wheat Standard Middlings with Ground Wheat Screenings
Planet Feed—No Screenings, No Scourings
Red Turkey Wheat Bran
Wheat Bran
Wheat Flour Middlings with Ground Wheat Screenings
Wheat Mixed Feed and Ground Wheat Screenings
Wheat Standard Middlings with Ground Wheat Screenings
XXX Comet Wheat Product Composed of Wheat Red Dog

D. A. Stickell & Sons, Inc., Hagerstown, Md.
Blue Ridge Egg Mash
Blue Ridge Pig and Hog Ration
Dairy Queen Sweet 20% Milk Maker
Snap Scratch Grains
Snap Sweet 20% Dairy Feed
Stickell's Certified 20% Dairy Ration
Stickell's Intermediate Chick Feed
Stickell's Poultry Fatner
Stickell's Stock Feed
Su-Pur All Mash Starter
Su-Pur Broiler Mash
Su-Pur 16% Dairy and Fitting Ration
Su-Pur Egg Mash
Su-Pur Fitting Ration
Su-Pur Growing Mash
Su-Pur Horse and Calf Feed
Su-Pur Rabbit Pellets
Su-Pur Turkey Growing Mash
Victor Chick Feed
Victor Egg Mash
Victor 35% Horse and Mule Feed
Zip Egg Mash (Anchor Mills)
Zip Growing Mash
Zip Sweet 16% Dairy Feed

The St. Lawrence Flour Mills Co., Ltd., Montreal, Canada
Premier Bran Product of Wheat

Swift & Co. Dairy & Poultry Plant, Palmer, Mass.
Swift's Broiler Mash

Swift & Co., Soybean Mills, Champaign, Ill.
Swift's 43% Protein Soybean Oil Meal

Thomaston Supply Co., Inc., Thomaston, Conn.
Thomaston Dairy Ration
Thomaston Egg Mash with Fortified Vitamin A and D Feeding Oil
Thomaston Growing Mash with Fortified Vitamin A and D Feeding Oil
Thomaston Scratch Feed
Thomaston Stock Feed

Tioga Mills, Inc., Waverly, N. Y.
- Chicatine
- Conditiontine
- 18% Creamatine
- Egatine
- Or-Co Feed
- Tasty Laying Food
- Ti-O-Ga Brood Sow and Shoat Feed
- Ti-O-Ga Calf Food
- Ti-O-Ga Calf Grower
- Ti-O-Ga Chick Grains
- Ti-O-Ga 16% Dairy Feed
- Ti-O-Ga E-Gee 20% Dairy Feed[1]
- Ti-O-Ga Grower
- Ti-O-Ga Growing Grains
- Ti-O-Ga Horse Feed
- Ti-O-Ga Poultry Grains
- Ti-O-Ga Red Brand 24% Dairy Feed
- Ti-O-Ga Starter and Grower

Jacob Trinley & Sons, Linfield, Pa.
- Favorite Growing Mash
- Limerick Laying Mash
- Real Starter and Broiler Mash
- Supreme 85% Horse Feed

Union Sales Corp., Dist. for Union Starch & Refining Co., Columbus, Ind.
- Union Corn Gluten Feed
- Union Corn Gluten Meal

United Co-operative Farmers, Inc., Fitchburg, Mass.
- United Farmers Breeder Mash
- United Farmers Broiler
- United Farmers 16% Dairy Feed
- United Farmers Egg Mash
- United Farmers Fitting Ration
- United Farmers Grower
- United Farmers Horse Feed
- United Farmers Intermediate Scratch Feed
- United Farmers Layer and United Farmers Layer Pellets[20]
- United Farmers Milkmaker
- United Farmers Scratch Feed
- United Farmers Starter

Unity Feeds, Inc., 177 Milk St., Boston, Mass.
- C. V. Fitting Ration
- Life Saver 20% Dairy Ration[1]
- Life Saver Mash
- Paycheck 20% Dairy Ration[1]
- Paycheck Laying Mash
- Unity Breeder Mash
- Unity Calf Starter
- Unity Chick Starter
- Unity Complete Starting and Broiler Mash
- Unity 20% Dairy Ration[1]
- Unity Fitting Ration
- Unity Growing Mash
- Unity Horse Feed
- Unity Laying Mash
- Unity Scratch Feed
- Unity Stock Feed
- Unity Turkey Starting and Growing Mash

Valier & Spies Milling Co., St. Louis, Mo.
- Valier's Pure Wheat Bran

The Van Iderstine Co., Railroad & Greenpoint Aves. Long Island City, N. Y.
- Vico Special Steamed Bone Meal

Vita-Lac Co., Middlebury Center, Pa.
- Neo-Lac A Blended Concentrate Milk Mixer

Hiram Walker & Sons, Inc., Peoria, Ill.
- Corn Distillers' Dried Grain with Solubles[31]

Ward Milk Products Div. of Kraft Cheese Co., 500 Pestigo Court, Chicago, Ill.
- Kraco Dried Cheese Whey (Feeding)
- Ward Dried Skim Milk (Feeding)

The Watertown Co-op. Assoc., Inc., Watertown, Conn.
- Sterling Scratch Feed
- Storr's Chick Starter
- Storr's Growing Mash
- Storr's Laying Mash
- Storr's 16% Pasture Ration
- Storr's Standard 20% Ration

Wayne County Grangers Feed Corp., Clyde, N. Y.
- Economy 20% Dairy Feed
- Milkproducer 20% Dairy Feed
- Satisfaction Growing Mash
- Satisfaction Laying Mash
- Superior Chick Starter
- Superior 16% Dairy Feed[1]
- Superior Growing Mash
- Superior Hog Ration
- Superior Horse Feed
- Superior Laying Mash
- Superior Turkey Grower and Fattener

H. K. Webster Co., Lawrence, Mass.
- Blue Seal All Mash Egg Ration
- Blue Seal All Mash Growing Ration
- Blue Seal Breeder's Laying Mash
- Blue Seal Broiler Mash
- Blue Seal Calf Ration with Vitamin D Yeast
- Blue Seal Chick Starter
- Blue Seal "16" Dairy Ration
- Blue Seal "18" Dairy Ration
- Blue Seal "20" Dairy Ration
- Blue Seal Egg Mash
- Blue Seal Fitting Ration with Vitamin D Yeast
- Blue Seal Fleshing Pellets
- Blue Seal Growing Mash
- Blue Seal Horse Feed with Vitamin D Yeast
- Blue Seal Pig Feed with Vitamin D Yeast
- Blue Seal Richford 16 Dairy Ration
- Blue Seal Richford 20 Dairy Ration
- Blue Seal Scratch Feed
- Blue Seal Stock Feed
- Blue Seal Succulent Feed
- Blue Seal Turkey Growing

Western Condensing Co., Petaluma, Calif.
- Peebles Lacto-G Dried Whey

West-Nesbitt, Inc., Oneonta, N. Y.

All Pure 20% Milk Ration[32]
Fitting Ration for Horses and Cattle
Ideal 20% Dairy Ration[33]
Pure Feed Broiler Mash
Pure Feed Chick Grains
Pure Feed Dairy Ration
Pure Feed Egg and Breeder Mash
Pure Feed Egg Maker
Pure Feed Horse Ration
Pure Feed Scratch Grain
Pure Feed Starting and Growing Mash
Pure Feed Swine Ration
Pure Feed Turkey Finisher
Pure Feed Turkey Grower
Pure Feed Turkey Starter

The Windsor Locks Grain Co., Windsor Locks, Conn.

Rocco's Laying Mash
Rocco's Starter and Grower Mash

Wolf's Feed Store, Shelton, Conn.

Wolf's Chick Starter
Wolf's Egg Mash
Wolf's Growing Mash
Wolf's Sweetened 14% Fitting Ration
Wolf's Sweetened 16% Dairy Ration
Wolf's 20% Sweetened Dairy Ration[1]

The Yantic Grain & Products Co., Norwich, Conn.

Big (Y) All In All Egg Ration
Big (Y) All In All Growing Ration
Big (Y) Breeder Mash
Big (Y) Calf Ration
Big (Y) Chick Scratch Grains
Big (Y) Chick Starter
Big (Y) Dairy 16%
Big (Y) Dairy 18%
Big (Y) Egg Maker
Big (Y) Fitting Ration
Big (Y) Hog and Pig Ration
Big (Y) Horse Feed
Big (Y) Intermediate Chick Grain
Big (Y) M and O Growing Feed
Big (Y) M and O Laying Mash
Big (Y) Progressive Growing Feed
Big (Y) Provender
Big (Y) Rabbit Feed
Big (Y) Scratch Feed
Big (Y) Starter and Broiler Ration
Big (Y) Stock Feed
Big (Y) Turkey Fattener
Big (Y) Turkey Growing Feed
Big (Y) Turkey Starter Feed

Vitamin D Carriers

The Borden Co., 350 Madison Ave., New York, N. Y.

Flaydry 85
Flaydry 400
Ladpro 250 A, 100 D (See also feed analyses—Table I.)
Ration-ayd 85
Ration-ayd 160
Ration-ayd 400

Eastern States Farmers' Exchange, West Springfield, Mass.

Eastern States Fortified Sardine Oil

Gorton-Pew Fisheries Co., Ltd., Gloucester, Mass.

Gorton's A and D Feeding Oil—400 D
Gorton's G. P. Fortified Cod Liver Oil—400 D
Gorton's Vitamin A and D Feeding Oil—85 D

Maine Fish Meal Co., Portland, Me.

Maine Vitamin D Concentrate (See also feed analyses—Table I.)

National Oil Products Co., Inc., Harrison, N. J.

Nopco 85 Vitamin D Feeding Oil
Nopco X Vitamin A and D Feeding Oil
Nopco XX Vitamin A and D Feeding Oil
Nopco XXX Fortified Cod Liver Oil
Nopco 400 Vitamin A and D Feeding Oil

Sea Board Supply Co., Meadow & McKean Sts., Philadelphia 48, Pa.

Sea Board 400 D

Silmo Chemical Corp., Vineland, N. J.

Silmo A—D Oil (Vitamin A and D Feeding Oil)—100 D
Silmo Vitamin A and D Feeding Oil—85
Silmo Vitamin A and D Feeding Oil—400 D—1,000 A
Silmo Vitamin A and D Feeding Oil—400 D—2,000 A
Silmo Vitamin A and D Feeding Oil—400 D—3,000 A
Silmo XX 400

E. R. Squibb & Sons, 745 Fifth Ave., New York, N. Y.

D—Sec—200 D
Exadol—400 D

White Laboratories, Inc., 113 No. 13th St., Newark 7, N. J.

Clo-Trate "Dry D" 2,000
Clo-Trate "Junior 800"
Clo-Trate "Super 400" Vitamin A and D Feeding Oil
Clo-Trate "400" Vitamin A and D Feeding Oil
Clo-Trate "800" Vitamin A and D Feeding Oil

Whitmoyer Laboratories, Inc., Myerstown, Pa.

Whitcod—Cod Liver Oil Fortified—400

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[1] Later revised to 18%.
[2] Substituted by "Beacon Emergency Broiler Feed (for range, floor, or battery use)".
[3] Revised to "Beacon Egg Mash".
[4] Revised to "Beacon Growing Mash".
[5] Revised to "Beacon Emergency Test Cow Ration".
[6] Substituted by Nibco Dairy, 16%.
[7] Substituted by "Corenco Fish Meal 58%".
[8] Substituted by "Scratch Grains without Corn".
[9] Revised to "16 %".
[10] Revised to "Dailey's 16% Milk Producer" and again to "Dailey's 18% Milk Producer".
[11] Substituted by "Dailey's War Emergency Grains".
[12] Substituted by "Dailey's 16% Dairy Ration (with Beet Pulp and Crimped Heavy Oats)".
[13] Revised to "Delaware Growing Mash".
[14] Revised to "Delaware Laying Mash".
[15] Revised to "28%".
[16] Revised to "Elmore Milk Grains Eighteen".
[17] Revised to "Granger Sixteen Dairy Ration".
[18] Revised to "Eshelman Red Rose Starter and Grower (with A & D Oil)".
[19] Revised to "Grandin's Green Feed".
[20] Substituted by "Grandin's Emergency 16 Dairy Feed".
[21] Substituted by "Grandin's Emergency Stock Feed".
[22] Substituted by "Grandin's Emergency Poultry Mash".
[23] Substituted by "Grandin's Emergency Scratch Grains".
[24] Substituted by "Kasco 18% Milkmaker".
[25] Substituted by "Produlac Brand Dried Wheat Distillers Grains with Solubles".
[26] Substituted by "Utility Sweet 14% Dairy Feed".
[27] Revised to "Ful-O-Pep Calf Starter".
[28] Revised to "Ful-O-Pep Fitting Ration".
[29] Revised to "27%".
[30] Substituted by "Emergency All Mash".
[31] Substituted by "Wheat Distillers' Dried Grains with Solubles".
[32] Revised to "All Pure Milk Ration".
[33] Revised to "Ideal Dairy Ration".

INSPECTION

In the calendar year 1943 a total of 1,540 samples was examined. This number includes official samples of commercial feeds and vitamin D carriers, and miscellaneous materials as shown in the following summary:

Commercial feeding stuffs, official samples	726
Vitamin D carriers, official samples	42
Feeds analyzed for purchasers	58
Biological specimens examined for poisons	73
Pasture grass, etc., samples for Storrs Station	250
Samples (chick bones) for Poultry Department, Storrs Station	386
Check feeds, A.F.C.O.	5
Total	1,540

Samples examined for the Storrs Station are in connection with investigations carried on by that Station and are not for discussion in this report.

The results of analyses of official inspection samples, other than vitamin D carriers, are summarized as follows:

Total number of samples		726
Samples deficient in:		
one item	122	
two items	10	
three items	1	133
Percentage of samples meeting guaranties		82
Total guaranties made		2,171[1]
Guaranties not met:		
protein	38	
fiber	14	
fat	93	145
Percentage of guaranties met		93

Feed manufacturers have been confronted with unprecedented difficulties during the past year. The supply of ingredient materials for mixed feeds has been intermittent and uncertain, and this has necessitated frequent revisions of formulas. Consequently, it has been a problem to maintain guaranties and accurate ingredient lists as required by feed control laws. Feed control officials have appreciated the factors involved and have cooperated so far as their obligations under their several statutes would permit.

It is not surprising that a somewhat larger proportion of samples showing deficiencies was found this year than in preceding years. The above summary shows that 82 per cent of the samples examined met substantially guaranties made for them as compared with 90 per cent in 1942. Of the total guaranties made, 93 per cent were met as compared with 96 per cent in the preceding year. Under the circumstances this is a creditable performance.

[1] Seven samples with only two guaranties.

Microscopic examination of inspection samples has indicated them to be substantially in accord with claims as to ingredients so far as could be determined. Contamination with weed seeds has not been encountered in recent years.

Analyses of official samples are given in Table 1.

VITAMIN D CARRIERS

Of 42 samples of vitamin D carriers tested, 31 met fully the potencies claimed for them; nine were sufficiently close to the guaranties to be passed; two were definitely below guaranties.

The results of biological tests are summarized in Table 2.

A 7-year summary of biological tests of vitamin D carriers is as follows:

Year	No. of samples tested	Samples Satisfactory	Passed	Below guaranty
1937	44	27	4	13
1938	55	42	5	8
1939	45	31	11	3
1940	56	20	20	16
1941	42	24	12	6
1942	48	25	16	7
1943	42	31	9	2

MISCELLANEOUS FEEDS

Fifty-eight samples of feeds and fodder materials have been examined for purchasers and dealers.

Suspicion on the part of purchasers that some feed deficiency is responsible for a drop in milk production, or for symptoms of sickness, or, especially in the case of poultry, for mortality, is not uncommon, but such instances have not been any more numerous than usual this year. Laboratory examination has rarely established any satisfactory or convincing evidence that the feed is the probable cause of the unfavorable effects.

Occasionally, substances which are definitely poisonous are found but these are explained by accidental contamination with insecticides or other poisons on the farm premises. One such sample was found this year; it contained lead arsenate.

In one instance (several years ago) where the symptoms observed in poultry suggested a deficiency of D vitamin a biological test of the feed tended to confirm the suspicion. In contrast to this experience however, bioassays of a limited number of commercial poultry feeds fortified with D carriers have not indicated any deficiency of vitamin D.

Epidemic disease in flocks of poultry has often been the demonstrated cause of mortality. If such mortality is coincident with a change of feed, the latter is likely to be the suspected cause.

Palatability is a factor in animal feeding. Any change in ingredients imparting a taste that is unfamiliar may cause feed to be refused by animals, or eaten with indifference, until they have become accustomed to it.

BIOLOGICAL SPECIMENS EXAMINED FOR POISONS

Seventy-three biological specimens have been examined for the Department of Animal Diseases of the Storrs Station, the Connecticut Humane Society, veterinarians and others during the year.

In 25 cases, results were conclusive enough to be regarded as probable or possible causes of mortality. In the other samples, the results were regarded as negative.

One specimen of stomach contents of a calf contained 708 p.p.m. of lead, the probable source being paint material.

Lesser amounts of lead, 20 to 33 p.p.m. in stomach contents, with 3 to 6 p.p.m. of absorbed lead in accompanying specimens of liver, were found in five samples and were regarded as of possible significance,

Lead arsenate was the probable cause of poisoning in three cases, yellow phosphorus was found in two cases and strychnine in quantity was present in five.

Copper fills a physiological need in animals but excesses may be poisonous, especially to sheep, (Year book of Agriculture, 1942, p. 336). Copper in amounts of from 8 to 83 p.p.m. were found in four specimens from sheep, in one instance 55 p.p.m. had been absorbed in the liver.

Prussic acid was indicated in two cases, one of them showing 32 p.p.m. of HCN in stomach contents.

Solanine was indicated in one case and veratrin in two others, wild hellebore leaves being found in one of the specimens. These plant principles were not conclusively demonstrated by chemical tests.

Bulletin 470, April, 1943, discusses some common causes of animal poisoning including poisons of plant origin.

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Pounds per hundred (or percent)						
			Water	Protein (N x 6.25)		Fiber		Fat	
				Found	Guaranteed not less than	Found	Guaranteed not more than	Found	Guaranteed not less than
	Albers Milling Co., Seattle, Wash.								
8452	Proven Calf Manna	New Haven: R. G. Davis & Sons, Inc.	7.81	26.00	25.00	5.10	5.00	4.85	4.00
	Allied Mills, Inc., Chicago, Ill.								
8687	Economy Laying Mash with Fortified Sardine Oil	Cornwall Bridge: R. W. Sandmeyer	9.27	18.25	18.00	4.98	8.00	3.04	3.50
7931	Red Feather Scratch Feed	Plainville: Sunshine Feed Store	10.60	11.38	9.00	1.96	4.00	2.27	2.00
7943	Screened Cracked Corn	Plainville: Sunshine Feed Store	11.83	9.13	8.50	1.45	2.50	2.53	2.50
7933	Wayne Breeder Mash with Fortified Sardine Oil	Plainville: Sunshine Feed Store	9.23	21.50	20.00	6.34	8.00	4.00	3.50
7937	Wayne Calf Meal (Pellets)	Plainville: Sunshine Feed Store	8.90	24.25	24.00	6.27	7.00	4.77	4.00
7929	Wayne Chick and Broiler Ration	Plainville: Sunshine Feed Store	10.15	19.75	19.00	6.32	8.00	4.16	3.50
7928	Wayne Chick Starter	Plainville: Sunshine Feed Store	10.06	18.38	18.00	4.55	7.00	4.18	4.00
7945	Wayne 16% Dairy Feed	Plainville: Sunshine Feed Store	9.89	19.56	16.00	7.79	9.00	4.63	3.50
8684	Wayne 18% Dairy Feed	Falls Village: H. E. Dean	9.08	20.38	18.00	7.70	10.00	3.69	3.50
7932	Wayne Egg Mash with Fortified Sardine Oil	Plainville: Sunshine Feed Store	9.60	21.31	20.00	5.67	8.00	4.20	3.50
7944	Wayne Fitting Ration	Plainville: Sunshine Feed Store	10.71	15.25	12.00	6.38	9.00	4.28	3.50
7930	Wayne Flushing Mash	Plainville: Sunshine Feed Store	8.29	21.13	20.00	3.84	6.00	3.55	3.00
7936	Wayne Growing Mash with Fortified Sardine Oil	Plainville: Sunshine Feed Store	9.39	18.13	16.00	4.72	7.00	4.15	3.50
7934	Wayne Horse Feed	Plainville: Sunshine Feed Store	11.48	9.94	9.50	5.28	8.00	3.10	3.00
7935	Wayne Intermediate Scratch Feed	Plainville: Sunshine Feed Store	10.08	11.75	9.00	1.81	4.00	2.94	2.00
7938	Wayne Pork Maker	Plainville: Sunshine Feed Store	9.50	15.63	14.00	4.91	7.00	3.68	3.50

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Pounds per hundred (or percent)						
			Water	Protein (N x 6.25)		Fiber		Fat	
				Found	Guaranteed not less than	Found	Guaranteed not more than	Found	Guaranteed not less than
	American Maize-Products Co., New York, N. Y.								
8867	Amaizo Gluten Meal	Norwich: The Yantic Grain & Products Co.	8.20	47.38	41.00	3.68	6.00	2.10	1.00
7959	Cream of Corn Gluten Feed	Canaan: Community Service, Inc.	10.21	26.44	23.00	7.62	9.50	3.45	2.00
	Archer-Daniels-Midland Co., Minneapolis, Minn.								
8817	Archer Brand 32% Protein Old Process Linseed Oil Meal	Plainfield: Dayville Grain & Feed Co.	8.60	34.38	32.00	8.28	9.00	4.62	3.50
8601	Archer Brand 34% Protein Old Process Linseed Oil Meal	Watertown: Watertown Co-Op. Assoc., Inc.	7.50	35.31	34.00	7.28	9.00	6.07	3.50
8051	Archer Brand 41% Protein Soybean Oil Meal	Danielson: Dayville Grain & Feed Co.	8.58	42.31	41.00	6.09	7.00	4.28	3.50
	Ashcraft-Wilkinson Co., Atlanta, Ga.								
8284	Cow-Eta Brand 41% Protein Cottonseed Meal, Prime Quality	Middletown: Meech & Stoddard, Inc.	6.98	41.00	41.00	9.98	13.00	5.00	5.00
	E. W. Bailey & Co., Montpelier, Vt.								
8165	Bailey's Pennant Brand C-16 Dairy Ration	Derby: Derby Feed Store	8.53	16.31	16.00	12.00	13.00	4.21	3.50
7923	Bailey's Pennant Brand 18% Dairy Ration	Wallingford: A. E. Hall	10.71	18.06	18.00	5.67	8.50	3.30	3.70
7914	Bailey's Pennant Brand Fine Chick Scratch	Wallingford: A. E. Hall	11.35	12.88	10.00	1.95	3.00	3.86	2.00
7926	Bailey's Pennant Brand Growing Mash	Wallingford: A. E. Hall	10.14	20.06	18.00	4.17	7.00	3.75	3.50
7916	Bailey's Pennant Brand Horse Feed	Wallingford: A. E. Hall	11.96	12.38	10.50	5.45	9.00	3.85	3.50
7925	Bailey's Pennant Brand Laying Mash	Wallingford: A. E. Hall	10.31	21.00	20.00	4.73	7.00	3.45	3.50
7927	Bailey's Pennant Brand Pig Feed	Wallingford: A. E. Hall	10.58	18.81	17.00	4.44	7.00	4.22	3.50
7915	Bailey's Pennant Brand Turkey Grower	Wallingford: A. E. Hall	9.86	21.25	20.00	5.21	7.00	4.00	3.50
7924	Bailey's Pennant Brand Turkey Starter	Wallingford: A. E. Hall	9.85	25.88	25.00	5.26	6.50	4.15	3.50
	Bay State Milling Co., Winona, Minn.								
8863	Wingold Standard Hard Wheat Middlings and Wheat Screenings	Norwich: Checkerboard Feed Co.	10.26	18.63	16.50	8.20	9.50	6.00	4.00
	The Beacon Milling Co., Inc., Cayuga, N. Y.								
8477	Auburn "16"	Southbury: H. H. Stone	8.43	19.25	16.00	7.80	10.00	3.76	3.25
8530	Beacon Battery Growing Ration	Danbury: Barnum's Feed Store	8.59	17.63	14.00	6.38	7.75	4.14	3.50
8484	Beacon Calf Grain	Southbury: H. H. Stone	9.98	16.13	14.00	6.95	10.00	4.43	4.00
8479	Beacon Calf Starter	Southbury: H. H. Stone	7.85	19.13	19.00	5.95	7.00	4.63	3.50
8514	Beacon's Cayuga Horse Feed	Danbury: Barnum's Feed Store	10.08	11.63	10.00	6.90	9.00	3.56	2.50
8498	Beacon C-C Pellets (Mfr'd under U. S. Patent 2056107)	Botsford: G. T. Rasmussen	8.42	17.88	15.00	4.18	5.00	7.79	1.00
8502	Beacon Chick Feed	Botsford: G. T. Rasmussen	9.56	12.50	10.00	1.78	2.50	3.85	3.00
8527	Beacon Complete Rabbit Ration	Danbury: Barnum's Feed Store	9.67	14.81	13.50	12.48	16.00	3.50	2.50
8485	Beacon Complete Starting Ration	Southbury: H. H. Stone	8.03	22.25	20.00	4.60	6.50	4.71	3.50
8488	Beacon Duck Fattener	Southbury: H. H. Stone	8.40	15.25	14.00	3.88	5.50	3.88	3.50
8489	Beacon Duck Grower	Southbury: H. H. Stone	7.93	18.94	17.00	4.30	6.00	4.26	3.50
8486	Beacon Egg Mash	Southbury: H. H. Stone	8.18	20.94	20.00	6.48	7.50	4.52	3.50
8487	Beacon Emergency Broiler Ration (For range, floor or battery use)	Southbury: H. H. Stone	8.30	21.19	20.00	4.60	7.00	3.95	3.50

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Pounds per hundred (or percent)						
			Water	Protein (N x 6.25)		Fiber		Fat	
				Found	Guaranteed not less than	Found	Guaranteed not more than	Found	Guaranteed not less than
	The Beacon Milling Co., Inc.,—*Cont.* **Cayuga, N. Y.**								
8513	Beacon Emergency Test Cow Ration	Danbury: Barnum's Feed Store	8.92	18.94	16.00	7.00	9.00	4.41	4.00
8490	Beacon Fitting Ration	Southbury: H. H. Stone	9.38	15.75	14.00	6.78	8.00	3.65	3.75
8501	Beacon Fleshing Pellets	Botsford: G. T. Rasmussen	8.52	19.63	17.00	6.55	7.50	3.51	3.25
8531	Beacon Goat Ration	Danbury: Barnum's Feed Store	10.06	16.00	16.00	7.03	10.00	3.50	3.50
8497	Beacon Growing Mash	Botsford: G. T. Rasmussen	8.83	19.13	18.00	5.08	7.50	4.10	3.50
8512	Beacon Hog Feed	Danbury: Barnum's Feed Store	9.20	21.38	18.00	5.45	7.00	3.74	4.00
8525	Beacon Pheasant Grower (1/8″ Pellets)	Danbury: Barnum's Feed Store	8.13	26.00	26.00	5.40	6.00	5.69	3.50
8478	Beacon Special "18"	Southbury: H. H. Stone	8.72	20.19	18.00	7.18	9.00	4.29	3.50
8521	Beacon Special Scratch Grains	Danbury: Barnum's Feed Store	10.82	13.25	9.00	4.05	5.00	2.81	2.00
8526	Beacon Turkey and Game Bird Breeder Mash	Danbury: Barnum's Feed Store	7.39	23.94	22.00	6.08	7.50	5.28	3.50
8500	Beacon Turkey Growing Mash	Southbury: H. H. Stone	8.90	23.13	20.00	4.68	7.00	4.01	3.50
8593	Beacon Turkey Starter	Bantam: Washington Supply Co.	8.42	25.00	24.00	5.00	6.00	5.08	3.50
8771	Corn and Oats Chop	Hampton: D. T. Philips	9.60	11.69	9.50	5.15	7.00	4.00	4.00
	Berkman Grain & Coal Co., North Franklin, Conn.								
8467	Nibco Breeder Mash with Fortified Cod Liver Oil	Lebanon: Berkman Grain & Coal Co.	8.25	21.13	20.00	5.20	7.00	3.81	4.00
8468	Nibco 16% Dairy Ration	Lebanon: Berkman Grain & Coal Co.	8.22	17.50	16.00	5.43	8.00	3.85	4.00
8469	Nibco Flushing Mash	Lebanon: Berkman Grain & Coal Co.	8.02	18.81	18.50	3.50	4.00	3.54	3.00
8466	Nibco Growing Mash with Fortified Cod Liver Oil	Lebanon: Berkman Grain & Coal Co.	8.70	18.38	15.00	4.87	7.00	3.18	3.50
8465	Nibco Laying Mash with Fortified Cod Liver Oil	Lebanon: Berkman Grain & Coal Co.	8.41	19.56	19.00	4.48	7.00	3.43	4.00
8464	Nibco Starter and Broiler Mash with Fortified Cod Liver Oil	Lebanon: Berkman Grain & Coal Co.	8.24	21.19	18.50	6.23	6.00	4.28	3.50
	Bisbee Linseed Co., Inc., Amsterdan, N. Y.								
8386	K & M Brand 32% Protein Old Process Linseed Meal	Amston: Amston Grain Mill	8.15	34.69	32.00	7.05	10.00	6.30	5.00
	Blatchford Calf Meal Co., Waukegan, Ill.								
8009	Blatchford's Calf Pellets and Blatchford's Calf Meal	Mansfield Depot: G. Merritt Thompson	10.17	26.56	25.00	5.50	6.00	4.83	4.50
8420	Blatchford's Complete Calf Ration	Higganum: Higganum Feed Store	10.07	19.69	19.50	9.50	9.50	3.72	3.00
8001	V-D	Guilford: Fred C. Morse & Son	10.03	28.38	31.00	5.00	5.50	4.09	4.00
	Blatchley & Ballard, Inc., Middletown, Conn.								
8373	Bee Brand 18% Dairy Ration	No. Westchester: Solomon Bros.	9.40	17.88	18.00	8.03	11.00	5.39	4.50
8375	Bee Brand 85% Grain Horse Feed	No. Westchester: Solomon Bros.	8.98	15.50	10.00	9.35	6.00	3.72	3.50
7816	Bee Brand Growing Mash	Montowese: Osmun's Feed Service	11.20	17.63	16.00	5.48	7.00	5.40	4.00
8578	Bee Brand Hog Ration	Manchester: Little & McKinney, Inc.	10.13	18.75	17.00	4.98	8.00	3.62	3.00
7815	Bee Brand Sure Lay Mash	Montowese: Osmun's Feed Store	12.27	17.38	18.00	5.55	7.00	4.55	4.00
8261	Victory Mash-Starter-Grower-Layer	Meriden: Meriden Grain & Coal Co.	10.15	19.75	17.00	4.95	8.00	2.96	3.00
	The Borden Co., Special Products Div., New York, N. Y.								
8856[1]	Ladpro (Poultry Feed Supplement)	Middletown: Meech & Stoddard, Inc.	9.51	49.06	45.00	4.43	5.00	6.53	3.00
	L. Broder & Co., Colchester, Conn.								
8376	L. B. Diamond Starter and Broiler	Colchester: L. Broder & Co.	9.45	21.50	17.00	4.75	7.00	3.84	4.00
8377	L. B. 16% Milk Ration	Colchester: L. Broder & Co.	8.96	18.94	16.00	6.33	8.00	3.92	4.50

[1] See also Vitamin D Carriers—Table 2.

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Pounds per hundred (or percent): Water	Protein (N x 6.25): Found	Protein (N x 6.25): Guaranteed not less than	Fiber: Found	Fiber: Guaranteed not more than	Fat: Found	Fat: Guaranteed not less than
	Brooklawn Grain & Feed Co., Bridgeport, Conn.								
8334	Brooklawn 20% Dairy Ration	Bridgeport: Brooklawn Grain & Feed Co.	4.28	22.50	20.00	8.20	9.00	4.78	4.50
8336	Brooklawn Egg Mash	Bridgeport: Brooklawn Grain & Feed Co.	5.55	19.56	20.00	5.75	6.00	4.33	5.00
8327	Brooklawn Growing Mash	Bridgeport: Brooklawn Grain & Feed Co.	4.70	20.56	18.00	5.93	5.00	4.28	4.00
	The C. W. Campbell Co., Pawcatuck, Conn.								
8430	Best Pig and Hog Ration	Westerly: The C. W. Campbell Co.	9.50	18.75	15.00	5.08	8.00	4.45	4.00
8428	Camco Grower	Westerly: The C. W. Campbell Co.	8.65	19.31	18.00	4.95	8.00	4.15	4.00
8858	Camco Laying Mash	Mystic: The C. W. Campbell Co.	10.00	18.00	20.00	4.63	7.00	3.74	4.00
8432	Campbell's 16% Dairy Ration	Westerly: The C. W. Campbell Co.	10.15	19.50	16.00	4.93	8.00	4.00	4.00
8429	Egg-O Chick Starter and Broiler Ration	Westerly: The C. W. Campbell Co.	8.63	18.75	18.00	4.78	6.00	4.01	4.00
8427	Egg-O Laying and Breeding Mash	Westerly: The C. W. Campbell Co.	7.51	20.13	18.00	4.63	8.00	4.65	4.00
8434	Egg-O Turkey Grower	Westerly: The C. W. Campbell Co.	7.93	20.50	20.00	4.93	8.00	4.31	4.00
8431	Supreme Scratch Grains	Westerly: The C. W. Campbell Co.	10.47	11.88	10.00	5.38	5.00	3.69	2.00
	Center Milk Products Co., Middlebury Center, Pa.								
8859	"Center" Dried Skim Milk	Norwich: The A. E. Shedd Co.	7.89	34.13	33.00	..	..	0.66	0.50
	Clinton Co., Clinton, Iowa.								
8000	Clinton Corn Gluten Feed	Guilford: Fred C. Morse & Son	10.50	23.63	23.00	6.93	8.50	1.91	2.00
	Commander-Larabee Milling Co., Minneapolis, Minn.								
8209	Sunfed Wheat Bran with Ground Screenings	Seymour: Seymour Grain & Coal Co.	8.29	17.63	14.00	10.00	12.00	5.44	4.00
	Community Service, Inc., Canaan, Conn.								
7955	Community Complete Pig Feed	Canaan: Community Service, Inc.	11.75	14.50	14.00	5.57	8.00	4.14	4.00
7952	Community 16% Dairy Feed	Canaan: Community Service, Inc.	11.23	14.88	16.00	7.87	11.00	4.79	3.50
7953	Community Fitting Ration	Canaan: Community Service, Inc.	11.55	15.25	14.00	6.06	8.50	5.04	3.50
7951	Community Poultry Mash	Canaan: Community Service, Inc.	11.62	16.50	18.00	5.86	6.50	4.08	4.00
7950	Community Scratch Feed	Canaan: Community Service, Inc.	11.45	11.44	9.00	2.33	5.00	2.64	2.00
7954	Community Starter and Grower Mash	Canaan: Community Service, Inc.	11.72	17.13	17.00	5.92	6.50	4.57	4.00
7956	Cornell Calf Starter	Canaan: Community Service, Inc.	11.60	16.38	16.00	5.63	8.00	3.58	3.00
	Consolidated Rendering Co., Boston, Mass.								
8506	Corenco Bone Meal	Danbury: H. E. Meeker	6.11	22.13	20.00	..	..	7.31	2.00
8440	45% Corenco Meat and Bone Scrap	Norwich: The A. E. Shedd Co.	4.94	44.44	45.00	..	..	9.14	6.00
8053	Corenco 50% Meat and Bone Scrap	Danielson: The Dayville Grain & Feed Co.	4.81	48.13	50.00	..	..	10.04	6.00
7971	Corenco 55% Meat Scrap	Southington: Louis Perillo Coal Co.	6.53	52.13	55.00	..	..	10.33	6.00
	The O. A. Cooper Co., Humboldt, Nebraska								
8696	Cooper's Best Lay and Gro Mash	Danielson: Dayville Grain & Feed Co.	8.74	15.31	15.00	5.28	7.00	3.19	2.25
	Corn Products Refining Co., New York, N. Y.								
8049	Buffalo Corn Gluten Feed	Danielson: Young Bros. Co.	10.82	22.88	23.00	7.29	8.50	2.40	2.00
8811	Diamond Corn Gluten Meal	Dayville: Dayville Grain & Feed Co.	8.25	41.19	41.00	2.93	6.00	1.73	1.00

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water	Protein (N x 6.25) Found	Protein Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	C. A. Cowles, Inc., Plantsville, Conn.								
8305	Blue C Hog and Pig Feed	Plantsville: C. A. Cowles, Inc.	9.15	16.38	18.00	7.55	6.00	4.03	5.00
8304	Cowles' B. C. Turkey Starting and Growing Mash	Plantsville: C. A. Cowles, Inc.	9.05	22.31	20.00	4.70	7.00	4.43	4.50
8653	Cowles' Blue C Broiler and Starting Mash	Warehouse Point: C. A. Cowles, Inc.	9.68	18.50	18.00	6.18	8.00	3.65	4.50
8301	Cowles' Blue C Dairy Ration	Plantsville: C. A. Cowles, Inc.	9.35	19.31	18.00	8.83	11.00	3.65	4.00
7330	Cowles' Blue C Fitting and Calf Ration	Cheshire: Conn. Reformatory	12.26	13.38	12.50	4.68	8.00	3.66	4.00
8262	Cowles' Blue C Growing Mash	Meriden: Meriden Grain & Coal Co.	8.15	16.38	16.00	5.43	7.50	3.87	4.00
7856	Cowles' Blue C Horse Feed with Molasses	Milford: C. A. Cowles, Inc.	12.91	12.00	10.00	7.53	10.00	3.68	3.00
8263	Cowles' Blue C Laying and Breeder Mash	Meriden: Meriden Grain & Coal Co.	9.15	18.88	18.00	5.25	7.50	3.53	4.00
8300	Cowles' Plantsville Dairy Ration	Plantsville: C. A. Cowles, Inc.	8.69	18.38	18.00	10.05	12.00	3.43	3.50
8307	Cowles' Red C Laying Mash	Plainville: August Torrero	9.18	17.63	18.00	7.30	7.00	4.14	4.00
8238	Cowles' Red C Starting and Growing Mash	Naugatuck: Valley Grain & Supply Co.	8.72	16.56	15.00	7.18	6.00	4.28	4.00
7329	Cowles' Special 16% Dairy Ration	Cheshire: Conn. Reformatory	11.62	14.94	16.00	4.98	9.00	3.73	4.00

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water	Protein (N x 6.25) Found	Protein Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	Chas. M. Cox Co., Boston, Mass.								
7974	Commercial Mixed Grains with Cracked Corn	Cheshire: Center Grain Co.	12.60	12.06	10.00	2.86	6.00	3.37	2.80
8290	Du-Ration 12% Dairy Feed	Cromwell: F. I. Nordgren	8.34	15.13	12.00	5.13	9.00	3.73	3.00
8475	Du-Ration 16% Dairy Feed	Southbury: Southbury Grain Co.	7.69	16.75	16.00	5.90	9.00	4.00	3.00
8411	Du-Ration Poultry Mash	Noroton Heights: The Davis Grain Co.	8.90	19.63	18.00	4.35	7.00	2.70	3.00
8352	Du-Ration Stock Feed	Southport: C. Buckingham Co., Inc.	7.35	12.69	10.00	7.08	9.50	3.73	2.00
8474	Scratch Grains without Corn	Southbury: Southbury Grain Co.	9.95	14.00	10.00	3.80	6.00	2.77	2.50
7896	Wirthmore Breeder Mash	Stepney: Wirthmore Grain & Coal Co.	10.50	20.13	20.00	4.89	7.00	4.00	3.00
8410	Wirthmore Calf Starter Meal	Noroton Heights: The Davis Grain Co.	8.60	22.81	24.00	5.15	4.50	3.77	4.50
8273	Wirthmore Complete Breeder Ration	Meriden: H. Grulich	8.35	17.50	15.00	4.60	6.00	3.43	3.00
8214	Wirthmore Complete Egg Ration (Pellets)	Ansonia: Ansonia Feed Co.	10.50	15.13	15.00	4.58	6.00	3.03	3.00
7864	Wirthmore Complete Growing Ration	Branford: S. V. Osborn Estate	10.77	16.00	15.00	4.13	7.00	3.58	3.00
8215	Wirthmore 14 Fitting Ration	Ansonia: Ansonia Feed Co.	9.70	15.63	14.00	6.53	8.00	4.38	4.00
7897	Wirthmore Fodder Greens	Stepney: Wirthmore Grain & Coal Co.	10.87	13.88	10.00	10.83	15.00	3.93	3.00
8267	Wirthmore Growing Mash	Kensington: A. S. Labieniec	9.40	17.63	17.50	4.15	7.00	2.73	3.00
7973	Wirthmore Laying Mash	Cheshire: Center Grain Co.	10.54	19.38	20.00	4.02	7.00	3.56	3.00
8054	Wirthmore Pig and Hog Feed	Danielson: Dayville Grain & Feed Co.	10.38	18.13	17.00	5.68	9.00	4.65	4.00
8050	Wirthmore Poultry Flush	Danielson: Dayville Grain & Feed Co.	8.71	18.50	17.50	3.96	6.00	2.53	3.00
8055	Wirthmore Rabbit Pellets	Danielson: Dayville Grain & Feed Co.	9.29	16.19	14.00	8.73	15.00	3.99	3.00
8216	Wirthmore 16 Record Ration	Ansonia: Ansonia Feed Co.	8.68	16.31	16.00	6.08	8.00	4.54	4.00
8264	Wirthmore Scratch Feed	Kensington: A. S. Labieniec	11.26	13.81	9.50	3.00	4.00	2.61	2.50
8351	Wirthmore Standard 16 Dairy Ration	Southport: C. Buckingham Co., Inc.	6.85	17.69	16.00	5.88	8.50	3.66	3.00
8265	Wirthmore Standard 18 Dairy Ration	Kensington: A. S. Labieniec	9.31	19.00	18.00	6.98	8.50	4.28	3.00
8473	Wirthmore Standard 12 Fitting Ration	Southbury: Southbury Grain Co.	7.68	13.81	12.00	6.10	8.00	3.61	4.00
7863	Wirthmore Starter and Broiler Ration	Branford: S. V. Osborn Estate	10.44	21.25	20.00	4.41	6.50	3.63	3.00
8378	Wirthmore Stock Feed	Colchester: L. Broder & Co.	8.46	10.63	9.00	8.15	9.50	4.32	4.00
8784	Wirthmore Super Pellets	New Milford: Soule Grain Co.	9.10	21.75	20.00	5.86	10.00	3.82	3.00
7865	Wirthmore Turkey Breeder Ration (Pellets)	Branford: S. V. Osborn Estate	9.76	22.81	24.00	4.74	7.00	4.40	3.00
8393	Wirthmore Turkey Fattening Ration	Norwalk: Winnipauk Grain Co.	8.80	17.25	16.00	4.15	7.00	3.25	3.00
8222	Wirthmore Turkey Growing Ration	Ansonia: Ansonia Feed Co.	9.63	20.25	20.00	4.55	7.00	3.13	3.00
7830	Wirthmore Turkey Starting Ration	Milford: Milford Grain Co.	10.20	24.94	25.00	5.13	7.00	3.70	3.00
8350	Wirthmore Twin-Mix Calf Ration	Southport: C. Buckingham Co., Inc.	7.05	17.75	17.00	6.50	7.00	4.33	4.00

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Pounds per hundred (or percent) Water	Protein (N x 6.25) Found	Protein (N x 6.25) Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	Crawford Bros., Inc., Walton, N. Y.								
8795	Crawford's Broiler and Growing Mash	New Canaan: Clapboard Hill Feed Co., Inc.	8.46	21.06	20.00	7.70	8.00	4.57	4.00
8524	Crawford's Hog Feed	Danbury: Barnum's Feed Store	9.55	15.25	14.00	4.80	7.00	2.85	4.00
8794	Crawford's Laying and Breeding Mash	New Canaan: Clapboard Hill Feed Co., Inc.	8.51	24.50	20.00	5.33	8.00	3.84	4.00
8796	Crawford's Special Test Ration	New Canaan: Clapboard Hill Feed Co., Inc.	7.70	22.63	18.00	6.35	10.00	4.85	4.00
8272	Economy Growing	New Britain: Wm. Cohen	8.69	19.38	18.00	5.23	8.00	5.03	4.00
8227	Economy Laying Mash	Naugatuck: Reliable Grain & Fuel Co.	9.64	21.19	18.00	6.10	8.00	3.89	4.00
8698	Economy Laying Mash	Danielson: Dayville Grain & Feed Co.	8.92	20.69	18.00	7.10	8.00	4.01	4.00
8228	Economy Starting and Growing Mash	Naugatuck: Reliable Grain & Fuel Co.	9.33	20.00	18.00	5.05	8.00	4.77	4.00
8662	Producer	Eastford: Wm. S. Warren	9.07	21.06	16.00	7.85	9.00	3.96	4.00
8374	Victory Ration	No. Westchester: Solomon Bros.	8.59	18.00	14.00	5.60	12.00	5.20	3.00
8223	Wallkill Sweet Dairy Ration	Ansonia: A. Hodos & Sons	8.84	23.69	18.00	6.38	8.00	3.48	5.00
	P. Cutler, Inc., Colchester, Conn.								
8442	Prosperity Dairy 16%	Colchester: P. Cutler, Inc.	7.22	19.88	16.00	8.15	11.00	3.64	3.50
8445	Prosperity Laying Mash	Colchester: P. Cutler, Inc.	8.36	19.63	16.00	6.23	10.00	3.90	4.00
8443	Prosperity Scratch Feed	Colchester: P. Cutler, Inc.	10.75	14.38	9.00	3.58	6.00	2.67	2.00
8444	Prosperity Stock Feed	Colchester: P. Cutler, Inc.	8.28	12.13	8.00	8.33	10.00	2.70	3.50
	Dailey Mills, Inc., Binghamton, N. Y.								
8183	Dailey's All Mash Grower	Windsor Locks: The Windsor Locks Grain Co.	10.18	14.63	14.00	3.75	8.50	4.08	4.00
8785	Dailey's 16% Dairy Ration (with Beet Pulp and Crimped Heavy Oats)	New Milford: Paul Caldwell	8.45	17.94	16.00	6.68	8.00	3.93	4.00
8184	Dailey's Egg Producer Mash	Windsor Locks: The Windsor Locks Grain Co.	10.40	18.75	19.00	5.15	7.00	4.10	4.00
8783	Dailey's Fitting Ration (with Crimped Heavy Oats)	New Milford: W. L. Richmond & Son	9.46	18.75	14.00	6.91	7.00	3.55	4.00
8176	Dailey's Horse Feed	Windsor Locks: The Windsor Locks Grain Co.	11.25	10.44	10.00	6.50	8.00	3.35	3.00
8536	Dailey's 18% Milk Producer	Brookfield: W. L. Richmond & Son	9.50	20.38	18.00	6.20	10.00	2.83	3.50
8186	Dailey's Pork Producer	Windsor Locks: The Windsor Locks Grain Co.	8.95	19.19	17.00	5.23	7.00	5.47	5.00
8188	Dailey's Revitalizer Mash	Windsor Locks: The Windsor Locks Grain Co.	8.05	15.63	13.00	3.33	4.00	4.16	3.50
8535	Dailey's Special Pig and Hog Ration (with Digester Tankage and Distilled Fish Solubles)	Brookfield: W. L. Richmond & Son	9.55	17.69	13.00	5.85	10.00	3.77	3.00
8187	Dailey's Straight 18% Money Maker	Windsor Locks: The Windsor Locks Grain Co.	9.47	17.75	18.00	5.70	12.00	4.45	3.50
8534	Dailey's Super All Mash Layer	Brookfield: W. L. Richmond & Son	9.71	15.94	14.00	6.00	8.00	3.32	3.50
8537	Dailey's Super 18% Dairy Ration (with Beet Pulp and Crimped Heavy Oats)	Brookfield: W. L. Richmond & Son	9.69	17.69	18.00	6.83	8.00	3.60	4.00
8538	Dailey's Super Hatch Producer	Unionville: Farmington Grain & Lumber Co.	9.09	19.06	20.00	5.73	7.00	3.39	4.00
8782	Dailey's Turkey Growing Mash	New Milford: W. L. Richmond & Son	9.13	21.88	20.00	5.85	8.00	3.46	3.50

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water	Protein (N x 6.25) Found	Protein Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	Dairy Farmers Union Feed, Plattsburg, N. Y.								
8812	Union Broiler Mash	Dayville: Dayville Grain & Feed Co.	8.91	16.50	15.00	4.88	8.00	4.05	4.00
8697	Union 16% Dairy Ration	Danielson: Dayville Grain & Feed Co.	8.45	16.50	16.00	11.43	14.00	2.66	2.50
8813	Union Laying and Growing Mash	Dayville: Dayville Grain & Feed Co.	9.61	18.56	16.00	5.33	8.00	3.96	3.00
	R. G. Davis & Sons, Inc., New Haven, Conn.								
8218	Davis 18% Dairy Ration	Ansonia: Ansonia Feed Co.	9.95	17.69	18.00	7.20	8.50	3.76	3.00
8412	Davis Egg Mash with Buttermilk and Cod Liver Oil	Clinton: Clinton Grain Co.	8.87	22.50	18.00	4.83	6.00	3.15	4.00
7977	Davis Horse Feed	Cheshire: Center Grain Co.	13.14	12.88	9.00	7.91	10.00	4.28	2.00
7978	Davis Scratch Feed	Cheshire: Center Grain Co.	12.09	11.94	10.00	2.93	5.00	2.80	2.00
	Dawes Products Co., Chicago, Ill.								
8148	Flavonne Ribo-D	Winsted: E. Manchester & Sons	11.31	21.88	21.00	2.63	6.50	4.90	3.00
	Delaware Mills, Inc., Deposit, N. Y.								
8151	Delaware Broiler Mash	Winsted: Hawley Feed Mills	10.66	17.00	20.00	5.03	7.00	3.07	3.00
8157	Delaware Egg Mash	Winsted: Hawley Feed Mills	10.08	18.38	19.00	5.40	9.00	3.18	3.00
8159	Delaware Grow Mash	Winsted: Hawley Feed Mills	10.21	18.19	16.50	5.73	9.00	3.18	3.00
8510	Delaware Growing Mash	Danbury: Barnum's Feed Store	10.04	17.81	17.00	4.00	7.00	3.10	3.00
8152	Delaware Horse Feed	Winsted: Hawley Feed Mills	12.37	11.25	9.00	5.08	10.00	3.37	3.00
8158	Delaware Pig and Hog Feed	Winsted: Hawley Feed Mills	9.88	16.63	16.00	4.90	8.00	3.98	4.00
8156	Indian Scratch Grains	Winsted: Hawley Feed Mills	11.35	11.75	10.00	2.65	4.00	2.80	2.00
8150	Delaware Starter and Broiler Ration	Winsted: Hawley Feed Mills	10.39	18.31	18.00	5.28	7.00	3.06	3.50
8154	Delaware Sweet 18% Dairy Feed	Winsted: Hawley Feed Mills	10.43	18.94	18.00	7.13	10.00	4.28	4.00
8155	Indian Sweet 16 Dairy Feed	Winsted: Hawley Feed Mills	9.71	15.94	16.00	12.28	14.00	4.06	3.00
8153	Indian Sweet 18% Dairy Feed	Winsted: Hawley Feed Mills	9.78	18.25	18.00	9.20	11.00	4.06	3.00
	The Denver Alfalfa Milling & Products Co., Lamar, Colo.								
8864	13% Triple XXX Alfalfa Meal	Norwich: Checkerboard Feed Store	7.58	14.81	13.00	27.35	33.00	2.43	1.00
	Derby Feed Store, Derby, Conn.								
8164	Litsky's Laying Mash with Cod Liver Oil	Derby: Derby Feed Store	9.31	21.75	18.00	5.48	7.00	4.36	4.00
	Dietrich & Gambrill, Inc., Frederick, Md.								
8044	D & G All Mash Turkey Starter	Danielson: The Young Bros. Co.	9.74	24.63	24.00	5.12	7.00	3.83	4.50
8045	D & G Calf Meal	Danielson: The Young Bros. Co.	9.54	22.88	21.00	3.40	4.50	3.56	4.00
8047	D & G Growing and Fitting Ration	Danielson: The Young Bros. Co.	9.73	15.63	13.00	5.79	10.00	3.93	4.00
8650	D & G Rabbit Feed (Pelleted)	Quinebaug: M. T. Dart	9.34	15.75	14.00	9.08	9.50	3.80	3.50
8048	Frederick 18% Dairy Feed	Danielson: The Young Bros. Co.	9.09	19.94	18.00	9.43	12.00	4.60	3.50
8647	Frederick Laying Mash	Quinebaug: M. T. Dart	9.23	20.44	18.00	6.78	9.00	4.54	3.50
8043	Frederick Stock Feed	Danielson: The Young Bros. Co.	10.26	8.88	7.50	9.30	12.00	3.88	3.00
8046	Gambrill's Chick Grains	Danielson: The Young Bros. Co.	11.40	10.31	9.00	1.77	4.00	3.63	2.50
8666	Gambrill's Growing Mash	Quinebaug: M. T. Dart	8.41	22.50	18.00	6.55	8.00	4.03	4.00
8388	Gambrill's Scratch Feed	Amston: Amston Grain Mill	9.72	14.06	9.00	3.63	4.00	2.50	2.50
8664	Pen-Mar 18% Dairy	Quinebaug: M. T. Dart	8.77	19.69	18.00	7.03	10.00	3.70	4.00
8387	Pen-Mar Stock Feed	Amston: Amston Grain Mill	9.22	12.38	10.00	7.75	12.00	4.24	3.00
8663	Pig and Hog Meal	Quinebaug: M. T. Dart	9.55	21.50	18.00	6.78	8.00	4.20	4.00

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Pounds per hundred (or percent): Water	Protein (N x 6.25): Found	Protein (N x 6.25): Guaranteed not less than	Fiber: Found	Fiber: Guaranteed not more than	Fat: Found	Fat: Guaranteed not less than
	Eastern States Farmers' Exchange, West Springfield, Mass.								
7909	Eastern States All-Mash Developer	No. Haven: Eastern States Branch	10.08	15.88	14.00	3.98	6.00	3.65	3.00
8023	Eastern States All Mash Egg	Willimantic: Eastern States Branch	10.26	16.75	15.50	3.65	5.50	3.67	3.00
8021	Eastern States Breeder Concentrate Pellets	Willimantic: Eastern States Branch	8.33	20.75	20.00	5.64	6.00	4.51	3.50
8676	Eastern States Calf Starter	East Hartford: Eastern States Branch	7.28	30.81	23.00	6.00	6.00	3.53	3.50
8080	Eastern States Calving Ration	Torrington: Eastern States Branch	12.95	12.50	10.00	13.68	18.00	2.03	1.50
7908	Eastern States Developer	No. Haven: Eastern States Branch	10.00	18.25	18.00	4.89	6.50	3.83	3.00
7907	Eastern States Egg Mash	No. Haven: Eastern States Branch	9.82	18.88	20.00	4.64	6.50	3.84	3.00
8020	Eastern States Fitting Ration 14%	Willimantic: Eastern States Branch	11.08	15.63	14.00	6.75	9.00	3.68	3.00
8019	Eastern States Finishing	Willimantic: Eastern States Branch	11.02	17.31	15.00	3.67	5.50	3.05	3.00
8022	Eastern States Flushing	Willimantic: Eastern States Branch	11.21	18.75	18.50	3.16	4.00	2.76	2.00
8077	Eastern States Horse Feed	Torrington: Eastern States Branch	11.10	12.25	10.50	5.93	7.00	3.90	3.50
7902	Eastern States Pig Starter and Breeder	No. Haven: Eastern States Branch	11.10	20.50	20.00	5.60	7.50	3.83	2.50
8081	Eastern States Pork Builder	Torrington: Eastern States Branch	10.50	15.63	15.00	5.05	6.50	3.50	2.50
8078	Eastern States Scratch Grains	Torrington: Eastern States Branch	10.93	12.13	9.50	2.90	3.00	2.63	2.50
7910	Eastern States Sheep and Goat	No. Haven: Eastern States Branch	12.50	14.88	16.00	5.61	7.50	3.65	3.50
7906	Eastern States Sixteen	No. Haven: Eastern States Branch	10.50	18.44	16.00	5.89	8.00	4.28	3.50
7903	Eastern States Starting & Broiler	No. Haven: Eastern States Branch	10.82	18.56	18.00	3.96	6.00	3.76	2.50
8079	Eastern States Stock Feed	Torrington: Eastern States Branch	10.98	11.88	11.00	3.65	7.50	3.45	3.50
8770	Eastern States 28% Supplement Feed	Bethel: Eastern States Branch	8.08	29.75	28.00	7.08	9.00	4.52	3.50
7905	Eastern States Turkey Grower	No. Haven: Eastern States Branch	9.45	21.88	20.00	5.23	6.00	4.08	3.00
7904	Eastern States Turkey Start	No. Haven: Eastern States Branch	9.12	25.44	25.00	5.82	6.00	4.35	2.50

	Elmore Milling Co., Inc., Oneonta, N. Y.								
8314	Elmore Calf Grain Ration	Plainville: W. S. Eaton	9.94	14.63	13.00	7.78	10.00	4.00	4.00
8042	Elmore Chick Feed	Danielson: United Co-op. Farmers, Inc.	11.47	10.63	10.00	1.07	3.50	1.55	2.50
7822	Elmore Chixsaver	Wallingford: Laden Bros. Co., Inc.	9.44	16.25	20.00	7.67	7.00	4.38	4.00
8240	Elmore Complete Growing Ration	Naugatuck: Valley Grain & Supply Co.	8.90	16.00	15.00	6.98	6.00	3.36	4.00
8241	Elmore Complete Market Egg Mash	Naugatuck: Valley Grain & Supply Co.	8.95	17.38	15.00	6.75	8.00	3.24	4.00
7821	Elmore Complete Starter-Broiler	Wallingford: Laden Bros. Co., Inc.	9.75	19.44	18.00	7.23	7.00	4.89	4.00
8308	Elmore Egg Mash	Plainville: W. S. Eaton	8.62	16.63	18.00	4.75	8.00	5.85	4.00
8686	Elmore Fitting Ration	Cornwall Bridge: R. W. Sandmeyer	9.22	15.44	14.00	7.83	9.00	4.41	4.00
8690	Elmore Fleshing Pellets	Bethel: Morrison & Dunham	8.26	18.56	15.00	6.33	6.00	3.81	5.00
8242	Elmore Goat Ration	Naugatuck: Valley Grain & Supply Co.	9.43	15.38	16.00	8.23	10.00	4.78	4.00
8818	Elmore Growing Mash	Jewett City: Jewett City Farmers' Exchange	9.47	20.13	17.00	5.70	8.00	4.50	4.00
8592	Elmore Horse Feed with Molasses	Bantam: Washington Supply Co.	11.19	11.56	9.00	6.35	11.00	3.50	2.50
8659	Elmore Improved Calf Starter	Hazardville: E. B. Buck	8.49	17.13	20.00	4.85	8.00	4.70	4.00
7819	Elmore M. A. C. Laying Mash	Wallingford: Laden Bros. Co., Inc.	10.38	17.31	18.00	6.83	7.00	5.23	5.00
8312	Elmore Makegrow Little Pig Ration	Plainville: W. S. Eaton	8.14	18.63	18.00	6.48	7.00	4.15	4.50
8626	Elmore Milk Flushing Mash	Hazardville: E. B. Buck	9.58	21.19	16.00	3.41	5.00	4.70	4.00
8309	Elmore Milk Grains "Sixteen"	Plainville: W. S. Eaton	9.07	19.75	16.00	5.10	10.00	5.68	5.00
8246	Elmore Rabbit Ration	Naugatuck: Valley Grain & Supply Co.	7.87	17.00	14.00	8.81	10.00	3.96	3.50
8819	Elmore Test Ration	Jewett City: Jewett City Farmers' Exchange	8.43	18.88	18.00	8.75	9.00	4.62	5.00
8313	Elmore Turkey Finisher (Fattener)	Plainville: W. S. Eaton	8.13	17.13	17.00	6.53	8.00	4.23	4.00
8692	Elmore Turkey Fitting Ration	Bethel: Morrison & Dunham	9.97	18.13	12.00	7.35	10.00	4.00	3.50
8108	Elmore Turkey Growing Mash	Cos Cob: F. Policastro	9.74	17.13	20.00	4.78	8.00	4.69	3.50
7820	Elmore Turkey Starting Mash	Wallingford: Laden Bros. Co., Inc.	9.77	16.25	24.00	6.60	6.00	4.08	4.00
8685	E-M-C-O Horse Feed	Cornwall Bridge: R. W. Sandmeyer	9.02	13.63	9.00	6.75	11.00	3.94	2.50
8109	Emco Scratch Feed	Cos Cob: F. Policastro	12.17	11.00	10.00	3.13	7.00	3.34	2.50
8315	Granger 16% Dairy Ration	Plainville: W. S. Eaton	9.16	17.94	16.00	9.47	10.00	4.25	3.50

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water	Protein (N x 6.25) Found	Protein Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	John W. Eshelman & Sons, Lancaster, Pa.								
8688	Eshelman Lancaster 60 Horse Feed	Bethel: Morrison & Dunham	10.64	11.94	9.00	8.55	11.00	3.60	2.50
8369	Eshelman Pennsy 16 Dairy Feed	So. Norwalk: The Roodner Feed Co.	6.78	18.50	16.00	10.38	11.00	4.51	3.00
8107	Eshelman Red Rose Breeder Mash (Pellets)	Cos Cob: Belmont Feed Co.	8.92	19.88	18.00	5.60	6.50	4.42	4.00
8094	Eshelman Red Rose Broiler Ration (with A and D Oil)	Cos Cob: Belmont Feed Co.	9.90	17.25	16.50	5.70	7.50	3.56	4.00
8447	Eshelman Red Rose Calf Starter	Norwich: The A. E. Shedd Co., Inc.	8.65	22.25	22.00	4.00	5.00	3.75	4.00
8039	Eshelman Red Rose Chick Grains	Putnam: Putnam Farmers' Co-op. Assoc., Inc.	11.19	12.13	10.00	2.10	3.00	4.11	2.50
8446	Eshelman Red Rose Complete Calf Grower	Norwich: The A. E. Shedd Co., Inc.	9.27	17.38	14.00	5.28	8.00	4.15	3.25
8448	Eshelman Red Rose Complete Laying Mash (with A and D Oil)	Norwich: The A. E. Shedd Co., Inc.	8.12	18.50	15.00	5.33	6.00	4.28	4.00
8451	Eshelman Red Rose Complete Rabbit Pellets	New Haven: The Moran-Patton Co.	8.22	14.75	14.00	9.90	16.00	3.00	2.50
8036	Eshelman Red Rose 16 Dairy Feed	Putnam: Putnam Farmers' Co-op. Assoc. Inc.	11.24	17.25	16.00	6.49	11.00	4.44	4.50
8038	Eshelman Red Rose 18% Dairy Feed	Putnam: Putnam Farmers' Co-op Assoc., Inc.	10.85	19.00	18.00	5.62	9.00	4.39	4.75
8861	Eshelman Red Rose 24% Dairy Feed	Norwich: The A. E. Shedd Co., Inc.	8.20	28.06	24.00	7.73	11.00	4.81	4.00
8368	Eshelman Red Rose Fattening Mash	So. Norwalk: The Roodner Feed Co.	6.75	15.63	14.00	5.95	5.50	4.38	4.00
8095	Eshelman Red Rose Fitting Ration	Cos Cob: Belmont Feed Co.	10.28	13.50	12.00	4.95	7.00	4.17	4.00
8035	Eshelman Red Rose 85 Horse Feed	Putnam: Putnam Farmers' Co-op. Assoc., Inc	11.53	10.38	9.00	6.56	10.00	3.71	3.00
8370	Eshelman Red Rose Intermediate Chick Grains	So. Norwalk: The Roodner Feed Co.	8.55	13.88	9.00	2.40	3.00	2.69	2.50
8098	Eshelman Red Rose Laying Mash (with A and D Oil)	Cos Cob: Belmont Feed Co.	9.13	19.88	18.50	5.33	7.50	3.60	4.00
8061	Eshelman Red Rose Pig and Hog Meal	Thomaston: Thomaston Supply Co.	8.92	18.56	18.00	7.68	10.00	3.53	3.50
8366	Eshelman Red Rose Rabbit Feed (Pellets)	So. Norwalk: The Roodner Feed Co.	6.43	14.38	14.00	7.48	9.50	3.05	3.50
8367	Eshelman Red Rose Scratch Grains	So. Norwalk: The Roodner Feed Co.	8.88	12.88	9.50	3.65	4.00	2.58	2.00
8093	Eshelman Red Rose Starter and Grower (with A and D Oil)	Cos Cob: Belmont Feed Co.	9.85	17.94	16.00	5.65	7.00	3.74	4.00
8689	Eshelman Red Rose Steer Feed	Bethel: Morrison & Dunham	9.20	21.56	18.00	12.53	15.00	3.50	2.50
8449	Eshelman Red Rose Turkey Starter (with A and D Oil)	Norwich: The A. E. Shedd Co., Inc.,	7.83	23.38	24.00	5.75	6.50	4.00	4.00
8092	Red Rose Turkey Grower (with A and D Oil	Cos Cob: Belmont Feed Co.	9.38	18.00	16.00	6.18	8.50	3.27	3.75
	Farmers Feed Co., New York, N. Y.								
7958	"Bull Brand" Dried Brewers Grains	Canaan: Community Service, Inc.	9.67	28.13	26.00	11.45	17.00	6.54	6.00
	Finger Lakes & Hudson Flour Mills, Inc., Geneva, N. Y.								
8870	Kangaroo Standard Wheat Bran	New Haven: R. G. Davis & Sons, Inc.	11.31	18.94	15.00	9.18	12.00	5.74	4.00
8283	Rye Feed	Middletown: Meech & Stoddard, Inc.	8.36	16.94	15.00	4.90	6.00	3.72	3.00
	First National Stores, Inc., Somerville, Mass.								
8871	Henfield Egg Mash	Colchester: First National Stores, Inc.	8.72	22.25	20.00	6.33	7.00	4.00	4.00
	Flory Milling Co., Inc., Bangor, Pa.								
8358	Blue Mountain Horse Feed-60% Grain	Saugatuck: L. H. Gault & Sons, Inc.	7.73	9.88	7.00	12.30	11.00	3.45	2.00
8363	Flory All-Mash Egg and Breeder Ration	Saugatuck: L. H. Gault & Sons, Inc.	7.55	18.06	16.00	4.85	7.00	3.00	3.00

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Pounds per hundred (or percent) Water	Protein (N x 6.25) Found	Protein (N x 6.25) Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	Flory Milling Co., Inc.—*Cont.* Bangor, Pa.								
8353	Flory Battery Laying Ration	Saugatuck: L. H. Gault & Sons, Inc.	6.23	17.25	16.00	5.52	7.00	3.20	3.50
8245	Flory Broiler Mash	Naugatuck: Valley Grain & Supply Co.	8.41	20.13	19.00	6.10	7.50	3.43	3.00
8354	Flory Complete All-Mash Ration	Saugatuck: L. H. Gault & Sons, Inc.	5.85	18.19	15.50	5.75	7.00	3.03	3.50
8239	Flory Corn, Wheat and Oats Scratch Feed	Naugatuck: Valley Grain & Supply Co.	10.00	14.38	10.00	3.60	5.00	2.34	2.50
8789	Flory 18% Dairy Feed	New Canaan: C. M. Jones	11.05	19.44	18.00	8.50	10.00	3.59	3.50
8792	Flory Egg and Breeder Mash (Pellets)	New Canaan: C. M. Jones	8.23	20.63	21.00	6.00	7.50	4.50	4.00
8791	Flory Fattener and Flesher Pellets	New Canaan: C. M. Jones	7.85	17.50	14.00	5.30	7.00	5.50	5.00
8790	Flory 18% Growing Mash	New Canaan: C. M. Jones	8.29	21.00	18.00	5.40	7.50	3.73	3.00
8360	Flory Hog Meal	Saugatuck: L. H. Gault & Sons, Inc.	7.10	17.81	15.00	4.53	9.00	2.63	3.00
8357	Flory Horse Feed—85% Grain	Saugatuck: L. H. Gault & Sons, Inc.	8.70	11.00	9.00	9.73	10.00	3.77	2.50
8244	Flory Laying Mash	Naugatuck: Valley Grain & Supply Co.	8.54	21.50	20.00	6.10	7.50	3.52	3.50
8361	Flory Pig and Hog Meal	Saugatuck: L. H. Gault & Sons, Inc.	7.43	20.75	18.00	4.58	8.00	3.75	3.50
8364	Flory Rabbit Pellets	Saugatuck: L. H. Gault & Sons, Inc.	6.03	14.94	14.00	8.88	9.00	3.23	3.00
8362	Flory Scratch Feed (Chick Size)	Saugatuck: L. H. Gault & Sons, Inc.	8.33	10.25	9.00	1.75	3.00	2.25	2.50
8356	Flory Starter Mash	Saugatuck: L. H. Gault & Sons, Inc.	6.43	20.13	20.00	6.00	7.00	3.48	3.00
8243	Flory Turkey Grower	Naugatuck: Valley Grain & Supply Co.	8.31	22.25	20.00	5.93	7.50	3.63	3.50
8355	Golden Egg Laying Mash	Saugatuck: L. H. Gault & Sons, Inc.	5.60	21.44	20.00	6.13	8.00	3.63	3.00
7817	Golden Egg Scratch Feed	Montowese: Osmun's Feed Service	11.30	10.13	9.00	2.38	4.50	3.10	2.50
	J. B. Garland & Son, Inc., Worcester, Mass.								
8651	Garland 16% Dairy Ration	No. Grosvenordale: Thompson Grain Co.	9.52	17.75	16.00	8.38	9.00	3.89	4.00
8670	Garland Fitting Ration	No. Grosvenordale: Thompson Grain Co.	10.23	16.94	12.00	6.83	7.00	4.03	4.00
8668	Garland Growing Mash	No. Grosvenordale: Thompson Grain Co.	8.75	17.25	14.00	6.80	7.00	4.04	4.00
8669	Garland Laying Mash	No. Grosvenordale: Thompson Grain Co.	8.34	19.00	18.00	6.98	7.00	4.16	4.00
8652	Garland Pig and Hog Ration	No. Grosvenordale: Thompson Grain Co.	9.80	19.19	17.00	3.93	8.00	3.90	4.00
8671	Garland Scratch Feed	No. Grosvenordale: Thompson Grain Co.	10.51	13.69	10.00	3.50	5.00	2.60	2.50
	General Mills, Inc., Larrowe Div., Detroit, Mich.								
7862	41% Protein Cottonseed Meal Prime Quality	Branford: S. V. Osborn Estate	8.05	39.00	41.00	8.91	10.00	5.93	6.00
8303	Larro Breeder Mash (Pellets)	Plantsville: C. A. Cowles, Inc.	8.19	20.13	20.00	5.20	8.00	4.51	4.00
7859	Larro 18% Broiler Feed	Branford: S. V. Osborn Estate	10.30	18.88	18.00	5.33	7.00	4.50	3.50
8509	Larro Calf Builder	Danbury: H. E. Meeker	8.05	24.69	24.00	3.98	5.50	5.58	4.00
7858	Larro Chick Builder	Branford: S. V. Osborn Estate	10.21	19.75	19.00	6.08	7.00	4.10	3.50
7854	Larro Chick Grains	Milford: C. A. Cowles, Inc.	11.48	10.75	9.50	1.53	4.00	2.23	2.00
8541	Larro 16% Dairy Feed	Suffield: Spencer Bros.	8.90	18.13	16.00	9.18	12.00	3.68	3.00
8149	Larro 18% Dairy Feed	Winsted: E. Manchester & Sons	10.00	18.19	18.00	8.50	12.00	3.72	3.25
7855	Larro Egg Mash	Milford: C. A. Cowles, Inc.	10.38	19.25	18.00	4.20	8.00	4.07	4.00
8507	Larro Growing Grains	Danbury: H. E. Meeker	10.70	12.50	9.50	2.08	4.00	2.96	2.00
8508	Larro Scratch Grains	Danbury: H. E. Meeker	10.93	12.25	9.50	2.53	4.00	2.65	2.00
7861	Larro Sow and Pig Builder	Branford: S. V. Osborn Estate	10.31	16.88	16.00	5.58	8.00	4.53	3.50
8302	Larro Turkey Breeder Mash	Plantsville: C. A. Cowles, Inc.	5.27	20.63	20.00	6.45	8.00	4.69	4.00
8505	Larro Turkey Finisher	Danbury: H. E. Meeker	8.91	19.50	19.00	5.98	7.50	4.28	3.00

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Pounds per hundred (or percent) Water	Protein (N x 6.25) Found	Protein Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	General Mills, Inc., Minneapolis, Minn.								
8371	Washburn's Gold Medal Hard Wheat Adrian Red Dog	So. Norwalk: The Roodner Feed Co.	7.65	18.50	16.00	2.08	4.00	3.85	3.50
8010	Washburn's Gold Medal Hard Wheat Bran and Wheat Screenings	Mansfield Depot: G. Merritt Thompson	10.34	16.00	14.00	9.16	12.00	4.70	3.50
8616	Washburn's Gold Medal Hard Wheat Standard Middlings and Wheat Screenings	Bristol: Bristol Grain & Supply Co.	9.08	17.19	15.00	7.78	9.50	5.28	4.00
	The Glidden Co., Soya Products Div., Chicago, Ill.								
8866	Glidden 4-Hi Brand 44% Soybean Oil Meal	Norwich: The Yantic Grain & Products Co.	8.70	45.38	44.00	6.68	7.00	1.30	0.50
	D. H. Grandin Milling Co., Jamestown, N. Y.								
8657	Grandin's Baby Chick Grains	Thompsonville: John William's Hatchery	10.83	13.06	10.00	2.20	5.00	2.30	2.50
8504	Grandin's Complete Rabbit Feed (Pellets)	Danbury: H. E. Meeker	7.83	17.44	17.00	14.58	20.00	3.73	2.00
8494	Grandin's Emergency 16 Dairy Feed	Botsford: G. T. Rasmussen	9.30	17.13	16.00	7.85	10.00	3.65	3.00
8495	Grandin's Emergency Poultry Mash	Botsford: G. T. Rasmussen	9.27	18.06	18.00	6.30	10.00	3.19	3.00
8503	Grandin's Emergency Stock Feed	Danbury: H. E. Meeker	9.08	13.69	12.00	8.58	12.00	3.65	3.00
8581	Grandin's 14 Fitting Ration	West Willington: Hansen's Store	9.32	15.50	14.00	6.10	9.00	3.76	4.00
8496	Grandin's Fleshing Pellets	Botsford: G. T. Rasmussen	8.66	17.06	15.00	5.08	8.00	4.23	4.00
8258	Grandin's Horse Feed	Meriden: Meriden Grain & Coal Co.	10.73	10.56	9.50	7.10	11.00	4.18	3.50
8658	Grandin's Intermediate Chick Grains	Thompsonville: John William's Hatchery	10.92	12.69	10.00	2.15	5.00	2.50	2.50
8270	Grandin's Laying Mash	Kensington: A. S. Labieniec	8.50	21.00	20.00	6.20	8.00	4.20	4.00
8493	Grandin's 16 Milk Maker	Botsford: G. T. Rasmussen	9.69	16.69	16.00	7.40	10.00	3.68	4.00
8672	Grandin's 18 Milk Maker	Warrenville: Ashford Co-Op. Assoc., Inc.	7.45	20.31	18.00	7.53	10.00	4.38	4.00
8656	Grandin's Pig and Hog Ration	Thompsonville: John William's Hatchery	8.91	18.19	18.00	6.58	10.00	5.04	4.00
8253	Grandin's Special 16 Dairy Feed	Meriden: Meriden Grain & Coal Co.	8.53	17.13	16.00	8.33	10.00	5.00	4.00
8252	Grandin's Start-To-Finish Mash	Meriden: Meriden Grain & Coal Co.	8.31	20.00	18.00	5.73	8.00	3.70	4.00
8259	Grandin's Turkey Finishing Mash	Meriden: Meriden Grain & Coal Co.	8.31	17.00	15.00	6.48	8.00	3.75	4.00
8251	Grandin's Turkey Grower	Meriden: Meriden Grain & Coal Co.	8.00	22.31	20.00	5.20	8.00	3.41	4.00
	Hales & Hunter Co., Chicago, Ill.								
8571	Kingfalfa Horse Feed	Manchester: Little & McKinney, Inc.	8.74	13.06	9.00	7.43	10.00	3.85	2.50
8546	Pioneer Dry and Freshening Feed	Manchester: Little & McKinney, Inc.	7.50	15.81	12.00	7.18	10.00	3.92	2.50
8570	Pioneer Hog Fattener	Manchester: Little & McKinney, Inc.	9.35	17.69	15.00	5.25	7.00	3.72	3.25
8545	Pioneer Pig and Hog Feed 20%	Manchester: Little & McKinney, Inc.	8.68	21.88	20.00	5.65	7.50	3.95	4.00
8542	Red Comb Breeder Mash	Manchester: Little & McKinney, Inc.	8.90	18.94	18.00	5.45	7.00	3.93	3.50
8654	Red Comb Broiler Mash	Warehouse Point: C. A. Cowles, Inc.	9.60	21.06	18.00	5.25	7.00	3.61	3.50
8544	Red Comb C Flakes	Manchester: Little & McKinney, Inc.	8.52	18.75	15.00	4.33	7.00	5.04	4.50
8547	Red Comb Chick Starter	Manchester: Little & McKinney, Inc.	8.79	19.56	18.00	5.20	6.00	3.55	3.50
8677	Red Comb Crate Fattener	East Hartford: C. A. Cowles, Inc.	8.55	16.63	13.00	5.20	7.00	3.47	3.50
8543	Red Comb Egg Mash	Manchester: Little & McKinney, Inc.	9.26	19.25	18.00	5.18	7.00	3.64	3.50
8549	Red Comb Fleshing Pellets	Manchester: Little & McKinney, Inc.	8.88	19.25	17.50	4.23	6.00	3.42	3.50
8857	Red Comb Growing Mash	Groton: C. W. Campbell Co.	8.81	17.44	16.00	6.05	7.00	4.05	3.50
8548	Victoria Rabbit Feed	Manchester: Little & McKinney, Inc.	7.77	16.00	12.00	9.75	15.00	3.95	2.00

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water	Protein (N x 6.25) Found	Protein Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	A. E. Hall, Wallingford, Conn.								
7911	Hall's Chick Starter	Wallingford: A. E. Hall	9.64	18.75	18.00	5.26	6.00	4.82	4.00
7912	Hall's Growing Mash	Wallingford: A. E. Hall	9.48	16.13	16.00	5.15	7.00	4.54	4.00
7913	Hall's Laying Mash	Wallingford: A. E. Hall	9.40	20.00	20.00	5.71	7.00	4.73	4.00
	Harper Feed Mills, Inc., Pittsburgh, Pa.								
8772	Harco Starting and Growing Mash	Hampton: D. T. Philips	8.80	18.06	18.00	5.18	7.00	3.50	3.25
	The Hubinger Co., Keokuk, Iowa								
8865	Ke-Ok-Uk Corn Gluten Feed	Norwich: The Yantic Grain & Products Co.	7.37	24.50	23.00	5.23	8.50	1.69	2.00
	International Milling Co., Minneapolis, Minn.								
8210	Blackhawk Wheat Red Dog	Seymour: Seymour Grain & Coal Co.	11.47	15.75	16.00	2.25	4.00	2.41	2.00
7972	Blackhawk Wheat Standard Middlings with Ground Screenings	Southington: Louis Perillo Coal Co.	11.38	16.88	16.00	4.84	9.00	4.42	3.00
	Interstate Farmers' Co-Op. Exchg., Inc., Moosup, Conn.								
8459	Interstate Laying Mash	Moosup: Interstate Farmers' Co-Op. Exchg., Inc.	6.75	18.94	14.00	6.18	7.00	5.53	4.00
	Kasco Mills, Inc., Waverly, N. Y.								
8391	Kasco All Mash Grower	Amston: Amston Grain Mill	8.68	16.50	15.00	6.75	7.00	3.57	3.00
8293	Kasco Beatsall 16% Ration	Portland: Valley Mills	9.24	16.13	16.00	6.80	10.00	3.80	3.50
8291	Kasco Broiler-Starter Ration	Portland: Valley Mills	8.64	19.25	18.00	6.08	7.50	3.93	3.00
8295	Kasco Complete Rabbit Ration	Portland: Valley Mills	10.40	15.25	12.00	8.70	15.00	3.30	2.00
8292	Kasco Egg Producer	Portland: Valley Mills	7.90	21.88	20.00	6.75	7.50	4.55	3.00
8390	Kasco 18% Milk Maker	Amston: Amston Grain Mill	8.68	19.38	18.00	7.43	10.00	4.22	3.50
8294	Kasco Pig Hog Feed	Portland: Valley Mills	8.11	21.63	20.00	6.60	8.00	5.28	4.00
8297	Kasco Poultry Flushing Mash	Portland: Valley Mills	8.10	17.00	17.00	6.70	6.00	3.59	3.00
	Kellogg Sales Co., Battle Creek, Mich.								
8226	Kellogg's Hominy Feed	Ansonia: Reliable Grain & Fuel Co.	8.26	10.69	10.00	4.50	5.00	7.86	6.00
	Spencer Kellogg & Sons, Inc., Buffalo, N. Y.								
7960	Kellogg's 32% Protein Old Process Linseed Oil Meal	Canaan: Community Service, Inc.	10.21	31.75	32.00	8.07	9.00	4.82	3.50
7991	Kellogg's 34% Protein Old Process Linseed Oil Meal	Guilford: Fred C. Morse & Son	9.61	34.25	34.00	7.86	9.00	4.45	3.50
8335	Kellogg's 41% Protein Soybean Oil Meal	Bridgeport: Brooklawn Grain & Feed Co.	6.08	44.06	41.00	5.00	7.00	6.08	3.50
	Chas. A. Krause Milling Co., Milwaukee, Wis.								
7970	Badger White Hominy Feed	Southington: Louis Perillo Coal Co.	10.50	11.31	10.00	4.77	6.00	6.08	6.00
	H. P. Kysor Feed & Grain Co., Plainville, Conn.								
7946	Kysor's A-1 Laying Mash with Cod Liver Oil	Plainville: State Farmers', Inc.	9.80	18.81	19.50	5.02	7.00	4.30	4.00

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No	Manufacturer and brand	Retail dealer in Connecticut	Pounds per hundred (or percent): Water	Protein (N x 6.25): Found	Protein (N x 6.25): Guaranteed not less than	Fiber: Found	Fiber: Guaranteed not more than	Fat: Found	Fat: Guaranteed not less than
	Laakso & Laakso, Plainfield, Conn.								
8815	L & L Layer Mash	Plainfield: Laakso & Laakso	10.28	20.31	19.50	5.80	8.00	4.02	4.00
8814	L & L Starter and Broiler Mash	Plainfield: Laakso & Laakso	9.75	20.25	19.00	5.78	6.00	4.24	4.00
	The Laden Bros. Co., Inc., Wallingford, Conn.								
7823	Laden's Laying Mash	Wallingford: The Laden Bros. Co., Inc.	9.32	15.19	18.00	6.63	5.00	4.35	5.50
	The Larabee Flour Mills Co., Kansas City, Mo.								
8161	"Sunfed" Winter Wheat Bran (Without Screenings)	Winsted: The Leonard Grain Co.	11.68	18.06	15.00	9.28	11.00	4.32	3.50
	Larrowe Milling Co., Div. of General Mills, Detroit, Mich.								
7992	Dried Beet Pulp	Guilford: Fred C. Morse & Son	9.95	8.63	7.00	18.57	22.50	0.70	0.30
	E. W. Latimer, So. Coventry, Conn.								
8591	College 16% Dairy Ration	So. Coventry: E. W. Latimer	9.64	18.00	16.00	5.95	9.00	4.12	4.00
8582	College Fitting Ration	So. Coventry: E. W. Latimer	8.60	18.38	14.00	7.08	9.00	4.73	4.00
8584	College Growing Mash	So. Coventry: E. W. Latimer	8.59	18.56	17.50	5.68	6.00	4.83	3.50
8583	College Mash with Oil	So. Coventry: E. W. Latimer	8.10	18.38	17.50	6.45	8.00	5.10	4.50
8585	College Starter and Broiler	So. Coventry: E. W. Latimer	9.03	18.00	16.50	5.50	6.50	4.00	3.50
	Libner Grain Co., Inc., Norwalk, Conn.								
8406	12% Libner's Blue Ribbon Fitting Ration	Norwalk: Libner Grain Co., Inc.	9.40	19.81	12.00	4.58	9.00	3.31	4.00
8397	Libner's Blue Ribbon Growing Mash (with Cod Liver Oil)	Norwalk: Libner Grain Co., Inc.	8.65	21.19	18.00	5.65	6.00	4.52	4.00
8395	Libner's Blue Ribbon Hog Ration (with Cod Liver Oil)	Norwalk: Libner Grain Co., Inc.	8.95	21.50	20.00	4.25	6.50	3.88	3.00
8396	Libner's Blue Ribbon Milk Egg Mash (with Cod Liver Oil)	Norwalk: Libner Grain Co., Inc.	8.85	21.88	20.00	5.35	6.50	4.36	3.00
8407	Libner's Blue Ribbon Starter and Broiler Mash (with Cod Liver Oil)	Norwalk: Libner Grain Co., Inc.	9.13	22.38	18.00	3.80	6.00	3.74	4.00
8394	20% Milkflow Dairy Ration	Norwalk: Libner Grain Co., Inc.	9.78	19.13	20.00	4.28	9.00	3.22	4.00
	Litchfield County Co-op. Assoc., Inc., Torrington, Conn.								
8085	"Common Sense" Horse Ration	Torrington: Litchfield County Co-op. Assoc., Inc.	10.17	12.50	10.00	5.88	9.00	3.43	3.00
8084	"Common Sense" Scratch	Torrington: Litchfield County Co-op. Assoc., Inc.	11.47	12.25	9.00	2.90	4.00	2.83	2.50
8082	"Common Sense" Starting and Growing Mash	Torrington: Litchfield County Co-op. Assoc., Inc.	10.39	17.06	18.00	5.38	7.00	4.29	4.00
	Long Hill Feed Store, Long Hill, Conn.								
8337	Improved Square Deal Dairy Ration	Long Hill: Long Hill Feed Store	5.55	21.88	20.00	7.08	10.00	4.12	4.50
8338	Square Deal Buttermilk Laying Mash	Long Hill: Long Hill Feed Store	5.75	19.38	20.00	6.08	7.00	4.80	5.00

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Pounds per hundred (or percent)						
				Protein (N x 6.25)		Fiber		Fat	
			Water	Found	Guaranteed not less than	Found	Guaranteed not more than	Found	Guaranteed not less than
	L. B. Lovitt & Co., Memphis, Tenn.								
8667	"Lovit Brand" 41% Protein Cottonseed Meal, Prime Quality	Quinebaug: M. T. Dart	7.74	40.00	41.00	10.95	13.00	5.67	5.00
	E. Manchester & Sons, Winsted, Conn.								
8120	Huntington Red Star Egg Mash	Winsted: E. Manchester & Sons	9.91	18.50	16.00	5.13	6.00	5.50	4.00
8147	Red Star Horse Feed with Molasses	Winsted: E. Manchester & Sons	13.86	9.88	8.00	5.40	10.00	3.00	3.00
8122	Red Star Pig Feed	Winsted: E. Manchester & Sons	9.81	14.88	12.00	3.98	8.00	3.98	4.00
8146	Red Star Scratch Feed	Winsted: E. Manchester & Sons	12.57	12.50	9.00	3.45	6.00	3.05	2.00
8119	Red Star Special Dairy Feed	Winsted: E. Manchester & Sons	9.43	20.88	18.00	5.95	10.00	4.78	4.00
8121	Red Star Starting and Growing Mash	Winsted: E. Manchester & Sons	9.92	19.13	16.00	5.70	6.00	5.23	4.00
	Maine Fish Meal Co., Portland, Me.								
8820[1]	Maine Vitamin "D" Concentrate	Dayville: Dayville Grain & Feed Co.	8.98	50.00	50.00	0.88	1.00	18.54	10.00
	Maritime Milling Co., Inc., Buffalo, N. Y.								
7829	B-B Broiler Ration	Windsor: Farmers Grain & Hardware Co.	10.87	19.13	20.00	6.20	7.00	3.69	3.50
7827	B-B Bull Brand Special Dairy Feed 18% Protein	Windsor: Farmers Grain & Hardware Co.	11.24	17.75	18.00	7.58	12.00	4.32	3.50
7824	B-B Egg Mash	Windsor: Farmers Grain & Hardware Co.	9.53	21.44	20.00	5.55	9.00	3.91	3.50
7828	B-B Growing Mash	Windsor: Farmers Grain & Hardware Co.	10.90	17.69	17.00	6.58	8.00	3.56	3.50
8372	B-B Horse Feed	East Hampton: Ed. Elkins	10.24	12.88	9.00	6.88	10.00	3.82	2.00
8299	B-B Pig and Hog Feed	Portland: J. Ahlberg	9.15	15.31	14.00	7.38	9.00	3.28	3.50
7826	Daisy Scratch Feed	Windsor: Farmers Grain & Hardware Co.	13.07	11.50	9.00	2.80	5.00	2.78	2.50
7825	Dollar Maker Egg Mash	Windsor: Farmers Grain & Hardware Co.	9.32	20.19	19.00	5.85	8.00	3.57	3.50
8298	Hi-Test Dairy Feed 18% Protein, Sweetened	Portland: J. Ahlberg	8.67	18.50	18.00	5.83	12.00	3.32	3.50
	Meech & Stoddard, Inc., Middletown, Conn.								
8285	Red Wing 16% Dairy Feed	Middletown: Meech & Stoddard, Inc.	9.23	19.13	16.00	10.03	10.00	3.80	3.50
8287	Red Wing Growing Mash	Middletown: Meech & Stoddard, Inc.	8.50	16.56	16.00	7.08	7.50	3.33	3.50
8286	Red Wing Laying Mash	Middletown: Meech & Stoddard, Inc.	8.42	16.38	17.00	6.73	7.00	3.14	3.00
8288	Red Wing Starting Mash	Middletown: Meech & Stoddard, Inc.	8.65	16.56	16.00	4.83	6.00	3.21	3.50
	Miner-Hillard Milling Co., Wilkes-Barre, Pa.								
8052	Steam Cooked Hominy Feed	Danielson: Dayville Grain & Feed Co.	8.50	11.63	10.00	4.35	5.00	7.37	5.00
	Geo. Q. Moon & Co., Inc., Binghamton, N. Y.								
8539	Complete Starter and Broiler Mash	Unionville: Farmington Grain & Lumber Co.	9.18	18.56	18.50	6.58	6.00	3.50	3.50
8421	Fitting Ration	Higganum: Higganum Feed Store	10.71	17.13	13.00	6.55	9.00	3.60	3.00
8318	Hog Feed	Stratford: Chas. Zimmerman & Sons	10.54	17.19	13.00	5.03	8.00	3.10	3.50
8683	Moon's Baby Chick Grains	Norfolk: A. P. Curtis	10.59	12.69	10.00	1.98	3.00	1.73	2.50
8426	Moon's Baby Chick Starter Mash	Higganum: Higganum Feed Store	9.04	17.88	15.00	5.55	6.00	3.79	3.50
8087	Moon's Developing Grains	Torrington: Litchfield County Co-op. Assoc., Inc.	11.09	11.81	10.00	2.18	5.00	3.92	2.00

[1] See also vitamin D carriers—Table 2.

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water	Protein (N x 6.25) Found	Protein Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	Geo. Q. Moon & Co., Inc.—*Cont.* Binghamton, N. Y.								
8089	Moon's Growing Mash	Torrington: Litchfield County Co-op. Assoc., Inc.	10.00	17.56	17.00	4.88	7.00	4.00	3.50
8317	Moon's 90 Horse Feed with Molasses	Stratford: Chas. Zimmerman & Sons	10.71	13.63	9.00	9.10	10.00	3.19	3.00
8320	Moon's Laying Mash (Pellets)	Stratford: Chas. Zimmerman & Sons	4.95	19.44	20.00	5.93	9.00	2.93	3.50
8086	Moon's Scratch Feed	Torrington: Litchfield County Co-op. Assoc., Inc.	11.79	12.00	10.00	3.03	5.00	2.82	2.00
8316	Moon's Special A Laying Mash	Stratford: Chas. Zimmerman & Sons	8.81	19.25	18.00	5.08	9.00	3.18	3.50
8319	Moon's Turkey Growing Mash	Stratford: Chas. Zimmerman & Sons	8.77	18.63	20.00	6.33	6.50	3.80	3.50
8091	Special A 16% Dairy Ration	Torrington: Litchfield County Co-op. Assoc., Inc.	10.67	16.50	16.00	5.70	10.00	4.29	4.00
8088	Special A 18% Dairy Ration	Torrington: Litchfield County Co-op. Assoc., Inc.	10.19	18.13	18.00	6.08	10.00	4.28	4.00
	Fred C. Morse & Son, Guilford, Conn.								
7986	Breeding Mash	Guilford: Fred C. Morse & Son	10.35	20.31	20.00	4.67	7.50	3.94	4.00
7988	Old Mill Broiler Mash	Guilford: Fred C. Morse & Son	10.30	19.00	20.00	6.26	7.50	4.61	4.00
7987	Old Mill 16% Dairy Ration	Guilford: Fred C. Morse & Son	10.86	16.56	16.00	6.09	10.00	4.35	4.00
7980	Old Mill 18% Dairy Ration	Guilford: Fred C. Morse & Son	10.18	18.25	18.00	6.55	9.00	4.37	4.00
7985	Old Mill Fitting Feed	Guilford: Fred C. Morse & Son	11.91	14.25	12.00	4.24	8.00	4.04	4.00
7979	Old Mill Green Label Laying Mash	Guilford: Fred C. Morse & Son	10.94	18.75	20.00	4.48	7.50	3.92	4.00
7981	Old Mill Growing Mash	Guilford: Fred C. Morse & Son	10.18	19.75	18.00	5.58	7.00	4.46	4.00
7989	Old Mill Horse Feed	Guilford: Fred C. Morse & Son	11.32	12.25	12.00	5.45	8.00	3.85	2.50
7990	Old Mill Intermediate Chick Feed	Guilford: Fred C. Morse & Son	10.97	12.13	10.00	1.96	4.00	3.08	2.50
7983	Old Mill Red Label Laying Mash	Guilford: Fred C. Morse & Son	10.37	19.06	18.00	4.77	7.50	3.74	4.00
7984	Old Mill Scratch Feed	Guilford: Fred C. Morse & Son	11.88	11.44	10.00	2.59	4.00	3.25	2.00
7982	Old Mill Starting Mash	Guilford: Fred C. Morse & Son	10.34	17.88	18.00	5.29	6.00	4.50	4.50
	Moses Bros. Co., Inc., Eaton, N. Y.								
7949	Moco Competitive Scratch Feed	Plainville: State Farmers, Inc.	11.18	11.06	10.00	2.69	5.00	2.75	2.00
7947	Moco Eggetter Mash	Plainville: State Farmers, Inc.	9.78	18.19	17.00	5.77	6.50	4.19	4.00
8268	Moco Hog Ration	Kensington: A. S. Labieniec	10.18	12.31	14.00	4.23	7.00	3.50	3.50
8786	Moco Perfection Laying Mash	Kent: H. H. Taylor & Son	9.38	22.06	19.00	6.78	7.00	4.53	4.00
7948	Moco Perfection Starting and Growing Mash	Plainville: State Farmers, Inc.	10.01	18.75	18.00	6.14	7.00	4.58	4.00
8266	Moco Steamline 18% Dairy Ration	Kensington: A. S. Labieniec	9.45	18.06	18.00	6.05	10.00	3.28	4.00
8787	Moco "Superior" Eighteen Dairy Ration	Kent: H. H. Taylor & Son	10.93	19.81	18.00	5.90	8.00	3.45	4.00
	National Distillers Products Corp., New York, N. Y.								
8002	Produlac Brand Dried Corn Distillers Grains with Solubles	Guilford: Fred C. Morse & Son	6.39	28.25	27.00	7.72	9.00	8.75	8.00
	National Lead Co., New York, N. Y.								
8280	Dutch Boy 34% Linseed Oil Meal	Granby: E. H. Rollins & Sons, Inc.	8.69	35.69	34.00	7.25	10.00	5.52	4.50
	Ogden Grain Co., Utica, N. Y.								
8631	"Biddy" Laying Mash	Quinebaug: M. T. Dart	9.68	19.25	18.00	5.05	7.00	3.73	4.00
8648	Cloverbloom 18% Dairy Ration	Quinebaug: M. T. Dart	8.90	19.38	18.00	8.90	12.00	2.93	3.50
8665	Pilgrim 16% Dairy Feed	Quinebaug: M. T. Dart	7.81	18.75	16.00	7.85	8.00	3.80	4.00
8649	Pilgrim Pig Feed	Quinebaug: M. T. Dart	9.53	19.94	16.00	5.68	10.00	4.00	3.50

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water	Protein (N x 6.25) Found	Protein Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	S. V. Osborn Estate, Branford, Conn.								
7860	Osborn Scratch	Branford: S. V. Osborn Estate	12.57	10.50	10.00	2.20	5.00	3.25	2.00
	The Park & Pollard Co., Buffalo, N. Y.								
8384	Bulky Sweet Dairy Feed	Amston: Amston Grain Mill	9.28	16.50	12.00	10.15	12.00	2.97	2.50
8476	Claco Dairy Ration	Southbury: C. L. Adams Co.	9.37	18.25	18.00	7.00	9.00	3.61	3.50
8234	Doublex 16% Dairy Ration	Naugatuck: Spencer Grain Co.	9.62	17.31	16.00	7.50	12.00	3.56	3.50
8163	Doublex 18% Dairy Ration	Winsted: The Leonard Grain Co.	9.42	19.44	18.00	10.35	11.00	3.72	3.50
8380	Go-Tu-It Pig and Hog Ration	Colchester: L. Broder & Co.	9.24	21.44	15.00	6.50	8.00	3.10	3.00
8392	Hi-Valu Scratch Feed (Pellets) (A Lay or Bust Feed)	Amston: Amston Grain Mill	8.30	12.69	11.50	6.23	8.00	3.01	2.50
8068	Intermediate Chick Feed (A Lay or Bust Feed)	Thomaston: Thomaston Grain & Coal Co.	9.72	13.81	10.00	2.58	3.50	2.88	2.00
8232	Lay or Bust Dry Mash	Naugatuck: Spencer Grain Co.	8.98	20.38	18.00	6.88	7.00	3.16	3.00
8414	Milkade Calf Meal	Essex: Essex Grain Co.	8.89	23.44	20.00	5.10	6.50	3.52	3.50
8389	Milkade Calf Starter (Pelleted)	Amston: Amston Grain Mill	8.12	23.94	22.00	5.25	5.00	4.22	4.00
8379	Milkmaid 16% Dairy Ration	Colchester: L. Broder & Co.	8.50	21.63	16.00	7.55	10.00	3.62	3.50
8065	Milkmaid 18% Dairy Ration	Thomaston: Thomaston Grain & Coal Co.	9.96	19.81	18.00	7.33	10.00	4.10	3.50
8413	Nine to One Scratch	Essex: Essex Grain Co.	11.09	13.00	11.00	2.30	4.00	2.04	1.50
8069	Paramount Dairy Ration (Black Rock Mfg. Corp.)	Waterbury: H. S. Coe & Co., Inc.	8.34	18.50	18.00	11.43	10.00	4.21	3.50
8027	Park & Pollard Breeder Mash (A Lay or Bust Feed)	Willimantic: W. D. Grant Co.	9.22	21.44	20.00	5.75	7.00	3.18	3.00
8025	Park & Pollard Chick Scratch (A Lay or Bust Feed)	Willimantic: W. D. Grant Co.	11.71	12.50	10.00	1.53	3.00	2.29	2.00
8024	Park & Pollard Chick Starter (A Lay or Bust Feed)	Willimantic: W. D. Grant Co.	9.83	22.44	17.00	5.34	6.00	3.73	3.00
8071	Park & Pollard Economy Scratch Feed	Waterbury: H. S. Coe & Co., Inc.	10.56	13.50	10.00	3.45	5.00	2.46	1.50
8385	Park & Pollard Fitting Ration	Amston: Amston Grain Mill	9.66	14.38	12.00	5.73	8.00	2.82	3.00
8236	Park & Pollard Fleshing Pellets (A Lay or Bust Feed)	Naugatuck: Spencer Grain Co.	8.91	18.38	16.00	7.15	7.00	3.10	3.00
8070	Park & Pollard Growing Feed (A Lay or Bust Feed)	Waterbury: H. S. Coe & Co., Inc.	9.13	18.56	16.00	6.63	7.00	3.27	3.00
8289	Park & Pollard Growing Pellets	Middletown: P. Levson & Son	7.70	16.25	15.50	7.43	7.00	3.22	3.00
8160	Park & Pollard Horse Feed	Winsted: The Leonard Grain Co.	11.50	11.06	10.00	5.98	9.00	3.94	3.00
8028	Park & Pollard Layer and Breeder Pellets	Willimantic: W. D. Grant Co.	9.33	20.00	20.00	5.96	6.50	3.27	3.00
8162	Park & Pollard Manamar Fitting Ration	Winsted: The Leonard Grain Co.	11.45	13.63	12.00	5.33	7.00	4.25	3.00
8026	Park & Pollard Starter and Broiler Mash (A Lay or Bust Feed)	Willimantic: W. D. Grant Co.	9.75	20.44	18.00	5.71	6.00	3.32	3.50
8233	Park & Pollard Stock Feed	Naugatuck: Spencer Grain Co.	9.87	9.63	9.00	7.60	12.00	3.10	3.00
8231	Park & Pollard Turkey Grower (A Lay or Bust Feed)	Naugatuck: Spencer Grain Co.	8.42	22.81	20.00	5.85	7.00	3.54	3.00
8594	Park & Pollard Turkey Starter (A Lay or Bust Feed)	Litchfield: The Geo. J. Switzer Co.	9.76	26.94	26.00	6.08	6.00	4.00	3.00
8230	Rabbit Pellets	Naugatuck: Spencer Grain Co.	9.55	15.63	13.00	6.43	12.00	3.89	3.00
8066	Red Ribbon Scratch Feed (A Lay or Bust Feed)	Thomaston: Thomaston Grain & Coal Co.	10.10	13.25	10.00	2.93	5.00	3.03	2.00
8235	Yankee Horse Feed	Naugatuck: Spencer Grain Co.	10.15	12.06	10.00	5.40	9.00	3.78	3.00
	The Patent Cereals Co., Geneva, N. Y.								
7853	Hominy Feed	Milford: Milford Grain Co.	9.80	9.13	9.00	4.58	5.00	5.69	5.00

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Pounds per hundred (or percent) Water	Protein (N x 6.25) Found	Protein Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	Louis Perillo Coal Co., Southington, Conn.								
7965	Perillo's Wellworth Laying Mash	Southington: Louis Perillo Coal Co.	10.54	20.25	18.00	7.59	7.00	4.60	4.00
7966	Perillo's Wellworth Starting and Growing Mash	Southington: Louis Perillo Coal Co.	10.76	18.13	18.50	6.98	5.50	5.14	4.00
	A. D. Pierce, Brooklyn, Conn.								
8773	Pierce Laying Mash	Brooklyn: A. D. Pierce	8.96	20.25	19.00	7.18	6.80	4.51	4.50
8774	Pierce Starter and Broiler	Brooklyn: A. D. Pierce	8.82	20.50	17.50	6.48	6.50	4.55	4.50
	Pierce Grain Corp., Buffalo, N. Y.								
8229	18% Reliance Dairy Ration	Naugatuck: Reliable Grain & Fuel Co.	9.73	21.38	18.00	6.35	10.00	5.20	3.00
	Pillsbury Flour Mills Co., Minneapolis, Minn.								
8533	Pillsbury's Fancy Wheat Mixed Feed With Ground Wheat Screenings	Danbury: Benjamin Grain Co.	9.60	19.00	15.00	5.73	8.50	5.09	4.00
8269	Pillsbury's Hard Wheat Bran with Ground Wheat Screenings	Kensington: A. S. Labieniec	9.13	16.50	14.00	9.68	12.00	5.00	4.00
8523	Pillsbury's Hard Wheat Standard B Middlings With Ground Wheat Screenings	Danbury: Barnum's Feed Store	8.92	20.19	15.00	8.80	9.50	5.69	4.00
7818	Pillsbury's XX Daisy	Montowese: Osmun's Feed Service	9.83	21.69	16.00	3.55	4.00	5.75	4.00

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water	Protein Found	Protein Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	Pittsburgh Plate Glass Co., Newark, N. J.								
8596	Red Wing 32% Protein Old Process Linseed Meal	Washington Depot: Washington Supply Co.	8.67	34.56	32.00	7.30	9.00	6.08	4.00
	Pratt Food Co., Inc., Buffalo, N. Y.								
8622	Pratt's All Mash Laying Ration (Pellets)	Bristol: Bristol Grain & Supply Co.	8.32	19.56	16.50	5.75	7.00	4.00	3.50
8816	Pratt's Broiler Mash	Plainfield: Laakso & Laakso	9.10	18.44	18.00	5.23	7.00	3.93	3.50
8618	Pratt's Calf Meal	Bristol: Bristol Grain & Supply Co.	8.82	22.75	24.50	5.30	4.00	4.76	4.00
8620	Pratt's Chick Starter	Bristol: Bristol Grain & Supply Co.	8.80	18.94	18.00	5.23	7.00	4.10	3.50
8117	Pratt's Complete Rabbit Pellets	Norwalk: Independent Feed Store	8.66	17.63	17.00	13.65	20.00	4.43	2.00
8623	Pratt's Goat Ration	Bristol: Bristol Grain & Supply Co.	9.86	16.06	16.00	4.75	10.00	3.07	4.00
8118	Pratt's Laying Mash	Norwalk: Independent Feed Store	10.01	20.88	20.00	6.33	7.25	4.63	3.50
8619	Pratt's Pig and Hog Meal	Bristol: Bristol Grain & Supply Co.	9.18	16.25	16.00	5.72	8.00	3.10	4.00
8617	Pratt's Sweet 16% Dairy Feed 16-4-9	Bristol: Bristol Grain & Supply Co.	8.93	16.50	16.00	7.43	9.00	2.85	4.00
8621	Pratt's Turkey Growing and Finishing Mash	Bristol: Bristol Grain & Supply Co.	8.85	17.06	16.00	5.30	7.50	4.40	3.50
8359	Utility Horse Feed	Saugatuck: L. H. Gault & Sons, Inc.	8.00	11.81	9.00	7.53	11.00	2.93	2.00
8116	Utility Laying Mash	Norwalk: Independent Feed Store	9.29	20.81	20.00	5.73	8.00	4.08	3.50
	The Quaker Oats Co., Chicago, Ill.								
8174	Big Egg Laying Mash (Pellets)	Shelton: Wolf's Feed Store	10.03	20.31	20.00	6.18	8.00	4.32	3.00
7901	Big Egg Scratch Grains	Stepney: Wirthmore Grain & Coal Co.	11.13	13.88	9.50	2.40	3.50	2.89	2.00
8172	Early Bird Coarse Chick Feed	Shelton: Wolf's Feed Store	10.64	12.88	9.50	2.68	3.50	2.75	2.00
8575	Ful-O-Pep Broiler Mash	Manchester: Little & McKinney, Inc.	7.69	19.88	19.00	5.88	8.00	4.83	4.00
8529	Ful-O-Pep Calf Starter (Pellets)	Danbury: Barnum's Feed Store	7.75	21.63	20.00	6.13	8.00	5.25	4.50
8195	Ful-O-Pep Chick Starter	Thompsonville: The Geo. S. Phelps Co.	8.10	17.56	17.00	5.08	7.00	5.45	4.50
8694	Ful-O-Pep Coarse Chick Feed	Bethel: Morrison & Dunham	10.94	12.50	10.00	2.40	2.50	2.09	2.00
8345	Ful-O-Pep Crate Fattener	Fairfield: Fairfield Grain & Seed Co.	5.43	16.63	13.00	6.90	8.00	4.80	3.00
8573	Ful-O-Pep 18% Dairy Ration	Manchester: Little & McKinney, Inc.	7.75	19.00	18.00	7.73	9.00	4.59	3.75
8515	Ful-O-Pep Egg-Breeder Mash	Danbury: Barnum's Feed Store	8.67	20.06	20.00	5.65	8.00	5.05	4.50

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Pounds per hundred (or percent): Water	Protein (N x 6.25): Found	Protein (N x 6.25): Guaranteed not less than	Fiber: Found	Fiber: Guaranteed not more than	Fat: Found	Fat: Guaranteed not less than
	The Quaker Oats Co.—*Cont.* **Chicago, Ill.**								
8572	Ful-O-Pep Fitting Ration	Manchester: Little & McKinney, Inc.	8.55	15.81	14.00	7.63	10.00	3.81	3.50
8693	Ful-O-Pep Growing Mash	Bethel: Morrison & Dunham	8.00	19.81	19.00	5.95	7.00	5.22	4.50
8576	Ful-O-Pep Horse Feed	Manchester: Little & McKinney, Inc.	7.69	13.25	12.00	7.20	10.00	4.15	3.00
8193	Ful-O-Pep Laying Mash	Thompsonville: The Geo. S. Phelps Co.	9.13	20.31	20.00	6.83	8.00	3.65	4.00
8577	Ful-O-Pep Pig-N-Sow Feed	Manchester: Little & McKinney, Inc.	7.42	17.56	16.00	6.95	8.00	4.23	4.00
8520	Ful-O-Pep Scratch Grains	Danbury: Barnum's Feed Store	10.30	11.50	9.00	2.25	3.00	2.64	2.00
8173	Ful-O-Pep Super Greens (Pellets)	Shelton: Wolf's Feed Store	9.63	17.63	17.00	6.68	8.00	5.10	4.50
8282	Peterborough Oat Feed	Middletown: Meech & Stoddard, Inc.	6.09	5.69	3.50	28.41	32.50	1.83	1.00
8691	Quaker 16% Protein Dairy Ration	Bethel: Morrison & Dunham	6.62	16.94	16.00	13.75	15.00	4.44	3.00
8574	Quaker 18% Protein Dairy Ration	Manchester: Little & McKinney, Inc.	6.97	18.50	18.00	12.73	14.00	4.66	3.00
8511	Quaker Green Cross Horse Feed	Danbury: Barnum's Feed Store	10.13	12.69	10.00	8.43	12.00	3.72	2.50
8324	Quaker Schumacher Feed	Stratford: Farmers Flour & Grain Co.	3.80	11.88	10.00	9.83	12.00	3.93	3.00
8532	Quaker Sugared Schumacher Feed	Danbury: Barnum's Feed Store	8.32	12.38	10.00	8.68	12.00	4.27	3.00
	The Ralston Purina Co., St. Louis, Mo.								
8862	Chowmix Hog Feed B	Norwich: Checkerboard Feed Store	9.05	15.81	13.00	4.18	7.00	5.00	2.50
8416	Ontario 18% Dairy Feed	Deep River: Checkerboard Feed Store	9.01	20.38	18.00	10.88	11.00	2.63	3.00
8415	Oswego Growing Feed	Deep River: Checkerboard Feed Store	8.65	20.50	16.00	6.50	7.00	3.46	3.00
8014	Purina Breeder Lay Chow	Willimantic: Checkerboard Feed Store	9.74	23.06	22.00	5.73	8.00	4.94	3.50
8015	Purina Breeder Layena (Complete Ration)	Willimantic: Checkerboard Feed Store	10.45	15.38	15.50	5.25	8.00	4.12	3.50
8017	Purina Broiler Chow	Willimantic: Checkerboard Feed Store	10.29	18.94	18.00	4.42	7.00	3.94	3.50
8110	Purina B and M Cow Chow	Stamford: Clapboard Hill Feed Co., Inc.	10.34	17.13	16.00	7.13	10.00	4.28	3.50
8453	Purina Calf Chow	Willimantic: Checkerboard Feed Store	8.66	22.63	27.00	4.03	5.00	3.73	3.00
8115	Purina Calf Startena	Stamford: Clapboard Hill Feed Co., Inc.	10.32	20.69	19.50	7.45	9.50	3.64	2.50
8598	Purina Chick Chow (Coarse)	Waterbury: Checkerboard Feed Store	9.76	11.25	9.00	2.10	4.00	2.42	2.00
8580	Purina Chick Fatena Checkers	Rockville: Rockville Grain & Coal Co.	9.26	16.56	14.00	5.20	7.00	3.70	3.50
8018	Purina Chick Growena	Willimantic: Checkerboard Feed Store	10.75	17.56	17.00	4.99	7.00	4.12	3.50
8013	Purina Chick Startena	Willimantic: Checkerboard Feed Store	10.73	19.19	18.00	3.45	7.00	4.38	4.00
8296	Purina 18% Cow Chow	Portland: Valley Mills, Inc.	8.74	18.13	18.00	8.48	12.00	4.60	3.00
8111	Purina Dry and Freshening Chow	Stamford: Clapboard Hill Feed Co., Inc.	11.00	13.13	12.50	8.68	14.00	3.55	2.00
8454	Purina Goat Chow	Willimantic: Checkerboard Feed Store	9.14	16.88	16.00	6.60	10.00	4.07	3.50
8112	Purina Hen Chow	Stamford: Clapboard Hill Feed Co., Inc.	11.30	11.50	9.00	2.35	4.00	2.37	2.00
8417	Purina Hog Fatena	Deep River: Checkerboard Feed Store	9.50	15.38	14.00	6.05	7.00	3.43	3.00
8306	Purina 18% Lay Chow	Plainville: August Torrero	8.92	19.06	18.00	5.88	8.00	3.61	3.00
8518	Purina 22% Lay Chow	Danbury: Barnum's Feed Store	8.82	23.06	22.00	6.83	8.00	4.27	3.50
8419	Purina Layena (Complete Ration)	Deep River: Checkerboard Feed Store	9.53	16.25	15.50	5.20	8.00	3.50	3.50
8597	Purina Milk Chow (16%)	Waterbury: Checkerboard Feed Store	9.50	16.56	16.00	6.90	10.00	3.51	3.00
8113	Purina Omolene	Stamford: Clapboard Hill Feed Co., Inc.	10.67	10.94	10.00	7.38	11.00	4.17	3.00
8528	Purina Rabbit Chow (Entire Ration)	Danbury: Barnum's Feed Store	10.75	15.63	13.50	10.55	16.00	3.23	2.50
8177	Purina Rabbit Chow Checkers (Entire Ration)	Windsor Locks: Windsor Locks Grain Co.	8.72	16.44	14.50	14.03	18.00	3.19	2.00
8418	Purina Rabbit Chow Supplement	Deep River: Checkerboard Feed Store	8.76	17.25	16.00	6.25	8.00	4.25	3.50

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water	Protein (N x 6.25) Found	Protein Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	The Ralston Purina Co.—*Cont.* St. Louis, Mo.								
8519	Purina Turkey Fatena Checkers	Danbury: Barnum's Feed Store	9.51	17.44	14.00	7.10	7.00	3.80	3.50
8114	Purina Turkey Growena	Stamford: Clapboard Hill Feed Co., Inc.	10.05	20.19	18.00	4.68	7.00	4.00	3.50
8224	Purina Turkey Startena	Ansonia: A. Hodos & Sons	8.85	26.38	24.00	6.13	7.00	5.35	4.00
	John Reardon & Sons, Div. of Wilson & Co., Inc., Cambridge, Mass.								
8433	Register Brand 45% Protein Meat and Bone Scrap	Westerly: C. W. Campbell Co.	4.83	43.69	45.00	..	..	11.16	8.00
	Reliable Grain & Fuel Co., Ansonia, Conn.								
8225	Reliable Growing Feed with Buttermilk and Cod Liver Oil	Ansonia: Reliable Grain & Fuel Co.	8.53	18.44	15.00	5.03	7.00	5.30	4.00
	E. H. Rollins & Sons, Inc., East Granby, Conn.								
8278	Connecticut's Best Dairy Feed	East Granby: E. H. Rollins & Sons, Inc.	9.38	22.06	20.00	6.03	6.00	4.00	4.00
8279	Connecticut's Best Growing Mash	East Granby: E. H. Rollins & Sons, Inc.	10.72	20.75	17.00	5.90	7.00	3.80	4.50
8281	Connecticut's Best Laying Mash	East Granby: E. H. Rollins & Sons, Inc	9.96	22.06	18.00	5.73	7.00	3.90	4.50
	H. M. Rubin Co., Long Island City, N. Y.								
8595	Rubco Meat Bone Scrap 50%	Washington Depot: Washington Supply Co., Inc.	5.51	45.44	50.00	1.73	3.00	8.44	5.00
8409	Rubco Meat Bone Scrap 55%	Norwalk: Libner Grain Co., Inc.	4.20	49.06	55.00	3.03	3.00	9.66	5.00
	Russell-Miller Milling Co., Minneapolis, Minn.								
8540	Hard Wheat Occident Bran	Unionville: Farmington Grain & Lumber Co.	9.11	19.56	14.00	10.03	11.50	5.50	4.00
8579	Occident Barley Base Mix	Moosup: Interstate Farmers Co-op. Exchg., Inc.	8.97	19.00	16.50	10.63	10.00	2.23	3.00
	Schoeneck Farms, Inc., Nazareth, Pa.								
8064	Schoeneck's Super Green Dehydrated Alfalfa Meal	Thomaston: Thomaston Supply Co.	7.34	13.56	17.00	23.43	25.00	3.23	2.00
	Sea Board Supply Co., Inc., Philadelphia, Pa.								
8063	Crab Meal	Thomaston: Thomaston Supply Co.	10.81	29.25	32.00	10.43	11.00	2.51	1.00
	Seymour Grain & Coal Co., Seymour, Conn.								
8206	Miracle Chick Starter and Broiler Ration	Seymour: Seymour Grain & Coal Co.	9.39	19.56	18.00	7.47	7.00	4.36	4.00
8204	16% Miracle Dairy	Seymour: Seymour Grain & Coal Co.	10.28	18.13	16.00	6.70	9.00	3.58	4.50
8203	Miracle Grower	Seymour: Seymour Grain & Coal Co.	10.33	19.50	16.00	6.28	6.00	4.08	4.00
8208	Miracle Horse Feed	Seymour: Seymour Grain & Coal Co.	10.20	11.31	10.00	6.00	9.00	5.00	3.50
8205	Miracle Scratch Feed	Seymour: Seymour Grain & Coal Co.	11.28	12.69	10.00	3.33	6.00	3.69	2.50
8211	Miracle Scratch Feed	Seymour: Seymour Grain & Coal Co.	11.05	13.63	10.00	3.13	6.00	2.53	2.50
8207	See-More Milk Dairy Ration	Seymour: Seymour Grain & Coal Co.	10.15	21.00	18.00	6.58	9.50	3.59	4.50

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water	Protein (N x 6.25) Found	Protein (N x 6.25) Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	The A. E. Shedd Co., Norwich, Conn.								
8439	Shedd's 18% Dairy Ration with Vitamin D	Norwich: The A. E. Shedd Co.	8.49	19.25	18.00	6.63	11.00	4.18	4.00
8436	Shedd's Fitting Ration with Vitamin D	Norwich: The A. E. Shedd Co.	8.24	15.81	12.00	6.68	11.00	4.81	3.50
8435	Shedd's Laying Mash	Norwich: The A. E. Shedd Co.	7.28	21.13	19.00	5.95	8.50	5.40	3.50
8437	Shedd's Special Broiler Mix Ration	Norwich: The A. E. Shedd Co.	7.10	20.56	17.50	6.50	7.50	5.59	4.00
8438	Shedd's Special Grower Mix	Norwich: The A. E. Shedd Co.	7.46	18.44	16.00	6.93	8.00	5.03	4.00
	A. E. Staley Mfg. Co., Decatur, Ill.								
8090	Staley's Corn Gluten Feed	Torrington: Litchfield County Co-op. Assoc., Inc.	10.15	25.69	23.00	7.38	8.00	3.25	1.50
8062	Staley's 41% Protein Soybean Oil Meal	Thomaston: Thomaston Supply Co.	10.50	42.94	41.00	5.38	7.00	4.43	3.50
	Standard Milling Co., Chicago, Ill.								
8408	Hecker's Choice Wheat Bran with Ground Wheat Screenings	Norwalk: Libner Grain Co., Inc.	9.63	16.00	13.50	10.08	13.00	5.20	3.50
7969	Hecker's Wheat Standard Middlings with Ground Wheat Screenings	Southington: Louis Perillo Coal Co.	11.10	18.75	15.00	6.13	9.50	5.08	4.00
8450	Wheat Bran	New Haven: The Moran-Patton Co.	8.16	16.06	14.00	10.93	12.00	5.33	4.00
	D. A. Stickell & Sons, Inc., Hagerstown, Md.								
8381	Blue Ridge Egg Mash	Colchester: P. Cutler, Inc.	8.87	23.19	20.00	5.35	6.00	3.98	5.00
8681	Blue Ridge Pig and Hog Ration	So. Windsor: So. Windsor Grain & Feed Co.	10.28	18.94	17.00	5.10	6.00	3.17	3.00
8326	Dairy Queen Sweet 20% Milk Maker	Stratford: Farmers Flour & Grain Co.	5.33	20.38	20.00	6.05	10.00	3.80	3.50
8340	Snap Scratch Grains	Long Hill: Long Hill Feed Store	6.95	12.69	10.00	2.70	5.00	2.10	2.50
8339	Stickell's Intermediate Chick Feed	Long Hill: Long Hill Feed Store	6.98	13.19	9.00	2.28	5.00	2.20	2.00
8673	Su-Pur All Mash Starter	Middlefield: Burnham's Store	8.95	19.88	16.50	5.35	5.00	3.83	4.00
8383	Su-Pur Broiler Mash	Colchester: P. Cutler, Inc.	8.20	20.69	18.00	5.23	6.00	3.95	3.50
8674	Su-Pur 16% Dairy and Fitting Ration	Middlefield: Burnham's Store	9.80	20.13	16.00	5.68	11.00	3.05	3.00
8382	Su-Pur Growing Mash	Colchester: P. Cutler, Inc.	8.33	20.13	17.00	4.85	6.00	3.60	4.00
8325	Su-Pur Horse and Calf Feed	Stratford: Farmers Flour & Grain Co.	6.48	11.88	9.00	5.98	12.00	4.13	2.50
8260	Su-Pur Rabbit Pellets	Meriden: Meriden Grain & Coal Co.	8.23	21.50	17.00	6.68	8.50	3.09	3.00
8680	Su-Pur Turkey Growing Mash (Pelleted)	So. Windsor: So. Windsor Grain & Feed Co.	8.57	25.19	22.00	5.53	6.00	4.94	4.00
8678	Victor Chick Feed	So. Windsor: So. Windsor Grain & Feed Co.	9.18	14.13	10.00	2.38	5.00	2.55	2.50
8365	Zip Egg Mash (Anchor Mills)	Saugatuck: Saugatuck Grain & Supply Co.	6.50	20.75	18.00	5.00	6.00	2.77	4.00
8271	Zip Growing Mash	New Britain: Wm. Cohen	8.18	20.50	15.00	5.08	6.00	3.25	4.00
	Thomaston Supply Co., Inc., Thomaston, Conn.								
8057	Thomaston Dairy Ration	Thomaston: Thomaston Supply Co., Inc.	8.53	20.06	20.00	7.90	9.00	4.95	4.00
8059	Thomaston Egg Mash with Fortified Vitamin A & D Feeding Oil	Thomaston: Thomaston Supply Co., Inc.	9.41	18.88	18.00	6.37	8.00	4.25	4.00
8056	Thomaston Growing Mash with Fortified Vitamin A & D Feeding Oil	Thomaston: Thomaston Supply Co., Inc.	9.90	16.75	15.00	5.82	8.00	3.90	4.00
8060	Thomaston Scratch Feed	Thomaston: Thomaston Supply Co., Inc.	11.14	11.00	10.00	2.38	5.00	3.20	3.00
8058	Thomaston Stock Feed	Thomaston: Thomaston Supply Co., Inc.	9.00	15.50	15.00	7.30	9.00	5.00	5.00

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water (Pounds per hundred (or percent))	Protein (N x 6.25) Found	Protein (N x 6.25) Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	Tioga Mills, Inc., Waverly, N. Y.								
8793	Chicatine	New Canaan: C. M. Jones	7.83	19.81	18.00	5.90	7.50	4.10	3.00
7868	Egatine	Hawleyville: W. A. Honan	9.84	21.25	20.00	5.11	7.50	4.29	3.00
7866	Tasty Laying Food	Hawleyville: W. A. Honan	9.69	19.75	18.00	5.44	7.50	4.41	3.00
7890	Ti-O-Ga Brood Sow and Shoat Feed	Hawleyville: W. A. Honan	10.11	16.94	16.00	6.57	8.50	4.18	3.50
7889	Ti-O-Ga Calf Food	Hawleyville: W. A. Honan	10.47	25.00	24.00	3.57	6.00	3.30	3.00
7888	Ti-O-Ga Calf Grower	Hawleyville: W. A. Honan	9.59	20.94	20.00	6.76	8.50	3.12	3.00
7884	Ti-O-Ga E-Gee 18% Dairy Feed	Hawleyville: W. A. Honan	8.95	19.00	18.00	8.00	10.00	5.60	4.00
7886	Ti-O-Ga Grower	Hawleyville: W. A. Honan	10.62	16.56	16.00	6.32	8.00	3.94	3.00
7867	Ti-O-Ga Growing Grains	Hawleyville: W. A. Honan	10.86	11.19	10.00	1.86	4.00	2.88	2.50
7882	Ti-O-Ga Horse Feed	Hawleyville: W. A. Honan	12.23	11.88	10.00	5.89	8.00	3.41	3.00
7885	Ti-O-Ga Poultry Grains	Hawleyville: W. A. Honan	10.47	12.81	9.50	2.93	4.50	2.87	2.50
7883	Ti-O-Ga Red Brand 24% Dairy Feed	Hawleyville: W. A. Honan	8.65	23.56	24.00	8.48	12.00	6.55	4.00
7887	Ti-O-Ga Starter and Grower	Hawleyville: W. A. Honan	9.55	18.75	17.00	5.48	7.50	3.48	3.00
	Jacob Trinley & Sons, Linfield, Pa.								
8213	Favorite Growing Mash	Ansonia: Ansonia Feed Co.	10.21	16.13	16.00	6.68	8.00	2.66	4.00
8212	Limerick Laying Mash	Ansonia: Ansonia Feed Co.	9.91	18.25	18.00	7.93	8.00	3.00	4.00
8217	Real Starter and Broiler Mash	Ansonia: Ansonia Feed Co.	9.78	17.19	16.00	7.00	6.00	2.93	4.00
7957	Supreme 85% Horse Feed	Canaan: Community Service, Inc.	12.92	10.00	9.00	7.23	11.00	3.60	2.50
	United Co-op. Farmers, Inc., Fitchburg, Mass.								
8777	Emergency All-Mash	Danielson: United Co-op. Farmers, Inc.	8.93	16.94	15.00	5.35	8.00	4.23	3.00
8041	United Farmers 16% Dairy Feed	Danielson: United Co-op. Farmers, Inc.	9.93	17.00	16.00	7.29	10.00	4.36	3.50
8779	United Farmers Fitting Ration	Danielson: United Co-op. Farmers, Inc.	9.36	14.25	12.00	5.65	9.00	2.75	3.50
8781	United Farmers Horse Feed	Danielson: United Co-op. Farmers, Inc.	9.35	14.25	10.50	6.88	6.50	4.29	3.50
8780	United Farmers Layer	Danielson: United Co-op. Farmers, Inc.	8.87	19.25	18.00	5.58	8.00	3.93	3.00
8040	United Farmers Milkmaker	Danielson: United Co-op. Farmers, Inc.	10.43	17.50	18.00	5.27	8.00	4.65	4.50
8778	United Farmers Starter	Danielson: United Co-op. Farmers, Inc.	8.94	19.56	18.00	5.15	8.00	4.07	4.00
	Unity Feeds, Inc., Boston, Mass.								
8342	Life Saver Mash	Fairfield: Fairfield Grain & Seed Co.	6.98	20.94	17.00	4.98	8.00	4.05	3.00
8343	Paycheck 18% Dairy Ration	Fairfield: Fairfield Grain & Seed Co.	6.30	20.38	18.00	7.35	11.00	4.99	4.00
8682	Unity Calf Starter	So. Windsor: So. Windsor Grain & Feed Co.	9.72	18.19	18.00	3.83	6.00	3.50	4.00
8189	Unity Complete Starting and Broiler Mash	Windsor Locks: The Windsor Locks Grain & Feed Co.	9.74	16.69	18.00	4.53	7.00	3.90	3.50
8030	Unity 18% Dairy Feed	Putnam: Putnam Farmers Co-op. Assoc., Inc.	9.13	20.25	18.00	6.63	10.00	4.50	4.00
8031	Unity Fitting Ration	Putnam: Putnam Farmers Co-op. Assoc., Inc.	9.44	15.81	12.00	6.37	7.00	5.50	4.00
8037	Unity Growing Mash	Putnam: Putnam Farmers Co-op. Assoc., Inc.	10.85	16.13	16.00	5.59	7.00	5.63	3.00
8032	Unity Horse Feed	Putnam: Putnam Farmers Co-op. Assoc., Inc.	13.13	12.50	10.00	5.00	9.00	3.70	3.00
8341	Unity Scratch Feed	Fairfield: Fairfield Grain & Seed Co.	7.90	12.88	10.00	3.30	5.00	2.42	2.50
8029	Unity Stock Feed	Putnam: Putnam Farmers Co-op. Assoc., Inc.	9.77	10.38	8.50	9.94	12.00	4.90	4.00
8344	Unity Turkey Starting and Growing Mash	Fairfield: Fairfield Grain & Seed Co.	6.58	19.06	22.00	4.63	7.00	4.03	4.00

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water	Protein (N x 6.25) Found	Protein (N x 6.25) Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	Ward Milk Products, Div. of Kraft Cheese Co., Chicago, Ill.								
8860	Ward Dried Skim Milk (Feeding)	Norwich: The A. E. Shedd Co.	7.34	32.69	32.00	..	..	0.60	0.50
	The Watertown Co-op. Assoc., Inc., Watertown, Conn.								
8599	Storr's Chick Starter	Watertown: The Watertown Co-op. Assoc., Inc.	9.79	17.63	19.00	4.60	7.00	3.76	4.00
8602	Storr's Growing Mash	Watertown: The Watertown Co-op. Assoc., Inc.	9.17	17.88	17.00	5.98	7.00	4.00	4.00
8603	Storr's Laying Mash	Watertown: The Watertown Co-op. Assoc., Inc.	9.47	18.75	18.00	6.40	7.00	4.11	4.00
8600	Storr's 16% Pasture Ration	Watertown: The Watertown Co-op. Assoc., Inc.	8.97	19.31	16.00	8.48	10.00	4.39	4.00
	Wayne County Grangers Feed Corp., Clyde, N. Y.								
8630	Superior Chick Starter	Eastford: Wm. S. Warren	9.45	21.63	17.50	5.40	7.00	4.29	4.00
8627	Superior 18% Dairy Feed	Hazardville: A. D. Bridges' Sons	9.29	21.25	18.00	8.80	10.00	4.00	4.00
8661	Superior Growing Mash	Eastford: Wm. S. Warren	9.53	18.00	16.00	6.18	7.00	4.09	3.50
8628	Superior Hog Ration	Hazardville: A. D. Bridges' Sons	10.80	18.25	16.00	4.95	7.00	3.14	3.50
8660	Superior Laying Mash	Hazardville: A. D. Bridges' Sons	9.26	18.94	16.00	6.78	7.50	4.28	3.50
8629	Superior Turkey Grower and Fattener	Eastford: Wm. S. Warren	9.62	21.44	20.00	6.10	7.00	3.59	4.00

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water	Protein (N x 6.25) Found	Protein (N x 6.25) Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	H. K. Webster Co., Lawrence, Mass.								
8322	Blue Seal All Mash Egg Ration	Stratford: Farmers Flour & Grain Co.	6.00	17.00	15.00	5.10	5.50	3.35	4.00
8321	Blue Seal All Mash Growing Ration	Stratford: Farmers Flour & Grain Co.	6.75	17.38	14.50	4.70	6.00	3.45	4.00
8775	Blue Seal Breeder's Laying Mash (Pellets)	Brooklyn: A. D. Pierce	7.95	20.88	20.00	7.85	6.50	5.01	4.00
8655	Blue Seal Calf Ration with Vitamin D Yeast	Thompsonville: The Geo. S. Phelps Co.	9.66	19.56	18.00	4.55	5.00	4.30	4.00
8192	Blue Seal "16" Dairy Ration	Thompsonville: The Geo. S. Phelps Co.	10.13	18.00	16.00	6.43	9.00	4.58	4.00
8096	Blue Seal Egg Mash	Cos Cob: Belmont Feed Co.	9.03	21.63	18.00	4.98	6.50	4.20	4.00
8190	Blue Seal Fitting Ration with Vitamin D Yeast	Thompsonville: The Geo. S. Phelps Co.	10.46	14.38	14.00	5.78	9.00	3.95	4.00
8194	Blue Seal Fleshing Pellets	Thompsonville: The Geo. S. Phelps Co.	8.84	18.75	15.00	4.93	5.00	4.58	4.50
8196	Blue Seal Growing Mash	Thompsonville: The Geo. S. Phelps Co.	8.72	20.44	18.00	6.23	7.00	4.30	4.00
8097	Blue Seal Horse Feed with Vitamin D Yeast	Cos Cob: Belmont Feed Co.	11.17	10.81	10.00	4.75	6.50	3.90	3.00
8492	Blue Seal Pig Feed with Vitamin D Yeast	Southbury: H. H. Stone	8.63	18.00	15.00	5.53	6.00	4.00	4.00
8191	Blue Seal Richford 16 Dairy Ration	Thompsonville: The Geo. S. Phelps Co.	8.67	17.50	16.00	7.63	10.00	5.59	4.00
8099	Blue Seal Scratch Feed	Cos Cob: Belmont Feed Co.	11.65	12.50	10.00	2.70	4.00	2.85	2.50
8491	Blue Seal Stock Feed	Southbury: H. H. Stone	8.01	11.56	8.50	12.68	17.00	2.64	3.00
8776	Blue Seal Succulent Feed	Brooklyn: A. D. Pierce	8.93	14.75	10.00	11.88	18.00	2.80	1.50
8323	Blue Seal Turkey Growing	Stratford: Farmers Flour & Grain Co.	4.45	23.63	20.00	6.63	5.50	4.50	4.00
	Western Condensing Co., Petaluma, Calif.								
8788	Peebles Lacto-G Dried Whey	Torrington: Litchfield County Co-op. Assoc., Inc.	8.05	13.31	12.00	0.20	0.10	0.60	0.50

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Water	Protein (N x 6.25) Found	Protein Guaranteed not less than	Fiber Found	Fiber Guaranteed not more than	Fat Found	Fat Guaranteed not less than
	West-Nesbitt, Inc., Oneonta, N. Y.								
7967	All Pure Milk Ration	Southington: Louis Perillo Coal Co.	10.29	24.25	18.00	7.77	10.00	4.02	4.00
8008	Fitting Ration for Horses and Cattle	Mansfield Depot: G. Merritt Thompson	10.56	14.25	10.00	7.17	10.00	4.92	4.00
8007	Pure Feed Broiler Mash	Mansfield Depot: G. Merritt Thompson	9.85	19.88	18.00	7.00	7.00	4.44	4.00
8003	Pure Feed Chick Grains	Mansfield Depot: G. Merritt Thompson	11.24	11.06	10.00	1.46	3.00	3.25	2.50
8625	Pure Feed Dairy Ration	Bristol: Farmers Feed & Supply Co.	9.46	21.56	18.00	8.80	10.00	4.25	4.00
8005	Pure Feed Egg and Breeder Mash	Mansfield Depot: G. Merritt Thompson	9.76	20.31	20.00	6.68	6.00	4.82	4.00
8004	Pure Feed Egg Maker	Mansfield Depot: G. Merritt Thompson	9.69	21.31	18.00	7.47	8.00	4.43	4.00
7968	Pure Feed Horse Ration	Southington: Louis Perillo Coal Co.	12.39	14.75	9.00	7.83	10.00	4.00	3.00
8006	Pure Feed Scratch Grain	Mansfield Depot: G. Merritt Thompson	11.21	11.31	10.00	2.02	5.00	2.56	2.50
8012	Pure Feed Starting and Growing Mash	Mansfield Depot: G. Merritt Thompson	10.41	17.81	18.00	6.86	7.00	4.27	4.00
8472	Pure Feed Swine Ration	Mansfield Depot: G. Merritt Thompson	8.64	16.50	16.00	4.03	7.00	3.75	4.00
8624	Pure Feed Turkey Finisher	Bristol: Farmers Feed & Supply Co.	9.26	16.06	16.00	5.85	6.00	4.00	3.50
8471	Pure Feed Turkey Grower	Mansfield Depot: G. Merritt Thompson	8.73	21.56	18.00	6.08	6.00	3.95	3.50
8011	Pure Feed Turkey Starter	Mansfield Depot: G. Merritt Thompson	10.31	21.88	23.00	4.74	6.00	3.91	4.00
	The Windsor Locks Grain Co., Windsor Locks, Conn.								
8175	Rocco's Laying Mash	Windsor Locks: Windsor Locks Grain Co.	9.67	16.81	16.00	5.18	7.00	4.11	4.00
8185	Rocco's Starter and Grower Mash	Windsor Locks: Windsor Locks Grain Co.	9.26	17.94	17.00	5.03	7.00	4.09	4.00
	Wolf's Feed Store, Shelton, Conn.								
8171	Wolf's Chick Starter	Shelton: Wolf's Feed Store	8.44	18.75	19.00	6.03	8.00	4.84	4.50
8169	Wolf's Egg Mash	Shelton: Wolf's Feed Store	8.68	19.00	19.00	6.38	8.50	5.01	4.00
8170	Wolf's Growing Mash	Shelton: Wolf's Feed Store	8.77	18.75	17.00	6.43	8.00	5.15	4.50
8167	Wolf's Sweetened 14% Fitting Ration	Shelton: Wolf's Feed Store	10.37	15.25	14.00	7.78	9.00	4.64	4.00
8166	Wolf's Sweetened 16% Dairy Ration	Shelton: Wolf's Feed Store	8.92	17.38	16.00	8.10	9.00	4.50	4.00
8168	Wolf's Sweetened 18% Dairy Ration	Shelton: Wolf's Feed Store	10.55	19.38	18.00	7.48	9.00	4.33	4.50
	The Yantic Grain & Products Co., Norwich, Conn.								
8074	Big (Y) All In All Egg Ration	Torrington: Torrington Big Y Feed Store	9.27	17.44	15.00	4.18	5.00	3.80	4.00
8470	Big (Y) Breeder Mash	Willimantic: Boston Grain Co.	9.29	15.69	20.00	5.35	7.00	3.23	4.00
8076	Big (Y) Calf Ration	Torrington: Torrington Big Y Feed Store	10.39	15.56	12.00	5.48	8.00	4.35	4.00
8250	Big (Y) Chick Scratch Grains	Union City: Naugatuck Grain Co.	9.95	11.63	10.00	1.53	4.00	2.78	2.00
7892	Big (Y) Chick Starter	Stepney: Stepney Big Y Feed Store	10.56	20.69	20.00	4.84	6.00	3.85	4.00
7895	Big (Y) Dairy 16%	Stepney: Stepney Big Y Feed Store	10.72	23.31	16.00	5.22	9.00	3.96	4.00
7961	Big (Y) Egg Maker	Canaan: Canaan Big Y Feed Store	10.53	21.88	20.00	6.61	8.00	3.81	4.00
8075	Big (Y) Fitting Ration	Torrington: Torrington Big Y Feed Store	11.10	16.13	14.00	7.78	9.00	3.55	3.50

TABLE I. ANALYSES OF COMMERCIAL FEEDS, INSPECTION OF 1943—Continued

Station No.	Manufacturer and brand	Retail dealer in Connecticut	Pounds per hundred (or percent)						
			Water	Protein (N x 6.25)		Fiber		Fat	
				Found	Guaranteed not less than	Found	Guaranteed not more than	Found	Guaranteed not less than
	Yantic Grain & Products Co.—*Cont.* Norwich, Conn.								
8073	Big (Y) Hog and Pig Ration	Torrington: Torrington Big Y Feed Store	9.26	16.25	17.00	4.13	7.00	4.03	4.00
7894	Big (Y) Intermediate Chick Grain	Stepney: Stepney Big Y Feed Store	12.00	11.88	10.00	2.07	5.00	2.90	2.50
7964	Big (Y) M and O Growing Feed	Canaan: Canaan Big Y Feed Store	10.65	19.75	18.00	5.07	7.00	3.77	4.00
7962	Big (Y) M and O Laying Mash	Canaan: Canaan Big Y Feed Store	10.98	20.56	20.00	5.28	7.00	3.72	4.00
7963	Big (Y) Provender	Canaan: Canaan Big Y Feed Store	12.15	10.44	10.00	4.99	9.00	4.06	4.00
8072	Big (Y) Rabbit Feed	Torrington: Torrington Big Y Feed Store	8.83	16.75	14.00	7.20	9.00	4.05	3.50
7891	Big (Y) Scratch Feed	Stepney: Stepney Big Y Feed Store	11.85	11.81	10.00	2.62	5.00	2.71	2.00
7893	Big (Y) Starter and Broiler Ration	Stepney: Stepney Big Y Feed Store	10.68	20.44	18.50	6.17	6.00	3.92	4.00
8248	Big (Y) Stock Feed	Union City: Naugatuck Grain Co.	7.93	8.75	9.00	15.35	14.00	3.50	3.50
8675	Big (Y) Turkey Fattener	Middlefield: Middlefield Center Big Y Feed Co.	7.87	18.75	17.00	5.10	6.00	4.33	4.50
8249	Big (Y) Turkey Growing Feed	Union City: Naugatuck Grain Co.	8.08	17.81	20.00	4.53	6.00	3.82	4.50
8247	Big (Y) Turkey Starter Feed	Union City: Naugatuck Grain Co.	8.54	20.38	24.00	3.98	5.00	3.80	4.50

TABLE 2. VITAMIN D CARRIERS.

Manufacturer	Brand name and D unitage	Place, date of sampling and control number	Number of samples tested	Satisfactory	Passed	Below guaranty
The Borden Co., Special Products Div., New York, N. Y.	Ladpro, 100	Middletown, 11/24	1	....	....	1
	Ration-ayd, 85	Thomaston, 11/24, 26143	1	....	1	....
	Ration-ayd, 160	New Haven, 11/12, 25443	1	....	....	1
Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Fortified Sardine Oil, 400	No. Haven, 8/30, S D 112 X	1	1	....	....
	Eastern States Fortified Sardine Oil, 400	East Hartford, 9/3, S D 43 X	1	1	....	....
Gorton-Pew Fisheries Co., Ltd., Gloucester, Mass.	A and D Feeding Oil, 85	Bridgeport, 8/31, 466-53	1	1	....	....
	A and D Feeding Oil, 85	Unionville, 9/3, 8-R-5-J	1	1	....	....
	A and D Feeding Oil, 85	Colchester, 9/28, S-1-R-6-J	1	....	1	....
	A and D Feeding Oil, 85	Norwich, 10/20, 9-R-4-L	1	1	....	....
	A and D Feeding Oil, 400	New Haven, 4/28, 9-4-1-J	1	1	....	....
	A and D Feeding Oil, 400	Plantsville, 8/30, 1-R-4-2	1	1	....	....
	A and D Feeding Oil, 400	Plantsville, 9/23, 1-R-4-U	1	1	....	....
	A and D Feeding Oil, 400	Manchester, 10/21, 1-R-7-R	1	1	....	....
	A and D Feeding Oil, 400	New Haven, 11/12, S-1-R-2-U	1	....	1	....
	G. P. Cod Liver Oil, 400*	Seymour, 4/14, 7-A-4-O	1	1	....	....
	G. P. Cod Liver Oil, 400	Norwich, 4/27, 7-A-9-1	1	....	1	....
	G. P. Cod Liver Oil, 400	Seymour, 9/15, S-1-A-5-N	1	....	1	....
Maine Fish Meal Co., Portland, Me.	Maine Vitamin D Concentrate, 8	Dayville, 11/22	1	....	1	....

* Old stock.

TABLE 2. VITAMIN D CARRIERS—Continued

Manufacturer	Brand name and D unitage	Place, date of sampling and control number	Number of samples tested	Satisfactory	Passed	Below guaranty
National Oil Products Co., Inc., Harrison, N. J.	Nopco 85 Vitamin Feeding Oil	Southport, 9/27, 19	1	1	....	....
	Nopco 85 Vitamin Feeding Oil	Moosup, 10/20, 28	1	1	....	....
	Nopco 85 Vitamin Feeding Oil	Rockville, 10/21, 19	1	1	....	....
	Nopco X A and D Feeding Oil, 400	Willimantic, 4/29, 209 X	1	....	1	....
	Nopco XX A and D Feeding Oil, 800	Guilford, 8/30, 705	1	1	....	....
	Nopco XX A and D Feeding Oil, 800	Long Hill, 9/24, 708	1	1	....	....
	Nopco XX A and D Feeding Oil, 800	Moosup, 10/20, 707	1	1	....	....
	Nopco XXX Fortified Cod Liver Oil, 800	Guilford, 3/2, 817	1	1	....	....
	Nopco XXX Fortified Cod Liver Oil. 800	Middletown, 4/27, 818	1	1	....	....
	Nopco XXX Fortified Cod Liver Oil, 800	Middletown, 8/30, 820	1	1	....	....
	Nopco XXX Fortified Cod Liver Oil, 800	Fairfield, 8/31, 818	1	1	....	....
	Nopco XXX Fortified Cod Liver Oil, 800	Thomaston, 11/24, 817	1	....	1	....
Silmo Chemical Corp., Vineland, N. J.	Silmo A and D Feeding Oil, 85	Willimantic, 4/29, 6152	1	1	....	....
	Silmo A and D Feeding Oil, 85	Derby, 8/31, 6164	1	1	....	....
	Silmo A and D Feeding Oil, 100	Shelton, 8/31, 6165	1	1	....	....
	Silmo A and D Feeding Oil, 400	New Britain, 9/3, 41 D A 37	1	1	....	....
	Silmo A and D Feeding Oil, 400	Norwalk, 9/29, 41 D A 52	1	1	....	....
	Silmo A and D Feeding Oil, 400	Manchester, 4/29, 4038	1	1	....	....
	Silmo XX 400	Watertown, 4/28, 42 D X 6	1	1	....	....
	Silmo XX 400	Fairfield, 8/31, 4047	1	1	....	....
E. R. Squibb & Sons, New York, N. Y.	Exadol	So. Coventry, 11/29	1	1	....	....
White Laboratories, Inc., Newark, N. J.	Clo-Trate "400" Vitamin A and D Feeding Oil	Granby, 9/20, B-1184	1	1	....	....
	Clo-Trate "Super 400" Vitamin A and D Feeding Oil	Storrs, 10/7	1	....	1	....
Whitmoyer Laboratories, Inc., Myerstown, Pa.	Whitcod Cod Liver Oil Fortified, 400	Winsted, 11/24, 92743	1	1	....	....
		Total	42	31	9	2

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Bulletin 481 **October, 1944**

CONNECTICUT STATE ENTOMOLOGIST

FORTY-THIRD REPORT

1943

R. B. FRIEND, PH.D.

State Entomologist

Connecticut

Agricultural Experiment Station

New Haven

To the Director and Board of Control

Connecticut Agricultural Experiment Station:

I have the honor to transmit, herewith, the forty-third report of the State Entomologist for the year ending October 31, 1943.

Respectfully submitted,

ROGER B. FRIEND,

State and Station Entomologist

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CONNECTICUT STATE ENTOMOLOGIST

FORTY-THIRD REPORT

1943

R. B. Friend

Work of the Department

The effort to increase food production during 1943 has emphasized the role of insects in agriculture. In any food supply program, the first essential is production, and insects affect this both quantitatively and qualitatively. The control of their depredations, always important, is more so under the present stress, and forms our basic research pattern. In addition to this, the Department is responsible for certain large-scale insect control operations, such as those dealing with the gypsy moth and Dutch elm disease, horticultural inspection and quarantine enforcement, apiary inspection, and direct service to the people of the State in aiding them in the solution of various insect problems.

Since the establishment of the office in 1901, the State Entomologist has directed the preparation of a number of series of bulletins published by the Connecticut Geological and Natural History Survey under the general title of Guide to the Insects of Connecticut. The Survey published Part VI, The Diptera or True Flies of Connecticut, First Fascicle, as Bulletin 64 in 1943. This bulletin contains a section on the external morphology by Professor G. C. Crampton of the Massachusetts State College, the key to the families by Dr. C. H. Curran of the American Museum of Natural History, and the key to species, with distribution records, of the Tipuloidea, the most primitive flies, by Professor C. P. Alexander of the Massachusetts State College.

In the insecticide field, particular attention has been paid to the problem of the more efficient use of these chemicals. This is particularly important at the present time when both labor and materials must be used to the greatest advantage and crop production must not decline. Studies of the effect of diluents ("inert" carriers) in dust mixtures, relation between concentration of toxicant and method of application of dusts, effect of combining other materials with rotenone on the toxicity of dusts containing the latter, efficiency of cryolite as an alternate for rotenone, and value of adhesives and safeners in reducing the number of applications in the orchard spray schedule have all yielded significant results.

We have made progress in our investigations of methods of control of several insect pests of orchard fruits. New insecticides useful in the control of the European red mite offer some promise, and good results with a reduced spray schedule have been obtained. Attempts to secure good control of the apple maggot and other orchard pests with cryolite failed, probably because of poor adhesion to fruit and foliage. By using certain adhesives, the number of applications of lead arsenate necessary to control this pest was reduced from five to three. A new insecticide, containing neither arsenic nor rotenone, appears very promising for apple maggot control in cage tests. Progress has also been made in developing a good control of the Japanese beetle on grapes.

In our work with parasites and diseases of insects three pests have received attention. The distribution of *Macrocentrus ancylivorus*, a parasite of the oriental fruit moth, has been carried out as in previous years. The thermal death point of this fruit moth has been ascertained and that of Macrocentrus will be determined. Although the general infestation of Comstock's mealybug has declined in apple and pear orchards, the release of parasites of this pest is continuing. The most promising natural enemy of the Japanese beetle is the bacterium causing "milky" disease. The distribution of this disease throughout the heavily infested parts of Connecticut has been continued, and an examination of experimental plots indicates an increasing infection of larvae in some areas. This disease is being studied in both field and laboratory.

Among pests of vegetable and field crops, the European corn borer, eastern field wireworm, potato flea beetle, Mexican bean beetle, cabbage worms and Japanese beetle have been the objects of investigations. The European corn borer is a serious pest of sweet corn and in 1943 injured potato vines in many areas. In addition to testing the value of certain insecticides in controlling this insect, an attempt has been made to evaluate the individual treatments of the usual schedule on corn. Cryolite has been found effective against the corn borer on potatoes. The eastern field wireworm seriously injures the potato crop, and its bionomics, injuriousness, and control are being studied. Work with the potato flea beetle, Mexican bean beetle, and cabbage worms has been devoted to the evaluation of certain insecticides and the methods of applying them, and, in the case of the bean beetle, to the effect of different populations of the insect on the host plant. The Japanese beetle has damaged soybeans severely and its control on this crop is being studied.

The so-called imported long-horned weevil, *Calomycterus setarius*, is a potential pest of many plants and a study of its biology and control is in progress. It may become injurious to leguminous crops.

In addition to the Japanese beetle larvae, other Scarabaeidae injure grassland. They belong chiefly to the genera *Phyllophaga*, *Serica* and its allies, *Anomala*, and *Ochrosidia*. Particular attention is being given to the first and last of these.

The gypsy moth, smaller European elm bark beetle, European pine shoot moth and white pine weevil are serious pests of trees. The gypsy moth larvae defoliate hardwood trees of several species and are injurious to forests. We are particularly interested in the outbreaks of this species and are trying to anticipate them in our control operations.

The smaller European elm bark beetle is a pest of street and ornamental elms as well as those in the woodlands but, for quite obvious reasons, more attention is paid to it as a pest of shade trees than in the forest. The beetle and disease are being studied in cooperation with the Department of Plant Pathology and Botany. The beetle is not known to occur in eastern Connecticut. The disease occurs in most towns west of the Connecticut River.

The fluctuations in the population of the European pine shoot moth are being studied in a red pine plantation in North Guilford. The rate of increase of this insect has an important bearing on the success of control measures.

The white pine weevil studies at Rainbow have dealt with the effect of the weevil on young trees. The stands have been under observation for 10 years and this phase of the work is concluded.

A sawfly, *Diprion frutetorum* F., which in the larval stage defoliates red pine trees, has recently become abundant in the State. Mr. J. V. Schaffner, Jr. of the Federal Bureau of Entomology and Plant Quarantine has devoted considerable attention to the pest as it occurs in the northeastern part of this country and has contributed a brief discussion of it to this report.

The problem of protecting street and ornamental trees from pests is often acute. In order to form some basis for estimating the damage to shade trees by defoliating insects, a study of the effect of defoliation on elms is being carried out at Mount Carmel. Borers also affect ornamental trees and shrubs, and the conditions leading to infestation as well as the effect of the borers are often obscure. A study of the dogwood borer, about the biology of which little is known, is in progress and should throw some light on these questions.

The Department is charged with certain control, inspection and quarantine enforcement operations. The control of the gypsy moth involves scouting to determine infested areas, suppression of local outbreaks, and mapping of the types of growth in forested areas. Most of the Dutch elm disease work consists of cooperating with the Federal Bureau of Entomology and Plant Quarantine in preventing further spread of the disease into eastern Connecticut.

The Fish and Wildlife Service of the Federal Department of the Interior cooperates with this Station in controlling rodents in the State. We are particularly interested in meadow and pine mice, which are injurious to apple orchards and young forest plantings, and in rabbits as pests of young fruit trees and nursery stock. The control of mice is very important when the mouse population, which fluctuates in cycles, reaches a peak. Mice are apparently beneficial in the forest under some conditions, for there is evidence that they, together with shrews, prey upon gypsy moth larvae and pupae occurring on the forest floor. Rabbit repellents are being studied intensively.

The mosquito control work in Connecticut is under the direction of a State Board of Mosquito Control of which the Director of this

Station is Chairman. The State Entomologist is Fiscal Agent of the Board. Most of the control work is confined to salt marsh breeding areas, but additional attention is being given to fresh water breeding species, including the carriers of malaria.

The nursery and apiary inspections have been carried out as usual. The severely cold weather during the winter of 1942-43 caused a loss of about 30 per cent of the colonies of bees in the State. Much of this loss could have been prevented by proper care.

Inspectors of the Department aid in the enforcement of the gypsy moth, Dutch elm disease, and pine blister rust quarantines and make such inspections as are necessary for the shipment of plants and seeds to other states and foreign countries.

Abundance and Injuriousness of Pests

The insect pests of crops and trees vary in abundance from year to year. Some are seriously injurious much of the time, but others are economically important only during outbreaks, being insignificant in the intervening years. We attempt to evaluate the general abundance of the economically important species.

The infestation of the European corn borer, *Pyrausta nubilalis* Hübn., in early sweet corn was one of the heaviest on record. Many untreated fields produced no marketable crop. The second generation of the borer was also very abundant and caused some serious losses. The Federal Bureau of Entomology and Plant Quarantine estimated a loss in value of $497,636 to the sweet corn crop and $85,596 to the grain corn crop in six counties in Connecticut in 1943. The crops were valued at $746,096 and $376,067 respectively. The first generation of the borer also heavily infested both Irish Cobbler and Green Mountain potatoes in some fields, causing a severe breakage of the vines and undoubtedly some decrease in the crop. Tomato fruits were infested in some cases, apparently by larvae migrating from other host plants growing nearby.

Aphids were very abundant during July and August. Potatoes and tomatoes were injured by *Macrosiphum solanifolii* Ashm.; cabbage, peppers, eggplant and squash were heavily infested by *Myzus persicae* Sulz.; lima beans were attacked by *Aphis rumicis* Linn., and melons by an undetermined species. Aphids were present to a lesser extent on spinach and beets. In the fall, cabbage aphids were abundant on cole crops, especially broccoli and brussels sprouts, and, to some extent, turnips.

The seed-corn maggot, *Hylemyia cilicrura* Rond., was very destructive early in the season, damage being aggravated by slow germination in cold wet ground and by deep planting of seeds by many gardeners. This insect also injured newly set tobacco plants at Windsor.

The cabbage maggot, *Hylemyia brassicae* Bouché; imported cabbage worm, *Ascia rapae* Linn., and cabbage looper, *Autographa brassicae* Riley, were all injurious. The maggot infestation was about as

usual, the damage to unprotected early cabbage being moderate. Radishes seemed to be less affected than in 1942. The cabbage worm appeared earlier than usual and caused a moderate amount of damage. The looper, which has been abnormally abundant the past two years, was very destructive later in the season.

The potato flea beetle, *Epitrix cucumeris* Harris, and the potato leafhopper, *Empoasca fabae* Harris, were abundant, the former injuring potatoes, tomatoes and eggplant, and the latter being accompanied by serious tipburn on potatoes. The Colorado potato beetle, *Leptinotarsa decemlineata* Say, was more abundant than usual but was not a serious pest. The three-lined potato beetle, *Lema trilineata* Oliv., was destructive in some home gardens. The eastern field wireworm, *Limonius agonus* Say, severely injured potato tubers in restricted areas in Hartford County and caused the usual loss to the crop. This insect is one of the most serious pests of our agriculture.

The striped cucumber beetle, *Diabrotica vittata* Fab., was not as abundant as usual, although some loss of seedlings of cucurbits occurred. The squash bug, *Anasa tristis* DeG., was not troublesome.

Both generations of the Mexican bean beetle, *Epilachna varivestis* Muls., were abundant, more so than in 1942, but the high population level of the early 1930's has not been reached.

The garden springtail, *Bourletiella hortensis* Fitch, was abundant early in the season and caused some damage to beet, spinach and pea seedlings in home gardens.

The oriental beetle, *Anomala orientalis* Waterh., was abundant in a cornfield in New Haven, and the larvae destroyed most of the plants on two acres.

The Japanese beetle, *Popillia japonica* Newm., has become a notorious pest in several towns. It is particularly abundant along the shore from Greenwich to Madison, in a broad zone from New Haven north through Hartford to the Massachusetts line, up the Naugatuck Valley to Waterbury, and around New London. The adult feeds on the foliage of many shade and fruit trees, small fruits, shrubs and vines, garden vegetables and flowers, and on early ripening fruits, corn silks, etc. It was quite injurious to the sweet corn crop, eating the silks and tip kernels of the ears, and to several fields of edible soybeans in North Haven. The larval injury to turf was quite conspicuous in some places where no treatment had been applied.

The unusually frequent rains early in the season together with unseasonal heat following the calyx period and during mid-June, the short crop of some varieties, dryness during the middle and latter part of the season which apparently favored egg deposition by the apple maggot, and failure to apply sprays at the proper time because of mechanical and other difficulties all contributed to make orchard pests particularly troublesome.

The apple maggot, *Rhagoletis pomonella* Walsh, continued to be our most important apple pest. Damage was particularly severe in orchards where a full control program was not followed or in portions of well-sprayed orchards near neglected trees. Adult flies lived until harvest time in many orchards and eggs were laid almost continuously throughout August.

The control of the plum curculio, *Conotrachelus nenuphar* Hbst., in apple orchards was hampered by incessant rains early in the season which washed off the sprays as rapidly as they were applied. Many growers failed to control the insect satisfactorily and more than the usual damage occurred.

The codling moth, *Carpocapsa pomonella* Linn., increased sharply in abundance and during the last half of the season was presumably favored by hot dry weather. Some injury to apples occurred. The European red mite, *Paratetranychus pilosus* C. and F., not abundant early in the season, became numerous in August and browned the foliage of apple trees in some orchards. Apple redbugs, *Lygidea mendax* Reut., were abundant and quite injurious. The red-banded leaf roller, *Argyrotaenia velutinana* Walk., was abundant in apple orchards in Wallingford but not so much so elsewhere. Apple leafhoppers were locally abundant and caused severe damage near woodlands in some cases.

The apple leaf-curling midge, *Dasyneura mali* Kieff., was found in Connecticut in an apple orchard in Wilton in June. This insect is new to Connecticut but has been a pest of apples for some years in Massachusetts.

Comstock's mealybug, *Pseudococcus comstocki* Kuw., was less abundant in apple orchards than in 1942. Apple aphids, both rosy, *Anuraphis roseus* Baker, and green, *Aphis pomi* DeG., were relatively few in number. The Japanese beetle, although abundant throughout parts of the State and injurious to many plants, did little damage in commercial apple orchards to either fruit or foliage. The injury to grapevines by this insect was severe in south-central Connecticut and in the vicinity of Hartford.

The pear midge, *Contarinia pyrivora* Riley, caused considerable loss in two pear orchards in Wallingford. The pear psylla, *Psyllia pyricola* Foerst., caused some injury to foliage in late summer. The plum curculio and codling moth were more abundant and injurious than usual on pears.

There having been practically no peach crop in Connecticut in 1943, little can be said about the pests of that fruit. The oriental fruit moth, *Grapholitha molesta* Busck, survived the winter successfully. The peach borer, *Conopia exitiosa* Say, was about as abundant as usual.

The grape berry moth, *Polychrosis viteana* Clem., was more abundant than usual on grapes.

Many of our forest insects were affected by the extremely low temperatures of the winter of 1942-43. These minima differed in

different parts of the State. At New Haven the lowest official temperature was -9° F., at Hartford -24° F., at Putnam and Cornwall -23° F., and some unofficially reported temperatures in northern Connecticut were as low as -40° F. The larvae of the smaller European elm bark beetle, *Scolytus multistriatus* Marsh., were noticeably affected by the cold, and a mortality of up to 80 per cent was noted where the insect occurred above the snow line in Litchfield and New Haven counties except in the shore region. As reported by Wallace and Beard (Conn. Agr. Expt. Sta. Bul. 472: 291-305, 1943) the effect of cold becomes operative when the temperature reaches -5 to -10° F. The infestation was very light in 1943 in elm limbs broken by the ice storm of the preceding winter. Infestations of the European pine shoot moth, *Rhyacionia buoliana* Schiff., have declined significantly during the past two years because of the cold winters. Samples of infested red pine twigs from a number of plantations showed complete larval mortality. The larvae of this insect die at -19° F. according to West (Ann. Ent. Soc. Amer. 29: 438-448, 1936). The gypsy moth, *Porthetria dispar* Linn., also suffered an appreciable mortality during the winter. A majority of egg masses exposed above the snow line produced no larvae in the spring. Summers (U. S. D. A. Bul. 1080, 1922) has shown that gypsy moth eggs cannot survive -25° F., and that some are killed at higher temperatures.

The elm leaf beetle, *Galerucella luteola* Müll., was moderately injurious to elms, but the fall canker worm, *Alsophila pometaria* Harr., was very abundant, especially in the southern part of the State where it defoliated many elms, oaks and hickories. A heavy emergence of canker worm adults in November, 1943, presages an outbreak in southern Connecticut in 1944. The elm lacebug, *Corythucha ulmi* O. and D., was very abundant in the Housatonic River Valley and the northern part of the Farmington River Valley. Leaves on many trees were brown in late summer.

The oak leaf miner, *Lithocolletis hamadryadella* Clem., was common on white and swamp white oaks in southern Connecticut, many trees being severely affected.

The fall webworm, *Hyphantria cunea* Dru., was unusually abundant on many species of trees in the northern part of the State, completely defoliating some smaller specimens.

The birch leaf-mining sawfly, *Fenusa pusillus* LePel. (*pumila* Klug), caused conspicuous injury to gray birch, particularly in eastern Connecticut. Black and gray birches in part of North Haven were heavily infested with a species of *Bucculatrix*.

The tent caterpillar, *Malacosoma americana* F., was quite common in the southwestern part of the State. A local outbreak of May beetles, principally, *Phyllophaga hirticula* Knoch, defoliated hardwood trees in Madison in June.

A stand of young white pine in Salem, bruised by goats, was severely infested with the pitch mass borer, *Parharmonia pini* Kell., the larvae apparently entering the trees at the scars. Trees five to six feet high contained six to eight larvae each.

A sawfly new to Connecticut, *Acantholyda erythrocephala* L., severely injured several ornamental white pines planted along the Merritt Parkway.

The pine sawfly, *Diprion frutetorum* F., has been injurious to a few red pine stands in the State during the last few years. It is not widely destructive. The pine geometrid, *Lambdina athasaria pellucidaria* G. and R., was very abundant in a stand of red pine in North Branford, many trees being severely defoliated.

The dogwood borer, *Synanthedon scitula* Harr., has long been known as a pest of ornamental dogwoods. It has also been found of fairly frequent occurrence in the woods, about three per cent of the trees being attacked.

We receive a large number of insect specimens each year from citizens of the State with requests for information about them. A list of the categories is given below, as is also a list of the species received five or more times. The three leading species are household pests, and most of the field ants and hickory borers were also found in a dwelling by the sender.

In addition to the work of the Department covered in this report, members of the staff have published a number of scientific bulletins and journal papers giving the results of their research as well as popular articles about insect pests. A list of these publications is given on pages 320 to 321.

Summary of Specimens Received, 1943

Fruit pests	25
Field, vegetable and truck crop pests	59
Forest and shade tree pests	58
Pests of shrubs and vines	19
Flower garden and greenhouse pests	15
Household and stored food products pests	60
Timber and wood products pests	47
Soil and grassland pests	37
Insects annoying man and domesticated animals	11
Parasitic and predaceous insects	22
Miscellaneous	37
	390

Insects Received Five or More Times, 1943

	Times Received
Carpenter ant, *Camponotus herculeanus pennsylvanicus* DeG.	14
Termite, *Reticulitermes flavipes* Koll.	14
Black carpet beetle, *Attagenus piceus* Oliv.	12
Japanese beetle, *Popillia japonica* Newm.	10
European corn borer, *Pyrausta nubilalis* Hübn.	9
Hickory borer, *Cyllene caryae* Gahan	8
Common stalk borer, *Papaipema nitela* Guen.	8
Field ants, *Lasius* sp.	7
Potato flea beetle, *Epitrix cucumeris* Harr.	6
Seed-corn maggot, *Hylemyia cilicrura* Rond.	6
Spruce mite, *Paratetranychus ununguis* Jacobi	5

INSPECTION OF NURSERIES, 1943

M. P. Zappe

The annual inspection of nurseries as required by Section 2136 of the General Statutes began on June 29, 1943. Two new inspectors, Messrs. Frank Luddington and Richard Mezzotero, were employed to assist Mr. Devaux and the writer during July and August. Mr. Luddington has had some previous experience as a nursery inspector as he was employed at this work during the summers of 1920, 1921 and 1922. Inspection of nurseries was completed on September 30.

In order to save time and conserve gasoline and rubber, the inspectors did not return to New Haven each night when nurseries 30 miles or further away were inspected. In 1942 five inspectors were employed and the work was completed on September 18; this year with four men, the work was finished on September 30. In addition, the inspectors did some work on the Dutch elm disease project.

In the spring and fall of 1943 the nursery business was good. In fact, some of the nurserymen could not fill all their orders because of a shortage of help and the difficulties of transporting stock. In one of the largest nurseries in the State, no cultivation was done during the summer. This was also true of a number of smaller establishments. Weed growth and grass were high and made it more difficult to inspect these nurseries properly. The practice of leaving large holes (where large nursery trees had been dug) unfilled also made inspection work more difficult and hazardous.

Nursery pests in general were a little less abundant than in 1942, although some individual species were more abundant than in the previous year. One of these, the spruce mite, caused considerable injury during the early part of the season. It was noted in 46 nurseries in 1943 and in only 13 in 1942. Oystershell scale was a little more abundant than in 1942. Fall webworm was more abundant than usual, particularly in the eastern part of Connecticut. European pine shoot moth was very much less prevalent than usual. This was also true of both species of *Adelges* (gall aphids) on blue and Norway spruces. Pine leaf scale on red and mugho pines dropped from 23 cases in 1942 to 10 in 1943. The decrease in some of the insect pests in nurseries may perhaps be explained by the fact that abnormally low temperatures during the winter of 1942-43 killed off some of the less resistant species, particularly the European pine shoot moth.

A large number of nurseries (148) had no serious pests, probably due to the fact that we no longer record minor pests which cannot be transported on nursery stock and for which no treatment is required.

Plant diseases were about as abundant as usual and poplar canker much more so than in 1942. In the case of this disease, infection seems to depend upon the size of Lombardy poplars. Older and larger trees are almost sure to be infected. Younger trees are not so apt to have the disease, but it is just a matter of time before they become infected. All diseased trees are broken by the inspectors, and nurserymen are required to cut and burn the broken or marked trees. Many nurserymen no longer grow this species as it is sure to become infected eventually, and at present there are very few (if any) large Lombardy trees alive in this State.

Table 1 gives the number of nurseries infested by the more common pests during the last 10 years.

TABLE 1. TEN-YEAR RECORD OF CERTAIN NURSERY PESTS

Pests	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943
Oystershell scale	104	93	87	84	53	49	57	77	68	78
San José scale	19	17	11	8	2	1	2	7	4	10
Spruce gall aphids[1]	244	285	337	306	312	216	231	227	210	140
White pine weevil	67	98	82	101	97	93	70	61	27	28
Pine leaf scale	66	42	72	60	25	50	48	46	23	10
European pine shoot moth	120	121	108	128	130	110	108	106	54	6
Poplar canker	39	28	28	26	20	14	15	15	11	28
Pine blister rust	7	2	0	4	5	3	3	4	0	2
Nurseries uninfested	21	16	26	25	32	19	33	32	126	148
Number of nurseries registered	381	372	380	377	402	399	376	356	331	318

[1] Includes both *Adelges abietis* and *A. cooleyi*.

One of the regulations under which peach stock may be grown in Connecticut nurseries is that there shall be no chokecherries growing within 500 feet of any block of peach trees. This means a careful selection by the nurseryman of a suitable field. If hedgerows are not entirely free from chokecherries at time of planting the peach pits, they must be cleaned before seedlings get above ground. Then they must be kept free of chokecherries until the stock is finally grown and dug. Furthermore, the peach stock is inspected for "X" disease twice during the growing season. Only three nurserymen grow peach trees, and in 1943 only two had peach trees to dig, owing to failure of pits to germinate in the spring of 1942. No "X" disease has been found in Connecticut nurseries for several years.

Only one grower applied for the special raspberry inspection. He was granted a special certificate as only one suspicious plant was found and this was removed. In order to qualify for the special certification, two inspections are required, one in June, the other later in the season. If at the first inspection over 8 per cent of the plants are diseased, the grower is disqualified; if less, he may rogue out the diseased plants, but the second inspection must not have over 2 per cent diseased, and these also must be dug out and destroyed.

A total of 318 nurseries were registered and inspected, but all have not finished their required cleanup operations, and these latter have not been issued certificates to date. A classification of nurseries by size is given in Table 2. A total of 4,662 acres of land were devoted to the growing of nursery stock in 1943.

TABLE 2. CLASSIFICATION OF NURSERIES BY AREA

Area	Number	Percentage
50 acres or more	18	6
10 to 49 acres	45	14
5 to 9 acres	28	9
2 to 4 acres	80	25
1 acre or less	147	46
	318	100

The list of nurserymen varies from year to year. This year there are 13 less nurserymen than in 1942, but the acreage devoted to growing of nursery stock is somewhat greater. A few of the nurseries are temporarily out of business, as the owners have either taken up war work or are in the armed forces. Some of the smaller nurseries that have been carried as side lines have been discontinued because the owners did not find it worthwhile to carry on under the present wartime restrictions.

Some of the nurserymen failed to register before July 1, 1943, and, as required by Section 2137 of the General Statutes, were charged for the cost of inspection. Eighteen nurserymen paid the cost of inspection, and $180.00 has been turned over to the treasurer of the Station to be sent to the State Treasury. Nurserymen who failed to pay the cost of inspection and those who failed to clean up their pests were not issued certificates and therefore cannot sell their nursery stock legally.

The cost of inspecting the nurseries, including a few additional visits to see that pests were properly eradicated, was $2,371.55, exclusive of travel expenses.

Other Kinds of Certificates Issued

During the year 147 duplicate certificates were issued to Connecticut nurseries to be filed in other states. Seventy-one dealers' certificates were issued to stores and other dealers who do not grow their own stock. All this nursery stock is purchased from certified nurseries for resale. Under the amended nursery inspection law it is no longer necessary for out-of-state nurserymen to file their duplicate nursery certificates with this office and no shipper's permit is required for nursery stock entering Connecticut. Therefore none were issued. Under the present law, the out-of-state nurseryman has only to attach a copy of his valid certificate to the shipment consigned to Connecticut.

Approximately 401 parcels of nursery stock and other plant materials were inspected and certified for private shipments. Five hundred and eighty-one blister rust control area permits were issued.

Inspection of Imported Nursery Stock

Foreign nursery stock enters the United States at designated ports of entry under special permits issued by the Federal Bureau of Entomology and Plant Quarantine and is released to destination points where it is examined by state inspectors. Before the war large shipments of Manetti rose stocks were imported by rose growers for grafting purposes. During the season of 1942-43 no foreign rose stocks were received in Connecticut, probably due to the war and scarcity of shipping space on boats.

The following shipments of miscellaneous plants and seeds entered Connecticut during the year. This material is allowed entry into the United States in limited amounts under special permit by the Bureau of Entomology and Plant Quarantine. It is sent to Washington, D. C., where it is examined by federal inspectors and then reshipped to its final destination. None of these shipments were examined by state inspectors.

28 ferns
35 perennial plants
19 orchids
24 gladiolus corms
12 miscellaneous shrubs
4 peony roots
7 ounces of seed

QUARANTINE ENFORCEMENT AND MISCELLANEOUS INSPECTIONS, 1943

M. P. Zappe and L. A. Devaux

Many states have quarantines for various pests in order to protect themselves from damage these pests might cause if they were introduced from infested states. This of course hinders the free movement of plants and plant material. Nurserymen and others who do considerable shipping of this type of material are more or less familiar with the requirements of other states. The average person knows very little about such matters and only hears of them when he or she tries to ship plants from Connecticut to other parts of the country. The postal department and transportation companies know that it is illegal to accept plants and plant material for shipment unless accompanied by a valid certificate of inspection. We are often called upon to make inspections and furnish certification for such shipments. In some cases we are obliged to refuse certification because the shipment does not comply with the requirements of the state to which it is consigned. Fortunately, most of the requirements of nearby states are such that we can certify the materials, but it is almost impossible to ship certain plants, fruits, etc. into some of the mid-western and western states.

The European corn borer has spread quite a distance to the west, has crossed the Mississippi River, and is now known to be present in Missouri and Iowa. The federal quarantine has been lifted on this insect, but many states still have their own quarantines to prevent importation of susceptible plants. All of these quarantines will allow movement of host plants of the European corn borer into their states provided they have been inspected and are accompanied by a statement showing freedom from this insect. Of the plants affected by this quarantine, perennials of various kinds and shelled sweet corn are the ones most commonly shipped. A total of 520 European corn borer quarantine inspection tags were issued to certify shipments into 32 states and Canada. A large proportion of these shipments were for seed corn consigned to Canada.

The oriental fruit moth quarantine prevents movement of fruit, used fruit containers and fruit trees. This material can be shipped, but it must be fumigated under supervision in an approved fumigation chamber. The cost of the apparatus is so high that no fruit or fruit trees have been treated for shipment into states having such regulations.

Since the establishment of the Japanese beetle and gypsy moth quarantines in Connecticut, this department has cooperated with the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture in their administration. The State is divided into two sections, using the gypsy moth quarantine line as a boundary. The section of the State within the gypsy moth quarantined area, which includes Hartford, Middlesex, New London, Tolland, Windham and some towns in eastern Litchfield and New Haven counties, is under the supervision of Mr. H. N. Bartley who is in charge of the federal Japanese beetle and gypsy moth office at Waltham, Massachusetts. His inspectors make the necessary inspections to comply with the Japanese beetle and gypsy moth quarantines. In addition, Fairfield County, located within the Japanese beetle quarantined area, is under his supervision. The balance of Litchfield and New Haven counties outside of the gypsy moth quarantined area and the towns of Branford and North Haven in the gypsy moth quarantined area, are under the supervision of Mr. M. P. Zappe who is in charge of the New Haven office.

Japanese Beetle

The Japanese beetle activities consist of seasonal scouting of certain nursery and greenhouse properties for classification purposes, the inspection and certification of all articles included in the quarantine regulations, and other tasks necessary to the operation of the quarantine.

Scouting

Scouting for adult Japanese beetles has been conducted yearly to determine whether or not beetles were present on classified properties. Because of the decrease in the number of classified areas to be scouted the same procedure was used as in 1942, that is, the district inspectors performed the scouting activities instead of scout crews.

Only two districts in the State, containing three classified firms, were scouted during the 1943 season. This work was performed by Mr. J. F. McDevitt, Middletown, Conn., and Mr. D. Harrington, Westerly, R. I. Mr. W. J. Powers, of the Waltham office, assisted the above named inspectors. They began scouting on July 12 and finished on September 17, 1943.

In all, three nursery, greenhouse or other similar establishments were examined from three to four times. A total of 11 adult beetles were found on two of these units. One woodland area was scouted, no beetles being found.

Four firms were removed from the classified list because business conditions did not warrant such classification, and one establishment was removed because of the presence of beetles. One firm relinquished classification in its nursery but retained classification on certified greenhouses.

Inspection and Certification

The total number of plants inspected and certified for shipment to other states and foreign countries was 3,031,312.

The number and kinds of certificates issued are shown in the following table:

TABLE 3. NUMBER OF CERTIFICATES ISSUED, 1943

Kind	Farm products	Cut flowers	Nursery and ornamental stock	Sand, soil	Manure	Total
"A"	0	0	3,874	0	0	3,874
"B"	0	0	3,016	0	0	3,016
Total	0	0	6,890	0	0	6,890

No inspections of farm products and cut flowers were made because no towns in Connecticut are within the area which requires such inspection and certification.

Treating

During the past year two nurseries in the State treated nursery stock being shipped out of the Japanese beetle quarantined area with the new and approved ethylene dichloride dip, under our supervision. This method of treating has simplified the procedure considerably, and it is anticipated that more nursery stock will be treated in this way in the future.

Gypsy Moth

The gypsy moth work consists of the inspection and certification of all materials included in the gypsy moth quarantine regulations, occasional scouting of certain areas in order to issue the necessary certificates, and other tasks necessary to the operation of the quarantine.

Inspection and Certification

The total number of plants inspected and certified for shipment to points outside of the quarantined area was 2,076,755. Forest products inspected and certified totalled 32,086 pieces, 209 ½ cords, 1,705,575 board feet and 560 bundles. Stone and quarry products amounted to 420 tons, 125 boxes and 15 pieces. Evergreen products totalled 2,289 bales and 4,282 pieces.

The number and kinds of certificates issued are shown in the table below:

TABLE 4. NUMBER OF CERTIFICATES ISSUED, 1943

Kind	Nursery stock	Forest products	Stone and quarry products	Evergreen products	Total
"A"	2,622	144	14	772	3,552
"B"	2,261	630	11	57	2,959
Total	4,883	774	25	829	6,511

Miscellaneous

We are also called upon to certify miscellaneous seed shipments to foreign countries as required by the various foreign regulations. Most of these shipments are consigned to South and Central America and Canada, with an occasional shipment now and then to European countries. During the year 1943, 571 such certificates were used covering 297 shipments of seeds to South and Central America; 33 certificates were used covering 17 shipments to Europe and 311 certificates because of the European corn borer were used covering 80 shipments of seed corn to Canada.

INSPECTION OF APIARIES, 1943

M. P. ZAPPE

There has been no change in the personnel of the bee inspection service since last year. Mr. W. H. Kelsey works in Litchfield and Hartford counties, Mr. Roy Stadel in Fairfield, New Haven and Middlesex counties, and Mr. Elbra Baker in the eastern third of the State.

The inspectors reported that large numbers of bees died during the winter, due to several causes. Extreme winter temperatures were probably the main reason, together with insufficient stores of honey for winter food. In times of sugar shortages there is always a temptation to remove as much honey as possible, and in some cases this was overdone. As a result the bees starved before the spring honey flow started. Winter stores of honey were of poor quality in some sections and undoubtedly added materially to the winter mortality. Out of a total of 14,903 overwintering colonies of bees in the State, 4,372 colonies or nearly 32 per cent were dead when the inspectors visited the apiaries during the spring and summer of 1943.

This is a more serious loss to the apiarist than bee diseases, predators, poisoning, etc. combined. Even some of the bigger beekeepers sustained losses of as high as 50 per cent of their colonies. The winter of 1942-43 was more severe than normal, and the fact that many colonies were only supplied by the so-called "honeydew" for winter made the losses greater. Even in an ordinary winter the mortality is high, and it

TABLE 5. THIRTY-FOUR YEAR RECORD OF APIARY INSPECTION

Year	Number apiaries	Number colonies	Average number colonies per apiary	Average cost of inspection Per apiary	Per colony
1910	208	1,595	7.6	$2.40	$.28
1911	162	1,571	9.7	1.99	.21
1912	153	1,431	9.3	1.96	.21
1913	189	1,500	7.9	1.63	.21
1914	463	3,882	8.38	1.62	.19
1915	494	4,241	8.58	1.51	.175
1916	467	3,898	8.34	1.61	.19
1917	473	4,506	9.52	1.58	.166
1918	395	3,047	7.8	1.97	.25
1919	723	6,070	11.2	2.45	.29
1920	762	4,797	6.5	2.565	.41
1921	751	6,972	9.2	2.638	.24
1922	797	8,007	10.04	2.60	.257
1923	725	6,802	9.38	2.55	.27
1924	953	8,929	9.4	2.42	.25
1925	766	8,257	10.7	2.45	.22
1926	814	7,923	9.7	2.35	.24
1927	803	8,133	10 1	2.37	.234
1928	852	8,023	9.41	2.12	.225
1929	990	9,559	9.55	2.19	.227
1930	1,059	10,335	9.76	2.01	.206
1931	1,232	10,678	8.66	1.83	.212
1932	1,397	11,459	8.2	1.60	.195
1933	1,342	10,927	8.1	1.69	.208
1934	1,429	7,128	4.98	1.40	.28
1935	1,333	8,855	6.64	1.556	.234
1936	1,438	9,278	6.45	1.429	.221
1937	1,437	10,253	7.1	1.28	.18
1938	1,609	10,705	6.7	1.18	.177
1939	1,627	8,936	5.5	1.12	.204
1940	1,719	8,552	5.0	1.33	.268
1941	2,222	10,720	4.8	1.16	.239
1942	2,354	13,777	5.85	1.18	.201
1943	2,635	14,903	5.65	1.05	.186

would seem very much worthwhile for the beekeeper to make a strenuous effort to see that his bees are properly protected and cared for during this season.

This year 2,635 apiaries were inspected in the State, 281 more than last year, with a total of 14,903 colonies, an increase of 1,126 over last year (see Table 5). Subtracting the number of colonies that died during the winter of 1942-43 from the total number of colonies inspected in 1943 leaves 3,246 less colonies of live bees in the State than there were at the same time in 1942, even though there were 281 more apiaries in the State in 1943 than there were in 1942. The average number of colonies per apiary was 5.65 for 1943 as against 5.85 for 1942.

There was a decrease in the amount of American foul brood this year. For the entire State, 3.6 per cent of the colonies were diseased in 1942 but only 2.5 per cent in 1943. The greatest amount of foul brood was found in New Haven County (5.26 per cent) and Fairfield County (4.88 per cent). Both of these figures were substantially lower than in 1942. Most of the diseased colonies were burned either by the inspectors or by the owners. In a few cases where there seemed to be a good chance of saving the colony, it was transferred to clean hives and combs. Two colonies of bees were infected with European foul brood and eight cases of sacbrood were found.

TABLE 6. INSPECTION OF APIARIES, 1943

County	Apiaries Inspected	Apiaries Diseased (Am.f.b.)	Colonies Inspected	Colonies Diseased (Am.f.b.)	Per cent diseased	Per cent winterkilled
Fairfield	457	63	2,685	131	4.88	27.0
New Haven	342	40	2,088	110	5.26	31.0
Middlesex	156	9	1,186	22	1.85	30.0
New London	331	42	2,044	73	1.27	27.0
Litchfield	359	12	1,962	25	1.27	28.0
Hartford	575	14	2,982	12	.4	25.0
Tolland	217	2	1,000	2	.2	50.0
Windham	198	4	956	3	.4	28.0
	2,635	186	14.903	378	2.53	31.75

TABLE 7. SUMMARY OF INSPECTION

	Apiaries	Colonies
Inspected, 1943	2,635	14,903
Infected with American foul brood	186	378
Percentage infected	7.06	2.53
Average number of colonies per apiary		5.65
Average cost of inspection	$1.05	$.186
Total cost of inspection, 1943	$2,780.63	

The total cost of inspection varies somewhat from year to year. The cost per apiary has been decreasing steadily from the highest, $2.64, in 1921, to the lowest, $1.05, in 1943. The cost per colony ($.186) is a very low figure, having been lower in only two years, 1915 ($.175) and 1938 ($.177).

Financial Statement

January 1, 1943—December 31, 1943

Disbursements

January 1 to June 30, 1943:		
Salaries	$744.00	
Travel	388.90	
Miscellaneous	8.75	
		$1,141.65
July 1 to December 31, 1943:		
Salaries	$987.00	
Travel	632.30	
Miscellaneous	19.68	
		1,638.98
Total disbursements for 1943		$2,780.63

Registration of Bees

Section 2129 of the General Statutes provides that: Each beekeeper shall register his bees on or before October 1 of each year with the town clerk of the town in which the bees are kept, and that each town clerk, on or before December 1, shall report to the State Entomologist whether or not any bees have been registered and, if so, shall send a list of names and the number of colonies belonging to each registrant.

In 1943, 2,635 apiaries containing 14,903 colonies were inspected. However, only 1,689 apiaries consisting of 12,102 colonies were registered. This shows that 946 more apiaries and 2,801 more colonies were inspected than registered by the town clerks. No doubt some unregistered apiaries were not inspected by the apiary inspectors who were unable to locate them. Uninspected bees may be a source of foul brood infection for other bees in the community. Every effort is being made to have all beekeepers register their bees so that they may be inspected and treated if found diseased.

GYPSY MOTH CONTROL

J. T. Ashworth and R. B. Friend

Control Work[1]

Gypsy moth control work had to be curtailed on account of men being drafted into the service and others taking up war production jobs. The force was cut down to a very small percentage of the men usually employed. However, the gypsy moth infestation seemed to be at a low ebb this year, and the situation was helped very much by the extremely low temperatures of last winter, especially in the northern sections of the State. We are indebted to the United States Bureau of Entomology and Plant Quarantine for work done in the western part of the State and we wish to take this opportunity to express our appreciation to Mr. R. A. Sheals, in charge; Mr. S. S. Crossman, assistant to Mr. Sheals, and Mr. H. L. Blaisdell, in charge of field operations.

Type-mapping, a description of which will be found in the Connecticut State Entomologist's Report of 1940 was continued and the towns of Stafford, Chaplin, Scotland and Salem were completed.

During July, a survey was made in all towns east of the Connecticut River to discover any localities where defoliation occurred. Two isolated white oaks were found, one located in Stonington, which was completely defoliated, and one in Somersville, 75 per cent defoliated. Another white oak about 80 per cent defoliated was found in the town of Torrington. The infestation has been found to exist over quite an area in the southern part of Torrington.

A small amount of scouting and creosoting was done by state men in six towns, namely, Colebrook, Brooklyn, Durham, Killingly, Middletown and Norfolk. On and around a single oak tree in the town of Durham, 964 egg clusters were creosoted.

Federal men scouted in 34 towns within the barrier zone and east of the barrier zone in the State and found infestations in the towns of Canaan, Cornwall, Litchfield, Morris, Norfolk, North Canaan, Salisbury, Wallingford, Warren, Washington and Watertown. None of these towns, however, had any very large colonies. A detailed account of these infestations may be found in the table of statistics.

No spraying was done by state crews this spring. Man power was short and there were no dangerous colonies known in the eastern half of the State. However, in the towns of Canaan, Cornwall and Litchfield, federal forces sprayed about 41 acres of woodland and 50 trees in the open, using 1,695 pounds of arsenate of lead and 225 quarts of fish oil. Banding was done in seven towns in the barrier zone. Two thousand eleven bands were applied and, during the larval and pupal season, 1,275 larvae and pupae were crushed.

[1] July 1, 1942 to June 30, 1943.

TABLE 8. SUMMARY OF STATISTICS, 1942-1943

County	Number towns worked	Infestations found	Egg masses creosoted	Number colonies sprayed	Lbs. lead used	Larvae, pupae crushed	Bands applied	Miles scouted	Acres scouted
Fairfield	7	0	0	0	0	0	0	325	86,496
Hartford	1	9	39	0	0	0	0	5	2,867
Litchfield	19	57	359	4	1,695	1,217	1,781	426	112,739
Middlesex	1	1	964	0	0	0	0	0	0
New Haven	12	1	4	0	0	58	230	0	99,423
New London	0	0	0	0	0	0	0	0	0
Tolland	0	0	0	0	0	0	0	0	0
Windham	1	2	30	0	0	0	0	11	75
Totals	41	70	1,396	4	1,695	1,275	2,011	767	301,600

Effect of the Low Temperatures, Winter of 1942-43

The population of the gypsy moth in New England fluctuates noticeably over periods of time, not only over the infested area as a whole but locally as well. In 1942, for example, the records of the Federal Bureau of Entomology and Plant Quarantine show that the defoliation caused by this insect was less than that occurring in any year since 1924, and in 1943 a further decline took place. The causes of these fluctuations presumably involve the effect of such factors as weather, parasites, predators and food supply. There is good evidence that the low temperatures of the winter of 1942-43 killed a large percentage of eggs in Connecticut and appreciably depressed the population of subsequent larvae.

According to Summers (U. S. D. A. Bul. 1080, 1922): "An exposure of between -20° and -25° F. is necessary to kill entire clusters, though some eggs in each cluster may be killed by an exposure to -15°. No eggs will survive an exposure to lower than -25°." Eggs close to the ground, covered by snow during the winter, survive much lower air temperatures.

TABLE 9. HATCHING OF GYPSY MOTH EGGS, 1943, IN PER CENT

Egg masses	Height above ground in feet																	
	1	2	3	4	5	6	7	8	10	12	15	16	18	20	25	28	35	45
1	100	0	0	0	0	0	0	0	10	0	0	0	0	77	0	0	0	0
2	0	0	0	0	73	0	92	7	0	0	81			0		0		
3	94	0	0	0	0	0		0	24		30			0				
4	43	0	31	0		0		0	0					0				
5	82	0	0	13		0		44	34					0				
6	76		0			0												
7	78		0															
8	0		13															
9	74		0															
10	23		0															
11			62															
12			0															

In 1943 the Bureau of Entomology and Plant Quarantine reported that only 23.5 per cent of the egg masses, collected in New England and New York, found over one foot above the ground produced any larvae, and only 33.8 per cent of *all* the egg masses collected (300) produced larvae. In Connecticut, the per cent of hatching was determined for 70 egg masses found at various heights above ground and collected in the northern third of the State. The data are given in the table above. Only 22 of these egg masses produced any larvae. Forty-six of the 60 over one foot above ground failed to produce any larvae, but only two of those 10 within one foot of the ground failed to do so. In February, 1943, the temperature in the northern part of the State dropped to -23° to -24° F. according to official Weather Bureau records. It may have dropped below that in some localities. The temperatures of O° F. and lower during the winter of 1942-43 are given in Table 10.

For the sake of comparison, we have a record of the hatching in 1940 of 151 egg masses collected in Granby and Simsbury. All of these produced larvae, although in three masses the per cent of eggs which hatched was 1.6, 33.5, and 43.0, respectively. Eighteen egg masses within one foot of the ground had an average hatching of 83 per cent, whereas the average hatching of the 151 masses was 80 per cent, or about the same. The masses averaged 479 eggs each. The low temperatures during this winter are recorded in Table 10.

TABLE 10. MINIMUM TEMPERATURES, NORTHERN CONNECTICUT (FAHRENHEIT)

Date	Stations: Cornwall	Hartford	Putnam
Dec. 27, 1939	—1°		
Jan. 5, 1940			0°
7,	0		
9,		0°	
10,		— 5	—6
11,		—1	
17,	—1		
18,	0		
19,	—3	0	
20,		—5	—4
Feb. 23, 1940			—6
27,	0		—3
Dec. 17, 1942	—10°	—6°	
19,		—3	
20,	—18	—10	
21,	—14	—6	
22,	0	—4	
Jan. 9, 1943	—1		
22,	—6		0°
Feb. 14, 1943		0	—4
15,	—23	—18	—18
16,	—18	—24	—23
17,		—2	—4
18,	—1		
Mar. 4, 1943	—1		
9,	0		—1

As Summers has pointed out, the net effect of cold winter weather is modified by local snowfall and other conditions, such as amount of underbrush and stones and other debris on the ground on which eggs may be laid, and wetness of the soil surface. Moreover, other natural factors mentioned above may exert a tremendous effect on the population. In spite of the survival of 80 per cent of the eggs over the winter of 1939-40 in Granby and Simsbury, the gypsy moth population declined abruptly there in 1940 and has remained low ever since. In the winter of 1939-40, the number of egg masses per acre in eight one-acre plots varied from 299 to 1,403. In the winter of 1940-41, the number on seven adjacent one-acre plots varied from three to nine per acre, in the winter of 1942-43, on the same seven plots, from zero to seven per acre, and in the winter of 1943-44, from zero to three per acre.

RODENT CONTROL

FRANCIS B. SCHULER, Junior District Agent

Fish and Wildlife Service, U. S. Department of the Interior, in cooperation with The Connecticut Agricultural Experiment Station

The investigations on the cyclic tendencies of the meadow mouse (*Microtus pennsylvanicus*) and the development of a repellent to protect trees and shrubs from cottontail rabbits have been continued during the past year. In July a cooperative program with the Bureau of Entomology and Plant Quarantine was inaugurated to study the importance of predation by small mammals on large larvae, pupae and adults of the gypsy moth.

Meadow Mouse

The fall census of 1942 conducted in orchards throughout the State indicated a uniform and high population in most of the orchards, with the greatest known density being three times the previously recorded high on a comparable survey. Damage was reported in many orchards throughout the State. There were no reports of damage from orchardists who followed the recommended control practices.

A survey made in May of 1943 and many observations earlier in the spring showed that there had been a considerable reduction in the density of the *Microtus* population. This reduction probably occurred in late winter. Prior to this time, there had been prominent signs of a large population.

The results of the September survey of this year differ considerably from those of a year ago. This year the population was spotty. In many orchards where the cover crop was restricted in growth, due to the lack of rainfall, the orchard floor afforded little protection for the mice, and as a consequence there was a low population density. In orchards on wet locations, or where the rainfall had been adequate enough to produce a nearly normal cover crop, the population was dangerous. In one orchard having these conditions, 102 mice were removed from one acre.

Small Mammal-Gypsy Moth Study

In early September, personnel of this office supervised a census, by deadfall trapping, of two quarter-acre quadrats at Eastford and two at Simsbury, Connecticut. The quadrats were located in areas used by the personnel of the Bureau of Entomology and Plant Quarantine for ecological studies of the gypsy moth. The areas were of the oak-hickory type having a deep, moist litter on the floor. These conditions favor small mammals, and the population is relatively higher than that found on dry sites where the litter is shallow. Evidence gathered by the entomologists indicates the survival rate of the gypsy moth is greater on the dry locations.

At the time this census was conducted in Connecticut, similar work was done in Massachusetts and Pennsylvania on both dry and moist locations. The data collected should be useful on a comparative basis. To be of value this study should be continued for four or more years.

Rabbit Repellents

During the past winter, 45 wild cottontail rabbits, *Sylvilagus transitionalis* and *S. floridanus mallurus*, were trapped for use in studying the deterrent effect of various repellents under pen conditions. The procedure was the same as outlined in the 1941 report. Due to the high mortality among the experimental animals, no recheck tests were conducted on the most promising mixtures.

The following mixtures were tested:

R18a, Asphalt emulsion, ethylene dichloride, water
R21, Nicotine bentonite (Black Leaf 155)
R23a, Tetramethylthiuram disulfide
R26a, KR-237, ammonium thiocyanate
R31a, *Daubentonia drummondii*, ethanol extract, NNO adhesive, water
R31b, *Daubentonia drummondii*, ethanol extract, Nevillac soft resin, alcohol
R31c, *Daubentonia drummondii* (40 mesh screened), Nevillac soft resin, alcohol
R31d, *Daubentonia drummondii* extract, Nu-Film, water
R40a, Copper sulfate, NNO adhesive, dicalite, water
R56a, Cedarwood oil, dicalite, soluble dormant oil spray, water
R57a, Terpineol, dicalite, Nevillac soft resin, alcohol
R58a, Allyl isothiocyanate, dicalite, Nevillac soft resin, alcohol
R59b, Herring oil, dicalite, soluble dormant oil spray, water
R60b, Pilchard oil, dicalite, soluble dormant oil spray, water
R61b, Crotonaldehyde, dicalite, Nevillac soft resin, alcohol
R64b, Oil of myrbane, dicalite, Nevillac soft resin, alcohol
R65, Rezyl 12, asphalt emulsion, ethylene dichloride, copper carbonate, dry lime sulfur
R66, Rezyl 869, remainder same as R65
R69a, Alkyl substitute naphthalene, Nevillac soft resin, alcohol
R70b, Neutroleum alpha, Nevillac soft resin, alcohol
R74a, Sulfurized linseed oil, ethylene dichloride
R75a, Lime sulfur, asphalt emulsion, diatomaceous earth, water
R76, Rezyl 315, asphalt emulsion, ethylene dichloride, copper carbonate, copper sulfate, dry lime sulfur
R80a, N-butyl mercaptan, honey
R82, Para-formaldehyde, dicalite, Nu-Film adhesive, water
R83, KR 162 (lead perthiocyanate), NNO adhesive, Nu-Film, water
R84, KR 121 (perthiocyanic acid), Nu-Film adhesive, water
R85, Copper dimethyldithiocarbamate, Nu-Film adhesive, water
R86, Zinc dimethyldithiocarbamate, Nu-Film adhesive, water
R87, KR 92 (allyl perthiocyanate), dicalite, Rezyl 315 and 53, ethylene dichloride
R88, Monothioglycol, dicalite, NNO adhesive, water
R89, Pinene pentasulfide, Rezyl 315 and 53, ethylene dichloride
R90, Mountain Lion urine, dicalite, NNO adhesive, water
R91, Pentachlorphenol, Nevillac soft resin, alcohol

R92, Santobrite Neutral, Nevillac soft resin, alcohol
R94, Tung oil, turpentine
R94a, Tung oil (foreign), ethylene dichloride
R94c, Tung oil (foreign), turpentine
R94d, Tung oil (foreign), turpentine; modification of R94c
R95, Pine tar emulsion (prepared in Wildlife Research Laboratory)
R96, Pine tar, ethylene dichloride, lime sulfur
R97, Rezyl varnish combination, ethylene dichloride, zinc oxide
R98, Rezyl varnish combination, ethylene dichloride, lithopone
R99, Rezyl varnish combination, ethylene dichloride, zinc sulfide
R100, Anise oil, Vatsol OT, Hercolyn, NNO adhesive, water
R101, Pennyroyal oil, Vatsol OT, Hercolyn, NNO adhesive, water
R102, Oil of Citronella, Vatsol OT, Hercolyn, NNO adhesive, water
R103, Cedarwood oil, Vatsol OT, Hercolyn, NNO adhesive, water
R104, Creosote oil, Vatsol OT, NNO adhesive, water
R105, Bear gall bladder contents, Vatsol OT, NNO adhesive, water
R106, Camphor, Hercolyn, Nevillac soft resin, ethyl alcohol
R107, Acetic acid, Vatsol OT, NNO adhesive, water
R108, Quassia chips, Nevillac soft resin, ethyl alcohol
R110, Tung oil filter cake, Rezyl 869, ethylene dichloride
R111, Tung oil pomace (ground), Rezyl 869, ethylene dichloride
R112, Coal tar, ethylene dichloride
R113, Raw linseed oil, pine tar
R114, Pyrethrum powder, NNO adhesive, water

Summary of Tests

Tests	Repellents in order of effectiveness
1	R31a, R31c, R18a, R40a
2	R26a, R23a, R58a, R31b
3	R56a, R57b, R60b, R59b
4	R64b, R61b, R21, R74a
5	R65, R66, R76, R75a
6	R69a, R70b, R80a, R82
7	R83, R84, R85, R86
8	R87, R88, R89, R90
9	R94, R94a, R94c, R94d
10	R96, R95, R112, R113
11	R110, R111, R31d, R114
12	R106, R97, R98, R99
13	R92, R91, R101, R100
14	R103, R102, R104, R105
15	R96, R106, R107, R108

In the preliminary tests above, repellents 31a, 26a, 83, 96 and 106 indicated a greater deterrent value than the other mixtures. These will be rechecked during the winter of 1943.

MOSQUITO CONTROL[1]

R. C. Botsford, Agent
State Board of Mosquito Control

Mosquito breeding in the 11,000 acres of salt marshes accepted for state maintenance was well controlled considering the lack of labor. What was accomplished was due entirely to the knowledge gained by the foremen through many years of experience in locating sources of trouble and applying the most effective treatment at the proper time.

The work of the season duplicates that of last year. Shortage of labor forced nearly all work into areas where emergency measures were necessary to hold down mosquito breeding. New Haven County areas were served best because two men besides the foreman were employed through the season. Fairfield County was cared for as well as possible by one foreman. Middlesex County could be only partially covered by one foreman without labor assistance. New London County was neglected, due to lack of labor and the travel distance from New Haven.

Plans for important improvements and major repairs to drainage systems could not be carried out because funds could not be made available. These projects included a new dike and appurtenances to replace the structure at Great Harbor, Guilford, destroyed by storms; new tide gates at Sybil Creek in Branford, and Indian River, Clinton; and a new outlet at Hammock Point in Clinton. Other major repairs needed include correction of tide gate at Beach Park Road in Clinton to improve drainage of the marsh back of Grove Beach; improvement of outlets at Mulberry Point and Indian Cove in Guilford; correction of main drainage ditch at Silver Sands, East Haven, and reditching areas at Great Harbor, Guilford, north of Route 1 highway at Grove Beach, Clinton, and areas drained by Sybil Creek, Branford.

It seems apparent that potential mosquito breeding places on salt marsh areas here may or may not produce mosquitoes, depending entirely upon various natural and artificial conditions or a combination of both. Natural conditions would include tidal action, rainfall, humidity, temperature, storms, migration of minnows and porosity of the soil. Artificial or man-made conditions include design and state of repair of drainage systems, pollution and careless disposal of waste, deliberate or accidental placing of obstructions in the drainage system and poorly planned filling of salt marsh areas. Trouble caused by nature can usually be anticipated and corrections made in time to prevent annoyance, but man-made difficulties cannot always be predicted and many times a serious infestation is the first warning of them. Successful control of mosquitoes is accomplished only when

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[1] The control of mosquitoes is carried out under a State Board of Mosquito Control and is not a function of the Agricultural Experiment Station. This report is published here as a matter of convenience.

field operators are intimately acquainted with all local conditions affecting mosquito abundance, and are enabled to employ corrective measures whenever necessary.

Dr. Dietrich Bodenstein, formerly at Columbia University and Stanford University, was assigned to the staff of the State Board of Mosquito Control as entomologist on December 6, 1943. A small laboratory has been set up and Doctor Bodenstein will carry on mosquito investigations.

Due to the fact that military personnel is already being returned from highly malarious regions, it may be well to review the relationship between mosquitoes and malaria. Persons contract malaria only through the bite of certain mosquitoes and anyone may carry the infection in his or her blood for several years. So far as known there is in Connecticut but one species of mosquito, *Anopheles quadrimaculatus*, commonly transmitting malaria from one person to another by its bite. The infectiveness of a mosquito may be retained all through its lifetime, and the insect may live six or eight months and bite several persons. Research has shown that when the *Anopheles* mosquito draws blood, containing disease spores, from a victim of malaria, these spores must pass through certain changes inside the body of the mosquito, consuming about eight to 14 days, before the disease can be transmitted from the beak of the infected mosquito to another person. Symptoms of malaria may appear after about 10 days.

The malaria carrying mosquito is common in Connecticut, having been found in nearly all towns where examinations of likely breeding places have been made.

The adult female insect deposits her eggs on the surface of fresh clean, still water, usually in a grassy edged spring, ditch or pool, or a quiet lagoon of a lake or pond. The eggs hatch in a few days and the young insects then pass through the larval and pupal stages, lying at the surface of the water partly concealed in aquatic vegetation or floating debris. In less than a week the adult mosquito emerges and is soon on the wing.

Anopheles mosquitoes begin to appear about mid-July and bite during the early evening hours. Anyone with active malaria parasites in the blood may become the source of an epidemic if *Anopheles* mosquitoes occur in that locality and he or she is bitten. A victim of malaria should protect himself from being bitten if possible, and nearby mosquito breeding places should be eliminated. This caution may prevent a serious epidemic. Extensive epidemics of malaria in Connecticut are not anticipated, if the present control practices already provided are enforced.

The General Statutes of Connecticut, revision of 1930, sections 2413, 2414, 2415 and 2416, include the necessary authority for anti-mosquito work. Section 2413 gives the authority for any local health officer, health committee or board of health or selectmen to abolish swampy areas upon written complaint, provided the cost does not exceed $300.00. Section 2414 gives the authority to any health officer to order mosquito breeding in rain barrels, other receptacles and pools near human habitation abolished. Sections 2415 and 2416 apply particularly to the treatment of extensive mosquito breeding areas. This responsibility was originally placed upon the Director of the Connecticut Agricultural Experiment Station but a revision of the law in 1939 created a State Board of Mosquito Control, where the authority now rests. These two sections provide for the elimination of mosquito breeding conditions and the maintenance of the necessary drainage systems to prevent mosquito breeding. Funds may be provided by voluntary contributions or by municipal or state appropriation.

The tabulation below indicates expenditures on work in the field in maintaining state-accepted areas of salt marsh.

TABLE 11. STATUS OF CONNECTICUT SALT MARSH AREAS, 1943

Town	Salt marsh acres	Maintained by State	Year ditched	Cost maintenance, 1943 Labor	Travel	Foremen's time
Greenwich	200	none	1913, 1935	——	——	——
Stamford	300	250	1911	30.88	15.50	70.79
Darien	300	none	1912	——	——	——
Norwalk	600	550	1912, 1928	80.63	25.60	328.15
Westport	400	400	1926, 1927	223.29	92.45	855.59
Fairfield	1,200	1,200	1913	248.65	144.30	723.97
Bridgeport	173	——	——	——	——	——
Stratford	1,315	none	1934, 1936	——	——	——
Milford	630	none	1935	——	——	——
West Haven	463	222	1916, 1935	11.05	1.70	6.50
New Haven	750	600	1912, 1917, 1935	339.13	46.10	289.39
Hamden	571	571	1930	77.35	——	38.60
North Haven	310	none	1935	——	——	——
East Haven	545	500	1917, 1929	353.62	35.30	304.53
Branford	895	895	1916	735.30	95.35	724.36
Guilford	1,085	1,085	1916	1,043.93	148.65	804.94
Madison	1,315	1,315	1916	——	72.20	384.71
Clinton	785	650	1926, 1935	——	75.10	336.73
Westbrook	500	500	1927	51.00	109.90	561.46
Old Saybrook	1,373	none	1935, 1936	——	——	——
Lyme	493	none	——	——	——	——
Old Lyme	1,393	1,393	1929, 1931	——	168.50	509.28
East Lyme	424	none	1935	——	——	——
Waterford	204	none	1935	——	——	——
New London	34	none	1935	——	——	——
Groton	304	304	1931, 1932	——	——	——
Stonington	641	641	1931, 1932	——	——	——
Totals	17,203	11,076		3,194.83	1,030.65	5,939.00

REPORT ON PARASITES AND DISEASES

PHILIP GARMAN

Oriental Fruit Moth

Various changes are being made from time to time in our parasite breeding technique. For example, a method of rearing Macrocentrus on the potato tuber worm, developed in California, is being tested in our laboratories. It is hoped that we will be able by this method to supplement production in the spring when green apple stocks rot rapidly. At that time, it becomes difficult to rear sufficient fruit moth larvae to maintain Macrocentrus production. Fruit moth eggs are now being obtained in large numbers on green cellophane, which may eliminate the labor and expense of growing privet used heretofore for this purpose. Studies on survival of Macrocentrus and fruit moth larvae in cold chambers are being made in the hope of increasing the number of parasites carried over winter.

Fifty-nine growers ordered parasites in 1943, and a total of 37,000 Macrocentrus in 144 colonies was distributed. Collections from various peach orchards throughout the State indicate that Macrocentrus survived the severe winter of 1942-43 in most localities, but perished in occasional orchards. Wherever continued liberations have been made the parasites have been for the most part maintained at a high level.

Comstock's Mealybug

Field observations and scouting indicated that there was a general decline in orchard infestations throughout Connecticut. During the summer we received two shipments of mealybug parasites from the U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine. These comprised 1,250 mummies filled with hibernating *Pseudaphycus* sp. and 11,600 adults of the same species. These were released in three orchards where the mealybugs appeared to be most abundant.

Japanese Beetle

Distribution of the "milky" disease by Mr. Schread and a crew of three men was continued and the area between Hartford and New Haven and north to the Massachusetts line has now been covered. Examination of grubs from various infested districts indicates that the disease is now well established and is spreading rapidly. A decline in beetle population in southwestern Connecticut may be associated with a rise of disease and parasites. Data from experimental plot diggings are reported elsewhere by Schread. These include examinations for both disease and parasites.

The report on the laboratory studies of the "milky" disease is given in another section by Beard.

REPORT ON ENEMIES OF THE JAPANESE BEETLE FOR 1943

J. C. SCHREAD

"Milky" Disease

In early April, 1943, 35,000 Japanese beetle grubs were dug at Meadow Brook Country Club, Hamden. These were inoculated with the "milky" disease organism, *Bacillus popilliae* Dut., and sent to the United States Department of Agriculture laboratory at Moorestown, New Jersey. Approximately 25,000 grubs were processed, providing 270 pounds of "milky" disease spore dust. In June the spore dust was sent to this laboratory in two shipments of 180 pounds and 90 pounds, respectively.

Starting in July a crew of three men under supervision commenced spreading the "milky" disease. Twenty-four towns in five counties received from one to 112 one-half acre treatments each. A total of 963 one-half acres or 481.5 acres received 843 pounds of dust. The towns and number of treatments each received are as follows:

Town	No. Treatments	Town	No. Treatments
Fairfield County		**Middlesex County**	
Bethel	19	Cromwell	29
Redding	2	Middletown	112
Danbury	12	Middlefield	34
Hartford County		**New Haven County**	
Bristol	1	New Haven	1
East Windsor	65	Meriden	89
Enfield	83	Wallingford	112
Southington	85	Cheshire	2
Berlin	47	North Haven	44
East Granby	36	Branford	61
Suffield	2	Guilford	1
Simsbury	80	North Branford	44
		East Haven	1
Tolland County			
Somers	1		

The quantity of spore dust used was considerably in excess of that produced from grubs processed. All material over and above the 270 pounds was provided by the Moorestown laboratory. Owing to delay in the shipments of the "milky" disease spore dust, some towns scheduled for treatments were necessarily dropped until next year.

Positive results are being obtained from the use of the "milky" disease in experimental plots. Data accumulated in the spring and again in the fall show there is much improvement over previous seasons in the establishment and spread of the disease. In the Bridgeport and Hartford areas, the "milky" disease "take" was much higher than elsewhere. In June 43.3 per cent of the grubs in the Hartford area were diseased; in Bridgeport, 18.5 per cent. In the fall a considerable drop in percentage of diseased grubs was noted: 11.6 per cent in the Hartford area and 14.6 per cent in the Bridgeport area. The fall

grub population was much greater than the June population. However, soil temperature in the fall was less favorable to the development of the disease. Results so far indicate that the length of time the experimental plots have been established is of importance. Both in Hartford and in Bridgeport the highest percentage of diseased grubs were taken from plots treated with disease in 1939 and the lowest percentage from those treated in 1941.

Soil temperature is an important limiting factor in determining the degree to which *Bacillus popilliae* can be effective, as the organism becomes inactive at 60° F. In the absence of its preferred host, *Popillia japonica* Newm., or other hosts equally favorable to its development, the bacterium remains dormant for a long period of time in the soil. Soil temperatures in early summer are usually in excess of 60° F., and grubs infected with the bacillus at that time become seriously affected and die. A higher percentage of disease could not normally be expected in the fall at which time soil temperatures, in response to a normal drop in air temperature, fall rapidly. By the last week in September and early October, soil temperature has dropped to 55° to 60° F. Checks on the experimental plots were taken at a distance of from 50 feet to one-quarter mile (average, 327 feet). The average percentage of diseased grubs in the check plots in early summer was 25.4 per cent. In the fall this figure had dropped to 3.62 per cent. The average number of grubs per square foot in June was 2.3 in the experimental plots and 2.0 in the check plots. In the fall in the treated plots the number of grubs per square foot averaged 6.0 whereas in the check plots there was an average of 9.1 grubs per square foot.

New Canaan as a check town has given very interesting information. No disease has been released in this town; however, on June 30, 1943, diseased grubs were found in three locations; 71.4 per cent diseased in one location, 50 per cent in the second location and 15.2 per cent in the third location.

A field experiment on an extensive lawn in Bloomfield, in which a single circular spot of spore dust one foot in diameter, containing approximately 200,000,000 spores, was used, was conducted in the season of 1943. Grubs were taken from the experimental plot on five occasions, 20 diggings being the limit each time. Grub populations for each series of diggings show considerable variation from a total of 97 grubs or 4.8 per square foot in June to 316 grubs or 15.8 per square foot in October. All grubs were carefully examined for disease but only one revealed the presence of the bacillus. This diseased grub was taken from a hole 18 feet from the "milky" disease spot.

Mortality During the Winter

It has been commonly thought that a severe cold winter would be disastrous to Japanese beetle grubs with perhaps only those far below the surface of the ground escaping destruction. Fox (1) found that under natural conditions the lowest temperature Japanese beetle larvae can normally withstand is about +15° F. (—9.4° C.)

According to this author, some may die at temperatures in the neighborhood of 22° F. (—5.6° C.) Following exposure of Japanese beetle grubs at a minimum outdoor air temperature of +17° F., 100 per cent mortality ensued (1). Mail (2) points out that, with ample ground cover in the form of snow, a prolonged period of extremely cold weather has little effect in reducing the soil temperature much below the freezing point of water, which is considerably above the temperature injurious to Japanese beetle grubs. Data gathered in late winter, 1943, showed the existence of a certain percentage of winter mortality in widely separated localities in the State. It is thought that, owing to low air temperatures in the absence of snow (as a ground cover), soil temperatures dropped below the lethal of +15° F. for Japanese beetle grubs, resulting in their death. Diggings made between March 31 and April 13, 1943, showed as high as 25 to 42 per cent grub mortality in some beetle infested areas in the State during the winter of 1942-1943.

Tiphia

Scouting for adult *Tiphia vernalis* continued during late May and early June. Twenty-five colony sites were visited, some of them on several occasions. These sites varied in age (from the year of parasite release) from two to eight years; most of them, however, were eight, five and three years old. At only five of the 25 localities scouted were *T. vernalis* seen. Two of these sites, at which the parasite was abundant, were established in 1938. One site, at which only a very few *Tiphia* were observed, was established in 1939, and the remaining two sites at which upward of 100 adults were counted in each instance were established in 1941. The oldest colony sites, established back in 1936 and 1937, failed to reveal the presence of the parasite.

The relative abundance of Japanese beetle larvae and cocoons of *Tiphia vernalis* was investigated during early spring, 1943. The procedure was simply to make systematic soil diggings in the areas in which the wasp was formerly colonized and sift the earth carefully to remove all beetle grubs and parasite cocoons. With information thus gathered, it was possible to arrive at the relationship existing between grubs and parasites. The results of this investigation have brought to light some important information relative to the colonization of *Tiphia*. First of all, the older the colony, the more certainty there is of its permanent establishment and increase in population. Although only 18 per cent of all colony sites were examined, it was found that of this number *T. vernalis* cocoons were present in 100 per cent of the 1936 colony localities, 100 per cent of the 1937, 33 per cent of the 1938 and 14 per cent of the 1939. The 1940-41-42 colony sites were not visited. From the standpoint of percentage of Japanese beetle grub parasitism by *T. vernalis*, it was found that, in the 1936 localities, 45.83 per cent of the grub-parasite material removed from the soil was *Tiphia* cocoons. Only one 1937 parasite locality was visited revealing a parasitism of 1.66 per cent, which is hardly significant. The 1938 colony sites gave 9.3 per cent parasitism and the 1939, 1.54 per cent parasitism, which is likewise too small to be significant. The ratio of grubs to cocoons per digging varied greatly. There were instances in the 1936 colony sites which ran as follows: 1-3, 0-2, 2-1, 1-1, 9-8, 3-2, 7-8, whereas in the 1939 sites they were as follows: 13-1, 13-0, 10-0, 8-2, 9-1, 3-1, 5-0. The average number of grubs per square foot in 1943 at the 1936 *Tiphia* colony sites was 2.3; at the 1937 colony sites there were 5 grubs per square foot; at the 1938 colony sites there were 8.1 grubs per square foot and at the 1939 colony sites there were 5.5 grubs per square foot. Obviously, there exist from two to four times more grubs at the 1938 and 1939 *Tiphia* sites than at the 1936 colony sites. Whether or not the reduced beetle grub population at the 1936 colonization sites in contrast to later years may be attributed entirely to *Tiphia vernalis* parasitism is a matter of conjecture. It is certain, however, that the parasite is intrinsically valuable as a natural agency in suppressing Japanese beetles. High parasitism in some of the colony liberations indicates a depressing effect on grub population.

Forty-two observations were made in August and early September at 22 *Tiphia popilliavora* colony sites. All of the colonizations had been made in 1937 and in 1938. The parasite was taken from or observed at nine of the 22 sites. Seven of the nine were 1938 colonizations, the remaining two, 1937. In one instance (Seaside Park, Bridgeport) *Tiphia* were sufficiently abundant to permit collecting hundreds in a reasonably short time. Using the parasites collected from Seaside Park, five new colonies were released in the central part of the State. There were many *Tiphia* observed at all of the remaining eight colony sites mentioned.

Literature Cited

1. Fox, Henry, 1935. Some misconceptions regarding the effects of the cold of February 1934 on the larvae of the Japanese beetle, *Popillia japonica* Newman. Jour. Econ. Ent. 28: 154-159.
2. Mail, G. A., 1930. Winter soil temperatures and their relation to subterranean insect survival. Jour. Agr. Res. 41: 571-592.

LABORATORY STUDIES OF THE "MILKY" DISEASE

R. L. Beard

Studies are in progress on the mode of infection of Japanese beetle larvae by the bacteria causing the "milky" disease and on the factors which affect the dissemination of the disease. Results of experiments being published elsewhere demonstrate that the incidence of disease following injection of spores into the body cavity follows a characteristic dosage response curve and that relatively high concentrations of spores are required to cause much disease. This indicates considerable resistance on the part of the grubs to infection. Spores injected into the foregut of larvae cause an almost negligible amount of disease. Beetle grubs placed in soil contaminated with different numbers of spores become diseased in a characteristic dosage response, but more than 3,000,000 spores per gram of dry soil are required to cause disease amounting to 60 to 75 per cent of the grubs. These experiments indicate that very little disease can be expected from direct inoculation of the soil, and that the beetle grubs themselves must be depended upon to transmit the disease. This work also gives validity to the spot method of field distribution of spore dust, and suggests that to be most effective, the spot should be concentrated in area and placed among heavy beetle grub populations.

FURTHER EXPERIMENTS WITH STICKERS FOR HOLDING ARSENATE OF LEAD ON PLANT FOLIAGE

PHILIP GARMAN

Continuing the work begun several years ago, comparisons of a number of different adhesives were made, both by the glass slide method and also by washing sprayed plants in an improvised laboratory sprinkler-washer. No oils were used in these tests, the object being to find suitable agents for use with sulfur sprays because oils in general are incompatible with them. In the slide tests, lead arsenate was mixed with increasing amounts of each adhesive and the slides were weighed, sprayed, weighed, washed and reweighed in order to determine the loss. The amount of wash, the amount of lead arsenate and the volume of water were held constant and the sticker alone varied. Differences in the behavior of certain well-known materials soon became apparent. Soaps, such as sodium oleate, caused the arsenate to be removed more effectively as the percentage of soap increased. With skim milk and soybean flour, there was a slight rise in adhesion and then a decline. With aluminum hydroxide gel, there was a steady rise. Still another type of sticker gave a rapid rise and an equally rapid decline. One of the best examples of the latter type of adhesion is afforded by benzyl-ethyl starch (Figure 1) which stuck the spray on very well at 20 per cent (3 parts lead arsenate and .75 parts starch), but not so well above 20 per cent. Casein glue increased the tenacity of the mixture up to 40 per cent but it declined when the sticker was increased above 40 per cent. Triple mixtures, such as lead arsenate and bentonite-skim milk, gave much better adhesion than was obtained with lead arsenate and skim milk alone (Figures 2, 5, 6). Bentonite-flour and bentonite-lime were also inferior to bentonite-skim milk for holding lead arsenate on the glass plates or on plant foliage (Figure 4).

In order to determine the actual removal of arsenate from the slides, analyses were made in several tests by Mr. C. E. Shepard. Results parallel closely the total loss of weight obtained without analysis. Figure 3 gives the total loss of weight in experiments with aluminum gel, compared with the loss of lead arsenate computed from chemical analyses (dash line).

A slow increase in the per cent adhering to the slides was noted in tests with lead arsenate alone (no sticker added) when the actual amount on the slides was increased. This results in a slanting base line rather than a level one which must be used for comparison with lead arsenate-sticker combinations (Figures 1-3).

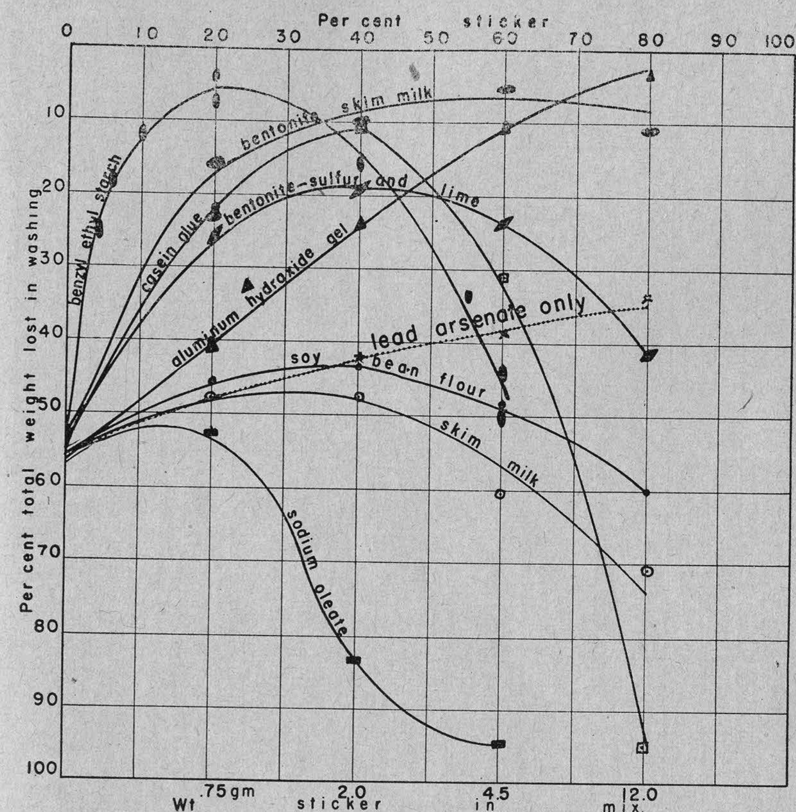

FIGURE 1. Chart showing adhesiveness of lead arsenate when sprayed on glass lantern slides with various "stickers". The materials were settled onto the slides in a settling tower and were washed in a container of distilled water. The washing method consisted of immersion, moving the slide to right or left and removing after each stroke and shaking off the water.

Lead arsenate was used at the rate of 3 gms. in 205 ml. water. This is about four times the concentration usually used in orchard sprays. The sticker varied, as shown in the chart. The curve for lead arsenate was obtained by adding to the original 3 gms. of lead arsenate amounts equal to the amount of sticker used in the sticker tests. The bentonite-skim milk and the bentonite-sulfur and lime were composed of 80 per cent bentonite or 80 per cent bentonite-sulfur, the remainder being either skim milk or lime.

Washing tests with apple, privet and peach foliage, as well as small green apples, confirmed most of the slide results. However, the increasing and then declining adhesion noted in slide tests with such materials as benzyl-ethyl starch, casein glue, etc., could not be verified by washing tests with apple leaves. A slight indication of the decline following an initial rise was, however, observed in the case of waxy privet leaves.

Small scale field tests using young Wealthy apple trees gave evidence that the best non-oil stickers, as determined by laboratory experiments, are not equal to oil preparations for holding on the lead arsenate over long periods. These tests, however, are not yet complete.

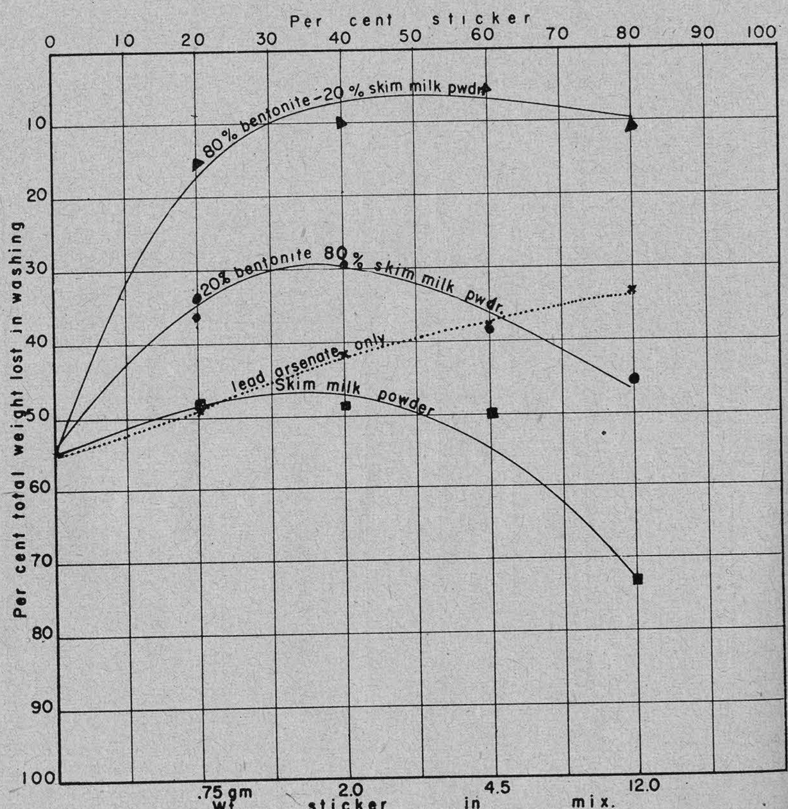

FIGURE 2. Experiments with bentonite-skim milk and skim milk alone as adhesives for lead arsenate. Lead arsenate without sticker given for comparison. Glass lantern slides and the same methods as described under Figure 1 were used.

Summary

In general, considering slide and foliage experiments, it is evident that:

(1) Adhesion as determined by the slide method may increase as the amount of sticker increases, but it may decline, as in the case of pure sodium oleate, or it may rise and then decline.

(2) The best adhesives in these experiments were aluminum hydroxide gel, bentonite-skim milk, benzyl-ethyl starch, bentonite-sulfur with lime, and casein glue. Benzyl-ethyl starch is not on the market at present, and casein glue probably has too much spreader value to allow a heavy deposit build-up. Bentonite-sulfur with lime, bentonite-casein or bentonite-skim milk (80 per cent bentonite, 20 per cent casein or skim milk), and aluminum gel gave fairly satisfactory tenacity in our laboratory experiments both on slides and foliage. These stickers are relatively cheap and all are obtainable. As indicated in the experiments described, aluminum gel must be used in considerable amounts to obtain good adhesion of the spray mixture.

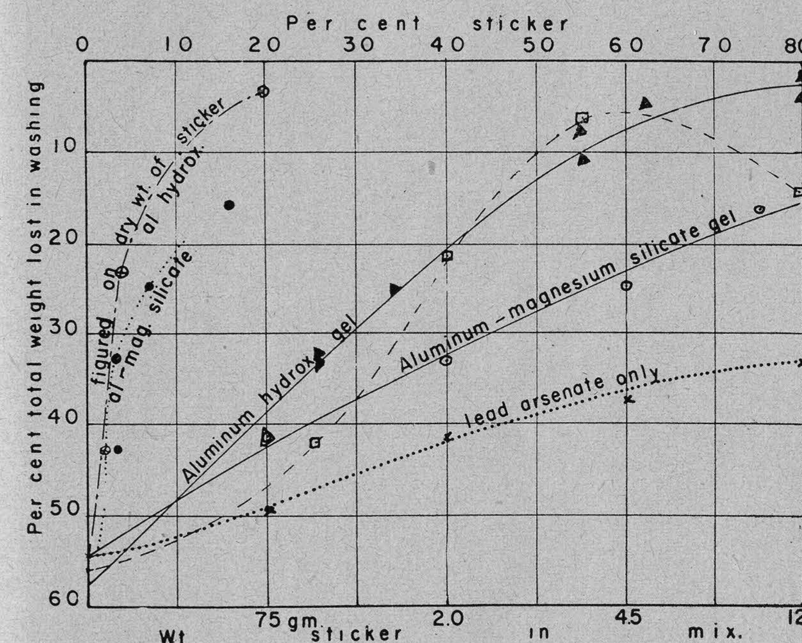

FIGURE 3. Comparison of two aluminum gels for holding arsenate of lead on glass plates. In the test with aluminum hydroxide gel, the dash line gives the results obtained from chemical analyses. Glass lantern slides and the same methods described under Figure 1 were used.

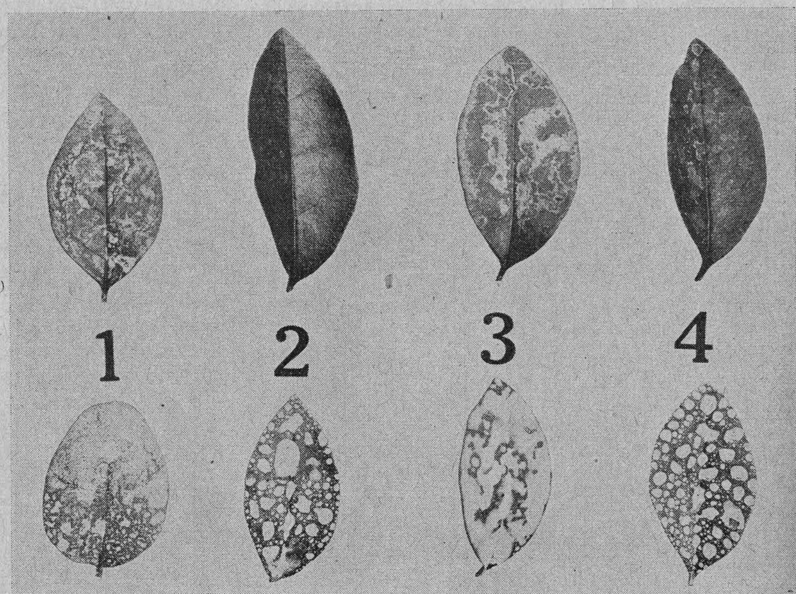

FIGURE 4. Privet leaves sprayed for 10 seconds in a spray tower and the top row washed one hour in a washer delivering 2 gallons per minute. Paired leaves with the same visible deposit before washing

1. Lead arsenate 3 gms., bentonite 3 gms., flotation sulfur 3 gms., casein 1 gm. to 205 ml. of water.
2. Lead arsenate 3 gms., bentonite 3 gms., flotation sulfur 3 gms., wheat flour 1 gm., water 205 ml.
3. Lead arsenate 3 gms., bentonite 3 gms., flotation sulfur 3 gms., skim milk powder 1 gm., water 205 ml.
4. Lead arsenate 3 gms., bentonite 3 gms., flotation sulfur 3 gms., lime 1 gm., water 205 ml.

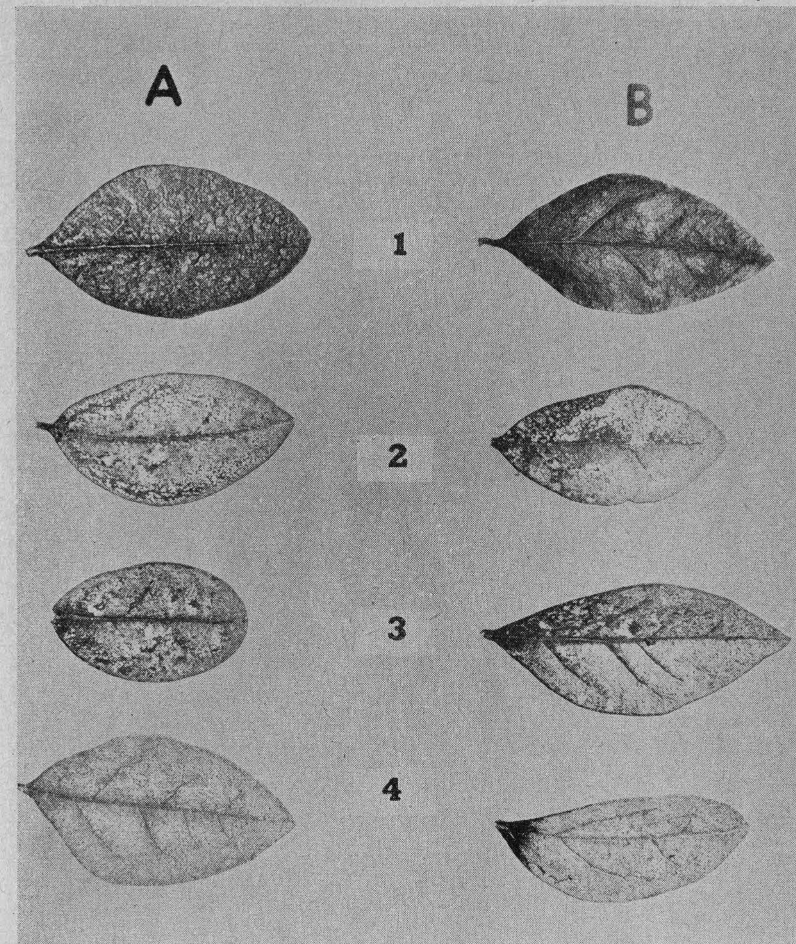

FIGURE 5. Privet leaves sprayed for 10 seconds in a spray tower and Row B washed one hour in a washer delivering 2 gallons per minute. Paired leaves with the same visible deposit before washing.

1. Lead arsenate 3 gms., water 205 ml.
2. Lead arsenate 3 gms., bentonite 1.6 gms., skim milk powder .4 gm., water 205 ml.
3. Lead arsenate 3 gms., bentonite-sulfur (Kolofog) 1.6 gms., lime .4 gm., water 205 ml.
4. Lead arsenate 3 gms., aluminum hydroxide gel 4.5 gms., skim milk .5 gm., water 205 ml.

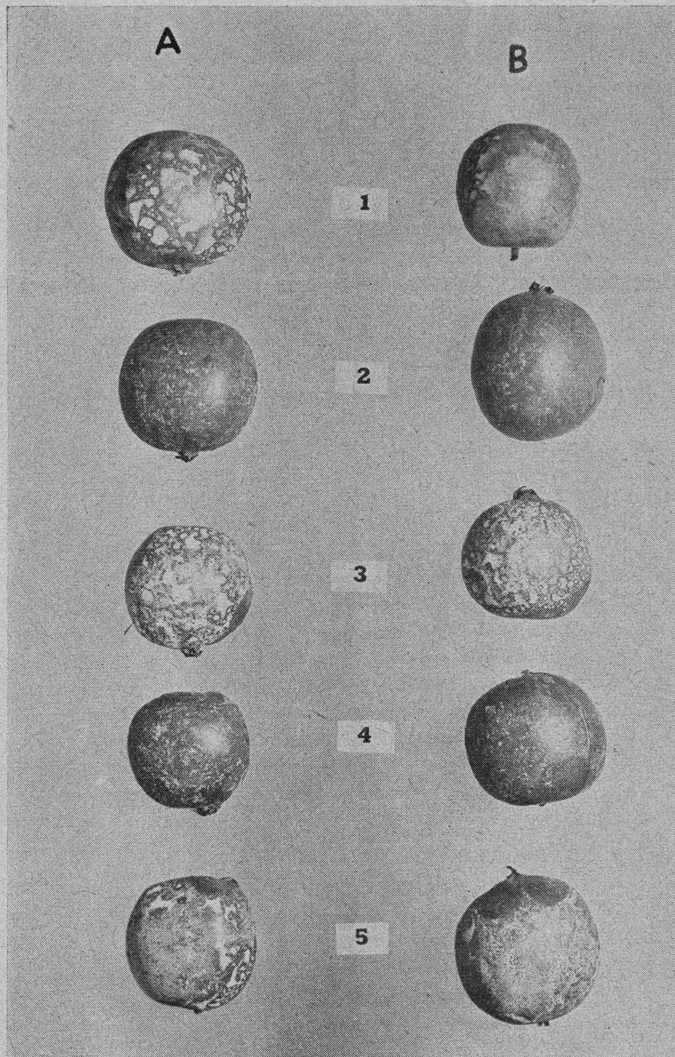

FIGURE 6. Row A unwashed. Row B washed one hour in washer delivering two gallons per minute. Each pair of apples sprayed for 10 seconds in a spray tower; both with the same visible deposit before washing. Note different amounts adhering in Row B.

1. Lead arsenate 3 gms., water 205 ml.
2. Lead arsenate 3 gms., skim milk powder 2 gms., water 205 ml.
3. Lead arsenate 3 gms., bentonite 1.6 gms., skim milk .4 gm., water 205 ml.
4. Lead arsenate 3 gms., Casco glue 2 gms., water 205 ml.
5. Lead arsenate 3 gms., bentonite-sulfur* 1.6 gms., lime .4 gm., water 205 ml.

* Commercial preparation.

FURTHER STUDIES IN SPRAY SCHEDULE REDUCTION

PHILIP GARMAN

Spraying experiments at Mount Carmel and Westwoods were continued in 1943. The main objective was to test fungicides as well as insecticides in reduced schedules. The fungicides used were Spergon[1] and Fermate[2]. Results in general continue to confirm previous data, namely, that insect control is nearly or quite equal to that obtained with more extended schedules. None of the 1943 experiments gave insect control (with either full or reduced schedules) equal to the 1941 and 1942 tests. This was largely because of the increased activity of curculio, redbug and apple maggot. For the first time, we obtained satisfactory control of apple scab with the reduced program. While this is very encouraging, it should be repeated in other years and in other orchards.

From work done so far, it seems possible to eliminate two and possibly three sprays from an average eight-spray schedule. In some years and in favorable locations, the entire spray program can probably be reduced to three sprays on scab resistant varieties without loss of effectiveness. (See Conn. Agr. Expt. Sta. Buls. 461 and 472).

It will be noted that the amount of lead arsenate was doubled in two of the reduced schedule sprays. When this is done and a sticker of the type used since 1940 is added, the actual amount of poison on the foliage and fruit is higher throughout the season than can be obtained with the usual dose and more applications. In addition to the increased dose, it is necessary to spray heavily and thoroughly in order to protect the fruit.

Experiments in the Burton orchard as well as those at the Connecticut Agricultural Experiment Station showed that curculio control on fruit from trees with the full schedules containing sulfur was improved by the addition of soybean flour and manganese borate. From these results it would appear advisable to add a spreader to sprays used in reduced schedules. Caution may be needed here, however, since too much spreader may cause the spray to weather more rapidly than is desired.

A general summary of results in control of curculio is given in Table 12. The differences have been analyzed by statistical methods and appear to be significant. A more complete summary of insect, disease and russet control is presented in Table 13. Experiments at Westwoods are shown in Table 14.

Summary and Conclusions

Observations this year indicated that our reduced schedule experiments showed: (1) Poorer curculio control than the extended schedule

[1] Chloranil (tetrachloroquinone: tetrachloro-p-benzoquinone).
[2] Ferric dimethyl dithiocarbamate.

with lead arsenate, sulfur, soybean flour and manganese borate. They were equal to schedules employing lead arsenate and wettable sulfur without spreader-safener. (2) Control of redbugs was also inferior to that obtained by extended schedules containing sulfur, but was not completely satisfactory in any of them since no contact insecticides

FIGURE 7. Baldwin apple trees showing difference in color of the foliage. Tree at the right is infested with European red mites. Treatment: Tree at left received three sprays containing lead arsenate (pink, 3 lbs. to 100, calyx and one cover 6 lbs.), ¾ lb. Fermate, and 1 ½ lbs. aluminum hydroxide gel, in 100 gals. Tree at right received five sprays of lead arsenate 3 lbs. and dry flotation sulfur 5 lbs., in 100 gals. Photo taken September 1.

TABLE 12. ADVANTAGE OF ADDING SOYBEAN FLOUR—MANGANESE BORATE SAFENER AND SPREADER TO FLOTATION SULFUR FOR CURCULIO

(Burton and Connecticut Agricultural Experiment Station Orchards, 1943)

Trees compared	% in favor of spreader-safener	Trees compared	% in favor of spreader-safener
D7 and D6	+13.09	D33 and C34	+17.13
D8 and D13	+ 4.03	D33 and C32	— .32
D5 and D9	+22.50	F12 and F16	+12.32
D9 and D11	+ 5.65	F14 and F16	+ 2.92
E15 and F16	+ .43	E9 and D9	+24.47
E17 and E18	+12.43	E11 and D11	+ 6.78
C24 and C32	+15.83		

Average difference in favor of spreader-safener 9.89

were used in 1943. (3) Red mite control (Figure 7) was better than that secured with full sulfur-lead arsenate schedule. (4) Apple maggot control was consistently better where the reduced schedules were used. (5) Spray russet was less than was produced with the extended program and the foliage was in better condition at the

TABLE 13. CONTROL OF APPLE INSECTS, 1943

Burton Orchard
McIntosh

Treatment[2]	Good[1]	Curculio %	Scab %	Conspicuous russet %
Green	75.04	6.51	4.09	29.36
Blue	60.74	11.67	.95	31.62
White	56.52	20.30	1.42	35.51
Red	63.00	14.60	11.77	6.88
Yellow	53.72	10.97	24.89	7.18

[1] Free of external insect marks, maggot and scab.
[2] Formulae given below

EXPLANATION OF TREATMENTS

Burton Orchard

	Materials for 100 gallons		Sprays
Green	Lead arsenate	3 lbs.	May 6 (Mac. & Del.)
	Dry flotation sulfur	5 lbs.	May 11
	Manganese borate	¼ lb.	May 20–21
	Soybean flour	½ lb.	June 2
			June 17
			July 8
Blue	Same as green only with half the amount of manganese borate and soybean flour		Same as green
White	Lead arsenate	3 lbs.	May 6 (Mac. & Del.)
	Dry flotation sulfur	5 lbs.	May 11
			May 20–21
			June 2
			June 18
			July 8
Yellow	Lead arsenate	3 lbs.	May 6 (Mac. & Del.)
	Aluminum gel	3 lbs.	May 11
	Spergon	¼ lb.	May 20–21
	White oil	½ gal.	June 9
Red	Lead arsenate	3 lbs. (6 lbs. at calyx and 1st cover)	May 6 (Mac. & Del.)
	Aluminum gel	3 lbs.	May 11
	Spergon	½ lb.	May 20–21
	White oil	½ gal.	June 9

end of the season. (6) Scab control by the best treatment in the reduced schedule series was superior to that of the full sulfur schedule (Table 14). All in all, our field spray tests during the last three years continue to show promise as regards reduction of the number of sprays and indicate that full success may possibly be obtained with further experiment.

TABLE 14. SCAB AND INSECT CONTROL IN TOWNSEND ORCHARD WITH REDUCED SCHEDULES

Treatment	McIntosh			Rome		
Amounts per 100 gallons	Tree No.	Good[1]	Scab	Tree No.	Good[1]	Scab
		percentages			percentages	
Lead arsenate—3 lbs. at pink,	I12	44.45	9.21	P23	54.16	16.66
6 lbs. at calyx and only cover	G21	19.52	41.71	P25	66.42	2.14
Fermate—¾ lb. plus aluminum	G18	31.99	11.01	P27	84.00	1.33
gel or bentonite and oil	H20	35.08	8.85	P19	59.82	3.57
				D15	58.93	7.83
4 sprays (At prepink, Fermate only)						
Averages		41.29	29.84		65.01	5.46
Lead arsenate—3 lbs. at pink,	K20	53.69	.18	P29	86.11	2.77
6 lbs. at calyx and only cover	M40	59.13	3.19	P31	90.56	.00
Fermate—1 ½ lbs.	E27	21.14	1.14	P33	66.37	2.62
Aluminum gel or bentonite and oil	H27	24.53	4.69	I20	93.68	.75
	O32	37.32	1.67	J17	84.87	3.36
4 sprays (At prepink, Fermate only)	M14	55.48	4.20	J19	87.33	2.00
	O30	80.14	2.36			
Averages		60.79	2.65		84.84	1.72
Lead arsenate—3 lbs.	D3	49.18	9.05	H11	91.46	5.90
Dry flotation sulfur—5 lbs.	E4	42.02	34.43	H17	82.06	3.58
	K25	81.52	7.60	F11	94.80	2.59
6 sprays (At prepink, flotation sulfur only)	K24	43.90	32.07	J21	87.45	5.78
				F7	66.72	12.99
				J27	87.70	2.15
				H5	73.60	3.43
Averages		57.59	19.22		81.57	6.34

[1] Free of external insect marks.

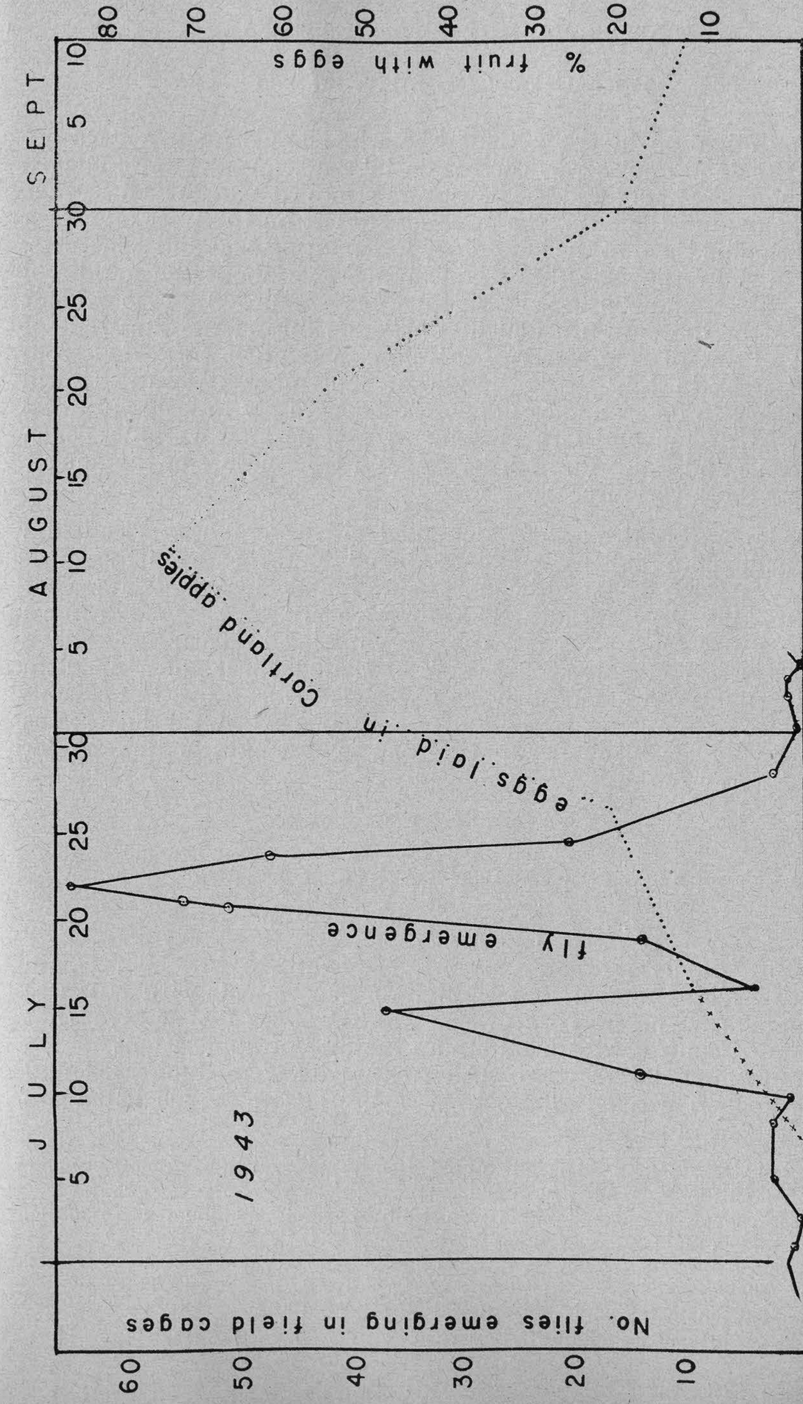

FIGURE 8. Chart showing emergence of apple maggot flies and the egg-laying activities in Cortlands, as determined by examination of apples removed from the trees after exposure for one week at different periods during the summer.

APPLE MAGGOT INVESTIGATIONS

Philip Garman and J. F. Townsend

An investigation of the actual time when apple maggot eggs are laid in Cortland apples was carried on in 1943. Apples were bagged about the first of July and the bags were removed at regular intervals. After removal of the bags, the apples were left on the trees one week before bringing them to the laboratory for counting eggs and punctures. The data show that the flies begin laying eggs about the middle of July or before, and continue into September (Figure 8). It is evident that most of the eggs are laid in Cortlands during the first half of August. Fruit of that variety, therefore, should be protected from the first week in July to the middle of September at least. It will be necessary to determine egg deposition separately in early varieties, such as Astrachan and Gravenstein, as well as later varieties, such as Delicious and Baldwin, in order to get a true picture of the danger period for those varieties.

In the laboratory, tests were conducted with several new insecticides of which dichloro-diphenyl-trichloroethane[1] appears to be the most promising. Cage tests with DDT spray and dust indicate that the dust kills very rapidly at comparatively low concentrations (1 ½ to 5 per cent). So far, the sprays tried in cage tests have been relatively ineffective. Exposure of the chemical under an ultra violet sun lamp did not destroy its effectiveness as a dust. Previous tests showed complete destruction of rotenone when the latter was exposed in the same manner and for the same length of time under the same lamp.

SPRAYS FOR JAPANESE BEETLE CONTROL

J. P. Johnson and Philip Garman

A small, heavily infested vineyard belonging to Mr. Van Doren on Waite Street, Hamden, was selected for experiments with Japanese beetle sprays. The purpose of the work was to test sprays that might afford control with a minimum number of applications. Five different formulae were tried. All treatments were duplicated and one check strip was left for comparison. The materials listed are for 100 gallons of spray.

(1) Lead arsenate, 6 pounds; white oil (80 viscosity), ½ gallon; bentonite, 1 pound, and Ultrawet spreader, ¼ pound.

(2) Basic copper arsenate, 3 pounds; white oil, ½ gallon; aluminum aceto-borate, 1 pound, and benzoic acid, 2 ounces.

(3) Copper arsenate, 3 pounds; soybean flour, ½ pound, and manganese borate, ¼ pound.

(4) Lead arsenate, 6 pounds; Bordeaux mixture (8–8–100).

(5) Copper arsenate, 3 pounds.

[1] Also known as "Gesarol" or "DDT".

Only one application was made, all formulae being applied on the same day, during the morning of June 30.

Frequent inspections showed that formula number 1 afforded the most complete protection, but that number 4 was a close second. Figure 9 shows two of the plots, number 1 (right) and number 3 (left of center), and gives an idea of the difference between the two on August 17. The foliage of the check vines was almost completely destroyed at the time the photograph was made. The differences between numbers 1 and 4 became more apparent as the season advanced, mainly because of the better adhesion of the bentonite-oil. Lead arsenate-Bordeaux mixture, however, gave a reasonable degree of protection for the greater part of the beetle feeding season.

All components of formulae 1 and 4 are obtainable. The ingredients of number 1 should be mixed thoroughly in a bucket with a small amount of water, before dilution. The Bordeaux mixture in number 4 was freshly prepared and was not a commercial product.

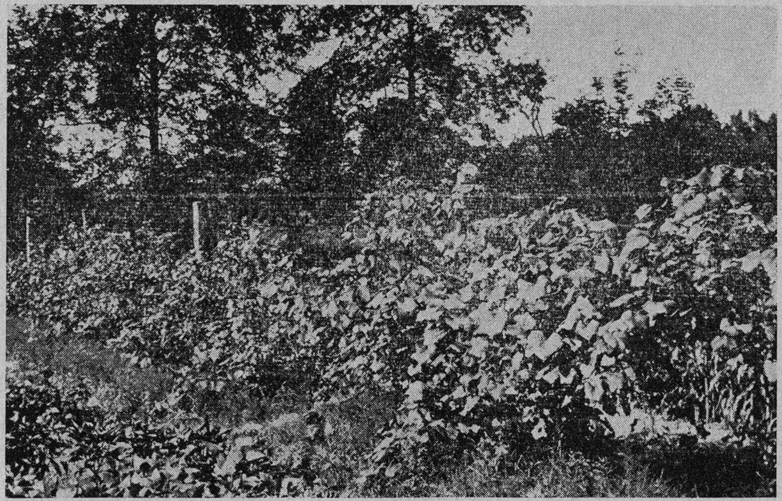

Figure 9. Grapevines receiving sprays for control of the Japanese beetle. Vines at right of center received one spray of lead arsenate 6 lbs., 80 visc. white oil ½ gal., bentonite 1 lb., and Ultrawet ¼ lb. in 100 gals. Left of center the vines were sprayed with basic copper arsenate 3 lbs., white oil ½ gal., aluminum acetic borate 1 lb. and benzoic acid 2 ounces. Vines to the right were protected all season with one application on June 30.

WIREWORMS

Douglas E. Greenwood

Wireworms are annually responsible for crop losses in the United States totalling several millions of dollars. These losses are not always apparent since, oftentimes, as in a stand of grain, they are brought about by a reduction in yield rather than in a reduction of marketable value, as on potatoes. Nevertheless, the damage caused by wireworms results in a substantial decrease in the national agricultural production.

The habits of wireworms, in general, are not too clearly understood because of their subterranean existence during a greater part of their lives. Some species pass through a complete life cycle in one year; others require several years. Some species prefer sod land, others prefer land under continuous cultivation. These differences, together with the agricultural practices peculiar to a given region, can make the problem of control either relatively simple or exceedingly difficult.

One of the principal economically important wireworm pests to Connecticut crops is the eastern field wireworm, *Limonius agonus* Say. A discussion of the life history of this species can be found in Bulletin 367 of this Station, but a few remarks on its habits will serve to present our immediate problem more clearly. The eastern field wireworm requires several years to complete its life cycle, so the destructive larval stage is present in the soil over several seasons. This wireworm also prefers sandy loam soils under continuous cultivation. From these habits, it is readily apparent that our principal tobacco and potato land is ideal for the survival and perpetuation of the pest. Other potentially injurious species of wireworms occur throughout the State but the agricultural practices which favor their development do not exist on a wide scale.

Observations on Tobacco

The injury caused by wireworms to newly set tobacco plants did not appear to be greater this year than during the past few seasons. Several reports were received, indirectly, from the East Hartford area where it was necessary to replant as many as three times but, on the whole, most growers considered the injury during 1943 to be negligible.

During the course of the past summer, many hours were spent discussing the wireworm problem with various growers. The greater part of those interviewed expressed the belief that since rye has been used as a winter hardy green manure crop for the maintenance of soil fertility, the wireworm problem has lessened materially in severity. No direct experimental work is available to substantiate this aspect of the problem but it seems perfectly feasible that such a practice could be used as a palliative measure. The period of vulnerability of newly set tobacco to wireworm attack is relatively short so that a green manure, which serves as food for the wireworm, may delay feeding on the tobacco long enough to enable the plants to become larger. Unfortunately, this practice could not be expected to work successfully on a crop such as potatoes since the major wireworm feeding period comes much later in the season, at a time when green manure no longer is an ideal source of food.

Soil samples, taken at random before a field of tobacco was set, revealed a wireworm population ranging from 10 to 25 or more larvae[1] per square foot, or approximately 435,000 to over 1,000,000 per acre. This particular field had had a green manure crop of rye plowed under in the spring. No trace of wireworm injury could be found. The effect of the green manure crop cannot be expressed with certainty but a wireworm population of such proportions could obviously ruin a tobacco setting if no other source of food existed.

Observations on Potatoes

Several days were spent, during the latter part of the digging period, talking with some of the larger growers of the main potato areas in Ellington and South Windsor in order to get a cross section of the wireworm damage in relation to the dry growing season. Most growers expressed the opinion that wireworm injury was less in 1943 than in preceding years and that the crop was relatively clean. This is not in complete agreement with data obtained from the careful examination of tuber samples of several previously chosen fields. The difference may lie in the fact that the growers considered their crops to be clean in comparison with those crops of previous years since a casual examination of some of the supposedly "clean" crops showed many tubers with one, two or three wireworm holes. In those areas where the wireworm populations were known to be high in cultivated land, the degree of damage was severe.

Table 15 shows the per cent tubers injured by wireworms in plots at the Experimental Farm, South Coventry, maintained by the Agronomy Department of the University of Connecticut. This particular range (L–1) represents potatoes grown for the second successive year following 10 different green manures planted in 1941. Each plot is an average of three replicates, including both grade U. S. 1 and grade U. S. 2 potatoes. The tubers were considered injured if they contained one or more wireworm holes. The degree of injury was severe enough to minimize the number of tubers having only one wireworm hole.

[1] Cryptohypnus abbreviatus Say.

Table 15. Wireworm Injury to Second Year Potatoes, South Coventry

Plot[1]	Total tubers	Number injured	Per cent injured	Plot	Total tubers	Number injured	Per cent injured
A	594	369	62.12	F	603	427	70.81
B	623	519	83.30	G	582	437	75.08
C	619	441	71.24	H	621	419	67.47
D	578	400	69.20	I	623	382	61.31
E	579	429	74.09	J	567	327	57.67

[1] A=Red clover, B=Crimson clover, C=Redtop, D=Timothy, E=Red clover—Timothy, F=Red clover—Timothy (both cut and removed for hay), G=Ladino clover, H=Crimson clover (plowed under in September), I=Japanese millet, J=Soybeans.

Table 16 shows the wireworm injury on the adjoining range (L–3). Potatoes grown on this range are first year potatoes following green manures in 1942.

TABLE 16. WIREWORM INJURY TO FIRST YEAR POTATOES, SOUTH COVENTRY

Plot[1]	Total tubers	Number injured	Per cent injured	Plot	Total tubers	Number injured	Per cent injured
A	683	292	42.75	F	673	563	83.65
B	673	316	46.95	G	785	547	69.68
C	673	120	17.83	H	605	303	50.08
D	651	232	35.63	I	599	214	35.72
E	684	220	32.16	J	690	260	37.68

[1] As above, except system G which is Pearl Vetch.

It is apparent, from Tables 15 and 16, that potatoes grown for a second year are more severely injured than first year potatoes following a green manure. This is in keeping with the report, by growers in general, that wireworm injury increases as the potato crop is continued on a given piece of land. Table 18 further bears this out.

Table 17 shows the wireworm injury to potatoes in several two-year rotations as conducted by the Soils Department at the Connecticut Agricultural Experiment Station, Windsor. The results are averages for three replicates, except PP (potatoes after potatoes) which had six replicates. Any tuber with one or more wireworm holes was classified as "injured".

TABLE 17. WIREWORM INJURY TO FIRST YEAR POTATOES, WINDSOR

Plot[1]	Number tubers	Number injured	Per cent injured
PT	299	74	25
PC	312	100	32
PP	592	304	51
PG	288	240	83

[1] PT=potatoes after tobacco, PC=potatoes after corn, PP=potatoes after potatoes, PG=potatoes after grass.

Potatoes following potatoes and potatoes following grass not only had a greater number of tubers injured but also the number of holes per tuber was far greater.

A random sample taken from the bin of a grower in South Windsor showed 98 out of 100 tubers severely injured. The number of holes per tuber ranged from three or four to over 30. The potatoes in the bin, from which the sample was taken, came from a two-acre section of a 60-acre field. Population counts made during the summer on this two-acre piece showed from five to 24 larvae per square foot, in the row, with eight samples having a population less than 10 larvae per square foot, nine samples with from 10 to 20 larvae per square foot, and four samples exceeding 20 larvae per square foot.

With respect to the seasonal habits of the eastern field wireworm, it has been reported that the larvae of this species come to the surface foot of soil with the advent of suitable soil temperatures in the spring, return to lower depths when the soil gets untenably hot and dry in July, return to the top soil again for the main feeding period in August and September, and return to the lower depths in late fall in preparation for the coming winter months. Numerous diggings throughout the summer showed the larvae to be within the top 12 inches of soil at all times. The main feeding period is believed to be in August but this year it began in late July and extended through early October. The larvae move in and out of the potato hill at random and do not concentrate in the rows as does the wheat wireworm, *Agriotes mancus* Say. Consequently, the injury caused by the eastern field wireworm is relatively less severe. One instance of wheat wireworm injury was observed, on a small piece of low, wet soil which had formerly been in clover, which was extremely severe resulting in as many as 50 holes per tuber.

The eastern field wireworm is usually found in sandy soil types which are under continuous cultivation. One instance was observed this past summer in which potatoes were being grown following seven years of hay and grass. Soil samples showed that *Limonius agonus* Say was present at population levels ranging from four or five to 15 or more larvae per square foot. Beetles of this species will oviposit in sod if given no other choice but apparently it is not a very common phenomenon. It is possible that a hayfield may become so sparsely covered that the beetles will select the site as readily as a cultivated field. It is significant that few tubers were injured in the field under observation. The bulk of the larvae concentrated in the turned-under sod which was below the general tuber level.

Table 18 shows the per cent tuber injuries for the same ranges and green manures over a period of four years, each crop treatment being the average for three replicates.

Since the study, for which the original experiment was designed, by Prof. B. A. Brown of the Agronomy Department, Storrs, was primarily to maintain and improve soil fertility, it appears from the data in Table 18 that conditions were also improved for the wireworm. In practically every case, the second year potato crop was more severely injured than the potato crop which preceded it. Yet, in practically every case, the degree of injury has increased over the preceding years. It is very probable that the larval population has increased each year, due in part to more favorable soil conditions, and the potato injury has served as a measure of this increased population. It is possible that the population level remained fairly constant and the feeding increased.

TABLE 18. SEASONAL WIREWORM INJURIES ON POTATOES, SOUTH COVENTRY
PER CENT OF TUBERS INJURED

L—1

Crop	1940	1941	1942	1943
A	15.5	Green manure	21.7	62.1
B	17.9		39.1	83.3
C	16.0		23.2	71.2
D	16.3		30.9	69.2
E	18.9		24.3	74.1
F	15.7		37.3	70.8
G	17.3		33.6	75.1
H	18.7		20.9	67.5
I	15.9		16.6	61.3
J	12.7		26.8	57.7

L—2

Crop	1940	1941	1942	1943
A	Green manure	6.5	37.6	Green manure
B		6.7	29.6	
C		14.7	25.1	
D		8.6	30.6	
E		9.0	36.3	
F		5.9	26.8	
G		12.6	35.0	
H		17.3	33.3	
I		11.2	32.0	
J		10.1	20.1	

L—3

Crop	1940	1941	1942	1943
A	7.1	19.5	Green manure	42.3
B	7.7	16.2		47.0
C	4.8	25.4		17.8
D	5.4	18.8		35.6
E	8.5	28.5		32.2
F	17.6	16.5		83.7
G	8.6	19.3		69.7
H	14.7	26.8		50.1
I	7.3	10.7		35.7
J	10.2	25.1		37.7

L—5[1]

Plot	1940	1941	1942	1943
6	10.4	43.3	33.3	37.0
31	11.3	44.4	24.9	55.6

[1] Potatoes continuously.

Note: Data for 1940-42 contributed by Dr. R. L. Beard of this Station.

CONTROL OF THE EUROPEAN CORN BORER ON POTATOES

NEELY TURNER

Severe infestations of the European corn borer in potatoes occur occasionally in Connecticut (Turner and Zappe, 2). Experiments to find suitable methods and materials for control were conducted in 1937. Early potatoes were artificially infested and treated three times during the period of hatching. The survival of larvae was extremely variable, as noted by Beard (1). Derris dusts and sprays and micronized lead arsenate applied with Bordeaux mixture were apparently somewhat effective in controlling the infestation. During the same season, the natural infestation in Green Mountain potatoes was too variable for evaluation of results of tests.

In 1943 Irish Cobbler potatoes planted early in May were heavily infested by the European corn borer. A schedule of dusts and sprays applied to control the potato flea beetle showed a substantial amount of control of the corn borer. Dusts were applied June 2, 4, 8, 14, 21 and 28, and July 6 and 12. The June 4 treatment was made to replace the June 2 application which was followed by rain. As far as the corn borer was concerned, only the June treatments were important, because few eggs were deposited after July 1.

On July 20 each plant was examined for evidence of entry or exit by corn borer larvae. There were 10 plants in a plot and the plots were randomized in each of four blocks. The results in terms of total number of damaged places on the vines are given in Table 19.

TABLE 19. CONTROL OF EUROPEAN CORN BORER IN POTATOES

Material	Concentration	Number borer entrances	Per cent reduction from check
None—untreated		243	
Tetramethylthiuram disulfide spray	4 lbs. to 50 gals.	84	65.3
	2 lbs. to 50 gals.	113	53.3
	1 lb. to 50 gals.	199	17.8
	½ lb. to 50 gals.	225	7.02
Derris—clay dust	2% rotenone	18	92.5
	1% rotenone	65	73.1
	.5% rotenone	111	54.1
	.25% rotenone	131	45.8
Derris—pyrophyllite dust	2% rotenone	26	89.2
	1% rotenone	50	79.3
	.5% rotenone	65	73.1
	.25% rotenone	100	58.7
Cryolite—clay dust	50% cryolite	24	90.1
	25% cryolite	80	66.9
	12.5% cryolite	72	70.2
	6.25% cryolite	181	25.2

All of the dusts were more effective than the one spray used. At three of the four dosages used, pyrophyllite was a more effective diluent than clay for derris. The cryolite dust was very effective and 50 per cent cryolite, a commonly used concentration, was more effective than .5 per cent or 1 per cent rotenone in derris.

The degree of infestation of potatoes by corn borers varies widely from season to season. Control measures are therefore not required every year. The dusts used, particularly cryolite dust, control flea beetles and are probably justified for that purpose only. The same materials and schedule used for flea beetles should control the corn borer as well. The suggested schedule would be four applications at weekly intervals during June.

Literature Cited

1. Beard, R. L., 1940. Effects of corn borers on potato yield. Conn. Agr. Expt. Sta. Bul. 434: 275–276.

2. Turner, N. and M. P. Zappe, 1937. European corn borer on potatoes. Conn. Agr. Expt. Sta. Bul. 396: 345–346.

THE EFFECT OF DILUENTS ON THE TOXICITY OF NICOTINE BENTONITE IN DUSTS

Neely Turner

The general effect of diluents on the toxicity of nicotine bentonite in dusts for the control of the European corn borer has been shown by Carruth (1). In his tests, walnut shell flour was more effective as a diluent than wood flour, talc or bentonite.

Wilson, Dieter and Burdick (3) and Wilson and Janes (4) have classified diluents according to the electrostatic charge they produce during the dusting process. Walnut shell flour in their tests produced a high electrostatic charge and talc a low charge.

The effect of diluents of these two types on derris root in dusts has been measured (Turner, 2). The materials selected were a pyrophyllite and a clay. These same diluents were used with nicotine bentonite and applied to control the European corn borer in sweet corn.

The nicotine bentonite was Black Leaf 155 containing 14 per cent nicotine. This was diluted to 1, 3 and 9 per cent nicotine content with each of the two diluents. The corn was Marcross planted April 26, 1943, dusted June 15, 20, 25 and 30, and harvested July 12 to 16. The corn was in the mid-green tassel stage when the first application was made, with 53 egg masses (including five hatched) on 10 plants. The last treatment was made when the corn was in full silk. The dusts were applied by hand to the whorl in the first treatment and to shoots or ears in subsequent applications.

The plots were four rows wide and 20 feet long, arranged at random in each of four blocks. Twenty sample plants were taken from the two inside rows at harvest time for dissection, and the number of larvae in the entire plant (exclusive of tillers) and in the ears determined by dissection. The results have been summarized in Table 20.

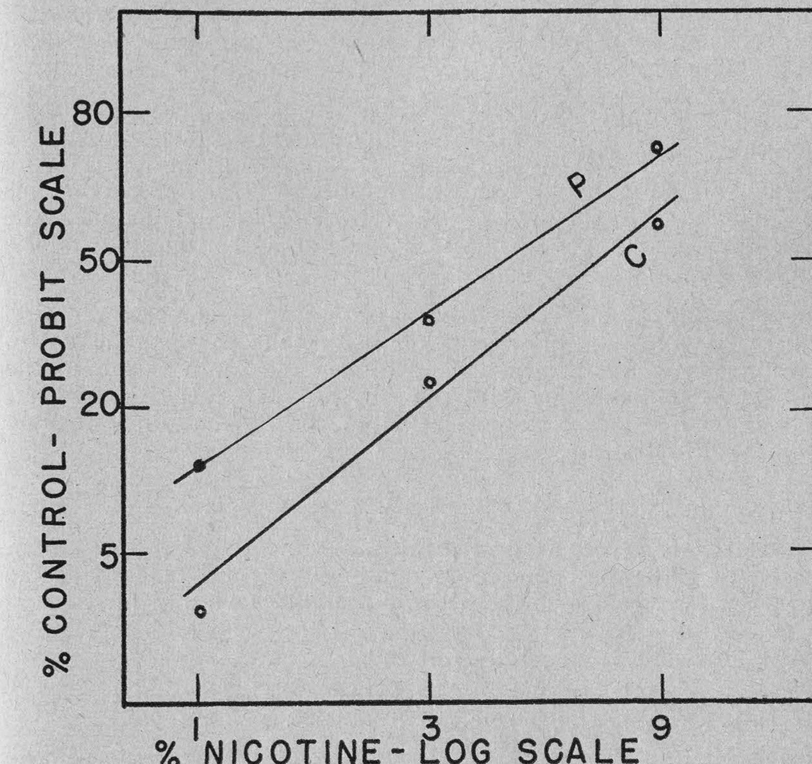

Figure 10. Dosage response curves for nicotine bentonite diluted with pyrophyllite (P) and clay (C). Control of the European corn borer.

Table 20. Effect of Diluents on Toxicity of Nicotine Bentonite in Dusts

Diluent	Per cent nicotine	Number larvae in 100 plants	Number larvae in ears	Per cent reduction in larvae	Per cent ears borer-free
Pyrophyllite	1.0	1,116	284	12.7	7.5
	3.0	799	195	37.5	8.8
	9.0	335	91	73.8	45.0
Clay	1.0	1,245	297	2.6	7.5
	3.0	966	247	24.4	10.0
	9.0	547	144	57.2	26.3
No treatment		1,278	243		2.5

The percentage reduction of larvae in the plants has been plotted in relation to the dosage of nicotine on the logarithmic-probability grid (Figure 10).

At the level of 40 per cent control, approximately 5 per cent nicotine was required with a clay diluent to equal 3 per cent nicotine with pyrophyllite. At 4 per cent nicotine content with pyrophyllite, the concentration used in commercial treatments, approximately 6.2 per cent nicotine with clay, would provide the same degree of control (48 per cent).

The infestation in the ears followed the same general pattern as in the entire plant — that is, the pyrophyllite diluent was more effective. With three of the six dosages, the number of larvae surviving in treated ears actually exceeded the number in untreated ears. This could indicate that the less effective treatments had changed the relation between number of larvae in the ear and infestation of the rest of the plant.

The percentage of ears borer-free was obtained by visual examination of the husks for signs of infestation before the ear was dissected. The results were not inconsistent with the other data except in the case of 3 per cent nicotine with pyrophyllite. In this case the percentage borer-free was low in relation to the amount of control in the plant and in the ears.

Summary

Approximately 5 per cent nicotine in a nicotine bentonite dust diluted with clay was required to equal the control of corn borers obtained by 3 per cent nicotine with pyrophyllite as a diluent.

Literature Cited

1. CARRUTH, L. A., 1943. An alternative insecticide for European corn borer control. N. Y. (Geneva) Agr. Expt. Sta. Bul. 703: 33–36.
2. TURNER, N., 1943. The effect of diluents on the toxicity of pure ground derris root in dusts. Jour. Econ. Ent. 36: 266–272.
3. WILSON, H. F., C. E. DIETER and H. L. BURDICK, 1943. Insecticidal dusts: A study of the effect on mortality of electrostatic charges produced by friction in applying insecticides. Soap 17 (4): 99–101.
4. WILSON, H. F. and R. L. JANES, 1942. Carriers of rotenone dusts. Soap 18 (4): 103–105.

THE EFFECT OF DILUENTS ON THE TOXICITY OF NICOTINE IN DUSTS

NEELY TURNER

The effect of diluents on the volatility of nicotine in dusts prepared from nicotine sulfate has been studied extensively (Campbell, 1; Rudolfs, 2; Thatcher and Streeter, 3, etc.) In general, the use of alkaline materials resulted in higher volatility and greater effectiveness than "inert" or adsorptive materials. There appears to be no information on the effect of diluents in dusts made from free or alkaloid nicotine.

A comparative test of two diluents, pyrophyllite and hydrated lime, was made using nicotine absorbed on a dry carrier, ground tobacco (Black Leaf 10). Dusts were prepared containing 1, 2 and 4 per cent nicotine, and were applied to young cabbage plants infested by aphids on July 21, 1943. Application was made using a small hand duster without a hood or other protective device to confine the dust to the plants. A count of aphids surviving treatment was made 48 hours later. Individual leaves were collected from the plants and the number of aphids surviving on one square inch recorded. The results have been summarized in Table 21 and plotted on the logarithmic-probability grid in Figure 11.

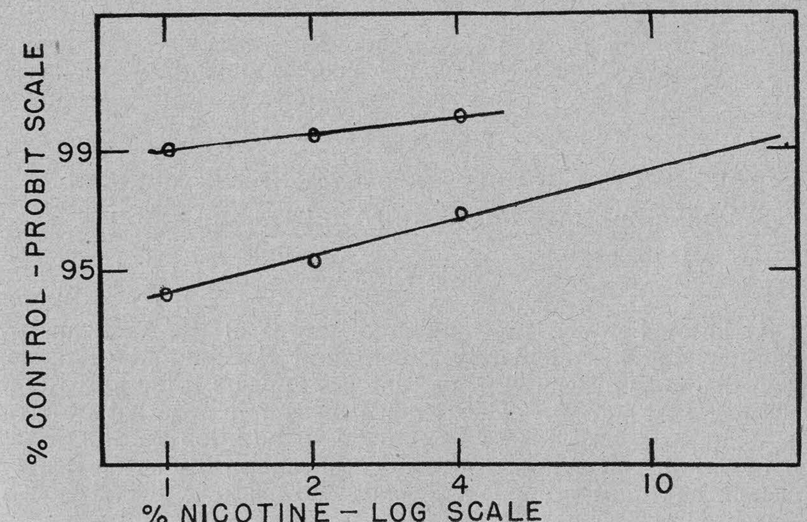

FIGURE 11. Dosage response curves for free nicotine dusts diluted with pyrophyllite (above) and lime (below). Control of aphids.

The dosages and responses were such that the dosage for equal control cannot be obtained except by extrapolation. It is evident, however, that the effectiveness of the lime diluent is considerably less than the pyrophyllite. By extrapolation at the 99 per cent level, approximately 15 per cent nicotine with lime would be required to equal 1.1 per cent nicotine with pyrophyllite. Since extrapolation from 4 per cent to 15 per cent dosage is required to obtain this comparison, little emphasis should be placed on the exact dosage ratio.

TABLE 21. EFFECT OF DILUENTS ON THE TOXICITY OF NICOTINE IN DUSTS

Diluent	Per cent nicotine	Number aphids surviving[1]	Per cent reduction in aphids
None	None	1,029	——
Pyrophyllite	1	10	99.0
	2	8	99.2
	4	6	99.4
Lime	1	67	93.5
	2	47	95.4
	4	26	97.4

[1] On five plants—sample one square inch leaf surface per plant.

Literature Cited

1. CAMPBELL, R. E., 1923. Notes on nicotine dust progress. Jour. Econ. Ent. 16: 497–505.
2. RUDOLFS, WM., 1922. Nicotine delivery from dust carrier. Jour. Econ. Ent. 15: 421–424.
3. THATCHER, R. W. and L. R. STREETER, 1923. Factors which effect the volatility of nicotine from insecticide dusts. N. Y. (Geneva) Agr. Expt. Sta. Bul. 501.

THE EFFECT OF NUMBERS OF LARVAE OF THE MEXICAN BEAN BEETLE ON DAMAGE TO PLANTS AND YIELD

NEELY TURNER

The relation between the number of larvae of the Mexican bean beetle surviving insecticidal treatment and the amount of damage to bean plants as measured in percentages appears to be logarithmic-probability (Turner, 4). The damage measured was that occurring prior to any applications of insecticide in addition to the feeding done by larvae surviving treatment. The implications of this fact were such that an experiment was conducted to study this relationship on untreated plants.

Methods

Bountiful beans were planted May 1 in rows one yard long, and thinned to 10 plants to the yard. A space of three feet was left between blocks to lessen migration. The one-yard plots were randomized in blocks with four replications. A second series of plots was planted May 25 to provide smaller plants for infestation.

When the overwintering adults of the bean beetle started depositing eggs on the plants, each plant was examined at least twice a week and the egg masses marked and counted. All eggs in excess of the number desired were removed. Infestation levels were set at two, four, eight, 16, 32 and 64 larvae per plant. In addition to these levels, one series of plots was left undisturbed and the natural infestation recorded. No particular effort was made to have the larvae distributed evenly over the plants. For instance, in most cases one egg mass of 20 eggs was left on a plot supposed to be infested by 20 larvae.

It was necessary to transfer egg masses to the plots planted May 25 in order to attain the high levels of infestation. This was done by pinning an egg mass on a small section of leaf to the underside of the leaf to be infested.

The amount of damage to the foliage was estimated, by a system already described (Turner, 5), on June 25 and again on July 1. On the latter date about 90 per cent of the foliage of the most heavily infested plots had been destroyed by larval feeding.

Yields were obtained from the weight of dried pods on July 21 for the early plot and August 2 for the late plot. It is recognized that these yields do not represent faithfully the yields of snap beans. However, it has been difficult to obtain satisfactory yield data for snap beans, because of failure to maintain a set standard of size or maturity of the pods. When the pods are left on the plant until they mature and dry, there is no confusion as to their maturity. Such yield data should therefore be dependable, although the yield as recorded is not for green snap beans.

Results

The observations and records have been summarized in Table 22. The relation between infestation and damage to foliage has been plotted on the logarithmic-probability grid in Figures 12 and 13. The relation between infestation and yield has been plotted in Figure 14, with the yield plotted arithmetically and the infestation logarithmically.

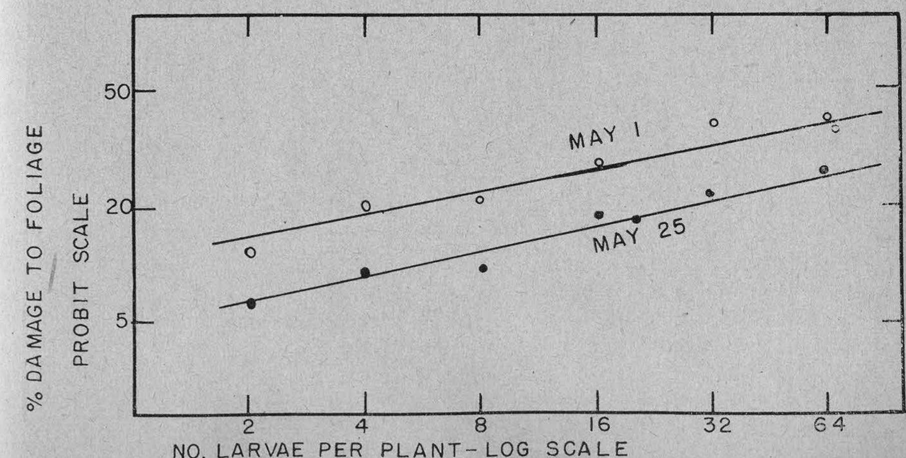

FIGURE 12. Relation between number of larvae of the Mexican bean beetle and damage to foliage on June 25. Dates refer to time of planting.

As was noted for infestation following application of insecticides (Turner, 5), the logarithmic-probability relationship prevails when no insecticides were involved. In other words, the damage increases as the logarithm of the number of larvae rather than directly with the number of larvae. The curves for June 25, when the most heavily infested plots showed about 40 per cent damage (Figure 12), are much flatter than those for July 1. Dimond, Horsfall, Heuberger and Stoddard (1) reported a similar change in slope for dosage control curves for sulfur on apple scab and copper for tomato defoliation diseases. They attributed the steeper slopes to environmental conditions favoring development of the fungus. In the case of the Mexican bean beetle, the observations were made on a single generation of larvae on two days less than a week apart, and therefore environment should not be involved.

In order to determine whether or not the date of hatching of the eggs was concerned, the detailed plot records have been summarized in Table 23. The percentage of eggs that had hatched on June 25 was calculated. In the series planted May 1, there is no tendency for the higher infestations to show a delayed hatching which might influence the amount of damage. Hatching of the May 25 series was more variable but still showed no consistent change which might influence results. Certainly the plot having the natural infestation and only 58 per cent of the eggs hatched on June 25 showed the expected amount of damage from the total number of larvae present.

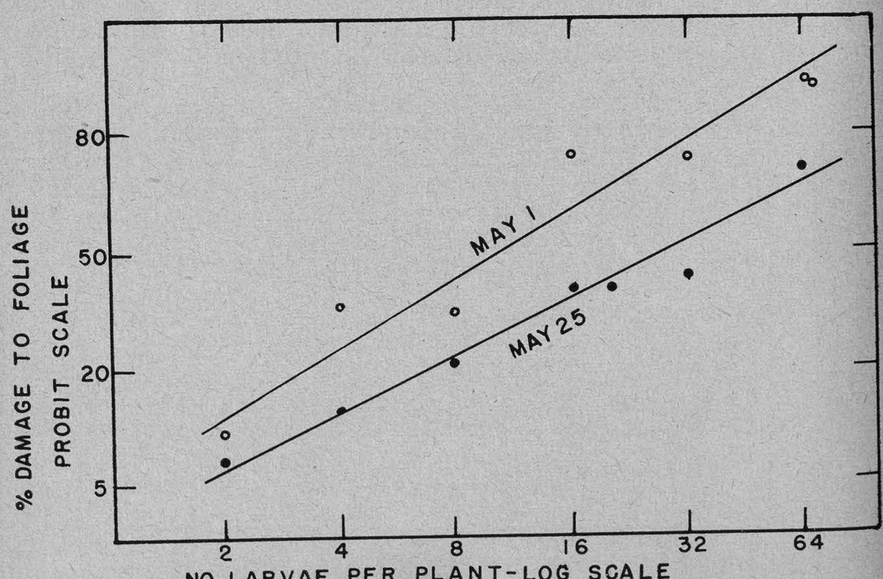

FIGURE 13. Relation between number of larvae of the Mexican bean beetle and damage to foliage on July 1. Dates refer to time of planting.

It is suggested that the change in slope was caused by the numbers feeding. In both series the change in amount of damage to the two - and four-larvae plants was relatively small. The change in amount of feeding on the more heavily infested plants was relatively much larger. In other words the two larvae per plant would presumably cause not much more than 12 per cent damage to the foliage in the course of the season. The larger numbers would cause more damage. Another criterion for this same effect would be the date on which the plants were defoliated. Unfortunately, such records were not kept on this experiment. It would be expected that the most heavily infested plants would be defoliated first, and that less heavily infested plants would follow. However, a degree of infestation too low to defoliate the plants would be reached. This should in effect be reflected in gradually steepening damage curves as the season progressed.

TABLE 22. LEVEL OF INFESTATION BY BEAN BEETLES; DAMAGE TO FOLIAGE AND YIELD OF BEANS

Number larvae per plant	Per cent damage to foliage June 25	July 1	Yield Ounces—12 ft. row
	Planted May 1		
2	12.2	9.4	44.5
4	20.6	34.4	46.5
8	21.3	33.3	41.3
16	30.0	74.2	35.3
32	39.4	73.8	44.0
64	41.9	89.7	20.2
68[1]	37.5	86.9	23.5
	Planted May 25		
2	6.3	6.9	30.5
4	9.4	13.1	33.0
8	10.0	21.3	30.0
16	17.9	38.8	26.5
32	21.3	41.9	23.5
64	26.9	71.9	21.0
20[1]	17.3	39.4	26.0

[1] Normal infestation.

TABLE 23. PERCENTAGE OF EGGS HATCHED ON JUNE 25

Number larvae per plant	Per cent hatched Planted May 1	May 25
2	66.7	100.0
4	86.0	94.0
8	79.0	89.0
16	90.0	67.0
32	97.0	82.0
64	93.4	95.8
Natural	83.3	58.1

The effect of the infestation on yield has been shown in Table 22 and Figure 14. The later planting yielded less than the earlier, at least partly because of dry weather. However, since the attack of the bean beetles occurred at approximately the same time in both plantings, and earlier relative to plant development on the late planting, some decrease in yield due to bean beetle feeding would be expected. The data for the late planting form a straight line when the infestation is plotted logarithmically against the yield. In other words, the yield decreased as the logarithm of the number of larvae present. The variation in the early planting was enormous, and no clear-cut relationship appears. Certainly there is nothing in the data inconsistent with the logarithmic relationship apparent in the later planting.

The method of obtaining the yield ignored damage to pods. In the previous study (Turner, 4) damage to pods was related to infesting population in exactly the same manner.

Discussion

This experiment was not designed to show the reasons for the relationships described. Two obvious possibilities are (1) that the survival of larvae is smaller as the infestation increases and therefore the damage from high infestations is not as much as expected and (2) that each larva does not consume the same amount of foliage, that is, 10 larvae per plant do not eat 10 times the foliage eaten by one larva per plant.

The experiment reported previously (Turner, 4) showed that the number of larvae surviving treatment was related logarithmically to the percentage of damage expressed in probits. Mortality from insecticides might be analogous to mortality from crowding. However, this cannot be accepted as final proof because the residues of insecticides might also influence the amount of feeding. That this probably

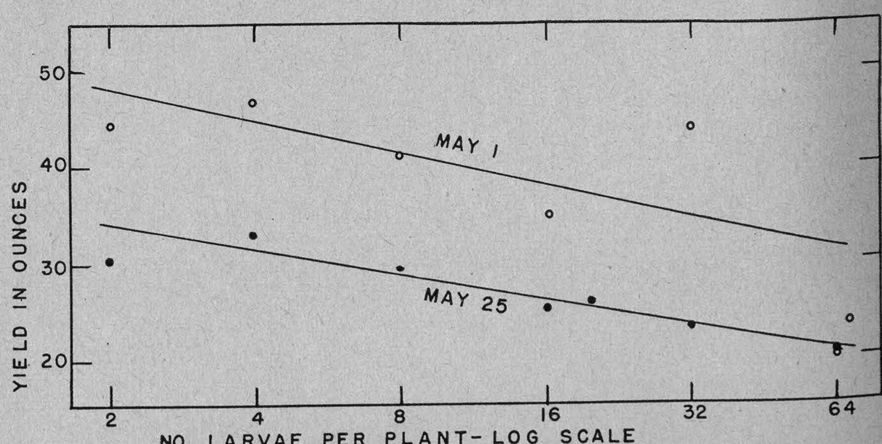

FIGURE 14. Relation between number of larvae of the Mexican bean beetle per plant and yield. Dates refer to time of planting.

occurred was indicated by the fact that the observation for the untreated check did not fit the curve drawn through points observed following treatment.

No observations were made regarding the other obvious possibility, that each larva did not consume the same amount of foliage. It is not beyond belief, however, that larvae crowded together on a plant do not consume as much foliage per larva as one larva on a plant.

The literature seems to contain little information on this general subject. Neiswander and Herr (2) presented data on corn borer population and damage. Their data on population per stalk and stalk breakage shows a relationship much closer to logarithmic than to arithmetic. Two of the three sets of data on infestation and yield show a definite logarithmic effect of infestation. The third is variable and could be either logarithmic or arithmetic. Patch et al. (2a) published data which show a linear relationship between logarithm of number of larvae and probit of percentage of breakage. Later, Patch et al. (3) showed an unmistakable arithmetic relationship between number of borers per plant and yield in a series of experiments conducted over a period of years.

Summary

The number of larvae of the Mexican bean beetle is related logarithmically to the amount of damage to the foliage expressed as probits. The effect of the number of larvae on yield is also logarithmic.

Literature Cited

1. DIMOND, A. E., J. G. HORSFALL, J. W. HEUBERGER and E. M. STODDARD, 1941. Role of the dosage-response curve in the evaluation of fungicides. Conn. Agr. Expt. Sta. Bul. 451.

2. NEISWANDER, C. R. and E. A. HERR, 1930. Correlation of corn borer population with degree of damage. Jour. Econ. Ent. 23: 938–945.

2a. PATCH, L. H., G. W. STILL, B. A. APP, and C. A. CROOKS, 1941. Comparative injury by the European corn borer to open-pollinated and hybrid field corn. Jour. Agr. Res. 63: 355–368.

3. PATCH, L. H., G. W. STILL, M. SCHLOSBERG and G. T. BOTTGER, 1942. Factors determining the reduction in yield of field corn by the European corn borer. Jour. Agr. Res. 65: 473–482.

4. TURNER, N., 1943. Relation between number of insects and damage to plants. Conn. Agr. Expt. Sta. Bul. 472: 268–272.

5. TURNER, N., 1943. The effect of diluents on the toxicity of pure ground derris root in dusts. Jour. Econ. Ent. 36: 267–272.

SPREAD OF THE DUTCH ELM DISEASE IN CONNECTICUT

M. P. Zappe

Since the first Dutch elm diseased tree was found in Greenwich in 1933, the disease has spread slowly to the north and east. At the present time diseased trees have been found in most of the towns west of the Connecticut River. Only a few towns in the northern portions of Litchfield and Hartford counties are still free from the disease. Infected trees have been found in only four towns east of the Connecticut River. A diseased tree was reported in Preston in 1940 but no further cases have been found there since. Old Lyme had the disease in 1934 and no other diseased trees were found until 1942 when another tree was removed. Several infected trees were found in Portland in 1942, and in 1943 a group of small elms was found diseased in the town of East Haddam. No other towns east of the Connecticut River are known to be infected.

The United States Department of Agriculture no longer carries on control operations in the older infected areas. They confine their activities to the areas north and east of the towns of Kent, Warren, Morris, Watertown, Waterbury, Cheshire, Wallingford and Guilford. This roughly corresponds to the area outside of the quarantine lines established in 1941. During the summer of 1943, 109 diseased trees were found and removed in the following 19 towns: Berlin, Bristol, Canton, Durham, East Haddam, Farmington, Guilford, Hartford, Meriden, Middlefield, New Britain, Newington, North Canaan, Plymouth, Portland, Salisbury, Southington, Thomaston and West Hartford. Of these towns eight were infected for the first time this year: North Canaan in Litchfield County, Durham, East Haddam and Middlefield in Middlesex County, and the four adjoining towns of Farmington, Newington, Hartford and West Hartford in Hartford County. All infected trees found in these 19 towns by employees of the Bureau of Entomology and Plant Quarantine have been removed and destroyed. All potential bark beetle breeding material found has also been destroyed.

In the older infected areas, south and west of the area in which the federal men are working, no systematic scouting has been done. In these towns the selectmen and tree wardens have been told to be on the watch for diseased trees and urged to remove and destroy them as soon as they were found. We have notified them of diseased trees found in their towns when brought to our attention. Many of the tree wardens have scouted their own towns and have removed and destroyed the diseased trees. We have cultured and reported samples of suspected elms which have been sent to the Experiment Station and have examined suspicious elms when asked to do so.

THE DEVELOPMENT OF DUTCH ELM DISEASE IN SOUTHWESTERN CONNECTICUT

Philip P. Wallace and George A. Zentmyer

Until the last few years, there has been little opportunity to study the development of the Dutch elm disease in areas where little or no control is practiced. To obtain information on local spread and to serve as a basis for estimating the status of the disease in the older infected areas of Connecticut, five one-half mile-square plots were established in each of four towns in Fairfield County in 1942. (See Connecticut State Entomologist, Forty-Second Report, 1942.)

These plots were carefully scouted in 1942 and 1943. Samples were taken from all suspects and cultures were made to determine the presence of *Ceratostomella ulmi*. The results of these examinations are shown in Table 24.

Table 24. Dutch Elm Disease Sample Plots in Fairfield County

		Greenwich 1942	Greenwich 1943	Stamford 1942	Stamford 1943	Darien 1942	Darien 1943	Norwalk 1942	Norwalk 1943
Plots:	Number diseased trees	11	6	23	50	20	24	10	14
	Per cent of total trees diseased	.66	.36	1.7	3.47	1.8	2.14	.84	1.01
Town:	Estimated number diseased	408	223	727	1485	244	293	236	282
Plots:	Diseased trees removed		5		3		3		0
	Per cent diseased trees removed		45		13		15		0
	Diseased previous year, standing		6		20		17		10
	With beetle emergence		5		10		10		3
	Without beetle emergence		1		10		7		7
Town:	Estimated number diseased standing		445		2079		500		520
	Estimated per cent of total trees diseased standing		.73		4.86		3.66		1.86

Since the local spread of the Dutch elm disease is largely dependent upon the emergence of elm bark beetles[1] from infected material within the area, the number of elms potentially effective in spreading the disease within an area may be considered to be those diseased elms from which beetles emerge. Many complex factors determine the effectiveness of these beetles in transmitting and establishing the fungus in nearby healthy elms and this will be discussed in a later paper. In these 20 plots there were 28 diseased elms from which bark beetles emerged in the fall of 1942 or the spring of 1943. The total number of newly infected elms in 1943 was 92, or 3.28 recurrences per diseased tree with bark beetle emergence on these plots.

[1] Consideration is restricted to the European elm bark beetle, *Scolytus multistriatus* Marsh., the principal vector of the Dutch elm disease in the United States. In the occasional localities where *Hylurgopinus rufipes* Eichh. is the vector, these factors will undoubtedly assume somewhat different relative importance.

In the study by Zentmyer et al. (2), large numbers of elm bark beetles emerged throughout the season from a diseased tree at the center of each of three plots, and elms were abundant and well distributed nearby. Fourteen and four-tenths per cent of the elms within a radius of 320 feet became infected the following season; the average number of new infections per plot was 9.33. Since this figure differs considerably from the sample plot average and the conditions for disease spread were somewhat more favorable than usual, a further study was made in the summer of 1943.

The areas surrounding 31 isolated, diseased elms which were found from 1937 to 1940 were carefully examined. Most of these trees were destroyed shortly after infection was determined and records were taken only where there was positive information concerning bark beetle emergence. The numbers of nearby[1] elms varied widely and are believed to approach randomness for this section. These locations are classified and the information is summarized in Table 25.

TABLE 25. THE RECURRENCE OF DUTCH ELM DISEASE NEAR ISOLATED INFECTED ELMS

	Without bark beetle emergence	With bark beetle emergence	Total
Number of locations inspected	21	10	31
Total disease recurrences	2	34	
Mean recurrences per tree	0.1	3.4	
Total number nearby elms	602	324	926
Per cent nearby elms infected	.33	10.5	
Mean number nearby elms	29	32.4	29.9

There is surprisingly good agreement between the observations of disease recurrence for these two sets of studies when they are compared on the basis of new infections occurring per diseased elm from which bark beetles emerged (3.28 and 3.4). Furthermore, the general observation is substantiated that there is an occasional new infection near diseased elms from which no bark beetles emerged. Such recurrences may be due to root grafts or to twig-crotch feeding by bark beetles near the place of attack for breeding; the beetles may have come from infected material of various types. Obviously, the number of recurrences of this type is very low.

When the data for both groups of observations are combined, the average number of new infections per diseased elm with beetle emergence is found to be 3.31. It is believed that the conditions surrounding these 38 elms approach randomness and that these observations may be indicative of the new infections occurring annually in southwestern Connecticut.

Literature Cited

1. WALLACE, PHILIP P. and DOLOR LABELLE, 1943. Dutch elm disease sample plots, 1942. Conn. State Entomologist, 42nd Report, 1942; Conn. Agr. Expt. Sta. Bul. 472: 285–287.

2. ZENTMYER, G. A., P. P. WALLACE and J. G. HORSFALL, 1944. Distance as a dosage factor in the spread of Dutch elm disease. Phytopathology (in press).

[1] "Nearby" refers to a radius of 200 feet.

TRAP LOG SCOUTING FOR *Scolytus multistriatus*

M. P. ZAPPE

In order to obtain more information on the distribution of the bark beetle, *Scolytus multistriatus*, in Connecticut, it seemed best to place a number of elm log traps in the northeastern towns of Connecticut along the Massachusetts line and also in all the towns on the eastern edge of Connecticut along the Rhode Island boundary. *Scolytus multistriatus* is known to be present west of the Connecticut River and in a few towns east of the river. We did not know just how far east this insect might be found. As some of the federal Dutch elm disease crews were working east of the river, we considered it a good plan not to attempt to trap bark beetles in these towns but to try trapping along the northeastern and eastern boundaries of the State.

According to available records on the distribution of *Scolytus multistriatus*, there is an isolated area of infestation in eastern Massachusetts extending to the north into southern New Hampshire and southerly to include all of Cape Cod. The western edge of this infestation roughly parallels the northern boundary of Rhode Island and almost reaches the northeastern corner of Connecticut. If *Scolytus* could be found in northeastern Connecticut or along the eastern boundary of the State, we might assume that this was an extension of either the eastern Massachusetts area, or the area west of the Connecticut River. In either case, it would be necessary to do more scouting or trapping for *Scolytus* to discover to which area this was connected, or whether both areas of *Scolytus* infestation had met in eastern Connecticut.

On June 8, 9, 10 and 11, 26 piles of elm logs were placed from the northeastern boundary of Connecticut south in the towns on the Rhode Island boundary and westward on Long Island Sound to East Lyme. Each trap pile consisted of four or five logs four feet long and from four to six inches in diameter. Two piles were placed in each town, and the piles were about five miles apart. Elm logs were cut fresh and only about one day's supply cut at a time. The logs were left undisturbed until September 13, 14, 15 and 16. At that time all logs were peeled with the following results.

Town	Larvae found
Eastford	Saperda
South Woodstock	Saperda
East Woodstock	Saperda
Putnam	Saperda, Magdalis
Putnam	Saperda, Magdalis, Hylurgopinus rufipes (a few galleries)
Thompson	Saperda (few)
Thompson	None
Pomfret	Saperda, Magdalis
Pomfret	Saperda (plentiful), one gallery H. rufipes
South Killingly	Saperda (few)
Killingly	Saperda

Plainfield	Saperda
Plainfield	Saperda (plentiful)
Sterling	Logs covered by road relocation
Sterling	Saperda
Griswold	Saperda (few)
Voluntown	Saperda (few)
Voluntown	Saperda (few)
North Stonington	Saperda (few)
North Stonington	Saperda (very few)
Stonington	Saperda (few)
Stonington	None
Groton	Saperda (very few)
Groton	None
Waterford	Saperda (very few), termites
East Lyme	Termites in one log

No *Scolytus* galleries were found in any of the trap log piles and only two cases of *Hylurgopinus rufipes*. *Saperda* sp. larvae were common in nearly all piles and in a few cases were very abundant. *Magdalis* sp. was found in only three piles in or near Putnam. Inasmuch as no *Scolytus multistriatus* was found in any of the trap logs it seems reasonable to believe that there is still quite an area free from this vector of the Dutch elm disease in eastern Connecticut and that the disease may not spread very rapidly in this area.

THE MEASURING AND SAMPLING OF ELM LEAVES

Philip P. Wallace

In the course of experiments to determine certain effects of defoliation of elm trees, it has been necessary to establish a valid basis for measuring and sampling the leaves. The details of the procedure and the relations which were found to exist are reported because of their wide adaptation to related problems.

Measurement

The measurement of tracings of leaves with a planimeter is so laborious and time-consuming that only a very small number of leaves per sample can be handled when many treatments must be measured. If an efficient and more rapid method of measurement can be employed, the precision of estimate can obviously be increased by the use of larger samples, even though the method itself may be subject to somewhat larger error.

Since elm leaves approach an ellipse in shape, and the area of an ellipse is equal to the product of the lengths of the two axes multiplied by a constant, .7854, the application of a similar relationship to the area of elm leaves was investigated. Preliminary measurements and calculations indicated that the relation for elm leaves is more complex, for the areas of large leaves is consistently underestimated and small leaves overestimated when the same constant is applied to both. It was also found that the relation between length

and width is so variable that the use of either measurement alone in an equation results in a very large error of estimate. These observations immediately suggest the application of a regression equation of the form $Y = \bar{y} + b\ (X - \bar{x})$, where X = length x width and Y = area.

Measurements were taken of the axes of four groups of 50 leaves, constituting random samples from each of four trees, and the leaf areas were accurately determined with a planimeter. When the logarithms of the products of the axis measurements are plotted against the logarithms of the corresponding measured areas, a rectilinear relationship is observed. However, the data have been retained in the original units of inches throughout for convenience and practical use of the regression equation, although they are plotted on log-log paper in Figure 15.

Table 26. Summary of Leaf Measurements
X= LW, Y= Area

Tree	1	2	3	4		Combined
S X	253.27	116.28	137.40	130.43		637.38
S (x^2)	1415.8525	400.4874	564.3186	529.4538		2910.1123
$\bar{x}$	5.0654	2.3256	2.7480	2.6086		3.1869
S Y	171.23	78.96	97.67	89.56		437.42
S (y^2)	651.0965	184.9204	287.7427	249.1450		1372.9046
y	3.4246	1.5792	1.9534	1.7912		2.1871
S (xy)	958.2548	272.0102	401.3210	361.6410		1993.2270
$[x^2]$	132.9387	130.0667	186.7434	189.2141	638.9629	878.8460
[xy]	90.9064	88.3808	132.9238	128.0148	440.2258	599.2133
$[y^2]$	64.7022	60.2268	96.0541	88.7252	309.7083	416.2234
b	.6838	.6795	.7118	.6766	.6889	.6818
Red. $[y^2]$	2.5404	.1721	1.4389	2.1104	6.4368	7.6798

$$Y = 2.1871 + .6818\ (X - 3.1869)$$
$$= .6818X + .0143$$

Table 27. Analysis of Variance

	Degrees of freedom	Sum of squares	Mean square	F
Combined slope, bc	1	303.3020	303.3020	
Between slopes	3	.1418	.0473	1.45
Between positions	3	1.2625	.4208	12.91
Error about curves for individual trees	192	6.2645	.0326	1.00

The relation between actual leaf area and the product of length by width has been fitted by least squares with a separate straight line for each tree. These calculations are shown in Table 26. The individual curves were then compared by the analysis of variance (Table 27). The largest of the four slopes exceeded the smallest by only 5 per cent and, as would be expected by so small a difference, the second row in Table 27 shows that the data for all four trees could be fitted satisfactorily by four parallel lines having a slope of $b_c = 0.6889$. These lines differed significantly, however, in their vertical positions as shown by $F = 12.91$ in the third row of the table. Since they did not agree statistically, the average shape of the leaves varied from tree to tree and a general mean based on four trees should be considered a provisional figure. Nevertheless, these differences were small enough that the observations did not scatter excessively around a single curve in which tree differences were ignored (Figure 15). The calculation of this curve is shown in the last column of Table 26. It may be written as $Y = 0.6818X + .0143$, which may be used for computing leaf area from the product of length by width. The mean product from a random selection of leaves on a tree may be substituted for X in the above equation to obtain the area of the average leaf. This provides a convenient means for estimating the total leaf area of a tree and eliminates the necessity of constructing and manipulating an alignment chart. Moreover, reasonably accurate measurements can be taken rapidly without removing any leaves from the plant.

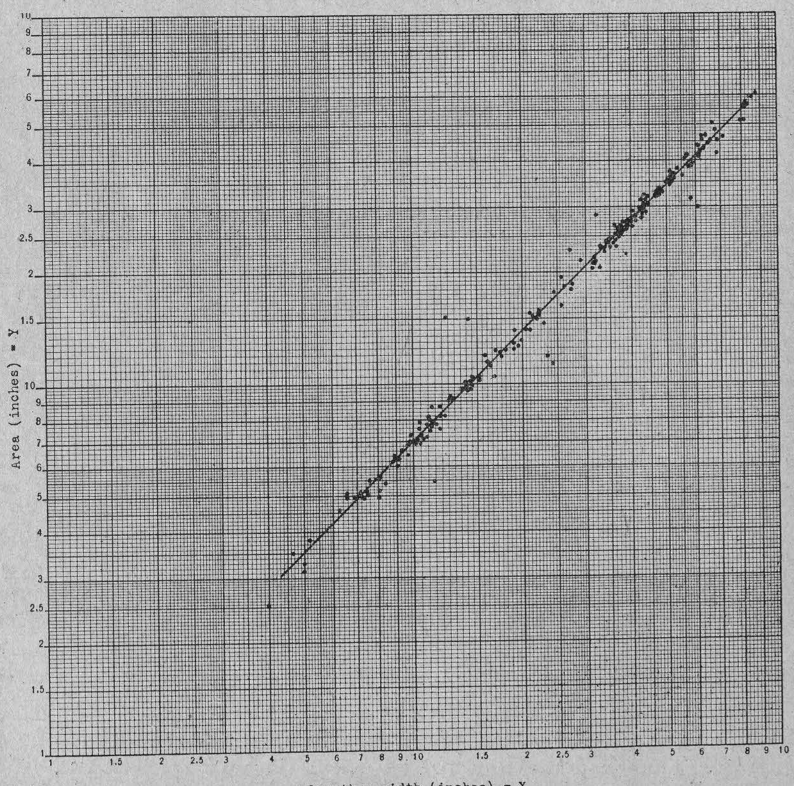

FIGURE 15. Elm leaf measurements. The relation of LW to area. Log-log scale.

Before the publication of this report, the application of similar measurements for determining sugar beet leaf areas was reported by Baten, W. D. and Muncie, J. H., 1943.[1] Although the original data and the method for calculating the regression equation are not available, it appears that the relationship between LW and Y is similar to that found in elm leaves. Computation of the equation as indicated above would undoubtedly produce a precise formula which would automatically adjust the differences which were observed for small and large leaves.

Sampling

It is well recognized that sampling procedure must be determined by the type and accuracy of the information desired, and these factors in turn are often dependent on the feasibility of obtaining and handling the samples. Moreover, the practice of applying highly accurate and laborious measurements or extensive computations of great precision to samples which are themselves subject to gross error is to be deplored.

In the current experiments, it was desired to estimate within an error of approximately 10 per cent the total leaf area of 42 elm trees, 10 to 15 feet in height. The size of the trees was prearranged so that the total number of leaves on each tree could be counted and sampled within a period of two days.

The sample size was arbitrarily set at 50 leaves per tree, or about 10 per cent of the total.

A random sample from a container holding all the leaves from each tree would supposedly constitute a good basis for estimate, but it would require the removal of all the leaves, to the detriment of the investigations. Moreover, it is very difficult to formulate and follow a standardized method for taking without bias a random sample from the leaves on a tree. In this preliminary study, the trees were sampled and all the remaining leaves were removed, following a hard frost in October.

From each of three trees two types of samples were taken, as well as a random sample from the rest of the leaves after they had been removed.

1. T.C.B. sample. Seventeen leaves were removed from the top branch of the crown. Commencing at the tip, proceeding toward the trunk, and back on the opposite side of the same branch, the alternate leaves were removed until the required number was obtained. Another sample of 17 leaves was taken in the same manner at the center of the crown, and 17 more were removed from the lowest branch from the bottom of the crown.

2. Center sample. Fifty leaves were taken from the branches at the middle of the crown in the manner described above.

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[1] Phytopathology 33 (11): 1071–1074.

TABLE 28. COMPARISON OF SAMPLING METHODS

Type of sample	Tree number	Sample Mean leaf area	Tree Total leaves	Estimated total area	Measured total area	Difference	Per cent error	Percentage of total leaves sampled
T. C. B.	1	1.7011	511	869.26	1056.29	—187.04	—17.7	10.0
	2	3.1865	472	1504.03	1676.86	—172.83	—10.3	10.8
	3	2.6780	533	1427.37	1404.81	+ 22.56	+ 1.6	9.6
Center	1	1.8386	511	939.52	1056.29	—116.77	—11.05	10.0
	2	3.4393	472	1623.34	1676.86	— 53.52	— 3.2	10.8
	3	2.3230	533	1238.16	1404.81	—166.65	—11.86	6.6
Random	1	2.2343	511	1141.73	1056.29	+ 85.44	+ 8.09	10.0
	2	3.6934	472	1743.28	1676.86	+ 66.42	+ 3.96	10.8
	3	2.6680	533	1422.0	1404.81	+ 17.19	+ 1.22	9.5

3. Random sample. The remaining leaves were placed in a container and 50 were chosen at random.

The areas of all leaves from the three trees were determined by measuring the leaf axes and applying the formula previously discussed, SY = (SX) .6818 + N (.0143). The results of the various methods of sampling are tabulated below.

These results have not been analyzed statistically because the information is limited to three replicates and it could be demonstrated that the variance of the standard error of estimate is significantly large. However, a record of the errors of estimate which occurred with these methods of sampling is offered, and it is possible to select that method which has been subject to the least error, even though the precise limits cannot be accurately established.

Omitting the random samples, it appears that the center samples offered a better basis for estimate with an indicated error of about 10 per cent. Moreover, the error for the center samples was fairly consistent and should be more reliable for use in comparing treatments. It is believed that this error can be materially reduced by following the same sampling procedure and disregarding the few very small leaves which occasionally are found.

DIPRION FRUTETORUM (F.)

J. V. SCHAFFNER, JR., Associate Entomologist

U. S. Department of Agriculture, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine

The introduction of foreign tree species and the large-scale planting of conifers in reforestation projects have been responsible for a number of new insect problems in America. Some of the insects involved have been known for a great many years and have been relatively unimportant in their native habitats. A defoliator of pines which only recently has begun to attract attention in forest plantations in America is the sawfly *Diprion frutetorum* (F.) This is a European species, and, although described by Fabricius 150 years ago, little can be found in entomological literature regarding its importance on that continent. Hsin (6), in his studies of sawflies in Mecklenburg, Germany, from 1932 to 1934, reported that in one severely infested stand of pines in 1933, five species of *Diprion* were represented, and that *D. frutetorum* was the most abundant. Kuntze (7) studied the parasitization of the larvae in their cocoons during the last stage of an outbreak in western Poland in 1935.

Although the earliest known recovery of *Diprion frutetorum* in the United States was in 1932 from both Massachusetts and Rhode Island, this sawfly first began to attract attention as a serious pest in Connecticut in 1940. The information now at hand indicates that it was established in North America many years before its discovery here.

History in North America

The first published report of the occurrence of *Diprion frutetorum* on this continent was by Gray (5), who found the larvae feeding on Scotch pine in September, 1934 near Niagara Falls, Ontario, Canada. Collins (3) reported its recovery from New Jersey in 1938, the cocoons having been collected from litter in a red pine plantation near Lamington. In 1939 large numbers of sawfly adults which had been reared over a period of years from field-collected material received at the New England Station, Division of Forest Insect Investigations, were sent to the Division of Insect Identification for determination. The late Miss Grace A. Sandhouse, who determined much of this material, identified as *D. frutetorum* one adult reared from a cocoon collected in a Scotch pine plantation at Middletown, R. I., in May, 1932, and one adult reared from a larva collected on Scotch pine at Melrose, Mass., in July, 1932.

In Connecticut, insofar as is known, *Diprion frutetorum* was first discovered on September 1, 1938, at Litchfield by J. R. Hansbrough and the writer. This was reported by Friend (4) in 1941. Since the summer of 1938, infestations have been found in many red pine plantations scattered through Connecticut, Massachusetts, New Hampshire, New York and Rhode Island. C. F. W. Muesebeck has furnished the information that the only specimens in the United States National Museum, outside the range indicated above, are from Harrisburg, Pa., and they were collected in July, 1941.

It seems probable that if a search were made for this insect it would be found to be more widely distributed. Because of their protective coloration and solitary habits, the larvae are easily overlooked unless the infestation is heavy enough to cause noticeable defoliation.

This sawfly began to attract attention as a serious pest in 1940, when M. P. Zappe of the Connecticut Agricultural Experiment Station found it defoliating a 25-year-old plantation of red pine on the New Britain Water Shed in Southington, Conn.

Brown (1) reported it in 1940 as "increasing throughout southern Ontario, being generally in a light infestation, but attaining medium status at Windsor". In 1942 Brown (2) reported it then established through practically all southern Ontario.

Host Plants

In New England the favored food plants of *Diprion frutetorum* are red pine (*Pinus resinosa* Sol.) and Scotch pine (*P. sylvestris* L.) The larvae will feed on Austrian pine (*P. nigra* Arnold) and some others of the hard pine group. As yet, not all of them have been thoroughly tested in the laboratory. In the field, infestations have been found, thus far, only on red pine and Scotch pine. A striking example of food preference was observed during the summer of 1943 at Litchfield, Conn., in two adjoining plantations, both about 30 years old. No evidence of feeding could be found in a plantation of Austrian pine, whereas the adjoining plantation of red pine was generally infested.

Throughout the area of the known distribution of *Diprion frutetorum* in this country, few stands of natural reproduction of its favored food plants exist and, as yet, no infestations have been found in these stands. The most serious infestations, thus far, have occurred in plantations of red pine where the age of the trees is 25 years or more.

Description of Stages

The Adult

These sawflies are stocky, wasplike insects, having the four wings slightly cloudy with brown venation. The male and female are described below.

Male (Figure 16): Length 6-8 mm. Antennae large, black, pectinate; head and thorax black, coarsely sculptured; abdomen having the venter, all of the last two segments, and a wedge extending up on terga 2-7 anteriorly reddish, remainder of dorsum black; legs reddish yellow except coxae, which are largely black.

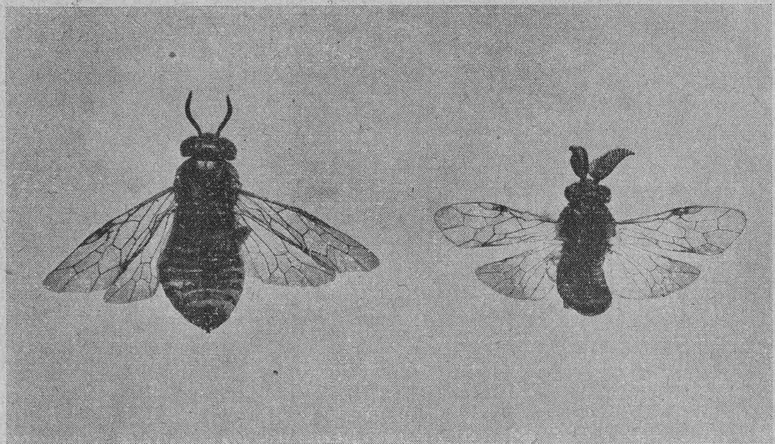


FIGURE 16. Adults of *Diprion frutetorum* (F.) Left, female; right, male. x 2.5 natural size.

Female (Figure 16): Length 7-9.5 mm. Antennae serrate, black, except scape and pedicel, which are yellowish; head black, except areas on vertex, face between antennae, clypeus, a spot on each side below eyes near base of mandibles, and all of palpi, which are yellowish; mandibles reddish; thorax yellowish with the following parts black: most of anterior and lateral lobes of scutum, posterior margin of scutellum, and postscutellum; abdomen yellow, with a transverse band posteriorly on terga 1-7, most of 8, and sheaths of egg-laying organs, which are black; legs reddish yellow with distal end of hind tibiae and last tarsal joints blackish.

The Egg

The freshly deposited egg is yellow, long and narrow, with a concave and a convex side and tapering at each end. It is 1.5 mm. in length. Usually one egg is deposited in a needle (Figure 17). It is inserted in a slit and is entirely concealed, leaving only a yellowish spot around the closed-up slit.

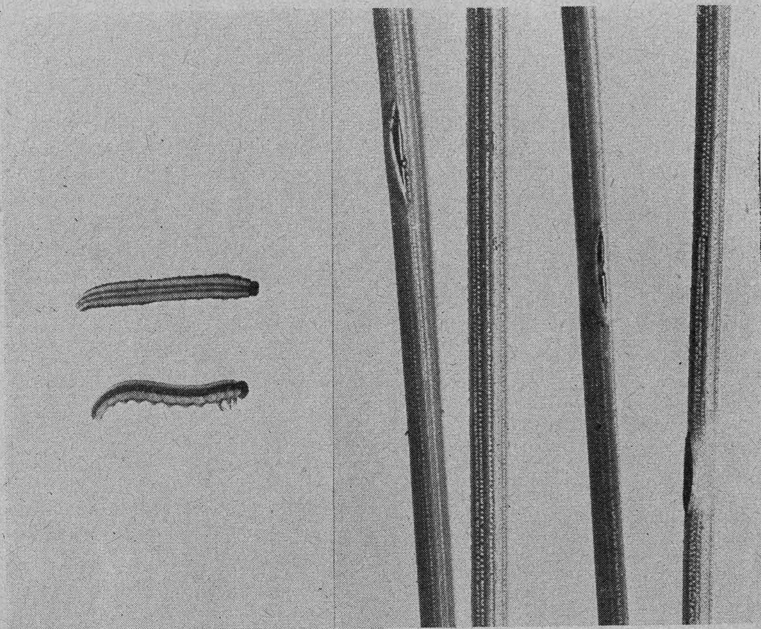


FIGURE 17. Left, fully grown caterpillars of *D. frutetorum*, natural size. Right, eggs, six times natural size.

The Larva

The full-grown larva, prior to molting into the last instar, is about four-fifths of an inch in length (Figure 17). The head is reddish brown, the eye spots and a large blotch on the frontal area are black, and usually near the middle of the blotch is a yellowish, inverted-V-shaped mark. The frons between the eyes is slightly concave. The body is light green with longitudinal dark-green markings as follows: two narrow stripes on the dorsum, a broad lateral and a supraspiracular stripe, and a narrower one at base of legs on each side; legs with black markings on outer side. When the larva molts into the last instar, it loses the darker markings except for the eye spots.

The Cocoon

The cocoon is capsule-shaped, light brown, of a strong paperlike texture, and ranges from 7 to 9.5 mm. in length by about 3 to 4 mm. in width. Occasionally, some are slightly flattened on one side when spun next to a flat surface.

Life History and Habits

There may be one or two generations each year in New England. The insect passes the winter as a prepupal larva in a cocoon and the adults from this generation may emerge from the latter half of May to the last of July. Those of the next generation may emerge over a period from the latter part of July to the first part of September, or remain in the cocoons, in the prepupal stage, until the next spring or later. The peaks of adult emergence in Connecticut usually occur between June 1 and 15 and between July 25 and August 10. In plantations separated by only a few miles there may be a difference of several days in the peaks of emergence and, consequently, in the larval development. Data from field observations show that, in general, the development of the insect in red pine plantations in Southington is from one to two weeks earlier than in Litchfield, about 20 miles to the northwest.

Eggs are deposited singly in slits cut in the needles (Figure 17). In the insectary, hatching takes place in from six to 10 days. Hsin (6), in his studies of this insect in Germany, found that the first larva emerged 11 days after the egg was deposited and the last in 16 days, the development depending on the time of year.

The larvae of the first generation may be found during the period from about June 1 to early in August and those of the second generation from late in July until late in the fall. They are solitary in habits and their color blends with that of the foliage. The growth of the current year is fed upon when necessary, especially by the larvae of the second generation, but the old foliage is preferred. Severe infestations have been found only in plantations where the crowns have already closed.

Occasionally a few cocoons are spun on the twigs of pine, but normally most of the larvae crawl or drop from the trees and spin their cocoons in the litter on the ground.

Since 1938 many collections of larvae and cocoons of *Diprion frutetorum* from various localities in New England and New York have been received at the New Haven laboratory. These have been reared for data on the natural enemies and in the study of the insect's life history. The records of adult emergence indicate that usually there is a slight predominance of females. Parthenogenetic reproduction has been proved in laboratory tests, but unfortunately the progeny were not reared to determine the sex. Hsin (6) found that parthenogenesis in *D. frutetorum* is arrhenotokous.

In captivity, the females, both mated and unmated, died before having deposited all their eggs, and at present no information can be given on the average number per female, deposited in the field. To determine the potential egg production, 12 gravid females were dissected. The number of eggs found in the ovaries ranged from 63 to 96, the average being 84.58 per female.

Injury

Because of the many factors involved in causing mortality of the different stages of this insect, an attempt to forecast just how serious the defoliation will be in an infestation would be hazardous. Population studies in red pine plantations during the last two years have shown that noticeable defoliation may occur when the cocoon population in the spring, prior to emergence of the adults, averages from three to six per square foot.

There have been no reports of *Diprion frutetorum* ever having caused complete defoliation in the United States. The population, however, has been increasing in a number of forest plantations during the last few years, and in Connecticut, the feeding has been heavy in some localities, particularly on the New Britain Water Shed in Southington. Severe infestations have been observed only on red pines and in stands where the crowns have closed. The feeding on thrifty red pines may escape notice until the population has built up to large numbers. The presence of green needle fragments and excrement in the litter on the ground may be the first evidence of a heavy infestation. In plantations at Southington the loss of foliage has been so great by the feeding of this species during the last three or more years that the light filtering through the thinned crowns has favored a prolific growth of weeds, vines and shrubs. Scattered through the area where the infestation has been most severe, single trees and small groups of trees have died or are now in a dying condition. All dead trees examined had been infested by either *Pissodes approximatus* Hopk. or *Ips* sp., and there is evidence that these insects are multiplying in other nearby trees which are in a weakened condition.

Natural Control

The more important natural enemies of *Diprion frutetorum* in Connecticut include rodents and shrews, predaceous bugs of the family Pentatomidae, and the small imported hymenopterous parasite *Microplectron fuscipennis* Zett. The small mammals destroy many of the cocooned larvae in the ground litter. The pentatomids kill a great many larvae during the summer. *M. fuscipennis* is a polyphagous parasite of sawfly cocoons which was introduced from Europe to aid in the control of the spruce sawfly, *Diprion hercyniae* (Htg.) It was first liberated in Connecticut in 1936 in a spruce plantation at Orange. When studies of *D. frutetorum* were begun in Southington in 1941, this parasite was found to be firmly established there and was taking a heavy toll of the cocoons. Based on the examination of sample collections of cocoons, the parasitization by this species each year has been as follows: 1941, 24.8 per cent; 1942, 25.4 per cent, and 1943, 23.6 per cent. Since 1941 this parasite has been found in most of the infestations of *D. frutetorum* in Connecticut. A number of ground-inhabiting insects are known to feed on the cocoons, but no study has been made to determine the true predators and those that act only as scavengers.

The fact that cocoons of this sawfly can be found in the ground litter every month in the year makes conditions generally favorable, insofar as food is concerned, for those ground-inhabiting insects and mammals which include sawflies in their diet. It is believed that such animals have been largely responsible for the relatively slow increase of *Diprion frutetorum* in the United States.

Artificial Control

Effective control can be obtained by the application of lead arsenate sprays as soon as the larvae are found. The powdered lead arsenate should be used at the rate of 4 pounds to 100 gallons of water, with fish oil as an adhesive at the rate of 4 ounces by weight to each pound of the powdered insecticide. This formula is particularly recommended for use in power sprayers, and it should be applied in as fine a mist as possible.

Literature Cited

1. Brown, A. W. A., 1941. Annual Report of the Forest Insect Survey. Canada Dept. Agr. Div. Ent., Sci. Serv. Ann. Rpt. (1940).
2. ————————, 1943. Annual Report of the Forest Insect Survey, 1942. Canada Dept. Agr. Div. Ent., Sci. Serv. Ann. Rpt. (1942).
3. Collins, C. W., 1938. A sawfly (*Diprion frutetorum* F.) U. S. Bur. Ent. and Pl. Quar., Insect Pest Survey, 18: 562 (Processed).
4. Friend, R. B., 1941. An infestation of a European sawfly, *Gilpinia frutetorum* L. Connecticut State Entomologist, 40th Report, 1940. Conn. State Agr. Expt. Sta. Bul. 445, p. 376.
5. Gray, D. E., 1938. Notes on the occurrence of *Diprion frutetorum* Fabr. in southern Ontario. Ent. Soc. Ontario, Ann. Rpt. (1937) 68: 50–51.
6. Hsin, C. S., 1935. Beiträge zur Naturgeschichte der Blattwespen. Monog. z. Angew. Ent. 22: 253–294.
7. Kuntze, R., 1935. Notizen über einige einheimische *Lophyrus*—Arten, Hym in Sylwan. Pub. Soc. Forest. Pologne Ser. A., Mem. 4, pp. 1–12, Lwow. (Abstract in Rev. Appl. Ent. (a) 25: 57. 1937.)

MISCELLANEOUS INSECT NOTES

A New Apple Pest for Connecticut. The apple leaf-curling midge, *Dasyneura mali* Kieff., was found for the first time in Connecticut orchards during the summer of 1943. The orchard in which it was found is located in the town of Wilton and is approximately seven miles north of Norwalk. Damage of the type shown in Figure 18 was seen throughout the orchard.

The insect has been studied by Prof. W. D. Whitcomb of the Massachusetts Agricultural Experiment Station, who reports three generations a year. No entirely satisfactory means of control were reported by him, although use of nicotine sulfate and molasses, and summer oils applied during the oviposition periods appear to have afforded some relief.

[Philip Garman]

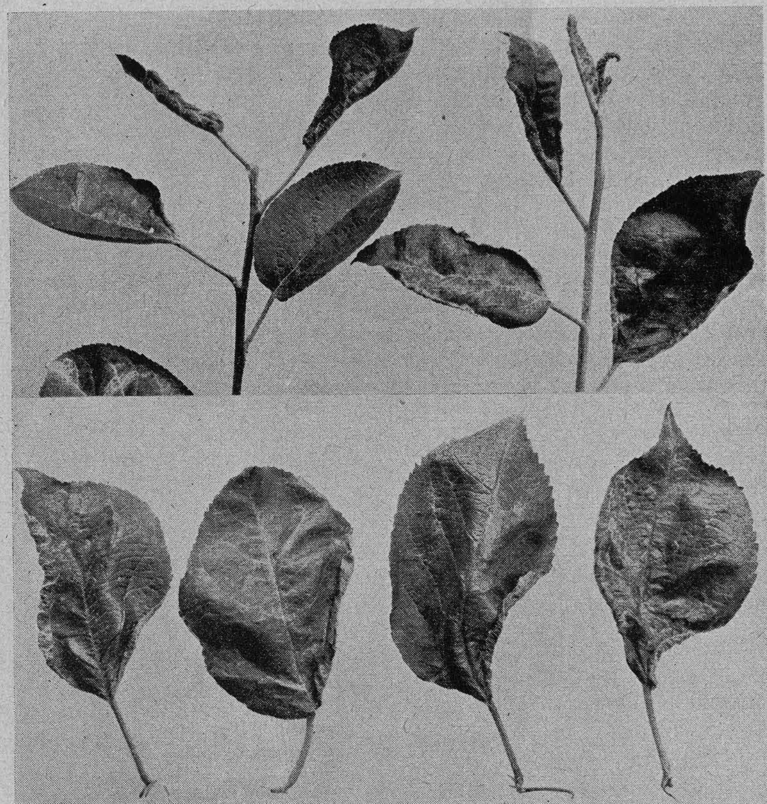


FIGURE 18. Work of *Dasyneura mali*, a new apple pest in Connecticut.

Sweet Corn Damaged by the Larvae of *Anomala orientalis* Waterhouse. Approximately three acres of a 20-acre field planted to sweet corn during the season of 1943 were severely damaged by the larvae of the oriental beetle, *Anomala orientalis* Waterhouse, feeding upon the roots (Figure 19). A few larvae of the Japanese beetle, *Popillia japonica* Newm., were also present but definitely in the minority. Parts of the field were heavy in grass before it was plowed, resulting in egg deposition the preceding season. The injury was noticeable in June, becoming more severe in July. After June 15 there was a deficiency of rainfall which caused the injured plants to wilt rapidly, as the drought was prolonged.

[J. PETER JOHNSON]

Further Notes on the Scarabaeid *Aphonus castaneus* Melsh. One adult *Aphonus castaneus* was reared from larval material[1] obtained

[1] Johnson, J. Peter, 1943. Conn. State Entomologist, Forty-Second Report, Bul. 472: 306–307.

in the fall of 1942. Later, in the summer of 1943, numerous adults were obtained from diggings made in the field to observe seasonal development. The first adults, completely transformed, were found with their pupal skins on July 17. On July 29, more than 66 per cent of the insects were in the adult stage. Diggings were made at intervals during the summer season and no eggs were found. No adults were observed in flight during daylight hours or early in the evening. All adults found were taken from the soil. The last diggings were made on September 21 and these yielded living adults and the remains of two mummified larvae.

In the spring and during the summer, numerous grubs were found that had been killed by a mummifying fungus. Rainfall was plentiful throughout the spring but the summer months were very dry. No record was made of the count of diseased grubs but it was evident that the fungus was responsible for a considerable decrease in the grub populations in the infested areas.

An infested area on one golf course fairway was treated with lead arsenate at the rate of 10 pounds to 1,000 square feet, in the fall of 1942. During June and July, 1943, only an occasional grub could be found in the treated area. Most of the injured turf recovered after the treatment and only the small areas which had dried out completely in 1942 failed to respond.

[J. PETER JOHNSON]

FIGURE 19. Corn damaged by *Anomala orientalis* larvae.

TABLE 29. *Phyllophaga* SPECIES AND HOST PLANTS

Host plant	anxia	crenulata	fraterna	oersteri	fusca	hirticula	ilicis	marginalis	micans	tristis	Total
Alder	8			8	3	85	1				105
Apple			7							3	10
Beech						25					25
Birch, grey		1									1
Blueberry				1	2			1			4
Dogwood		2		1		1					4
Elm	12	2	1	6	5	124					150
Hazel	3	1	1	36	1	105	2	2	2	1	154
Hickory	2	7			1	56		6			72
Oak, white and chestnut		1	1	5		99		1		1	108
Peach	5	3				10					18
Poplar	1				1						2
Raspberry				8	3	19	1			54	85
Rose	1	36		71	8	61			1	1	179
Willow	7	1		3	3	83					97
Miscellaneous	20	9	3	8	10	67			1		118
Light trap	16	30		6	3	182				3	240
Hand collected when emerging		4	15	3	37	44					103
Total	75	97	28	156	77	961	4	10	4	63	1,475

TABLE 30. *Phyllophaga* SPECIES AND DATES COLLECTED

Location	Date	anxia	crenulata	fraterna	foersteri	fusca	hirticula	ilicis	marginalis	micans	tristis	Total
Shelton	5—17—43	3			1							4
Pine Orchard	5—18—43			22		37					3	62
New Haven	5—25—43				3							3
Shelton	5—27—43	2					18					20
Shelton	5—28—43	4					22					26
Shelton	5—29—43				1		2					3
Shelton	6— 2—43	14	10	1	1		39					65
Shelton	6— 3—43	6	24		54	3	64				2	153
Shelton	6—11—43	4	10		15		30				2	61
Mt. Carmel	6—12—43				4	4	8					16
Shelton	6—12—43	2	11		4	1	16					34
Mt. Carmel	6—14—43				4	3	10					17
Shelton	6—14—43		1		3	1	11		3			19
Shelton	6—15—43	2	2		3	1	5		5			18
Madison	6—16—43	24	20	1		4	411			4		464
Shelton and Woodmont	6—18—43		1				1					2
Shelton	6—20—43		5				5					10
Oxford	6—22—43	12	2	2	23	11	264	1			1	316
Shelton	6—23—43		1			1	1					3
Woodmont	6—23—43		1	1	5	3	2					12
Shelton	6—24—43	1			18	3	25	1			44	92
Orange	6—25—43	1	1		3	3	7		2		1	18
Shelton	7— 6—43				19		12	2			10	43
Total		75	89	27	161	75	953	4	10	4	63	1,461

Notes on *Phyllophaga* and Their Host Plants. The year 1943 was a heavy flight year for *Phyllophaga.* This was expected, as considerable turf was destroyed by second-year grubs in 1941.[1] Hand collections were made and a light trap was used at rather regular intervals, when weather conditions permitted, from the middle of May until early in July. The beetles were very active when the temperature was above 70° F. but their activity declined rapidly when the temperature dropped to 60° F. or below, very few beetles being captured in the light trap when the temperature was near 60° . All the light trapping and most of the hand collections were made in Shelton near turf areas not damaged by the grubs in 1941. The infestations were not as heavy as those in Pine Orchard, Madison and Oxford.

In Madison, small ornamental beech, elm, hazel, peach, climbing rose, white oak and willow were severely defoliated. Collections were made there on a warm evening and the drone of hundreds of beetles in the taller trees could be heard from dusk until after 11 P.M. Most of the beetles in Oxford were collected from alder, hazel, hickory and oak. Climbing roses were the preferred host plant in Shelton, where most of the beetles were taken in the urban area. Table 29.

P. fraterna and *P. fusca* were most numerous about the third week in May, with *P. hirticula* appearing the last week in May. *P. hirticula* was without question the predominant species during 1943. *P. foersteri* followed *P. hirticula* in numbers in the area where collecting was done throughout most of the season. Probably more *P. fusca* and *P. fraterna* would have been obtained if it had been possible to be in the field more often in early May. *P. anxia, P. crenulata* and *P. foersteri* were most numerous during the first three weeks of June. *P. ilicis, P. marginalis* and *P. micans* did not appear until the middle of June or later, and *P. tristis* was most numerous in late June. Table 30.

[J. PETER JOHNSON]

Willow Flea Weevil, *Orchestes rufipes* LeC. While we have a number of specimens of this weevil in our collection, this is the first time it has been reported abundant enough to be noticeable. An outbreak was found on August 17, 1943, on some willow trees in the Stratfield section of Fairfield. A number of broad-leaved willows (*Salix pentandra*) were infested. The trees were partially defoliated and all of the remaining leaves were brown. The leaves showed the characteristic feeding punctures made by the adult weevils and many of the blotch mines made by the larvae.

The eggs are laid in punctures in the leaves about the latter part of June and early July. The larvae or grubs are leaf miners and live inside the leaf tissues. The grubs pupate in the leaves and the adults emerge during August. There is only one generation each year and adults are said to hibernate in soil under the trees or under stones and beneath loose bark.

[1] Johnson, J. P., 1942. White grubs during 1941. Conn. Agr. Expt. Sta. Bul. 461, pp. 523-530.

Two applications of the following spray should give control: 1 1/3 pints of nicotine sulfate, 1 3/5 pints of liquid potash soap to 100 gallons of water. Sprays should be applied about the latter part of June and the middle of July.

[M. P. ZAPPE]

PUBLICATIONS, 1943[1]

R. B. Friend

Entomology. The American Year Book, a Record of Events and Progress, Year 1942, pp. 769–771. March, 1943.

Connecticut State Entomologist. Forty-Second Report. Bul. 472, 115 pp., 20 figs., with index. May, 1943. (Issued August, 1943).

Get Rid of Diseased Elm Trees. Spec. Bul., 2 pp. August, 1943.

Controlling Weevils in Dried Beans. Spec. Bul. (mimeographed), 2 pp. September, 1943.

Wing Venation. Guide to the Insects of Connecticut, Part VI, The Diptera or True Flies of Connecticut, First Fascicle. Conn. Geol. and Nat. Hist. Survey Bul. No. 64, pp. 166–174, 3 figs. September, 1943.

Raimon L. Beard

The Significance of Growth Stages of Sweet Corn as Related to Infestation by the European Corn Borer. Bul. 471, 31 pp., 5 figs. May, 1943. (Issued June, 1943).

Philip Garman

Looking Ahead to Insect Outbreaks and Insecticide Supplies in 1943. Pomological Pointers for Conn. Fruit Growers, No. 153 (1 ½ columns). January, 1943.

Insect Control and the Insecticide Situation for 1943. Proc. 52nd Annual Meeting, Conn. Pomol. Soc., pp. 27-31. March, 1943.

Report on Parasite Breeding and Distribution for 1942. Proc. 52nd Annual Meeting, Conn. Pomol. Soc., pp. 74–75. March, 1943.

The Insect Outlook. Pomological Pointers for Conn. Fruit Growers, No. 156 (¾ column). April, 1943.

Studies of Reduced Schedules for Control of Apple Insects in Connecticut. Jour. Econ. Ent., Vol. 36, No. 2, pp. 211–214. April, 1943.

Seasonal Insect Notes. Pomological Pointers for Conn. Fruit Growers, No. 157 (1 column). May, 1943.

Timely Insect Notes for Fruit Growers. Pomological Pointers for Conn. Fruit Growers, No. 159 (1 column). July, 1943.

Control of the Apple Maggot With Rotenone Dusts. Bul. 474, 8 pp., 1 fig. August, 1943. (Issued October, 1943).

Philip Garman, R. B. Friend, H. W. Davidson and John H. R. Bishop

Report of Committee on Injurious Insects. Proc. 52nd Annual Meeting, Conn. Pomol. Soc., pp. 66–67. March, 1943.

J. Peter Johnson

Cutworms—Gardeners' Perennial Enemies. Horticulture, pp. 80-81. February 15, 1943.

Vegetables in Poisoned Lawns. Horticulture, New England Edition, p. 166. April 15, 1943.

The Effect of Hot Water Treatment for Cyclamen Mite Upon Cyclamen Plants. Jour. Econ. Ent., Vol. 36, No. 2, pp. 286–289. April, 1943.

Control of the Japanese Beetle. Circ. 157, 8 pp., 1 fig. June, 1943.

Neely Turner

The Effect of Diluents on the Toxicity of Pure Ground Derris Root in Dusts. Jour. Econ. Ent., Vol. 36, No. 2, pp. 266–272. April, 1943.

Reversals in Order of Effectiveness of Insecticides. Jour. Econ. Ent., Vol. 36, No. 5., pp. 725–728. October, 1943.

---

[1] Inasmuch as the articles in this Report written by members of the Department all bear the authors' names, they are not listed here.

Neely Turner and James G. Horsfall

Controlling Pests of War Gardens. Circ. 155, 15 pp. April, 1943.

B. H. Walden

Controlling Tomato Insects. Spec. Bul. (mimeographed), 2 pp. April, 1943.

R. C. Botsford

Civil Mosquito Control in Connecticut in Wartime. Proc. 30th Annual Meeting, N. J. Mosq. Exterm. Assoc., pp. 79–80. March, 1943.

INDEX

Bulletin 482 **July, 1944**

THE FORTY-EIGHTH REPORT ON

FOOD PRODUCTS

AND THE THIRTY-SIXTH REPORT ON

DRUG PRODUCTS

1943

E. M. BAILEY, Chemist in Charge

Connecticut
Agricultural Experiment Station
New Haven

EDWIN G. WOODWARD

Edwin G. Woodward died on July 7, 1944 as the result of burns and injuries received in the tragic circus fire in Hartford the previous day. His wife and grandson also lost their lives in the fire.

Mr. Woodward served as Dairy and Food Commissioner of this State from 1934 to 1941, resigning his commission to become Dean of the College of Agriculture of the University of Connecticut, which office he held at the time of his death.

He served as Commissioner with conspicuous success and became nationally recognized as a leader in the field of food and drug control. He was elected president of the Association of Food and Drug Officials of the United States in 1940 and declined re-election.

He was largely instrumental in securing the passage of our present Food, Drug and Cosmetic law which was enacted during his term as Commissioner.

The following resolution was adopted by the New England Association of Food and Drug Officials at their annual meeting in Brattleboro, Vt., August 2, 1944.

Whereas, Edwin G. Woodward was a former member of our New England Association of Food and Drug Officials and for a term of years served as its president, during which time he also rendered outstanding service as president of the Association of Food and Drug Officials of the United States: and

Whereas, his clear understanding and appreciation of food and drug control problems contributed largely to the interest and success of our meetings, and to constructive food and drug control throughout the country; and

Whereas, his many admirable qualities as a man compelled our respect and won the esteem and affection of us all; be it

Resolved, that we express our deep sorrow and the keen sense of personal loss that we feel at his passing; and be it further

Resolved, that a copy of this resolution be sent to his family, and a copy also to the Chairman of the Editorial Committee of the Association of Food and Drug Officials of the United States.

For the Association

E. M. BAILEY, *Connecticut*

E. R. TOBEY, *Maine*

W. A. QUEEN, *Washington, D. C.*

Material	Page	Sampled by or submitted to: The Station	Sampled by or submitted to: The Dairy and Food Commissioner	Total	Adulterated, below standard or questionable
FOODS					
Beverages	332	...	21	21	8
Coffee	333	...	11	11	3
Deceptive packaging	334	...	36	36	23
Fats and oils:					
Olive oil	335	3	42	45	29
Butter	335	4	4	8	3
Foods examined for contamination, etc.	336	54	33	87	6
Honey	336	...	4	4	1
Meat products:					
Hamburg	337	7	14	21	1
Sausage, etc.	337	...	22	22	7
Milk and milk products:					
Market milk	337	210	...	210	1
Vitamin D milk	338	...	115	115	6
Miscellaneous	338	3	...	3	...
Maple syrup, etc.	340	...	3	3	1
Pickles, condiments, etc.	340	...	8	8	5
Salad dressings	340	...	18	18	3
Spray residue	341	12	139	151	4
Miscellaneous	342	...	11	11	7
Total		293	481	774	108
DRUGS, etc.					
Denatured alcohol	342	...	97	97	24
U.S.P. or N.F. drugs:					
Ammoniated mercury ointment	343	...	60	60	23
Mercurial ointment	343	...	36	36	10
Tincture of iodine	344	...	11	11	6
Mild tincture of iodine	344	...	34	34	17
Strong solution of iodine	344	...	38	38	37
Turpentine	346	...	79	79	3
Miscellaneous drugs, cosmetics, etc.	347	...	23	23	...
Rubber prophylactics	349	...	19	19	2
Warning statements	350	...	...	...	...
Prescription drugs	354	...	...	...	...
Total		...	397	397	122
Collaborative work	355	972	...	972	...
Total for all samples		1265	878	2143	230
Babcock glassware, etc.	355	2804	...	2804	17

THE FORTY-EIGHTH REPORT ON FOOD PRODUCTS

and the

THIRTY-SIXTH REPORT ON DRUGS

1943

E. M. BAILEY

This report summarizes examinations of official samples of foods, drugs and cosmetics submitted by the Dairy and Food Commissioner during the calendar year 1943.

Samples examined for health officers and others, and work done for other State and Station Departments are included.

The Dairy and Food Commissioner is responsible for the enforcement of the Food, Drug and Cosmetic law, and largely also for its administration. The Director of this Station is jointly responsible with the Commissioner for regulations provided for in the Act. Scientific and technical service required by the Commissioner is rendered by this Station and by the State Department of Health as the law provides.

During the past year, special attention has been given to food products for evidence of decomposition or of contamination, faulty labelling, deceptive packaging; and to so-called economic frauds, such as the substitution of various edible vegetable oils for olive oil without proper declaration.

The Commissioner has been active in the drug field, removing old stocks from circulation, submitting samples for checking with current official standards, and for conformity to labelling requirements. A limited survey of cosmetic preparations has been made. Samples of denatured alcohol and of turpentine have been submitted and examined under the special statutes relating to those articles.

A very considerable amount of analytical work done as a service to other State and Station departments is indicated by the summary at the end of this report.

Babcock glassware, and thermometers used in checking pasteurization temperatures in milk plants have been checked as required by statutes.

The loyal and effective cooperation of the department staff in carrying on this work is again gratefully acknowledged.

FOODS

BEVERAGES

H. J. Fisher and C. E. Shepard

Twenty-one samples of beverages of various kinds were examined. The subjoined summary shows the nature and extent of examinations made, and the results of examination.

Table 1. Examination of Beverages

No.	Name of article and manufacturer	Place of sampling	Remarks
N-143	Ginger ale, Charter Oak Beverage Co., Hartford	Middletown	Mold present.
E.S.-86	Root beer, Dr. Swett's	New Haven	No declaration of net contents, or name and address of manufacturer.
E.S.-83	Lemon and lime soda, Atlantic Bottling Works, New Haven	New Haven	Mold present.
E.S.-84	Lemon soda, R.F. Baker and Co., Inc., Danbury	New Haven	Mold present; coal tar color present, not declared.
E.S.-140	Imitation grape juice drink, Grapelene; Paradise Pkg. Co., Brooklyn, N.Y.	New Haven	Pass, with suggestion for revision of label.
W-165	Extra soda, X-Tra Bot. Co., Springfield, Mass.	Hartford	Contained foreign matter (pieces of cardboard).
K.C.-301	Lime soda, Colonade Beverage Co., E. Norwalk	E. Norwalk	Appreciable residue of silica. Faulty cleaning of bottle?
H.C.-901,S-233-4	Hard cider	Front St., Hartford	Alcohol 4.78, 5.38 and 4.67%, respectively. Sediment apple marc and yeast cells. Illegal sale of alcoholic beverage.

Table 1. Examination of Beverages—Continued

No.	Name of article and manufacturer	Place of sampling	Remarks
K.C.-272-5	Gold Medal Beer and Old India Ale, Commonwealth Brewing Corp., Springfield, Mass.	So. Norwalk, E. Portchester and Greenwich	Visible sediment consisting of or containing yeast cells, mold mycelia and spores, and flecks of paint or enamel from bottle tops.
K.C.-287-91	Beer and ale, Commonwealth Brewing Corp., Springfield, Mass.	So. Norwalk	Filter clean; no appreciable sediment.
Sta. No. 7676	Light beer, Ballantine	New Haven	No mold or sediment other than trace of yeast.
Sta. No. 7685	Orange soda	New Haven (Purchaser's sample)	No evidence of foreign matter.

COFFEE, etc.

C. E. Shepard and H. J. Fisher

Eight samples of ground coffee were examined and no evidence of adulteration was found. One sample, E.S.-104, was misbranded in that the package did not bear the name and address of the packer or distributor.

Two samples of Demi Tasse coffee ("extract") were examined. They were Mexican products labelled as containing 15 per cent of sugar.

Partial analysis:

	E.S.-79	K.C.-267
Caffeine gm./100 cc.	0.12	0.27
Sucrose gm./100 cc.	1.43	0.52
Invert sugar gm./100 cc.	2.39	2.65
Total sugars gm./100 cc.	3.82	3.17

Assuming the average caffeine content of coffee to be 1.2 per cent, the extracts represent approximately 10 and 20 per cent coffee, respectively. Sugar is much less than declared.

A sample of "Coffeeaid", a coffee stretcher composed of roasted rye, barley and malted barley cereal was analyzed as follows:

Moisture 6.85 per cent, protein 13.88, crude fiber 7.43, fat 3.00.

The article is apparently a mixture of roasted cereals as claimed, and for the purpose of mixing with coffee to stretch the household coffee supply.

DECEPTIVE PACKAGING OF FOODS

H. J. Fisher and E. M. Bailey

An article of food is misbranded if its container is "so made, formed or filled as to be misleading". The immediate container may be slack filled; or outer cartons may be deceptive as to the size of the inner immediate container. In both of such cases the food is misbranded.

If the package is closed so that the purchaser cannot see and judge as to the quantity of contents before purchase, the question of deception is not difficult to decide. In case of packages in which the contents are more or less exposed to view, e. g. packages with cellophane "window" or covers, deception depends upon the extent to which the purchaser may inform himself as to the nature and quantity of contents by exercise of reasonable attention and alertness. Novelty packages designed for holiday trade belong in this category.

Flavoring Extracts. Eight samples of vanilla or imitation vanilla extracts were examined as to deceptive packaging. Seven were regarded as deceptively packaged. The bottles containing the extracts occupied much less than the actual capacity of the outside cartons. Waste space in the cartons ranged from 54 to 71 per cent. One sample showed about 50 per cent of waste space in the outside container but the shape of the bottle was such (tapering) that a smaller container would hardly suffice and the package was passed.

Two samples were examined as to labelling. Both were imitation vanilla extracts. One failed to bear a statement of ingredients, and the other failed to declare artificial color although caramel was listed as an ingredient.

Orange Extracts. Four samples of orange extract were deceptively packaged, the waste space in the outer containers ranging from 50 to 68 per cent.

Miscellaneous. Twenty-two samples of confections, pastry, etc. were examined. Seven were considered to be deceptively packaged. The others were passed on the point of deceptive packaging, but three of them were otherwise misbranded.

FATS AND OILS

H. J. Fisher, W. T. Mathis and C. E. Shepard

Olive Oil, etc.

Forty-two official samples of olive oil and other vegetable oils have been examined. Of this number, 29 were adulterated or misbranded, or both. Thirteen were passed as examination revealed nothing objectionable.

Adulteration consisted in substituting common domestic oils such as corn, cottonseed and peanut oils for olive oil, or in some cases substituting them for one another. The addition of artificial color and flavor to simulate olive oil and so make the article appear better or of greater value than it is has been another common form of adulteration.

Misbranding has consisted in selling oils or mixtures that were not the oils or mixtures that they purported to be; in failing to give the name and address of the packer or distributor; in not correctly stating the net volume of contents of cans (many were short volume), and in failure to declare the presence of artificial color and artificial flavor if present.

The large proportion of illegal samples found is probably not a true picture of market conditions in the State because many of the samples have been taken on complaint or suspicion or in channels of trade where sophistication is more likely to occur.

Three unofficial samples of olive oil were examined for purchasers and all appeared to be genuine.

Butter

Four official samples of butter were examined.

Analyses:

No.	G-171	KC-196	KC-302	N-138
	%	%	%	%
Moisture	12.87	22.23	14.06	13.07
Ash (salt)	2.25	2.00	2.05	2.19
Casein	0.86	0.87	0.72	0.76
Fat	84.02	74.90	83.17	83.98
Artificial color	present	none	present	none

Sample KC–196, made by Norman Dairy, New Canaan, contained excess water and less than the standard amount (80%) of fat. It was also misbranded because the package did not show the name and address of the packer; and there was no declaration of net weight.

Two samples contained artificial color which was not declared. The food law in this State does not exempt butter from the requirement to declare artificial color if present.

Four samples were submitted by purchasers on suspicion of quality but no evidence of adulteration was found.

FOOD EXAMINED FOR EVIDENCE OF CONTAMINATION

C. E. Shepard and H. J. Fisher

Thirty-three official samples, including tea, corn starch, pop corn, canned vegetables, flour, sugar, salt, peanuts, cereal products and meat products were submitted by the Commissioner to be examined for evidence of filth or other contamination.

Three of these, salted peanuts and two samples of flour, were infested with insects; one sample, corn meal, was found to be contaminated with filth (rodent hairs and excreta), and one sample of chocolate syrup was moldy.

Fifty-four samples were submitted directly by health officers and others, chiefly on suspicion of unfitness for food purposes or to determine the cause of alleged illness. One of these, a sample of sugar said to have caused illness may well have done so. It contained about 15 per cent of boric acid, evidently an instance of accidental contamination in the home.

HONEY

H. J. Fisher and D. C. Walden

Four official samples of honey were examined.

One sample N–146, packed by the H & M Packing Co., Inc., Brooklyn, N. Y., was grossly short weight. It was not further examined.

Two samples had the flavor and composition of true honey, but one of them was an opaque, cream-colored paste. It was called "creamed" honey and distributed by Meyer and Lange, New York City. It appeared to be full of minute air-bubbles, an effect that could conceivably be accomplished by whipping.

One sample was strawberry-flavored honey "Rexley brand", packed by Tavern Fruit Juices Co., Inc., Brooklyn, N. Y. The flavor of honey predominated but it also had a true strawberry flavor.

MEAT AND MEAT PRODUCTS

C. E. Shepard, R. T. Merwin and D. C. Walden

Hamburg

Fourteen official samples of hamburg were examined. No preservative (sulphite) was detected in any of the samples.

A regulation limiting the proportion of fat in hamburg has been proposed and 25 per cent appears to be a reasonable limit. Some control officials regard 20 per cent as liberal enough while others regard 27 per cent as not excessive.

Fat was determined in six of the samples submitted and the range for fat content was 26.4 to 37.7 per cent. The average was 30 per cent. Selling fat at the price of meat is an unfair practice especially in times of strict rationing and high prices of meat and meat products.

Seven samples of chopped meat were submitted by health officers and others. One contained sulphite, an illegal preservative.

Sausage, etc.

Twenty-one samples of frankfurt sausage were submitted by the Commissioner. Seven were found to contain starchy filler in excess of the limit of 3.5 per cent fixed by government regulation.

One sample was corned mutton of Argentine packing. No evidence was found that the article was not as labelled.

MILK AND MILK PRODUCTS

Market Milk

O. L. Nolan

Two hundred and ten samples of milk have been tested for producers, consumers and health officers. One sample examined for the Bridgeport Department of Health was found to be watered milk. Most of the samples were submitted by producers and were tested only for fat content.

Vitamin D Milk

R. B. Hubbell

One hundred and fifteen samples of vitamin D milk were examined during the year and 95 per cent of the samples contained the guaranteed unitages of vitamin D or were sufficiently close to the guaranty to be passed without question.

The results of the vitamin D tests are given in Table 2.

The following summary shows the inspection record of this product since it was first offered for sale in this State in 1935. Only 10 per cent of all samples examined have been definitely below guaranty.

Summary of Vitamin D Milk Assays, 1935-1943, Inclusive

Year	No. of samples tested	Satisfactory	Passed	Below guaranty
1935	14	10	2	2
1936	62	49	6	7
1937	78	65	6	7
1938	87	79	3	5
1939	84	63	10	11
1940	77	63	8	6
1941	92	62	14	16
1942	101	80	10	11
1943	115	99	10	6

Miscellaneous

Two samples of ice cream and one of evaporated milk were also tested.

Table 2. Summary of Assays of Vitamin D Milk

City or Town	Dairy	No. of samples tested	Satisfactory	Passed	Below unitage claimed
Avon	Woodford Farm	2	2	...	...
Bloomfield	Chris Neilsen & Son	3	2	...	1
Bridgeport	Beechmont Dairy	2	2	...	...
	Dewhirst Dairy	2	2	...	...
	F. A. Marsh & Son	2	2	...	...
	Mitchell Dairy	2	2	...	...
	Round Hill Dairy	2	2	...	...
Bristol	E. H. Elton	3	3	...	...
Clinton	Burr Dairy	1	1	...	...
Danbury	Rider Dairy	3	3	...	...
Fairfield	Wade's Dairy	2	2	...	...
Greenwich	Round Hill Farm	4	3	1	...
Hamden	Brock-Hall Dairy	4	4	...	...
Hartford	Bayer's Dairy	1	...	...	1
	Bergren's Dairy	3	3	...	...
	Bryant & Chapman Co.	2	2	...	...
	Cloverdale Dairy	2	2	...	...
	Farmers' Cooperative	2	2	...	...
	Highland Dairy	3	2	1	...
	Lincoln Dairy	3	3	...	...
	Petersen Farms	3	2	1	...
Kensington	Ferndale Dairy	2	2	...	...
Litchfield	Preston Davenport	1	...	...	1
	Tollgate Farms	1	1	...	...
Manchester	Dart's Dairy	2	2	...	...
	West Side Dairy	2	2	...	...
Milford	Cold Spring Farms	2	1	...	1
New Britain	United Milk Co.	2	2	...	...
New Haven	Clark Dairy	2	2	...	...
	Knudsen Bros. Dairy	2	1	...	1
	New Haven Dairy	3	2	1	...
	Sagal-Lou Dairy	2	2	...	...
	J. H. Story	2	2	...	...
Newington	J. A. Moylan	1	1	...	...
	Spring Brook Dairy	2	2	...	...
New London	Radway's Dairy	2	2	...	...
New Milford	Sunny Valley Farms	3	3	...	...
Norwalk	Borden Co.	2	2	...	...
	Harrick Dairy	3	3	...	...
	Strawberry Hill Dairy	3	1	2	...
Oakville	Sanford's Overlook Farms	1	1	...	...
Putnam	Deary Bros.	2	2	...	...
Shelton	Von Werder Farms	1	1	...	...
Springdale	Clear View Dairy	4	2	2	...
	Maplehurst Dairy	3	3	...	...
Stratford	Deering Dairy	2	1	1	...
Thompsonville	Skipton's Dairy	2	2	...	...
Torrington	Torrington Creamery	3	2	1	...
Waterbury	Brock Hall Dairy	2	2	...	...
	Brookside Dairies	2	2	...	...
	Worden's Dairy	2	1	...	1
Watertown	Sanford's Overlook Farms, Inc.	1	1	...	...
	Totals	115	99	10	6

MAPLE SYRUP, etc.

H. J. FISHER

Two official samples of maple syrup were examined and both were passed. No evidence of adulteration was found.

A sample of "pancake syrup" was examined as to labelling only. It was misbranded in that it bore no statement of net weight or of ingredients.

PICKLES, CONDIMENTS AND SAUCES

H. J. FISHER

Seven official samples of pickles and relishes were submitted for review of labels. Three were passed with minor criticisms. Four were misbranded in that they were articles for which no definition and standard has been promulgated and the labels failed to bear lists of ingredients.

Although the law does not require it, some manufacturers give label information as to ingredients in articles of food for which definitions and standards of identity have been adopted. This is a commendable practice because, as a matter of informative labelling, the ingredient picture of standardized foods is of as much interest and importance to the purchaser as that of unstandardized foods.

A sample of "Mos-ness French Sauce", Mosness Food Products, Boston, was examined. The label declaration describes the product as non-fattening. The ingredients are declared to be "oil, vinegar, sugar, flavoring, salt and spices". It contains about 36 per cent of oil and about 18 per cent of sugar. The oil is a food oil, largely or entirely saponifiable. Together the oil and sugar yield about 400 calories per 100 grams of sauce, and the "non-fattening" claim is not convincing.

SALAD DRESSINGS

H. J. FISHER AND R. T. MERWIN

Eighteen samples of salad dressings were submitted by the Commissioner. The oil ingredient in three of these was mineral oil.

Mineral oil is a non-food oil and is not a suitable ingredient of salad dressing for general food purposes. It is permissible in dressings sold for special dietary purposes (low-calorie diets) when labelled

to show its restricted purpose as provided by the special purpose foods clause in the Food, Drug and Cosmetic Act. But packing such dressing in large-sized containers (e.g., 1 gallon), is an invitation to misuse, especially when sold to hotels and restaurants. Such misuse was found in one case.

In sample W-157, Thallon-naise, the oil ingredient was substantially all mineral oil. The container was labelled to show its special dietary purpose. Inspection evidence, however, revealed a large stock of gallon jars of this dressing in a restaurant; and the dressing was served there as mayonnaise.

Sample W-166, Eee Bee Brand, Minermaise, listed mineral oil among its ingredients, but the label did not reveal any special purpose feature.

Sample E.S.-93, Golden brand salad dressing, was labelled as containing cooked starch and mayonnaise, but it contained mineral oil. There was no special purpose declaration on the label.

In the remaining samples no evidence of mineral oil was found. They were passed with suggestions or criticisms as to labels in some cases.

SPRAY RESIDUE

C. E. SHEPARD AND J. L. SHEPARD

One hundred and thirty-nine official samples of apples from orchards in the State were submitted by the Dairy and Food Commission.

The tolerance for lead (.05 grain per pound) and arsenic (.025 grain As_2O_3 per pound), named in 1940 by the U. S. Public Health Service and adopted by the Food and Drug Administration, has been used as the guide in judging samples submitted. Only two samples exceeded the limit for lead and these also carried slight excesses of arsenic. The amounts found were lead, .056 and .064, and arsenic, .029 and .028, grain per pound in the two samples, respectively. In routine examinations only lead was determined. Arsenic was determined only in those samples showing excess of lead.

Six samples of apples, grapes and grape juice were examined for growers. Two samples of grapes carried 11.8 and 16.8 parts per million of lead. This is 1.7 and 2.4 times the tolerance and washing the grapes with dilute acid and salt solution was recommended.[1] A sample of grape juice made from the grapes carrying the higher amount of lead contained 6.5 p.p.m. of lead.

1. To 5 gallons of water in a wooden tub or stone crock add 7 ounces of table salt, 18 fluid ounces of concentrated hydrocloric acid and mix thoroughly. Immerse the fruit in the solution for two minutes and rinse thoroughly with water.

Six samples of vegetables were submitted by home gardeners. The vegetables, celery, beets, turnips, cabbage and rhubarb, had been grown in soil previously treated with lead arsenate to destroy Japanese beetles.

The celery, cabbage and rhubarb gave negative tests for arsenic; the beets and turnips showed negligible amounts, .2 and .07 p.p.m., respectively.

MISCELLANEOUS

Eleven official samples of miscellaneous foods were submitted chiefly for criticism of labelling.

Seven were misbranded in one or more respects; the others were passed.

DRUGS, etc.

DENATURED ALCOHOL

C. E. Shepard

Having noted some flagrant abuses in the sale of denatured alcohol in paint and hardware stores, the Dairy and Food Commissioner made a survey of market conditions and submitted 97 samples for examination as to identity and/or labelling.

Twenty-one of the samples submitted contained wood alcohol. They were sold in bulk without any identification whatever, or were falsely labelled "alcohol".

The remaining 76 samples were labelled as "denatured alcohol" with the usual cautionary statement, or labelled as "poison" or otherwise to warn the purchaser of the identity of the articles.

Section 2674 of the General Statutes prohibits the sale of any wood alcohol unless labelled "wood alcohol, poison"; and it further prohibits the sale of any article of food or drink, or of any drug, or of any perfume or toilet preparation containing any wood (methyl) alcohol. No specific provision is made for the labelling of denatured alcohol, but in case the denaturing is accomplished wholly or in part by the addition of wood alcohol the statute cited was considered to be applicable; and in any case the article should be so labelled as to inform the purchaser of its true identity and with proper warning statements.

Three other samples were straight wood alcohol without proper labelling.

AMMONIATED MERCURY OINTMENT

H. J. Fisher and R. T. Merwin

This official preparation formerly contained 10 per cent of ammoniated mercury (7.1 to 8.7 per cent of mercury), but the active ingredient has been reduced to 5 per cent (3.5 to 4.5 per cent of mercury) in the current Pharmacopoeia, U.S.P. XII.

Sixty samples were submitted by the Dairy and Food Commissioner. Of these, 25 were 10 per cent preparations, no doubt manufactured when U.S.P. XI was in effect. The remainder were 5 per cent preparations.

All met the requirements of the respective standards for mercury content except three of the 5 per cent samples in which the mercury was excessive in one and deficient in two.

As to labelling, 29 samples bore directions for use and warning statements that were satisfactory or acceptable. A satisfactory warning statement is one that cautions the user that this preparation may cause irritation of the skin and that application to large areas may cause serious mercury poisoning (Conn. Agr. Exp. Station Bul. 460, p. 453, 1942). Other forms of statement that convey an equal warning are acceptable.

For 20 samples directions or warning statements, or both, were omitted or were regarded as unsatisfactory.

Eleven samples bore statements that restricted the articles to prescription use and in such cases it is presumed that sales will be made on prescription only.

MILD MERCURIAL OINTMENT

H. J. Fisher

This official preparation formerly contained 30 per cent of mercury, but the mercury content has been reduced to 10 per cent. U.S.P. XII specifies that the mercury content shall be not less than 9 nor more than 11 per cent.

Thirty-six samples were examined of which 19 contained substantially 10 per cent of mercury as required by U.S.P. XII now in effect. Seventeen samples contained 30 per cent of mercury and were evidently old stock.

Twenty-four samples bore directions for use and adequate warning statements, and 10 did not. In one sample the warning statement did not recognize the possibility of poisoning through application to the skin. One other bore the legend "to be used as directed by the physician". In our opinion this limits the article strictly to prescription use. No directions or warning statement appeared on the label.

IODINE PREPARATIONS

H. J. FISHER

Tincture of Iodine

Tincture of iodine contains in each 100 cc 6.8 to 7.5 grams of iodine and 4.7 to 5.5 grams of potassium iodide.

Eleven official samples were examined. All were passed as to composition, but only five had directions for use and cautions against misuse.

Mild Tincture of Iodine

This preparation differs from tincture of iodine in that it is made with sodium iodide instead of potassium iodide, and both iodine and iodide are present in lesser proportion.

The mild tincture contains in each 100 cc from 1.8 to 2.2 grams of iodine and from 2.1 to 2.6 grams of sodium iodide.

Thirty-four official samples were examined. Twenty-three were passed as to composition. Eleven samples did not meet the specifications of the U.S.P. in all respects. Some contained potassium iodide instead of sodium iodide and others were not within the specified limits for iodine or iodide, or both.

Seventeen of the samples bore adequate directions for use and suitable cautions against misuse. The remaining seventeen bore no directions or cautionary statements.

Strong Solution of Iodine

Strong Solution of Iodine is a new official name for Lugol's solution, the latter name being retained, however, as a synonym. Compound Solution of Iodine U.S.P. XI is another synonym recognized in the present Pharmacopoeia U.S.P.XII.

This preparation contains in each 100 cc 4.5 to 5.5 grams of iodine and 9.5 to 10.5 grams of potassium iodide. It is an aqueous solution and not a tincture.

A new preparation of iodine has been included in U.S.P. XII. Its official name is Solution of Iodine. It is especially adapted for wound dressing in first aid work. It is an aqueous solution containing in each 100 cc 1.8 to 2.2 grams of iodine and 2.1 to 2.6 grams of sodium iodide. It contains the same ingredients in the same proportions as the Mild Tincture but it is a water solution instead of an alcoholic solution (tincture).

Thirty-eight official samples of aqueous solutions of iodine were examined. There was apparently some confusion as to what was called for, but taking the samples as labelled, 30 were labelled Lugol's Solution or Compound Solution of Iodine U.S.P. XI, and eight were labelled Solution of Iodine.

Of the latter, only three were correct as to composition; five were made with potassium iodide instead of sodium iodide, or the amounts of one or both ingredients were not within the official limits specified for this article. Moreover, only one sample bore directions for use.

Of thirty samples labelled as Lugol's solution, 26 were passed as to composition but none bore directions for use or cautions against misuse.

With so many preparations of iodine, some of them relatively new, it was anticipated that there might be some confusion in dispensing them. The differences are shown in the following summary:

Name	Solvent	Ingredients in 100 cc Iodine	Iodide potassium	Iodide sodium
Tincture of Iodine........	Alcohol...	6.8—7.5	4.7—5.5	....
Mild Tincture of Iodine...	Alcohol...	1.8—2.2	....	2.1—2.6
Strong Solution Iodine, (Lugol's Solution, Compound Solution of Iodine U.S.P. XI)................	Water.....	4.5—5.5	9.5—10.5	....
Solution of Iodine........	Water.....	1.8—2.2	....	2.1—2.6

Directions for use and cautions against misuse appeared on some of the labels, especially those that were dispensed in original commercial packages. When small quantities (1 or 2 ounces) are dispensed from bulk, the objection may well be made that it is not reasonably possible to type or write directions and warning statements in the space available on such small containers. But it is quite evident that stock labels are available for small containers and the alternative is to use such stock labels or to stock the drug in unit packages suitable for retail trade.

TURPENTINE

C. E. SHEPARD AND E. M. BAILEY

Seventy-nine samples of turpentine were examined for the Dairy and Food Commissioner under the provisions of Section 2461 of the General Statutes relating to adulterated turpentine.

Gum turpentine is made by distilling the gum or oleoresin that exudes from the chipped or scarified trunks of living pine trees. Wood turpentine is made by steam distillation or destructive distillation of resinous stumps of dead or fallen pine timber. Sulphate wood turpentine is a type of turpentine recovered from pine wood in the sulphate process of making paper pulp. It is so refined as to comply with specifications for gum or wood turpentine except as to odor.

Adulteration of turpentine may be due to admixtures of cheaper oils derived from petroleum and which resemble turpentine in physical character, such as benzine, kerosene, "painters' naptha" and "mineral spirits". Products of coal-tar origin such as benzol (not the same as benzine), xylol or coal-tar naptha are also sometimes used as adulterants.

The statute provides no numerical specifications for pure turpentine. The specifications given in Bulletin 898, U.S. Department of Agriculture, were used as a guide in judging the samples submitted and are as follows:

	Maximum	Minimum
Specific gravity at 15.5° C.	0.875	0.862
Refractive Index at 20° C	1.478	1.468[1]
Unpolymerized residue,		
gum turpentine.	2.0	. . . . . .
wood turpentine.	2.5	. . . . . .
Initial B.P. degrees C.	160.0	150.0
Distilling below 170° C., per cent	. . . . . .	90.0

Of the samples submitted, 54 were entirely within the limits prescribed for pure turpentine. Unpolymerized residues ranged from a trace to 2.5 per cent by volume, and averaged 1.9 per cent.

Twenty-one were within the limits as to specific gravity and refractive index, but the percentages of unpolymerized oil were somewhat excessive, ranging from 2.6 to 3.9 per cent. The refractive indices of the unpolymerized residues in nearly all cases, however, were not less than the minimum of 1.480 given in A.S.T.M. specifications for wood turpentine; and in no case was it significantly less than that minimum.

One sample contained 4.1 per cent of unpolymerized oil, the refractive index of which was 1.457. This was suspicious and probably was manipulated. Two samples were not turpentine but rather paint solvents, one of them being so labelled. One sample had the odor of turpentine but it was contaminated with unidentified foreign material.

1. A.S.T.M. specifications give 1.465 for gum and 1.463 for wood turpentine.

Many of the samples were purchased in bulk and were not in original commercial containers.

MISCELLANEOUS DRUGS, COSMETICS, etc.

H. J. FISHER AND R. T. MERWIN

Drugs

Eleven samples of miscellaneous drugs were examined for the Commissioner, health officers and others.

Among these were three samples of *Castoria*, a well-known laxative preparation for children. The samples were submitted following rather wide-spread complaints of unfavorable symptoms following administration of the remedy. From our chemical examination we could find nothing to suggest a probable cause of the ill effects of which consumers complained. That the product did produce nausea and other symptoms appears not to be questioned but the causes were obscure. The manufacturers of the product made an exhaustive investigation and in due time were able to correct the difficulty.

Sta. No. 7452, *Amzol.* American Drug and Chemical Co., Minneapolis, Minn. A disinfectant and germicide. Examination indicated the preparation to be essentially a solution of sodium benzylphenate (equivalent to approximately 16 per cent of benzylphenol) in 30 per cent isopropyl alcohol, colored with a coal-tar dye, probably fluorescein.

Cosmetics

Twelve samples of miscellaneous cosmetic preparations were examined. They were submitted by the Commissioner, in some cases at the request of the manufacturer, distributor or user. The following are recorded for reference.

P-104. *Hair Lacquer.* Paramount Beauty Service, Inc., Springfield, Mass. The preparation is chiefly, or wholly, an aqueous solution containing in each 100 cc about 4.5 grams of rosin sodium soap (judging from the total solids 4.57 grams per 100 cc). Chemical tests and the odor indicated natural rosin as a component of the article rather than synthetic resins to some of which skin irritation has been attributed.

S-268. *"A" Inecto $4\frac{3}{4}$, hair dye.* Sales Affiliates, New York City. The preparation is an alkaline solution containing resorcinol as the major active ingredient with a little 2,5 diaminotoluene and perfumed oil. Other ingredients, if present, were not identified. The article bears on the label suitable directions for preliminary skin tests before using; and a warning not to use it on eyelashes or eyebrows.

S-265. *"B" Inecto.* This preparation accompanies Inecto "A" above and consists of or contains hydrogen peroxide.

S-267 *Instant Clairol. No. 17-A.* Clairol, Inc., Stamford, Conn. This is a medium brown hair dye bearing cautionary and warning statements cited above. The article consists of (1) a bottle of liquid; (2) a package containing 2 large white tablets, and (3) a package containing 1 small white tablet.

The composition of the several parts of the sample appear to be as follows:

(1). The liquid is an ammoniacal solution of organic amines containing about 16 per cent of potassium soap. The only amine identified was 2,5 diaminotoluene, but probably the bulk of amino compounds consists of aminophenols or aminosulfonic acids. There was not more than a trace of resorcinol, if any.

(2). The large tablets consist of, or contain, urea hydroperoxide.

(3). The small tablet was not analyzed.

S-264. *Roux Lash and Brow Tint.* Roux Laboratories, New York City. The sample consisted of three bottles labelled "No. 1 Brown", "No. 2 Brown", "Stain Remover", some paper shields and two glass cups. The liquid preparations appeared to be in the order named, a dilute isopropyl alcohol solution of pyrogallol, a solution of silver ammonium nitrate, and a sodium hypochlorite solution.

S-269. *Roux Lash and Brow Tint.* Roux Laboratories, New York City. Qualitative tests showed presence of silver, ammonia and nitrate. Preparation is a silver ammonium nitrate solution.

S-270. *Roux Lash and Brow Tint.* Roux Laboratories, New York City. Qualitative tests indicate the preparation to be an isopropyl alcoholic solution of tannic acid and sodium sulphite.

S-266. *Laxol Oil Shampoo Tint.* Sales Affiliates, Inc., New York City. A perfumed dark brown liquid. Examination indicates the product to be an ammoniacal solution of resorcinol containing alkyl sulphate, perfume, a little oil and some soap. Other ingredients, if present, not detected. Tablets accompanying the liquid consist of, or contain, urea hydroperoxide.

P-57. *Helene Curtis Empress Cold Wave.* National Mineral Co., Chicago. The sample consisted of (1) 2 ounce bottle of Preliminary Lotion Regular; (2) $2\frac{3}{4}$ ounce bottle "Waving Compound Regular"; (3) a paper of Neutralizing Fixitive; (4) a paper cap; (5) two test curl pads.

Examination of the components of the sample indicated the following composition:

(1) Preliminary Lotion, ammonium sulphite, 9.39 grams per 100 cc; free ammonia 0.49; alcohol, 0.25; ash, 0.06, perfume present.

(2) Waving Compound. Ammonium thioglycollate, 7.23 grams per 100 cc; free ammonia, 0.82; ash, 0.05, perfume present.

(3) Neutralizing Fixitive. Powder consisted of, or contained, borax and sodium lauryl sulphate (which according to directions are to be dissolved in hydrogen peroxide before use).

Other ingredients, if present, were not detected, but some wetting agent may be present in the liquid.

S-273. *Hygienic Powder.* Dainty Maid, Inc., Middlefield, Conn.

Analysis: Boric acid, 95.97 per cent; zinc oxide, 0.62; chlorine, 0.32; salicylic acid, 0.35, sulphate present.

Calculated composition: Boric acid, 95.97 per cent; zinc sulphate, 2.19; sodium chloride, 0.53; salicylic acid, 0.35, undetermined, 0.96.

Sta. No. 7674. *Shampoo 112 and 7675, Scalp Lotion 1052,* submitted by State Board of Pharmacy were examined. Analysis indicated the shampoo preparation to be a 32 per cent aqueous solution of potash soap perfumed with extractives of pine. The scalp lotion was essentially an aqueous solution of resorcinol (34 per cent) and hydroxyquinoline sulphate (0.4 per cent, approximately)

S-256. *Face Powder.* Lady Esther, Chicago. Qualitative tests indicated the powder to consist of a talc-stearate-zinc oxide base probably a little chalk, with perfume and coloring.

Rubber Prophylactics

Nineteen samples submitted by the Dairy and Food Commissioner were examined, of which two contained defective units.

WARNING STATEMENTS IN LABELLING OF CERTAIN DRUGS

Section 901 e, (f) (2) of the 1939 supplement to the General Statutes provides that a drug shall be deemed to be misbranded "unless its labelling shall bear such adequate warnings against use in those pathological conditions or by children where its use may be dangerous to health, or against unsafe dosage or methods or duration of administration or application, in such manner and form as shall be necessary for the protection of users."

The responsibility for suitable warning statements rests with the manufacturer or distributor of drugs, but in response to requests for suggestions as to acceptable statements, the Dairy and Food Commissioner issued the following notice to druggists and drug manufacturers. The suggested statements are in substantial accord with statements suggested by the Food and Drug Administration under the corresponding section of the federal act. The list is not complete and the manufacturer or distributor is not relieved of responsibility under the section referred to in the case of drug preparations not included.

I. Cathartic or laxative drugs (except castor oil and phenolphthalein) which act as irritants to the gastro-intestinal tract or stimulate intestinal peristalsis:
"Warning: Not to be used when abdominal pain (stomach-ache, cramps, colic), nausea, vomiting (stomach sickness) or other symptoms of appendicitis are present.
"Frequent or continued use of this preparation may result in dependence on laxatives."

II. Castor Oil:
"Warning: Not to be used when abdominal pain (stomach-ache, cramps, colic), nausea, vomiting (stomach sickness) or other symptoms of appendicitis are present.
"Frequent or continued use of this preparation may result in dependence on laxatives.
"Do not use during pregnancy except on competent advice."

III. Phenolphthalein:
"Warning: Not to be used when abdominal pain (stomach-ache, cramps colic), nausea, vomiting (stomach sickness) or other symptoms of appendicitis are present.
"Frequent or continued use of this preparation may result in dependence on laxatives.
"Important: If a skin rash appears, discontinue use."

IV. Roughage materials (so-called) intended for use in constipation: "Important: All varieties of constipation are not benefited by this preparation. It should be particularly avoided in cases such as spastic constipation in which abdominal discomfort or pain may be present."

V. Mineral oil for oral administration:
"Important: Do not take directly before or after meals."
Note: There will be no objection to an explanation added to the above statement indicating that mineral oil may interfere with the absorption of pro-vitamin A, carotene, and other substances.

VI. Sodium perborate intended for local use in the mouth and throat:
"Warning: This preparation may cause irritation and inflamation of the gums, tongue and mucous membranes of the mouth. It should be discontinued at the first sign of irritation or soreness. In case of doubt, consult your physician or dentist."

VII. Nose drops, inhalants and sprays:
1. Those that contain oil as a vehicle or base:
"Caution: Frequent or excessive use of this preparation may cause injury to the lungs. Do not use at all in infants and younger children except on competent advice."
2. Those that contain ephedrine, epinephrine, amphetamine (benzedrine), prepadrine, neosynephrin and other vaso-constricting drugs of similar activity:
"Caution: Frequent or continued use may cause nervousness, restlessness or sleeplessness. Individuals suffering from high blood pressure, heart disease, diabetes, or thyroid trouble should not use this preparation except on competent advice."

Note: The above warning may also be appropriate for the same ingredients intended for internal administration. However, amphetamine (benzedrine) indiscriminately distributed and intended for its systemic effect is dangerous.

VIII. Resins, oleoresins, and volatile oils intended for their effect upon the urinary tract:
"Warning: If disturbance of the stomach or bowels or skin rash is noticed, discontinue use."

IX. Atropine, hyoscyamine, scopolamine and pharmacologically related drugs:
"Caution: Frequent or continued use of this preparation should be avoided. Use cautiously if dryness of the throat occurs: discontinue if rapid pulse or blurring of vision appears.
"Warning: This preparation should not be taken by elderly people except on competent advice."

X. Iodine or iodides: (Internal use)
"Warning: Do not use in cases of lung disease, chronic cough or goiter (thyroid disease) except upon the advice of a physician.
"If a skin rash appears, discontinue use."

XI. Carbolic acid in preparations for external application:
Note: Products containing more than 2 per cent of carbolic acid are not considered safe for indiscriminate distribution.
"Warning: When applied to fingers and toes, do not use a bandage.
"Apply according to directions for use, and in no case to large areas of the body."

XII. Cresols, creosote, guaiacol and similar substances intended for use as douches.
Note: Preparations intended for use after dilution should bear adequate directions for preparing solution and thorough mixing before pouring into douch bag.
"Warning: The use of solutions stronger than those recommended may result in severe local irritation or burns or serious poisoning."

XIII. Cresols, creosote, guaiacol and similar substances intended for surface application:
"Warning: Do not apply to large areas of the body."

XIV. Nux vomica and strychnine:
"Warning: Do not take more than the dosage recommended. Frequent or continued use is to be avoided and its use for children and elderly persons may be especially dangerous."

XV. Acetanilid:
"Warning: Frequent or continued use may be dangerous, causing serious blood disturbances, anemia, collapse, or a dependence on the drug. Do not take more than the dose recommended. Not to be given to children."

XVI. Acetophenetidin:
"Warning: Frequent or continued use may be dangerous, causing serious blood disturbances.
"Do not take more than the dosage recommended."

XVII. Antipyrine:
"Warning: Frequent or continued use may be dangerous, causing serious blood disturbances.
"Do not take more than the dosage recommended."

XVIII. Bromides:
"Warning: Frequent or continued use may lead to mental derangement, skin eruptions or other serious effects.
"Do not take more than the dosage recommended.
"Not to be taken by those suffering from kidney disease."

XIX. Chlorates in mouth washes and gargles:
"Caution: Avoid swallowing."

XX. Arsenic preparations except those employed as chemotherapeutic agents for specific diseases such as syphilis, amebic dysentery, etc.:
"Caution: Continued or prolonged use may result in serious injury."

XXI. Quinine, cinchonine and cinchonidine:
"Caution: Discontinue use if deafness, skin rash, visual disturbances (eye trouble) or other serious symptoms appear."

XXII. Silver preparations:
"Caution: Prolonged or frequent use of this preparation may result in permanent discoloration of the skin and mucous membranes."

XXIII. Preparations sold under representations relating to coughs due to colds:
"Important: Persistant coughs may indicate the presence of a serious condition. Do not use this preparation if there is a high fever or the cough has persisted for 10 days without securing medical advice."

XXIV. Mercury:
1. Intended for administration by mouth or as a douche:
"Warning: The prolonged or frequent use of this preparation or the use of amounts in excess of the prescribed directions may cause serious mercury poisoning."
2. Intended for application to the skin:
"Warning: This preparation may cause irritation of the skin, and the application to large areas may cause serious mercury poisoning."
Note: This warning is not applicable to mercury bleach creams.

XXV. Rubefacients and counter-irritants such as ammonia, arnica, cantharides, cayenne pepper (capsicum), chloroform, ether, kerosene, methyl salicylate, pepper, mustard, or turpentine oil intended for surface application:
"Caution: This preparation may cause excessive irritation of the skin particularly if applied with rubbing. Avoid getting it into the eyes or on mucous membranes.

XXVI. Goa Powder and chrysarobin:
"Caution: The use of this product over large skin areas may cause kidney irritation.
"Warning: Keep away from the eyes."

XXVII. Digitalis, strophanthus, and pharmacologically related drugs in therapeutically effective proportions:
Note: Potent doses of these drugs have cumulative action and may lead to disastrous effects upon the heart and circulation. They should be used only under the direct supervision of a qualified physician. They should not be sold at retail except on prescription.

XXVIII. Anthelmintics:
Note: The following preparations in therapeutically potent doses are not safe for indiscriminate distribution and should only be used under the direct supervision of a physician:
1. Carbon tetrachloride:

Note: Specific adequate directions for administration of a saline cathartic after use of this drug should be given:
"Warning: Avoid castor oil or other preparations or foods containing oil or fat while this drug is being administered. The use of this preparation in debilitated children and persons addicted to alcohol is dangerous."
2. Tetrachlorethylene:
Note: Specific adequate directions for the administration of a saline cathartic should be given.
3. Aspidium (Male Fern):
Note: Specific adequate directions for administration of a saline cathartic should be given:
"Warning: Avoid castor oil or other preparations or foods containing oil or fat while this drug is being administered."
4. Santonin:
"Very important: Shake vigorously before using. Failure to do so may result in serious injury.
"Caution: The use of more than the prescribed dose is dangerous.
"Avoid castor oil or other preparations or foods containing oil or fat while this drug is being administered.
"The prescribed dose should not be repeated within 7 days."
5. Chenopodium oil:
Note: Specific adequate directions for administration of a cathartic, preferably castor oil, should be given.
6. Thymol:
Note: Specific adequate directions for administration of a saline cathartic should be given.
"Warning: Avoid alcohol or any preparation containing alcohol before or during administration of this drug."

Index to Foregoing Warning Statements

DRUGS WHICH MAY NOT BE SOLD AT RETAIL EXCEPT ON PRESCRIPTION

The Food, Drug and Cosmetic law of this State makes illegal the sale at retail of any drug which contains any quantity of amidopyrine, barbituric acid, cinchophen, dinitrophenol or sulfanilamide, or any derivative of any of these substances, except on prescription.

In addition thyroid, benzedrine (for internal use), chloral and paraldehyde should be likewise restricted according to agreement between the Dairy and Food Commissioner and the Pharmacy Commission, and the secretary of the Pharmacy Commission has so advised the retail trade.

Drugs which the Federal Food and Drug Administration consider too dangerous for sale at retail except on prescription are listed below:

- Aconite
- Amidopyrine
- Anthelmintic drugs:
  - Carbon tetrachloride
  - Male fern (aspidium)
  - Santonin
  - Tetrachlorethylene
  - Thymol
  - Wormseed oil (chenopodium oil)
- Barbiturates
- Benzedrine sulfate (for internal use)
- Cinchophen, and derivatives including neocinchophen
- Cantharides (for internal use)
- Chrysarobin or goa powder
- Chrysophanic acid
- Colchicine
- Colchicum
- Emetine
- Phosphides
- Phosphorus
- Radium
- Sulfanilamide
- Sulfapyridine
- Sulfathiazole
- Tansy, Tansy oil
- Thiocyanates
- Thyroid

Bromides—requiring dosage of more than thirty grains per day or more than fifteen grains during any three-hour period.

Acetanilid—in the case of medicines providing a total daily intake of more than five grains or more than three grains during any three-hour period.

Bromide-Acetanilid Combination—providing for more than a total daily dosage of fifteen grains sodium bromide and five grains acetanilid, or more than 5½ grains sodium bromide or 2½ grains acetanilid during any three-hour period. Comparable amounts of other bromide preparations are subjected to the same restrictions.

Acetophenetidin—in daily dosages of more than 15 grains.
Antipyrine—in daily dosages of more than 15 grains.
Epinephrine—in solution of 1 per cent or stronger.
Ipecac—in daily doses greater than 10 grains.
Strychnine—in daily dosages greater than 1/20 grain.

The Federal Food and Drug Administration also feels that products containing therapeutically effective proportions of digitalis, squill, strophanthus or any other pharmacologically related drugs will not be safe for indiscriminate distribution.

It has been ruled that the enforcement of the State and local Acts relating to the sale of drugs and the practice of Pharmacy in no way restricts the application of the Federal Law to the distribution by retailers of drugs which have been in interstate commerce.

COLLABORATION WITH OTHER DEPARTMENTS

Analytical work done for other State and Station departments not included in other reports from this laboratory is summarized as follows:

State Supervisor of Purchases	2
U.S. Geological Survey (water)	198
State Department of Health (narcotics)	8
Sterling Chemical Laboratory (nitrogen)	19
Experiment Station, Storrs, chick bones, calcium in	386
Station departments:	
Tobacco Substation	30
Soils	87
Entomology	212
Botany	27
Genetics	3
Total	972

BABCOCK GLASSWARE, etc.

J. L. Shepard

Under the provisions of Sections 2463 and 2488 of the General Statutes, glassware used in testing milk and cream, and thermometers used in milk-pasteurizing plants have been examined as follows:

	Pieces	Imperfect or inaccurate
Babcock glassware	2,635	10
Thermometers	169	7
	2,804	17

Connecticut Agricultural Experiment Station
New Haven

Laws and Regulations Concerning The Inspection of Nurseries in Connecticut And Transportation of Nursery Stock[1]

Compiled by
M. P. Zappe
Deputy State Entomologist

The present law governing the inspection and transportation of nursery stock was enacted in 1925, and published as Chapter 265, Public Acts of 1925. In the revision of the General Statutes of 1930, and as amended effective March 16, 1943, this law appears in slightly different form in Sections 2135 to 2140, inclusive, as follows:

Sec. 2135. Certificate of inspection of imported nursery stock. All nursery stock shipped into this state shall bear on each package a certificate that the contents of such package have been inspected by a state or government officer and that such contents appear free from all dangerous insects and diseases. If nursery stock shall have been brought into the state without such a certificate, the express, freight or other transportation company or person shall, before delivering shipment to consignee, notify the state entomologist of the facts, giving name and address of consignee, origin of shipment and approximate number of cars, boxes or packages and probable date of delivery to the consignee. The state entomologist may cause the inspection and, if infested, the treatment of the stock. No person, firm or corporation shall unpack any woody field-grown nursery or florists' stock brought into this state from foreign countries except in the presence of an inspector unless given permission to do so by the state entomologist or one of his assistants. If such stock shall be found infested with any dangerous pests, the state entomologist may order it treated. Any person violating any of the provisions of this section shall be fined not more than fifty dollars. No provision of section 6132 shall be construed to apply to any bale, box, package or load or to the contents thereof, which shall be transported into this state from outside the state, provided the same shall be labeled in such a manner as to indicate the place from which it shall have been transported and shall be accompanied by the certificate prescribed by this section.

Sec. 2136. Nursery stock; powers of State Entomologist. The state entomologist or his assistants shall, upon application, inspect at least once each year all nurseries at which woody field-grown hardy trees and plants shall be grown for sale or shipment; may inspect any nursery stock when dug, before shipment or at destination; may inspect nurseries at any time for the purpose of controlling plant pests or to ascertain whether such pests exist in nurseries; may prescribe forms for

[1] Revision of Circular 151, April, 1942.
Section 6132, referred to above, has been revised. See Section 1695c, 1935 Supplement.

registration, certificates and permits and may make rules and regulations regarding time and methods of inspection; may destroy or treat or order the destruction or treatment of, and prohibit the movement of, plants infested with dangerous pests; may coöperate with agents of the United States Department of Agriculture in the inspection of nurseries and control of plant pests; may, at reasonable times, enter any public or private grounds in performance of his duties under the provisions of this section and sections 2137 and 2138. In case orders shall be issued for the destruction or treatment of infested plants, the owner, manager or agent of the nursery shall, within a reasonable time from the date of such order, destroy such plants as shall be ordered destroyed and make such treatment within the time specified in the order or be subject to the penalty provided in section 2140.

Sec. 2137. Nurserymen and dealers to register. All nurserymen shall register with the state entomologist each year, on or before July first, and make application for inspection, and furnish such data on such blanks as the state entomologist shall prescribe and furnish. In case a nurseryman shall fail to make such application on or before July first, he shall pay to the state entomologist the cost of such inspection. All firms, stores and individuals who shall sell but shall not grow nursery stock shall be classed as dealers, and shall, each year, on or before March first, register with the state entomologist, giving the chief sources of their nursery stock and such data as he may require, on such forms as he may prescribe and furnish, and the state entomologist may issue a permit allowing such dealer to sell such nursery stock. The state entomologist may make such regulations as he deems necessary to govern the shipment of nursery stock into the state by any nursery, person, firm or corporation outside the state. The state entomologist shall keep a record of all money received as costs for inspection, and such money shall be deposited with the state treasurer.

Sec. 2138. Nursery certificate. Uninspected stock. The state entomologist shall issue to regular nurseries certificates, valid until the first day of August following the date of issue and covering the stock inspected and such other stock as shall have been received under valid certificates of inspection and may issue temporary permits covering certain portions thereof, and permits to dealers. All such certificates and permits may be revoked for cause. Nursery stock which shall not have been inspected or stock from a nursery not holding a valid certificate of inspection shall not be sold or transported, and transportation companies shall refuse to accept any shipment not bearing such certificate or some form of permit issued by the state entomologist, and all nurserymen shall furnish a certificate, and all dealers a permit, to accompany each package of stock sold or transported, but no provision of section 2136, 2137 or 2138 shall prevent or render liable any person or firm transporting stock from one field or property to another field or property belonging to or operated by such person or firm when such stock is not to be immediately sold or offered for sale and when such transportation shall not violate any established federal or state embargo or quarantine regulations.

Sec. 2139. Nursery and nursery stock defined. For the purposes of sections 2136, 2137 and 2138, any place at which hardy trees, shrubs and vines shall be propagated or grown out of doors for commercial purposes shall be considered a nursery, and such stock shall be regarded as nursery stock. Hardy herbaceous perennial plants, including strawberry plants, may be subject to the same provisions regarding inspection and pest control, if, in the opinion of the state entomologist, it shall be desirable to control the movement of such plants. Florists' ordinary plants, unless woody and field-grown, shall not be included.

Sec. 2140. Penalty. Appeal. Any person who shall interfere with the state entomologist or his assistant in the performance of his duties under the provisions of sections 2136, 2137 and 2138, or any person, firm or corporation who shall violate any of the provisions thereof, shall be fined not more than fifty dollars. Any person aggrieved by any order issued under the provisions of sections 2136, 2137 and 2138 may appeal to the superior court, or to any judge thereof if said court shall not be in session, and said court or such judge may grant such relief or issue such order or judgment in the premises as to equity may appertain.

REGISTRATION

All persons in Connecticut who grow nursery stock for sale or shipment are required to register with the State Entomologist each year before July 1. The annual inspection of nurseries begins in July and nurseries in existence the preceding year must bear the cost of inspection if they fail to register before July 1.

All persons who buy and sell but do not grow nursery stock are also required to register with the State Entomologist and receive a dealer's permit. No inspection is required, but a dealer is allowed to handle only stock procured from regular nurseries holding certificates.

CERTIFICATION OF NURSERIES

Inspection and Pest Control

In July, after the nurseries have registered, the inspection force examines the nurseries by groups to avoid unnecessary travel, beginning with those that request early attention. In case pests are found, directions for eradicating or controlling them are given by the inspector or sent from the office, and the owner or manager is expected to carry them out promptly and to notify this office when completed. Pests must be eradicated before a certificate can be issued.

Nursery Certificates

The original certificate issued by the State Entomologist under Section 2138 is to be kept in the nurseryman's possession, and is not to be attached to any package of nursery stock. It applies to the whole nursery which has been inspected and to such purchased stock as has been received from other nurseries under the certificate of a state or government officer. If any stock is received from outside the State unaccompanied by such a certificate, the State Entomologist should be notified at once so that it may be inspected.

An exact transcript of the certificate including number and date may be printed on labels or tags for shipping and must be attached to each package sent out of the nursery. An additional statement, made by the owner, that the stock has been fumigated will be required in some states. *The law now requires that the inspection certificate be attached to every package shipped to points both within the State of Connecticut and outside. Please see that a copy always accompanies each sale whether shipped by freight, express, mail, automobile or whether carried away by the purchaser.*

After the date of expiration, which is a part of each certificate, the document becomes invalid and should not be attached to any box, bale or package. The nurseryman has no right to change the date or any other portion of the certificate.

The improper use or abuse of a certificate will not be tolerated, and the certificate may be revoked for cause.

Duplicate copies of certificates for filing in other states will be furnished on request of the nurseryman.

Dealers' Permits

The original permit issued by the State Entomologist under Section 2137 should be kept in the dealer's possession and is not to be attached to any package or shipment of nursery stock, though copies may be made for this purpose. These may be typewritten or printed and a copy must go with each separate sale from stores, and with each shipment or package of nursery stock transported. This copy must be an exact transcript, and must include number, date of issue and of expiration. After the expiration date, the permit becomes invalid and should not be used. The dealer has no right to alter the date or any other portion of the permit. This permit may be revoked for improper use or abuse, and for not complying with the law.

Shippers' Permits

The out-of-state shippers' permits have been discontinued, as well as the necessity of filing out-of-state nursery certificates with the State Entomologist's office. All that is required now for shipments of nursery stock consigned to Connecticut is to attach a copy of valid certificate to the box, bale or parcel of nursery stock.

Package Certificates

Occasionally individuals and firms not in the nursery business wish to ship a few trees or shrubs but cannot do so without inspection certificates. If such materials can be inspected by our men on their usual trips without extra travel and expense, this will be done on request, as an accommodation. Other inspections may be arranged by special appointment, or plants can be sent to the Station with address and postage for forwarding, and here they will be examined and sent along.

The U. S. Postal Laws and Regulations, Section 595(a), governs the mailing of plants and plant products, and reads as follows:

"Nursery stock, including all field-grown florists' stock, trees, shrubs, vines, cuttings, grafts, scions, buds, fruit pits and other seeds of fruit and ornamental trees or shrubs, and other plants and plant products for propagation, except field, vegetable and flower seeds, bedding plants and other herbaceous plants, bulbs and roots, may be admitted to the mails only when accompanied with a certificate from a State or Government inspector to the effect that the nursery or premises from which such stock is shipped has been inspected within a year and found free from injurious insects and plant diseases, and the parcel containing such stock is plainly marked to show the nature of the contents and the name and address of the sender."

Such materials may be mailed without certificate to any Agricultural Experiment Station or to the United States Department of Agriculture. Florists' plants (not woody, field-grown) and vegetable or other annual herbaceous plants do not require certificates but must be plainly marked as to contents, origin and destination. Package certificates apply only to the contents of the packages on which they are placed, and the contents of which have been examined.

INTERSTATE REGULATIONS

At the present time every state in the Union has laws or regulations in regard to the inspection, certification and transportation of nursery stock. These all have one object in view, namely, the control of plant pests. But conditions are not uniform throughout the United States, and each state has established such requirements as seem to give it the best protection, with the result that there are many different regulations.

This situation assumes a serious aspect to the nurseryman who may wish to fill orders received from 18 or 20 or more different states. In order to tabulate and bring together these varying regulations in convenient form for the use of Connecticut nurserymen, this bulletin has been prepared. It should be understood that it presents only a brief digest in each case, and if any points are not clear, the nurseryman should write to the officer in charge of inspection in that state for more information.

In addition to the various state laws and regulations, there are several Federal quarantines regulating the shipment of nursery stock. A digest of these has been included in this bulletin, together with the regulations of the District of Columbia and of the Dominion of Canada.

Quarantines

The shipment out of Connecticut of nursery stock and forest products is now regulated by five different Federal quarantines, as follows:

Gypsy moth	Federal	quarantine	No.	45
Dutch elm disease	"	"	"	71
Japanese beetle	"	"	"	48
White pine blister rust	"	"	"	63
Barberry-grain black stem rust	"	"	"	38

In the quarantines relating to the gypsy moth and brown-tail moth and the Japanese beetle, provision is made for the movement of the restricted articles interstate from the regulated areas to points outside under a certificate of inspection relating to these respective pests.

In addition to the quarantines mentioned above, many state quarantines on account of the European corn borer prevent the shipment of certain kinds of plants from the infested states to points outside, unless certified. The Federal corn borer quarantine has been revoked but state inspectors are authorized to make inspections and issue certificates.

Gypsy Moth and Brown-Tail Moth. Quarantine No. 45, as revised effective September 29, 1938, regulates the interstate shipment of all nursery stock, forest products, Christmas trees and Christmas greens and greenery, such as boxwood, holly and laurel, and stone and quarry products from the regulated area in the New England states, to points outside the area and from the generally infested to the lightly infested area. Nursery stock must be inspected and certified by Federal inspectors.

There has been no recent change in the gypsy moth quarantine. The regulated area in Connecticut includes all of Windham, New London, Hartford, Tolland and Middlesex counties; the towns of Colebrook, Winchester, Barkhamsted, Torrington, New Hartford, Harwinton, Thomaston and Plymouth in Litchfield County, and the towns of

Waterbury, Wolcott, Meriden, North Haven, North Branford, Branford, Guilford and Madison in New Haven County. Woody field-grown nursery stock and forest products from the regulated area must be inspected and certified before they can be shipped outside the area. Regulated areas in other states include all of Rhode Island; all of Massachusetts except Berkshire County and the town of Monroe in Franklin County; in Vermont: Counties of Orange, Windham and Windsor; towns of Landgrove, Peru, Readsboro, Searsburg and Winhall in Bennington County; towns of Barnet, Danville, Groton, Kirby, Peacham, Ryegate, St. Johnsbury and Waterford in Caledonia County; towns of Concord, Granby, Guildhall, Lunenburg, Maidstone and Victory in Essex County; town of Elmore in Lamoille County; towns of Mount Holly, Mount Tabor, Pittsfield, Sherburne, Shrewsbury and Wallingford in Rutland County; towns of Barre, Berlin, Cabot, Calais, East Montpelier, Marshfield, Middlesex, Montpelier, Moretown, Northfield, Plainfield, Roxbury, Waitsfield, Woodbury and Worcester in Washington County; in New Hampshire: Counties of Belknap, Carroll, Cheshire, Grafton, Hillsboro, Merrimack, Rockingham, Strafford, and Sullivan; all that part of Coos County lying south of and including the towns of Stratford, Odell, Dummer, and Cambridge; in Maine: entire counties of Androscoggin, Cumberland, Kennebec, Knox, Lincoln, Sagadahoc, Waldo and York; and parts of the counties of Franklin, Hancock, Oxford, Penobscot, Piscataquis, Somerset and Washington.

Japanese Beetle. Quarantine No. 48, with regulations revised and amended effective January 14, 1943, regulates the interstate movement of all nursery stock and other materials, including soil, from the regulated areas to or through outside points. The regulated areas include the entire states of Connecticut, Delaware, Massachusetts, New Jersey and Rhode Island, the District of Columbia, and parts of the states of Maine, Maryland, New Hampshire, New York, Ohio, Pennsylvania, Vermont, Virginia and West Virginia.

Inspection and Certification

The district inspectors are responsible for the inspection and certification of quarantined materials on account of the gypsy moth and Japanese beetle quarantines. In general, application for inspection should be sent in advance to inspectors. The following is a list of these men and the towns in which they make inspections:

W. W. Eells, Box 63, Sta. A, Manchester. Telephone Manchester 4482.

Avon	Enfield	Stafford
Barkhamsted	Farmington	Suffield
Bloomfield	Granby	Tolland
Bolton	Hartford	Torrington
Burlington	Hartland	Union
Canton	Harwinton	Vernon
Colebrook	Manchester	West Hartford
Coventry	Mansfield	Willington
East Granby	New Hartford	Winchester
East Hartford	Simsbury	Windsor
East Windsor	Somers	Windsor Locks
Ellington	South Windsor	

J. F. McDevitt, Box 45, Middletown. Telephone Middletown 1613.

Andover	Guilford	Old Saybrook
Berlin	Haddam	Plainville
Branford	Hebron	Plymouth
Bristol	Killingworth	Portland
Chester	Lebanon	Rocky Hill
Clinton	Madison	Saybrook
Colchester	Marlborough	Southington
Columbia	Meriden	Thomaston
Cromwell	Middlefield	Waterbury
Durham	Middletown	Westbrook
East Haddam	New Britain	Wethersfield
East Hampton	Newington	Wolcott
Essex	North Branford	
Glastonbury	North Haven	

Daniel Harrington, Box 63, Westerly, R. I. Telephone Westerly 2604.

Ashford	Ledyard	Salem
Bozrah	Lisbon	Scotland
Brooklyn	Lyme	Sprague
Canterbury	Montville	Sterling
Chaplin	New London	Stonington
Eastford	North Stonington	Thompson
East Lyme	Norwich	Voluntown
Franklin	Old Lyme	Waterford
Griswold	Plainfield	Windham
Groton	Pomfret	Woodstock
Hampton	Preston	
Killingly	Putnam	

F. G. Winn, Wolfpit Road, R. R. No. 3, Norwalk. Telephone Norwalk 8-9053.
All towns in Fairfield County.

L. A. Devaux, Box 1106, New Haven. Telephone New Haven 5-6191.
All towns not listed above.

Black Stem Rust of Grains. Quarantine No. 38, as revised effective September 1, 1937, prohibits the movement of the common barberry or other species of plants (or parts of plants capable of propagation) of the genus *Berberis* (barberry) or of the genera *Mahonia* or *Mahoberberis* (Mahonias, holly grapes, holly barberries, or Oregon grapes) into any of the protected states, unless a permit shall have been issued therefor by the United States Department of Agriculture, except that no restrictions are placed on the shipment of Japanese barberry (*Berberis thunbergi*) or any of its horticultural varieties, or of cuttings of *Mahonia* shipped for decorative purposes and not for propagation. The protected states are: Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Montana, Nebraska, North Dakota, Ohio, Pennsylvania, South Dakota, Virginia, West Virginia, Wisconsin and Wyoming.

Permits are issued to nurseries which grow only those species of *Berberis* and *Mahonia* which are immune or resistant to black stem rust infection. To apply for inspection, address the Bureau of Entomology and Plant Quarantine, Washington 25, D. C., before June 1 of each year.

Dutch Elm Disease. Quarantine No. 71, as revised effective October 1, 1941, and modified by Administative Instructions (Circular B. E. P. Q. 517 effective November 10, 1941), prohibits the interstate movement from the regulated areas in New Jersey, New York, Connecticut and Pennsylvania, to or through any point outside thereof, of any and all parts of elms of all species irrespective of whether nursery, forest or privately grown; logs or cordwood of such plants; and lumber or containers manufactured from such plants, except that elm lumber or elm products entirely free from bark are exempt from restrictions. Restricted plants or restricted products which originate outside the regulated areas may be moved through or reshipped from the regulated areas under provisions specified under the regulations.

Connecticut. Fairfield County; towns of Bethlehem, Bridgewater, Harwinton, Litchfield, Morris, New Milford, Roxbury, Thomaston, Torrington, Washington, Watertown and Woodbury, in *Litchfield County;* all of *New Haven County* except the towns of Cheshire, Madison, Prospect and Wolcott; and the town of Preston in *New London County.*

New Jersey. Counties of *Bergen, Essex, Hudson, Hunterdon, Mercer, Morris, Passaic, Somerset, Sussex, Union* and *Warren*; townships of Bordentown, Chesterfield, Mansfield, New Hanover, North Hanover, Pemberton and Springfield, the city of Bordentown, and the boroughs of Fieldsboro and Pemberton in *Burlington County;* all of *Middlesex County*, except the townships of Cranbury and Monroe and the boroughs of Helmetta, Jamesburg and Spotswood; all of *Monmouth County*, except the townships of Freehold, Millstone, Neptune and Wall and the boroughs of Avon-by-the-Sea, Belmar, Bradley Beach, Brielle, Freehold, Jersey Homestead, Manasquan, Neptune City, Sea Girt, South Belmar, Spring Lake and Spring Lake Heights; and the township of Plumstead in *Ocean County.*

New York. Counties of *Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland* and *Westchester;* town of Bethlehem in *Albany County;* towns of Chenango, Colesville, Conklin, Fenton, Kirkwood, Sanford, and Windsor in *Broome County;* towns of Afton, Bainbridge, Coventry and Greene in *Chenango County;* towns of Ancram, Claverack, Clermont, Copake, Gallatin, Germantown, Ghent, Livingston and Taghkanic in *Columbia County;* town of Deposit in *Delaware County;* town of Catskill in *Greene County;* town of Unadilla in *Otsego County;* town of Mamakating in *Sullivan County;* and all of *Ulster County* except the towns of Benning, Hardenbergh, Kingston, Olive, Shandaken and Woodstock.

Pennsylvania. Township of Amity in *Berks County;* all of *Bucks County* except the townships of Lower Southampton and Upper Southampton; townships of Lower Milford, Salisbury and Upper Saucon and the borough of Coopersburg in *Lehigh County;* townships of Hanover, Pittston and Plains, city of Wilkes-Barre, and the boroughs of Ashley, Edwardsville, Forty Fort, Kingston, Larksville, Plymouth, Sugar Notch, Warrior Run and Wyoming, in *Luzerne County;* townships of Middle Smithfield, Smithfield and Stroud, and the boroughs of Delaware Water Gap, East Stroudsburg and Stroudsburg in *Monroe County;* townships of Franconia, Hatfield, Lower Merion, Lower Moreland, Marlboro, New Hanover, Perkiomen, Salford, Upper Hanover, Upper Merion, West Norriton, and that portion of Whitemarsh Township northeast of Stanton Avenue, and the boroughs of Bridgeport, Bryn Athyn, East Greenville, Greenlane, Hatfield, Narberth, Pennsburg, Red Hill, Souderton, West Conshohocken and West Telford in *Montgomery County;* townships of Bethlehem, Hanover, Lower Mount Bethel, Lower Saucon, Upper Mount Bethel and Williams, the city of Easton, and the boroughs of Freemansburg, Glendon, Hellertown, Portland, West Easton and Wilson in *Northampton County;* ward 35 in the city of Philadelphia in *Philadelphia County;* and the townships of Harmony and Jackson and the borough of Lanesboro in *Susquehanna County.*

White Pine Blister Rust. Federal Quarantine No. 63 regulates the interstate movement throughout the United States of five-leaved pines and currant and gooseberry plants.

Ribes may be shipped into Connecticut only after obtaining Control Area permits (Federal Form E Q 415).

In order that five-leaved pines may be grown in blister rust-free areas, Connecticut has legally established control areas around eight nurseries located in the following towns: Barkhamsted, Cheshire, Cromwell, Killingly, New Milford, Simsbury, Tolland and Windsor. No currants or gooseberries may be grown in or shipped to within 1,500 feet of the nursery sanitation zones.

In addition to the towns listed above, control areas have been established in the following towns because of the importance of white pine: Cornwall, Killingly, Norfolk, North Canaan, Salisbury, Thompson, Voluntown and Woodstock. Any currants or gooseberries found growing within 900 feet of white pine stands in the above towns may be destroyed, whether or not infected with white pine blister rust.

Pine Shipments

Under the Federal regulations revised effective July 1, 1938, the movement of five-leaved pines is prohibited into the following states, except that no restrictions are placed on the interstate movement of such pines from or between these 11 entire states nor from the part of California described:

Arizona
California
  That part lying south of the south line of the counties of Humboldt, Trinity, Tehama, Butte, Plumas, and Lassen.
Colorado
Georgia
Kentucky
Nevada
New Mexico
North Carolina
South Carolina
Tennessee
Utah
Wyoming

No other restrictions or requirements are placed by these regulations on the interstate movement of five-leaved pines unless they are visibly infected with blister rust.

Currant and Gooseberry Shipments

The interstate movement of European black currant plants, *Ribes nigrum*, or plants of the wild native western species known as *R. bracteosum* and *R. petiolare*, is prohibited except to and between the states of Alabama, Arkansas, Florida, Kansas, Louisiana, Mississippi, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota and Texas.

Currant and gooseberry plants shipped to the 11 entire states and part of California described in the preceding section relating to pine shipments, must be either dormant and defoliated or else dipped in lime-sulfur solution of 4.5° B. immediately before shipment. The solution is prepared by diluting one part of commercial concentrated lime-sulfur solution of 32° B. with eight parts of water.

A control area permit obtained from the state of destination must be attached to shipments of currant and gooseberry plants consigned to the following states:

California	Minnesota	Rhode Island
Connecticut	Montana	Tennessee
Georgia	New Hampshire	Vermont
Idaho	New Jersey	Virginia
Maine	New York	Washington
Maryland	North Carolina	West Virginia
Massachusetts	Ohio	Wisconsin
Michigan	Pennsylvania	

For further information regarding Federal quarantines and regulations, address: Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington 25, D. C.

REGULATIONS

District of Columbia

Each package of nursery stock (woody plants and parts capable of propagation, except domestic-grown seeds and fruit pits) entering the District of Columbia, must bear a valid certificate of inspection, and must be marked with the nature of the contents and with the name and address of both the consignor and consignee. Herbaceous perennial plants, including strawberry, bulbs and roots are required to be marked with the name and address of the consignor and the consignee and with the nature of the contents, but certification in advance is not required.

Bureau of Entomology and Plant Quarantine, Washington 25, D. C.

Dominion of Canada

Nursery stock and all plants for ornamental purposes, propagation or cropping (seeds and seed potatoes excepted), from the United States, can enter Canada only after permits (and official labels, if to be sent by mail) have been procured by the importer from The Secretary, Destructive Insect and Pest Act Advisory Board, Ottawa, Canada. Applications must specify the quantity, kind, value, origin

and destination of stock, the name and address of consignor and consignee, and whether the stock is to be shipped by mail or otherwise. The importer must retain the permit to present with the other papers in clearing the importation on arrival but he must furnish the permit number to the shipper, and this number must be marked on every container and on the shipping papers. A certificate of inspection issued at the time of packing must be supplied. The original certificate must accompany the way-bill with copy on containers. It must be signed by an authorized official of the state or country where the stock originated, contain the name and address of both consignor and consignee, and a declaration of kind and quantity of the stock. The following are designated as ports of importation:

Halifax, N. S.	Toronto, Ont. (Parcel post only)
Saint John, N. B.	Windsor, Ont.
Montreal, P. Q.	Winnipeg, Man.
Ottawa, Ont.	Estevan, Sask.
Niagara Falls, Ont.	Vancouver, B. C.

Prohibitions: Regulations prohibit the importation of conifers from New England; all five-leaf pines; black currant nursery stock, and parts thereof including seeds (except fresh fruits); barberry, genus *Berberis* (except hybrids, species and varieties determined immune from black stem rust of wheat); European buckthorn, *Rhamnus cathartica* L.; fresh peaches, peach nursery stock and peach fruit pits or seeds for propagation, into the Province of British Columbia from the states of Wisconsin, Illinois, Missouri, Arkansas and Texas and from all other states to the east of those mentioned; *Corylus* (hazel cob or filbert) into the Province of British Columbia from the states of Montana, Wyoming, Colorado, New Mexico and all states east of same; *Ulmus* and *Zelkova*, including elm logs or burls of any description; tobacco seed (*Nicotiana tabacum* L.), including all hybrids and varieties; living insects except the honey bee; pests, bacteria or fungous diseases destructive to vegetation, except for scientific purposes and under import permit.

Restrictions: Regulations restrict importations as follows: Potatoes from California must have a special fumigation certificate; potatoes from Pennsylvania, West Virginia and Maryland, special certificate stating potatoes were grown in an area free from potato wart disease; nursery stock (except prohibited conifers), forest products, stone and quarry products, etc. from New England, special certificate covering freedom from brown-tail and gypsy moth, and also from Japanese beetle from districts in which that insect occurs; chestnuts and chinquapin of the genus *Castanea*, all species, hybrids or horticultural varieties, unless accompanied by a certificate, issued and signed by an authorized officer of the country of origin, to the effect that the stock covered by the certificate originated in a district free from the chestnut bark disease, that the said disease has not been present in the district for at least 10 years, and that the stock has been inspected and found free from the disease; peach trees, peach roots, nectarine roots, nectarine trees or any kinds or varieties of trees or shrubs grafted or budded on peach or nectarine roots from the United States of America are prohibited, unless each importation is accompanied by a certificate issued and signed by an authorized officer of the United States Department of Agriculture, or a state Department of Agriculture, to the effect that the stock covered by the certificate originated in a nursery which has been inspected by an authorized inspector and that the phony peach disease is not known to occur either in the nursery or within one mile of its boundaries; and, further, that each tree or root contained in the shipment has been examined by the said inspector and is free from the peach borer (*Synanthedon* (*Aegeria*) *exitiosa* Say).

Corn and broomcorn, including all parts of the plant, all sorghums and sudan grass from the states of Connecticut, Indiana, Kentucky, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia and Wisconsin prohibited, except that broomcorn for manufacturing, clean shelled corn and clean seed of broomcorn may be imported from states mentioned if accompanied by a certificate of inspection, issued by an authorized official of the Federal or State Department of Agriculture and stating freedom from European corn borer; also, during the period June 1 to December 31, cut flowers and entire plants of chrysanthemum, aster, cosmos, zinnia and hollyhock, and cut flowers or entire plants of gladiolus and dahlia, except corms and roots thereof without stems, oat and rye straw as such or when used as packing, celery, green beans, beets with tops and rhubarb from the states of Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island may be imported from the states mentioned, provided each shipment is accompanied by a certificate signed by an authorized official of the Federal or State Department of Agriculture, stating freedom from infestation by European corn borer.

W. N. Keenan, Secretary, Destructive Insect and Pest Act Advisory Board, Department of Agriculture, Ottawa, Canada.

STATE REGULATIONS

Filing of Certificates in Other States

In order to ship nursery stock into the following states, it is necessary to file duplicate inspection certificates:

Alabama	Michigan	Pennsylvania
Arkansas	Minnesota	South Carolina
Delaware	Mississippi	South Dakota
Florida	Missouri	Tennessee
Georgia	Nebraska	Texas
Illinois	New Jersey	Virginia
Indiana	New Mexico	West Virginia
Iowa	North Carolina	Wisconsin
Kansas	North Dakota	Wyoming
Kentucky	Ohio	
Maryland	Oklahoma	

Filing of Bonds

Bonds of $1,000 are required in the states of Idaho and Montana.

Tennessee requires a bond of $5,000 where trees are planted by outside nurserymen under contract to prune and spray for a period of years.

Payment of Fees

The payment of fees is required for registration in certain states, as follows:

State	Registration fee	Agent's fee	State	Registration fee	Agent's fee
Alabama	$10	$1	Nebraska	$10	$1
		(Dealers) 10	New Mexico	10	
Arkansas	5	1	Ohio	10(Dealers)	1
Georgia	5	1	Oklahoma	10	
Idaho	15	1	Oregon	10(Dealers)	1
Indiana	1	1	South Dakota	1	1
Kansas	5(Dealers)		Texas	5	
Kentucky	5	5	Utah	10	
Maine	1(Dealers)	1	Virginia	10	1
Michigan	15	1	Washington	5	1
Montana	15		West Virginia	15	

Reciprocal Agreement

Certain states requiring fees and bonds from nurseries in other states are now able to make reciprocal agreements. To illustrate: State A charges a fee of $5.00 to outside nurseries, and State B charges a fee of $10.00. By this reciprocal agreement nurseries in State A may ship stock into State B by paying a fee of $5.00, the same as charged by State A. In like manner the fee may be remitted altogether as concerns nurseries in states where no fee is charged to outside nursery firms. The laws in the following states provide for such reciprocity.

Alabama	Kansas	Nebraska	Texas
Arkansas	Maryland	North Dakota	Virginia
Georgia	Michigan	Oklahoma	Washington
Iowa	Minnesota	Tennessee	Wyoming

State Tags

State tags are required and will be furnished at the shipper's expense by the following states:

Arkansas	Georgia	West Virginia
Florida	New Mexico	

Fumigation

All deciduous nursery stock subject to the attack of San José scale must be fumigated with hydrocyanic acid gas and labeled with a certificate or affidavit stating that this has been done, before it will be allowed to enter the state of Florida.[1]

[1] Fumigate all host plants of San José scale with hydrocyanic acid gas, at the standard dosage, or thoroughly scrub in a solution of fish oil soap at a dilution of one lb. of soap to three gal. of water immediately before shipment into Florida. Such stock entering Michigan must bear certificate of fumigation.

State Quarantines on Account of European Corn Borer

Since the repeal of the European corn borer quarantine in 1932, many states have established quarantine regulations for protection against this insect. Some of these have revoked their quarantines. Prohibited or restricted articles are: corn, broomcorn, sorghums, Sudan grass (debris, cobs and parts of plants except clean shelled corn and seeds), aster, chrysanthemum, gladiolus, dahlia (cut flowers or entire plants, except bulbs or tubers without stems), beans in the pod, beets with tops, rhubarb, celery, oat and rye straw, cosmos, zinnia and hollyhock (cut flowers or entire plants).

This class of plants and plant material is rarely shipped by nurserymen with the exception of hardy chrysanthemums and hollyhocks. Special certificates showing freedom from infestation are necessary for these if they are to be shipped into the following states:

Arizona	Louisiana	South Carolina
Arkansas	Maine	South Dakota
California	Mississippi	Tennessee
Colorado	Missouri	Texas
Florida	Nebraska	Utah
Georgia	Nevada	Vermont
Idaho	New Mexico	Washington
Iowa	North Carolina	Wyoming
Kansas	Oklahoma	
Kentucky	Oregon	

Special Inspection and Certification of Raspberry Plants

In an attempt to control mosaic and allied diseases of raspberry plants, certain states require two summer inspections, one in June and the other a month later, after all mosaic plants discovered at the first inspection have been removed. If the plants are then free from mosaic diseases, a certificate to that effect may be granted. The following states require this special inspection and certification for shipping raspberry plants:

Kansas	North Dakota	Vermont
Michigan	Ohio	Washington
Minnesota	Oregon	Wisconsin
New York	Pennsylvania	

Oriental Fruit Moth

Because of the oriental fruit moth, all varieties and species, including the flowering forms and fresh fruits, of almond, apple, apricot, cherry, chokecherry, nectarine, peach, pear, plum and quince trees, or parts thereof, and the containers that have been used to hold such plants or parts thereof, are prohibited from entering the following states:

Arizona	Idaho	Oregon
California	Montana	Utah
Colorado	Nevada	Washington

Taking and Transportation of Evergreen Trees or Foliage

This subject is covered by Section 1695c of the 1935 Supplement of the General Statutes. In addition to the provisions of the following law, it is necessary to have the material inspected and certified if it is gathered within the gypsy moth quarantined area and is to be transported outside of said area. (See page 5 for gypsy moth quarantine).

If the material is to be moved out of the quarantined area, it must be inspected by one of the Federal inspectors listed on pages 6 and 7.

Section 1695c. Taking and transportation of evergreen trees or foliage. (a) No person shall take from the land of another the whole or any part of any pine, spruce, hemlock, fir or other evergreen tree with needle-bearing branches thereon, or any Kalmia latifolia, commonly known as mountain laurel; or any ferns, vines or foliage branches of trees or shrubs, without having in his possession the written permission of the owner or lessee, or his duly authorized agent, of the land from which such material was taken, and the presence in transit on any highway or in the possession of any common carrier of an amount greater than twenty pounds of the above commodities shall be prima facie evidence of a violation of the provisions of sub-section (b). (b) No person shall take from the land of another the whole or any part of any pine, spruce, hemlock, fir or other evergreen tree with needle-bearing branches thereon, or any Kalmia latifolia, commonly known as mountain laurel, or any ferns, vines or foliage branches of trees or shrubs, to be sold or offered for sale as a commodity, without having obtained and filed with the town clerk of the town in which such land is situated, the written permission of the owner or lessee, or his duly authorized agent, of the land from which the same was taken. Each bale, box, package or load containing more than twenty pounds of any commodity or commodities described in this section, transported upon the highway or offered for transportation to any common carrier, shall be legibly marked by tag, stencil or otherwise to indicate the name and address of the owner or lessee of the land from which such material was taken and the name and address of the person who gathered the same. The presence in transit, either upon the highway or in the possession of any common carrier, of any such bale, box or package not so marked, shall be prima facie evidence of a violation of the provisions of this section by the person in possession, or, if in the possession of a common carrier, by the consignor of such bale, box or package. (c) Any tree warden or officer authorized to serve criminal process may enforce the provisions of this section and of section 6131 and may inspect and weigh any bale, box or package containing such material, but the provisions of this section shall not be construed as authorizing any officer to stop or impede the progress of any train or electric car of any common carrier upon which such material may be in transit. No provision of this section shall be construed to apply to any tree, shrub or plant in transit from or growing in any commercial nursery. (d) Any person who shall violate any provision of subsection (a) shall be fined not less than ten dollars nor more than fifty dollars. Any person who shall violate any provision of subsection (b) shall be fined not less than fifty dollars nor more than one hundred dollars for each offense. The owner, occupant, person or agent in charge of the land as such authorized agent, or such person as he may command to assist him, may arrest any person violating any provision of this section, and forthwith take such person before such competent authority, who shall, upon complaint of the prosecuting officer, try such person. The owner, occupant, person or agent in charge of the land, arresting any person pursuant to the provisions of this section shall be entitled to the fees allowed by section 2280 to constables for similar services, which fees shall be taxed as costs by the court before which the trial is held. (e) Justices of the peace shall have jurisdiction in prosecutions for violation of the provisions of this section.

Alabama. Out-of-State Nurseryman's Non-Citrus Certificate. This certificate covers non-citrus stock grown outside the State of Alabama and is issued upon the filing of a copy of a satisfactory inspection certificate (issued to the applicant and signed by the inspection official of the state wherein stock is grown) with the Division of Plant Industry, accompanied by a registration fee of ten dollars ($10.00). Reciprocal agreement on fees.

Agent's Certificate. This certificate can be obtained only through the principal for whom the agent is to solicit orders, on the payment of a fee of one dollar ($1.00) to the Division of Plant Industry. An agent's certificate may be issued through either a nurseryman or a dealer. This certificate expires on September 30, the end of the fiscal year for which it is issued.

Dealer's Certificate. This certificate covers stock handled by one who grows no stock, but buys and re-sells nursery stock. A list of all nurseries from which a dealer will buy stock during the ensuing shipping season must be filed with the Division of Plant Industry, accompanied by a registration fee of ten dollars ($10.00), and if said list is satisfactory, a dealer's certificate may be issued. *Provided*, the Commissioner of Agriculture and Industries may enter into reciprocal agreements with the responsible officers of other states whereby the required out-of-state dealer's certificate or permit may be granted to dealers of such states without the payment of the required fee, provided Alabama dealers are permitted to ship nursery stock into such states without having to pay a fee for a certificate or permit granting that privilege. This certificate expires on September 30, the end of the fiscal year for which issued.

B. P. LIVINGSTON, Chief, Division of Plant Industry, Montgomery, Ala.

Arizona. All nursery stock and plant products entering Arizona through the United States mails or transported in any manner shall be prominently labeled, showing (a) name and address of consignor; (b) name and address of consignee; (c) certificate of inspection; (d) locality were grown, and (e) contents of shipment. Common carriers shall not deliver to consignee any shipment of nursery stock or plant products until inspected by the State Entomologist or his agent and a certificate of release issued in each case to the common carrier and to the consignee. Postmasters are required to forward all parcels of nursery stock or plant products to the nearest Post Office Inspection Station, and cannot forward from these stations to point of destination any parcel of nursery stock or plant products unless accompanied by an inspected plant shipment tag.

Every plant, tree, or shrub, found infected with crown gall in a plant shipment shall be destroyed. A tolerance of one per cent infection (except in the case of apple trees - five per cent tolerance allowed) will be the maximum tolerance allowed before condemning the entire shipment.

Nursery stock, plants, or plant products, arriving in Arizona shall be free from paraffin wax or other covering which interferes with the careful examination of the same.

Grapevines or cuttings showing evidence of infestation by phylloxera are prohibited. If there is no visible evidence of infestation, grapevines or cuttings are admissible if accompanied by an official certification of one of the following treatments: (1) Complete submergence in water of 125-130° F. for three to five minutes. (2) Nicotine oil dip for ten minutes. (3) Methyl bromide fumigation.

Strawberry plants must be accompanied by an official certificate stating that they were grown in an area free of strawberry root weevil, and are free of any other insect pest or plant disease.

A quarantine prohibits the entrance of: peach, nectarine, almond, plum, or apricot trees or cuttings, grafts, scions, buds or pits, or trees budded or grafted upon peach stock from Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, Ohio, Indiana, Michigan, Illinois, West Virginia, Tennessee, North Carolina, Arkansas, Nevada, Florida, Mississippi, Kentucky, South Carolina, Alabama, Georgia, Oklahoma, and any other section in which peach yellows or rosette are known to exist.

Almond, apple, apricot, cherry, loquat, nectarine, peach, pear, plum, and quince, chokecherry, *Crataegus* sp. (hawthorn), *Prunus ilicifolia* (California evergreen cherry), *Prunus ilicifolia* variety *integrifolia* (Catalina cherry), *Prunus caroliniana* (Carolina cherry), *Prunus laurocerasus* (cherry-laurel), *Cotoneaster parneyi* and *Photinia arbutifolia*, trees, plants, grafts, scions, cuttings and parts thereof, including the ornamental or flowering forms, all fresh fruit, and all boxes, barrels, baskets, and other containers that have been used in handling of fresh fruit of the above hosts of the oriental fruit moth, are prohibited entry unless treated. Bare-rooted, dormant trees, or parts thereof, during the period from November 1st to April 1st, may be given atmospheric fumigation in an approved gas-tight chamber for a period of four hours, using no less than three pounds of methyl bromide, at a temperature of not less than 60° F., or two pounds methyl bromide at not less than 70° F. per 1,000 cubic feet of chamber space. Official certification of treatment must accompany the shipment.

Cut flowers and entire plants of chrysanthemum, aster, dahlia, and gladiolus (except corms, roots, bulbs or tubers without stems) and rhubarb must be accompanied by an official state or federal European corn borer certificate if originating in any of the infested states.

All species of hickory, pecan and walnut trees, and parts thereof, including cuttings, grafts, buds and scions are admissible from all states east of and including Montana, Wyoming, Colorado and New Mexico only under Arizona permit and treatment.

J. L. E. LAUDERDALE, State Entomologist, Box 2006, Phoenix, Arizona.

Arkansas. Reciprocal registration fees: Nurserymen shipping into Arkansas will be charged the same registration fee that the state in which the nursery is located would charge an Arkansas nurseryman shipping into that state. Nurseries having agents in Arkansas must pay a $5 license fee, and $1 for each agent, and the same bond, if any, as the shipping state requires.

Permit to be attached to each package: A permit-label must be attached to each package of nursey stock coming into Arkansas. The price in all quantities is two cents each.

Quarantines: Nurseries must refrain from shipping chestnut trees into Arkansas unless special arrangements have been made with the Arkansas Plant Board.

Permits subject to cancellation: Permits are subject to cancellation because of diseased shipments, or for failure of the nursery to carry out the Board's requirements.

Applying for permits: In applying for permits, send a copy of current certificate of inspection or dealer's certificate, a registration fee, if any, as indicated in the first paragraph, and two cents for each permit desired. (Unused permits are not redeemable). If nurseries will have agents in Arkansas, they should send one dollar for each agent's license and five dollars for nursery license.

Cut flowers or entire plants of chrysanthemum, aster, cosmos, zinnia and hollyhock, and cut flowers or entire plants of gladiolus and dahlia, except the roots, bulbs or corms thereof, without stems, cannot be shipped into Arkansas from the states of Connecticut, Indiana, Maine, Massachusetts, Michigan, New Jersey, New Hampshire, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia or other states infested with European corn borer, unless they have been inspected by a State or Federal inspector and certified by same to be free from the European corn borer, and unless a certificate to this effect is attached to each container.

There are no requirements governing shipment of bulbs and herbaceous plants, except sweet potato, tomato, onion and cabbage plants.

PAUL H. MILLAR, Chief Inspector, Little Rock, Ark.

California. All shipments of nursery stock, plants, seeds and similar material into the state of California must be marked in a conspicuous manner and place with the name and address of the shipper, the name and address of the consignee, and a statement of the contents of each package; also the name of the country, state or territory where the contents were grown.

Of several state quarantines, the following are of interest to shippers to California:

Quarantine Order No. 2 (new series) prohibits the entry into California of all chestnut and chinquapin trees, plants, grafts, cuttings, scions and nuts thereof from all states and districts east of and including the states of Montana, Wyoming, Colorado and New Mexico, on account of chestnut bark disease.

Quarantine Proclamation No. 3 (revised). Because of oriental fruit moth, the following host trees and propagative parts thereof are restricted entry into California from infested areas as noted below:

Restricted Host Plants: All varieties and species of almond, apple, apricot, cherry, chokecherry, hawthorn, loquat, nectarine, peach, pear, plum, quince, and *Prunus caroliniana, Prunus illicifolia* (including *P. illicifolia integrifolia*), *Prunus laurocerasus, Cotoneaster parneyi*, and *Photinia arbutifolia.*

Infested Areas: Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Illinois, Iowa, Indiana, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, and West Virginia, and the District of Columbia; and in Canada, the Province of Ontario.

Restrictions: No restrictions on host trees and cuttings, scions, etc., shipped to counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura, and southern portion of Santa Barbara. Bare-rooted host trees admitted into any area of California during November 1 to April 1 if treated in approved-type fumigator under official supervision and so certified. Budwood admitted if treated same as trees or under permit during entire year.

Quarantine Order No. 4 (new series) prohibits the entry into California of all trees, plants, grafts, cuttings or scions of all species and varieties of the cultivated filbert or hazelnut and American wild hazel (*Corylus americana*) from all states and districts east of and including the states of Montana, Wyoming, Colorado and New Mexico, on account of Eastern filbert blight.

Quarantine Proclamation No. 11 prohibits the entry into California of peach, nectarine, almond, plum or apricot trees or cuttings, grafts, scions, buds or pits of such trees; or any trees budded or grafted upon peach stock or roots that have been in a district where any of the diseases known as peach rosette, little peach and peach yellows are known to exist. The states known to be infected are as follows: Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Delaware, Maryland, Pennsylvania, Virginia, West Virginia, North Carolina, Tennessee, Kentucky, Mississippi, Ohio, Michigan, Illinois, Indiana, Arkansas, Florida, South Carolina, Georgia, Alabama, Oklahoma and the District of Columbia.

Quarantine Order No. 12 (new series) prohibits the entry into California of all varieties and species of hickory, pecan, and walnut trees (*Hicoria* sp. and *Juglans* sp.) and parts thereof from all states east of and including the states of Montana, Wyoming, Colorado and New Mexico, on account of the pecan leaf casebearer and the pecan nut casebearer, except that bare-rooted trees, grafts, cuttings or scions are admissible if treated at origin in a manner and by method approved by the Director of Agriculture in a fumigation chamber which has first been approved by the Director or under written permit from the Director subject to treatment at destination in California.

Quarantine Proclamation No. 15 (revised) prohibits the entry of all host plants of the European corn borer unless inspected and certified by a Federal or State inspector.

Quarantine Proclamation No. 16. Because of the Colorado potato beetle, potato, eggplant and tomato plants from all other states except Nevada and Territory of Hawaii must be accompanied by an official certificate of the state of origin, certifying that they were grown in a district in which the Colorado potato beetle is not known to occur.

D. B. MACKIE, Chief, Bureau of Plant Quarantine, Sacramento, Calif.

Colorado. Each package of nursery stock entering the state must bear a certificate of inspection signed by a duly authorized inspector in the state from which it was shipped. On arrival, shipments are turned over to the County Inspector, who, in turn, if they pass inspection, releases them to the consignee.

Quarantines prohibit the entrance of the common barberry.

Host plants of the European corn borer are prohibited unless inspected and certified by a Federal or State inspector.

Fruit stock is prohibited on account of oriental fruit moth except under certain regulations.

F. HERBERT GATES, State Entomologist, Bureau of Plant and Insect Control, State Museum, Denver, 2, Colo.

Connecticut. Nurseries are inspected annually, and nurserymen are required to register before July 1 of each year. If they fail to do so they are charged the cost of inspection. Dealers are given permits to sell if they purchase stock from certified nurseries. All stock entering this state and all stock transported within the state must bear a certificate of inspection, and transportation companies are subject to prosecution if they accept shipments without valid certificates. Nursery stock imported from foreign countries must be held unopened until an inspector arrives. Inspectors have the authority to inspect any stock at destination.

Quarantines regulate the shipment of all nursery stock and forest products, on account of the gypsy moth, and prohibit the shipment of all elms from the Dutch elm disease quarantined area.

R. B. FRIEND, State Entomologist, New Haven 4, Conn.

Delaware. Each shipper of nursery stock must file a copy of his valid certificate with the State Board of Agriculture. Each shipment must bear a copy of the certificate of inspection of the state of origin. All shipments must conform to Federal rules and regulations.

S. L. HOPPERSTEAD, State Board of Agriculture, Newark, Del.

Florida. In order to make shipments from other states into Florida, in compliance with the rules and regulations of the State Plant Board, a nurseryman from without the state should comply with the following: (1) File with the Nursery Inspector, Gainesville, Florida, a copy of his certificate of inspection, personally signed by the proper official of his state; (2) secure Florida permit tags by making application for same on form supplied by Nursery Inspector with remittance to cover cost of same; (3) attach one, and only one, Florida permit tag to each package, box or bundle of nursery stock shipped into Florida. In club orders, one permit tag should be attached to each individual order, and one permit tag attached to the package containing the individual orders; (4) each permit tag is serially numbered. An invoice showing the name and address of consignor, name and address of consignee, kind and amount of nursery stock in the shipment, and number of the permit tag attached to the shipment should be mailed to the Nursery Inspector, Gainesville, Florida, on the day the shipment is made. An invoice is required for each individual order in a club order and also for the package containing the individual orders; (5) return *all* spoiled or mutilated permit tags to the Nursery Inspector, Gainesville, Florida, for cancellation; (6) return all unused permit tags when same become void; (7) fumigate all host plants of San José scale with hydrocyanic acid gas, at the standard dosage, or thoroughly scrub in a solution of fish-oil soap at a dilution of one pound of soap to three gallons of water, immediately before shipment into Florida; (8) plants showing signs of infestation or infection by an especially injurious plant pest will be prohibited entry into the State of Florida; (9) *all citrus trees and parts thereof are prohibited entry into the State of Florida from all other states and countries;* (10) bulbs may be sold and shipped into Florida without inspection and/or certification; (11) woody perennials, including palms and orchids, whether grown in greenhouse or field, must be accompanied by permit certificate when shipped into Florida; (12) plants and plant products which are hosts of the European corn borer must be accompanied by a valid certificate of inspection issued by a State or Federal inspector certifying the material to be free from the European corn borer.

For additional information, address:

J. C. GOODWIN, Nursery Inspector, Gainesville, Fla.

Georgia. Out-of-state nurseries and dealers must file with the Director of Entomology a duplicate certificate of inspection issued by the official certifying agency of the state of origin; obtain Georgia nursery certificates to be attached to every bundle or container of nursery stock moved into or within the State of Georgia, and pay registration costs.

The Director of Entomology may enter into reciprocal agreements with the certifying agency of other states whereby (1) no registration cost will be required, and (2) only valid nursery certificates of the state of origin will be required. (3) And any other reciprocal agreement that the Director may approve, for out-of-state nurserymen and dealers who otherwise qualify under these regulations; provided, that the inspection standards of that state are satisfactory to the Director and that such state will permit Georgia nurserymen and dealers, who otherwise qualify, to ship nursery stock into their state, without being required to pay a registration or permit fee and that only valid Georgia nursery certificates will be required.

Host plants of the European corn borer are prohibited unless inspected and certified by a Federal or State inspector.

C. H. Alden, Director of Entomology, Atlanta, Ga.

Idaho. No person, firm or corporation outside of Idaho shall sell nursery or floral stock by agents within the state without first applying to the Department of Agriculture for an annual license, according to the following schedule: Class A: Persons, firms or corporations doing a gross business in Idaho of over $200.00 per annum must pay an annual license fee of $15.00 and $1.00 annual license fee for each agent. If any fruiting plants or cuttings, grafts, scions, buds, fruit pits, or other seeds of fruiting plants are sold, they must furnish the Department of Agriculture with a $1,000 bond covering the sale of such stock. Class B: Persons, firms or corporations doing a gross business of $200.00 or less in Idaho per annum must pay a $5.00 annual license and $1.00 annual license fee for each agent, but no bond is required. All shipments into the state must show name of shipper, locality where grown, variety of nursery or floral stock. All nursery and floral stock shipped into the state must be inspected upon arrival, and when neither the shipper nor receiver has an Idaho license there is a destination inspection charge at the rate of 10 per cent of the invoice value of the shipment. An inspection certificate tag must be attached to all shipments.

State quarantines exclude the entrance of all five-leaf pine, currant, gooseberry, poplar, willow, peach, nectarine, prune, almond or other trees worked on peach stock and all pits, cuttings, buds, or scions grown in a district where peach yellows or other detrimental diseases exist.

Permits for entry must be secured from the Bureau of Plant Industry and accompany the shipment before any currants or gooseberries can be shipped into the state. The eight northern counties are designated as a blister rust control area from which currants, gooseberries and five-leaf pines are excluded. Host plants of the European corn borer are prohibited unless inspected and certified by a Federal or State inspector.

D. A. Stubblefield, Director of Plant Industry, Boise, Idaho.

Illinois. Outside nurserymen and dealers in nursery stock, wishing to ship nursery stock into Illinois or to solicit business through agents in Illinois, are required to send to the office of the Chief Plant Inspector a duplicate copy of their certificate of inspection personally signed by their State Inspector. Those employing agents are required to apply to the Chief Plant Inspector for a permit to employ agents in Illinois and for a permit for each agent so employed before he engages in the business of soliciting orders for nursery stock. All agent's permits must be renewed annually after July 1. All outside nurseries are required to file a complete list of all agents in this state after that date.

All nursery stock entering the state must bear a valid State or Federal certificate of inspection, the names and addresses of the consignor and consignee, and a statement of the nature of the stock.

Transportation companies receiving stock without certificate of inspection must report the fact to the Department of Agriculture and must either return the stock to the consignor, hold it for inspection, or send it to the Department of Agriculture for inspection. Any person receiving nursery stock without certificate in this state is required to notify the Department of Agriculture and not to use the stock nor let it pass from his possession until it has been inspected or released by the Department of Agriculture and expenses incurred paid.

Stock shipped into Illinois in violation of a State or a Federal quarantine is destroyed or returned to the consignor or otherwise disposed of at the discretion of the Department.

H. F. Seifert, Horticultural Inspection Supervisor, Division of Plant Industry, Glen Ellyn, Ill.

Indiana. Nursery stock entering or shipped within the state must bear an official inspection certificate and give the names of both the consignor and consignee. All out-of-state nurseries must file with the State Entomologist a copy of their valid inspection certificate before shipping stock into the state. Each dealer and agent selling or soliciting sales of nursery stock in Indiana must pay $1.00 and obtain a license from the State Entomologist.

Frank N. Wallace, State Entomologist, Department of Conservation, Indianapolis, Ind.

Iowa. Copy of inspection certificate must be filed with and approved by the State Entomologist, and must accompany each shipment of nursery stock into the state. The State Entomologist may make reciprocal agreements with officials of other states regarding fee. Otherwise, the fee for out-of-state shippers from any particular state is the same as the fee charged Iowa nurserymen by the officials in that state.

Quarantine against the European corn borer prohibits all the usual host plants entering the state from the infested areas, unless accompanied by a certificate of inspection showing freedom from the pest.

Carl J. Drake, State Entomologist, Ames, Iowa.

Kansas. Nurseries are inspected annually and all certificates expire on June 1, following date of issue. Nurserymen in other states wishing to ship nursery stock into Kansas must file with the Secretary, Kansas Entomological Commission, State House, Topeka, Kansas, printed copies of their current certificates of inspection, and attach a copy of this certificate to each package of nursery stock shipped to a separate destination.

Dealers in nursery stock must register with the Kansas Entomological Commission, pay a fee of $5, and receive a dealer's license. Agents selling or soliciting orders for nursery stock must register with the Commission and receive and carry an agent's license.

Provision for reciprocal agreement or fee.

Special inspection and certificate required on raspberry plants.

No fees required from Connecticut nurserymen.

Quarantine No. 4 prohibits the entry of all susceptible plants from states infested by the European corn borer unless inspected and certified by a Federal or State inspector.

GEO. W. KINKEAD, Secretary, Entomological Commission, Topeka, Kans.

Kentucky. Kentucky nurseries are inspected annually and certificates are issued when stock is found free of dangerous pests. All nurserymen, resident or non-resident, must file credentials at the office of the State Entomologist annually, and if in good standing will receive a permit on payment of a fee of $5.00.

Agents and dealers must file credentials annually, including names of "nurseries, nurserymen or persons represented," and on payment of a fee of $5.00 are issued a permit. Agents soliciting orders must carry their permits to show prospective buyers, county officials or agents of the State Entomologist, on demand. Host plants of the European corn borer are prohibited unless inspected and certified by a Federal or State inspector.

W. A. PRICE, State Entomologist, Lexington, Ky.

Louisiana. Out-of-state nurserymen are no longer required to obtain Louisiana permit tags and file a copy of their certificates of inspection with us. All that is required is that each shipment of nursery stock entering Louisiana have attached proper valid certificate permit tag, as issued by the proper officials of the state of origin.

Host plants of the European corn borer are prohibited unless inspected and certified by a Federal or State inspector.

W. E. ANDERSON, State Entomologist, Department of Agriculture, Baton Rouge, La.

Maine. All nursery stock shipped into this state from any other state, country or province shall bear on each box or package a certificate that the contents of said box or package have been inspected by a duly authorized inspecting officer, and that said contents appear to be free from all dangerous insects and diseases. Nurserymen, dealers or other persons residing or doing business outside of the state, desiring to solicit orders for nursery stock through agents in this state shall file a certified copy of their original state certificate with the State Horticulturist, and shall keep on file with the State Horticulturist a list of agents and representatives in the state. The State Horticulturist, or his competent assistants, may inspect at the point of destination all stock coming into the state, whether under certificate or not and, if such stock is found to be infested with any injurious insects or plant diseases, the State Horticulturist shall cause it to be destroyed or returned to the consignor at the consignor's expense, if he shall so elect.

STANLEY L. PAINTER, State Horticulturist, Augusta, Me.

Maryland. Nurseries are inspected twice each year. Nursery stock coming from blocks that show evidence of San José scale must be hand-inspected to eliminate visibly infested stock. Shipments entering the state must bear certificates of inspection, besides names of consignor and consignee. A duplicate certificate should be filed with the State Entomologist. Reciprocal agreement with other states.

Maryland has quarantines designed to protect the state against the Japanese beetle, white pine blister rust and potato wart. These regulations are similar to the Federal quarantines and are administered in coöperation with the Federal authorities.

ERNEST N. CORY, State Entomologist, College Park, Md.

Massachusetts. All growers and agents who sell nursery stock for delivery within the state must have a grower's certificate or an agent's license, and a copy of such certificate or license must accompany each car, box or package of stock shipped or delivered. Agents must apply to Director, Division of Plant Pest Control and Fairs, Boston, Mass., and file list of nursery firms from which they purchase stock before receiving agent's license. Authority is granted to inspect at destination all stock entering the state and, if found infested, it may be destroyed, treated or returned to the consignor at his expense.

Federal quarantine prohibits *Ribes* from entering the state except under permit.

R. H. ALLEN, Director, Division of Plant Pest Control and Fairs, 24 State House, Boston, Mass.

Michigan. All nurseries are inspected at least annually. Annual fees are: nurseryman, $15; native tree dealers, buyers and dealers in nursery stock, $10; growers and dealers in perennial plants, $2; agent's permit, $1.

Out-of-state nurseries must file copies of their inspection certificates and need not obtain licenses unless they operate through Michigan agents, in which case each must have an out-of-state license, for which the annual fee is $15. Each Michigan agent for an out-of-state nursery must carry an agent's permit (Fee, $1.00) transferable from one agent to another within the period of one year. Agents must qualify either by experience or by a written examination before receiving permit. All native trees and shrubs not grown in a regular nursery require that a special native tree tag, furnished at cost by the Commissioner of Agriculture, be attached to each plant in addition to inspection.

Special inspections and certificates required on raspberry plants.

Provision for reciprocal agreements.

Federal control area permits required for currants and gooseberries.

C. A. Boyer, Director of Orchard and Nursery Inspection Service, Department of Agriculture, Lansing, Mich.

Minnesota. All shipments must be accompanied by a valid certificate of inspection on the outside of each package. A copy of this certificate must be filed with the State Inspector before nursery stock is shipped into the state. No filing fee is required unless the nurseries are located in states which charge Minnesota nurseries, dealers or agents a fee for shipping stock into such states. A fee is charged in the same amount as such states charge Minnesota nurseries, dealers or agents. All agents and salesmen are required to carry an agent's registration card. This is issued without fee only through the firm which they represent.

Minnesota Quarantine No. 6 requires that all raspberry plants shipped into Minnesota must be accompanied by a valid certificate showing that the plants have been inspected and found apparently free from mosaic and other virus diseases. A special affidavit signed by the shipper may be accepted in lieu of such certificate on each package.

The term "nursery stock" includes all wild and cultivated trees, shrubs, perennial vines, small fruit plants, perennial roots, rhizomes, herbaceous perennials, cuttings, buds, grafts and scions for or capable of propagation. A certificate of inspection is not required for greenhouse or housegrown plants, bedding plants, herbaceous annuals, vegetable plants, bulbs, corms and tubers.

All nursery stock for shipment into Minnesota must comply with the requirements of quarantines promulgated by the Federal Bureau of Entomology and Plant Quarantine.

T. L. Aamodt, State Entomologist, University Farm, St. Paul, Minn.

Mississippi. Nurseries wishing to ship nursery stock into Mississippi must file with the State Plant Board a copy of their certificate of inspection personally signed by their State Entomologist. No nursery permits are required, but each shipment must have attached a valid Connecticut nursery certificate tag.

All plants capable of defoliation must be defoliated. Plants infected with root knot (caused by nematodes), crown gall, or showing any insect pest or disease or markings thereof, must not be shipped into Mississippi. The movement of all trees and plants commonly known as nursery stock, consisting of palms and woody perennials (including budwood and scions), strawberry plants and kudzu plants, which do not have attached thereto a proper certificate tag issued by the Connecticut State Entomologist, is prohibited.

There is no quarantine on Connecticut peach stock, as the phony peach disease has not been reported from Connecticut.

In order to prevent the introduction into the State of Mississippi of the European corn borer, the movement into Mississippi of the usual host plants from the infested area is prohibited unless the plants are inspected by a duly authorized State or Federal inspector and certified to be free from the European corn borer.

Each agent representing a nursery is required to register with and obtain an agent's certificate from the Plant Board before selling, delivering or taking orders for nursery stock in Mississippi. Stock shipped to nursery agents for delivery in Mississippi must be packed in individual packages, and each of these accompanied by a Connecticut permit.

R. P. Colmer, Chief Inspector, State College, Miss.

Missouri. Non-resident nurserymen and nursery dealers are required to secure a "nursery agent's certificate" for each agent operating in Missouri. Each package of nursery stock entering the state must bear the names of both consignor and consignee, statement of contents, and a certificate showing that the stock therein contained has been inspected where grown by a duly authorized inspector and found to be apparently free from dangerously injurious insect pests and plant diseases. Transportation companies are not permitted to deliver nursery stock unless so labeled.

Any nurseryman of any other state, territory or district of the United States who desires to ship "nursery stock" in Missouri, shall make application to the State Department of Agriculture for a Missouri "nursery permit certificate," and shall include with his application a duplicate copy of his state nursery inspection certificate. Upon receipt of same in proper order, the State Entomologist will issue a "nursery permit certificate" without charging any fee whatsoever.

Annually, on or before October 1, each nurseryman or nursery dealer shall file with the State Entomologist a complete, confidential list of his agents operating in Missouri. Upon the approval of the

State Entomologist there will be issued without charge, for each such qualified nursery agent, a "nursery agent's certificate." This applies to non-resident nurserymen and nursery dealers, as well as to those in Missouri. Supplementary lists shall be filed after October 1, as additional agents are appointed. Each nursery agent shall keep his certificate in his possession, while acting in such capacity, to be shown upon request by any prospective customer or authorized representative of the State Entomologist.

Quarantine No. 3 against the European corn borer prohibits the entry of susceptible plant material, into certain parts of the state, unless it has been inspected and certified by a State or Federal inspector and a copy of the certificate is attached to each package or shipment.

J. ALLISON DENNING, State Entomologist, Jefferson City, Mo.

Montana. All nursery stock brought into the state must be unpacked and inspected at one of the following designated quarantine stations: Anaconda, Billings, Bozeman, Butte, Culbertson, Dillon, Glasgow, Glendive, Great Falls, Hamilton, Havre, Helena, Kalispell, Lewistown, Miles City, Missoula, Noxon, St. Regis, Troy.

Nurseries are required to pay an annual license fee of $15 for general nurseries; $10 for nurseries handling ornamentals only and $5 for those handling only perennials and bulbs.

Quarantines exist against the following:

No. 2-A. Common barberry plants from all states.

No. 3-A. Shipment or movement into or within the state of any cultivated black currant plants.

No. 7-B. Entry into or movement through Montana of any black locust plants, or untreated black locust products from the territory east of the eastern boundary of the states of Montana, Arizona, Idaho, and Utah; also the State of Washington and from the Dominion of Canada.

No. 11-A. Oriental Fruit Moth: *Grapholitha* (*Laspeyresia*) *molesta*. Area: Against all states east of the Mississippi River except Wisconsin, and against Kansas, Missouri, Arkansas, Oklahoma, Texas and Louisiana; also that portion of California described as follows: the entire counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego, Ventura and all that portion of Santa Barbara County south of the first standard parallel North, San Bernardino Base line; and in Canada the entire province of Ontario.

Regulated Products. All varieties and species, including the flowering forms of almond, apple, apricot, cherry, chokecherry, hawthorn (*Crataegus* sp.), nectarine, peach, pear, plum and quince trees and plants or parts thereof including the fresh fruits and all used containers of these fruits.

Also all five-leaved pines, currant and gooseberry plants as specified in Federal Quarantine No. 63, and as amended.

GEORGE L. KNIGHT, Chief, Division of Horticulture, Missoula, Mont.

Nebraska. Non-resident nurserymen, dealers or other persons wishing to ship nursery stock into Nebraska must file a duplicate certified copy of their original certificate with the State Department of Agriculture and Inspection. If this certificate is approved by the Department of Agriculture and Inspection, they will be issued a permit allowing them to ship nursery stock into this state during the period that such original certificate, issued by the state in which they reside or are doing business, is in force. A $10 fee is charged for the non-resident dealer's or nurseryman's permit, except for nurserymen in states that do not charge a fee of Nebraska nurserymen. Nurserymen in those states will not be charged a fee to ship into Nebraska. Each shipment of nursery stock coming into the state must be plainly and legibly marked in a conspicuous place with a statement showing: (a) the name and address of the consignor; (b) the name and address of the consignee; (c) the general nature of the contents; (d) the name of locality where grown and (e) a certificate of inspection from the proper official of the state, territory, district or country from which it was shipped. All agents selling nursery stock or soliciting orders for nursery stock for any nurseryman or dealer, located either within or without the state of Nebraska, shall be required to secure and carry an agent's permit. The fee for this permit is $1.

Any prohibited insect pest or plant disease, plant product or other substance or thing, brought into the state in violation of any regulation of the State Department of Agriculture and Inspection or any Federal quarantine, shall at the expense of the owner be either destroyed, returned to the consignor or otherwise disposed of, as the Department of Agriculture and Inspection may direct.

Quarantine against the European corn borer prohibits all the usual host plants entering the state from the infested areas, unless accompanied by a certificate of inspection showing freedom from the pest.

RUFUS M. HOWARD, Director; L. M. GATES, Entomologist, State Department of Agriculture and Inspection, Lincoln, Nebr.

Nevada. All nursery stock entering the state must bear, on each car, bale or package, a copy of a valid official inspection certificate, and names of consignor and consignee. Transportation companies shall not deliver nursery stock lacking such certificate.

The law prohibits the transportation or movement into the State of Nevada of any trees, plants or parts thereof, of any and all varieties and species, including the ornamental forms, of peaches, nectarines, almonds, apricots, plums, cherries, chokecherries, quinces, pears and apples, including the fresh fruits thereof, and all boxes, barrels, baskets or other containers that have been used to contain same, directly or indirectly, from any part of the States of Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, West Virginia and the District of Columbia, and any other states or territories that hereafter may be found to be infested with the oriental fruit moth. Bare-rooted trees of peaches, nectarines, almonds, apricots, plums, cherries, chokecherries, quinces, pears or apples, and the flowering forms thereof, will be admitted into the State of Nevada during the dormant period, from November 1 to March 15, only, provided the same have been fumigated in loose unwrapped bundles with methyl bromide, using a dosage of not less than 3.5 pounds of methyl bromide per 1,000 cubic feet of space, and at a temperature of not less than 70° F. for a period of four hours. Fumigators used shall be constructed, equipped and operated under the direction of the Department of Agriculture of the state of origin, and a list of all approved fumigators shall be filed with the Nevada State Department of Agriculture. All shipments of said host plants shall be accompanied by a certificate signed by a proper official of the Department of Agriculture of state of origin, certifying that the above-prescribed treatment was given under his personal supervision and that, following such fumigation, the stock was immediately packed and shipped to consignee and was not exposed to nontreated stock. At time of shipment a duplicate copy of said certificate shall be mailed to the State Department of Agriculture, P. O. Box 1027, Reno, Nev.

Any nursery stock, plants, fruits, containers, or commodities covered by this quarantine arriving in the State of Nevada from any of the areas included in said quarantine, except in accord with the provisions of these regulations, shall be immediately sent out of the state or destroyed, at the option and expense of the owner or owners.

Quarantines also regulate shipment of all plants subject to infestation by the European corn borer from infested states.

Any of the articles covered by this quarantine will be admitted into the State of Nevada, providing each shipment or lot is accompanied by a certificate signed by an inspector of the U. S. Bureau of Entomology and Plant Quarantine certifying that the material contained in the shipment or lot has been disinfected or treated under the supervision of such inspector in such a manner as to eliminate all risk of transmitting the European corn borer; or a certificate signed by a duly authorized inspector of the state of origin, certifying that the material has been treated under official supervision in a manner and by a method approved by the Nevada State Department of Agriculture. Such certificate shall set forth the material used, the dosage schedule, period of exposure, date and place of treatment. At time of shipment a duplicate copy of said certificate shall be mailed to the address below.

George G. Schweis, Director, Division of Plant Industry, Box 1027, Reno, Nev.

New Hampshire. All nursery stock entering this state must bear on each container a copy of a valid inspection certificate.

Quarantines prohibit the entrance of currants or gooseberries into any part of the state, except an area in the northernmost part of the state, beginning with the towns of Stratford, Odell, Millsfield and Errol; and prohibit entry of plants susceptible to attack by the gypsy moth, the brown-tail moth, and the satin moth from infested regions into uninfested territory, except with the proper certificate.

W. C. O'Kane, Deputy Commissioner of Agriculture, Durham, N. H.

New Jersey. All nurserymen, dealers, or other persons residing or doing business outside of New Jersey and desiring to ship nursery stock into New Jersey, shall file once each year with the New Jersey Department of Agriculture, previous to shipments, a signed copy of their original current, resident state certificate of inspection. Shipments into the state must be accompanied by a certificate of inspection of current date, or copy thereof, attached to each car or parcel. It shall be the duty of all carriers to refuse for transportation within the state all stock not accompanied by a certificate of inspection. All stock coming into the state may be detained for examination, wherever found, by the Chief of the Bureau of Plant Industry, and if found to be infested with any insects or plant diseases, injurious or liable to become so, will be destroyed.

It shall be the duty of every nurseryman, or other person who imports plant material of any kind from without the state, and every transportation company or other carrier for hire that brings plant material from without the state for delivery to any person, persons, firm, or corporation within the state, to notify the Chief of the Bureau of Plant Industry of such shipment prior to, or within 24 hours after, its arrival. Such notice shall state the kind, the quantity of plant material, the name and address of the shipper, the date of shipment, and if from a foreign country, the name of the country or district in which the shipment originated, the port of entry, and the approximate date of arrival at said port.

Strawberry plants may be brought into the State of New Jersey or moved from point to point within the state only after they have been inspected by an official state inspector of the state in which they were grown, and found to be free from the so-called red stele disease (*Phytophthora* sp.) also known as red core, brown stele or brown core. All shipments of strawberry plants must have attached thereto a copy of a special certificate issued by the proper state official of the state of origin, attesting that the plants contained in the shipment were inspected by an official state inspector and found to be free of the red stele disease.

Harry B. Weiss, Chief, Bureau of Plant Industry, State Department of Agriculture, Trenton, N. J.

New Mexico. Nurserymen in other states desiring to ship nursery stock into New Mexico must file a copy of their certificate of inspection signed with pen by the proper official, with a filing fee of $10, and secure a permit-certificate bearing the facsimile signature of the Deputy Inspector, which must accompany each shipment of nursery stock into the state. Tags may be purchased at the following prices:

50 tags	$1.00	200 tags	$2.00
100 tags	1.25	500 tags	4.25

Quarantines prohibit shipments of white pines and *Ribes* on account of white pine blister rust.

Red cedars (*Juniperus virginiana*) are prohibited on account of danger of introducing cedar-apple rust. Host plants of European corn borer are prohibited unless inspected and certified by a Federal or State inspector.

R. F. CRAWFORD, Plant Quarantine and Regulatory Office, State College, N. M.

New York. Nursery stock cannot enter the state or be moved within the state unless a valid certificate is attached issued by the New York State Department of Agriculture and Markets, or by the state in which the shipment originated. Transportation companies and all persons bringing nursery stock into the state from other states, must send notice to the Department of Agriculture and Markets. Blanks will be furnished for such notices. An exact copy of the certificate must be attached to each package sent by mail. Stock received from abroad or from other states unaccompanied by a valid certificate of inspection must not be unpacked or distributed until after inspection or release by the Department of Agriculture and Markets.

Quarantines prohibit the entrance of Christmas trees and woody greens from New England except from those areas lightly or not infested by gypsy moth (Federal certificates must accompany shipments from the lightly infested area); of raspberry plants unless apparently free from mosaic diseases and so certified after two inspections and the removal of all diseased plants, as is practiced in New York State. Currants and gooseberries cannot be grown in certain pine-growing areas of the state and permits must be obtained to ship them into the state. Name and address of consignee must be given in application.

A. B. BUCHHOLZ, Director, Bureau of Plant Industry, Department of Agriculture and Markets, Albany, N.Y.

North Carolina. Nursery stock may enter the state only when shipments bear a valid copy of the official nursery certificate of state of origin, a copy of which must be filed with the State Department of Agriculture.

Quarantines prohibit the entrance of five-leaf pines and *Ribes* except in accordance with Federal regulations.

C. H. BRANNON, Entomologist, State Department of Agriculture, Raleigh, N. C.

North Dakota. Shipments of nursery stock into the state must bear a certificate of inspection showing that the stock has been inspected and found free of injurious insects and plant diseases. Copy of said certificate must be filed with the office of the State Entomologist of the North Dakota Experiment Station, State College Station, Fargo, North Dakota.

J. A. MUNRO, State Entomologist, North Dakota Experiment Station, State College Station, Fargo, N. D.

Ohio. Non-Resident Certification — Nurserymen, dealers, or agents residing or doing business outside the State desiring to ship or transport nursery stock into this State, shall, upon filing a certified copy of their original state certificate with the Director of Agriculture, obtain a certificate permitting such person to ship or transport nursery stock into this state. Each dealer within or without the state shall obtain annually a dealer's certificate, by furnishing an affidavit that he will buy and sell only inspected stock and will maintain with the Secretary of Agriculture a list of all sources from which he obtains nursery stock. Each affidavit shall be accompanied by a fee of $10. Each agent soliciting orders for nursery stock shall file annually a statement that he will sell only inspected stock, and pay a fee of $1. He shall carry an agent's certificate and a copy of the certificate held by his principal. Each shipment entering the state shall be accompanied by a tag or poster giving an exact copy of the valid certificate of inspection. Altered certificates are prohibited.

Raspberry plants must be inspected twice and certified as being free from virus and other diseases.

JOHN W. BARINGER, Chief, Division of Plant Industry, Department of Agriculture, Columbus, Ohio.

Oklahoma. Each nurseryman or dealer outside of the state must file a duplicate copy of his valid certificate with the Chief Inspector and apply for an Oklahoma Foreign Nursery Permit. A copy of the certificate of the state of origin must be attached to each shipment of nursery stock consigned to Oklahoma. "Nursery stock" as defined by Oklahoma regulations includes plants of all kinds: florist stock, corms, scions, grafts, etc., except vegetable plants and roots and bulbs used for the production of food. Oklahoma and Connecticut are on a reciprocal fee basis; neither state charges the other a permit fee.

CLYDE A. BOWER, Chief, Div. of Entomology and Plant Industry, Oklahoma City, Okla.

Oregon. Shipments of nursery stock entering the state must be plainly marked with names and addresses of both consignor and consignee, name of state, territory where grown, nature of contents, and be accompanied by a valid nursery inspection certificate of the state of origin. All shipments are inspected. Nurserymen's licenses are required ONLY of nurserymen who have a place of business in said state. A fee of $1.00 is required for each agent operating in the state. A flat $10.00 license fee is required of dealers.

Quarantines prohibit entrance of hazel and filbert trees, all chestnut and chinquapin trees or cuttings or scions of said nut trees from eastern states.

On account of the oriental fruit moth, bare-rooted trees of the peach, nectarine, almond, apricot, plum, cherry, chokecherry, quince, pear or apple and the flowering forms thereof will be admitted into the State of Oregon only during the dormant period from November 1 to March 15, provided the same have been fumigated in loose, unwrapped bundles, with methyl bromide, using a dosage of not less than 3.5 pounds of methyl bromide per 1,000 cubic feet of space and at a temperature of not less than 70° F. for a period of four hours, or with such other formula that may be recommended by the U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine, and in a fumigator to be constructed, equipped and operated in accordance with plans and specifications first approved by the Department of Agriculture, State of Oregon. Shipments of fresh fruit may be made under similiar restrictions.

Plants of the genus *Rubus* will be admitted when accompanied by a certificate signed by the proper state inspection officer of Connecticut, certifying that all of the plants in said lot or shipment were taken from a planting which had received field inspection during the growing season and found to be free from virus diseases.

Grapevines and cuttings accepted when accompanied by certificate that shipment is from an area or premises free of phylloxera, or has been given one of the approved treatments.

Host plants of the European corn borer must be accompanied either by a treatment or inspection certificate signed by an inspector of the Bureau of Entomology and Plant Quarantine, or by the proper official of the state of origin.

All narcissus bulbs coming into the state must carry a certificate certifying that all of said bulbs were given the spring and fall inspection and found free from nematode and greater bulb fly or had received the required treatments for nematode and/or bulb fly.

Frank McKennon, Chief, Division of Plant Industry, Department of Agriculture, Salem, Ore.

Pennsylvania. Each nurseryman from outside of the state must file with the Director of the Bureau of Plant Industry a duplicate copy of his valid inspection certificate, signed in person by the state inspection official in charge, and supply a statement giving the exact acreage of nursery stock he is growing, as well as the acreage being grown for him under contract. Upon compliance with these regulations a certificate is issued that must be received before stock is shipped into the state. Dealers are granted certificates on application and receipt of a statement from each that he will buy stock only from nurseries holding valid certificates of inspection. Agents soliciting for the sale of nursery stock in the state must obtain and carry agent's duplicate certificates. All shipments of nursery stock entering the state will be rejected unless accompanied by certificates of inspection.

Special certification is required for raspberry plants.

T. L. Guyton, Director, Bureau of Plant Industry, Harrisburg, Pa.

Rhode Island. All stock entering the state must bear a valid official certificate of inspection, but is subject to further inspection and may be destroyed or returned to the consignor if found infested. Agents must obtain agent's licenses, on stating where they expect to purchase their stock. State of origin certificate to be filed.

Ribes or white pines can be shipped into the state or planted in certain parts of the state only on permission. Planting of black currant is prohibited.

Brayton Eddy, State Entomologist, State House, Providence, R. I.

South Carolina. File valid certificate of state of origin with South Carolina State Crop Pest Commission.

Quarantines prohibit the entrance of five-leaf pines, currants and gooseberries, except when shipped in conformity with Federal regulations. Citrus stock is allowed to enter only by special permit. Fumigation of host plants of San José scale is required. Host plants of European corn borer not allowed entry without inspection and certification.

All peach and nectarine roots, and peach and nectarine trees with roots, and all other stock budded or grafted on peach or nectarine roots, will not be permitted to enter the state unless accompanied by a state certificate showing that (1) the stock was grown in a county in which no phony peach disease has been found, or (2) that the nursery and its environs within a mile have been inspected and no phony peach disease found, and (3) that each plant has been hand-inspected after digging and found free of infestation by the peach borer.

South Carolina State Crop Pest Commission, Clemson College, S. C.

South Dakota. Out-of-state nurserymen may obtain a certificate permitting them to sell nursery stock within the state by filing a certified copy of their valid certificate with the Department of Agriculture, Pierre, South Dakota and paying a fee of one dollar. (Excepting that the fee may be omitted from states making no charge for a similar service to South Dakota nurserymen). Agents engaged in soliciting orders shall secure and carry an agent's certificate (fee, $1.00) bearing a copy of the certificate held by his principal. Dealers are required to obtain a dealer's certificate (fee, $10.00) and must purchase their stock from certified nurseries.

Host plants of the European corn borer are prohibited unless inspected and certified by State or Federal inspectors.

NORRIS M. PAULSON, Director, Division of Plant Industry, Department of Agriculture, Pierre, South Dakota.

Tennessee. Out-of-state nurseries must file duplicate inspection certificates and reciprocal fee. Every shipment must bear a valid inspection certificate, and failure to comply with this requirement subjects the stock to confiscation. Nursery agents and dealers must file sworn statements on official Tennessee blanks, which will be supplied. Each agent operating in Tennessee, and each dealer or jobber, is required to secure a license. Nurserymen selling trees under contract to prune and spray the same for a period of years are required to take out a bond of $5,000 before selling trees under such special contract.

State quarantines prohibit the entrance of all varieties of barberry, except *Berberis thunbergi.* Other restrictions apply to the Japanese beetle, the European corn borer, gypsy moth, sweet potato weevil, pink bollworm of cotton, Argentine ant, Japanese camphor scale, white-fringed beetle, phony peach disease, and white pine blister rust. Peach and pecan seedlings are allowed entrance only by special permit for experimental purposes.

G. M. BENTLEY, State Entomologist and Plant Pathologist, Knoxville, 16, Tenn.

Texas. No person, partnership or corporation may ship nursery stock into the state without first having filed with the Commissioner of Agriculture a certified copy of their certificate of inspection issued by the proper authorities in the state from which the shipment originates. Each box, bale or package of nursery stock from outside the state shall bear a copy of the certificate of the state in which it originates. No charge is made to Connecticut nurserymen because this state does not charge Texas nurserymen a fee to ship nursery stock into Connecticut. Definition of nursery stock includes greenhouse plants or propagation stock, berry plants and cut flowers.

Quarantine No. 71 regulates entry of plants susceptible to infestation by European corn borer.

For further information as to other quarantines, communicate with

J. M. DEL CURTO, Chief Entomologist, Department of Agriculture, Austin, Texas.

Utah. No person shall engage or continue in the business of selling within the state, or of importing into the state, any nursery stock without first having obtained a license. A license fee costs $10. All nurseries are inspected annually, and infested stock must be destroyed or otherwise treated as determined by the inspector. A certificate must be attached to each package, box, bale or car lot shipment. Nursery stock from other states must be held for inspection and release by Utah inspectors before distribution.

State quarantines prohibit the shipment of all fruit trees and their flowering varieties from eastern and middle United States on account of the oriental fruit moth; all pecan, Japanese walnut and hickory trees from all states, except California, on account of the pecan casebearer; and all plants susceptible to infestation by the European corn borer, unless inspected and certified by a Federal or State inspector.

EARL HUTCHINGS, Supervising Inspector, State Board of Agriculture, Salt Lake City, Utah.

Vermont. All nursery stock entering the state must bear valid official inspection certificates and the names and post office addresses of both consignor and consignee.

Quarantines restrict the free movement of out-of-state shipments of uncertified raspberry plants on account of mosaic, leaf roll and rosette, hosts of the European corn borer, and all uninspected and non-nursery grown trees and forest products on account of the gypsy and brown-tail moths.

M. B. CUMMINGS, State Nursery Inspector, Burlington, Vt.

Virginia. Nursery stock shipped into Virginia must have attached to each package an official inspection tag or certificate issued by the state of origin. Inspection certificates of the state of origin must be filed before shipping nursery stock into Virginia. Registration of out-of-state nurserymen to ship into Virginia is no longer required, except that nurserymen in states requiring Virginia nurserymen to pay registration fee shall be charged a $10.00 fee.

All agents operating in Virginia must register, the cost for each agent being $1.00. Make checks for registration payable to Treasurer of Virginia.

Nursery stock under the Virginia regulations includes trees, shrubs and vines, bush fruits, grapevines, whether cultivated, native or wild, and buds, scions and cuttings from such plants. Roses and other woody plants that are greenhouse grown, but that are sold for outside planting, are considered nursery stock. Greenhouse plants, unless woody and field grown, are not included as nursery stock, and inspection certificates are not required. The same is true of herbaceous perennials and bedding plants.

G. T. French, State Entomologist, Department of Agriculture and Immigration, Room 1112, State Office Building, Richmond, Va.

Washington. No person, firm or corporation shall sell, solicit sales or distribute nursery stock without first obtaining a license to do so from the Director of Agriculture. The license fee is $5 for nurserymen who grow all the stock they sell, $15 for other nurserymen, dealers, brokers and landscape architects, and $1 for agents, salesmen and solicitors. However, the Director of Agriculture may enter into reciprocal agreements with other states, under which nursery stock owned by licensed nurserymen or licensed nursery dealers of such states may be sold or delivered in the State of Washington without payment of a license fee: *Provided*, that like privileges are accorded in such other states to licensed nurserymen of the State of Washington. All licenses expire July 1. All nursery stock entering the state shall have contents, names and addresses of consignor and consignee, and name of state, territory, or country where the stock was grown, plainly marked on each car, box, bale or package, also must have state of origin certificate attached. The state is divided into eleven horticultural districts with an inspector-at-large in charge of each district. Notice must be sent to one of these inspectors of any shipments arriving without the proper license certificate or labels, and the said inspectors are authorized to inspect such shipments and charge such fees as may be fixed by the Director of Agriculture.

Quarantines prohibit the entrance of currants, gooseberries, chestnut, chinquapin, hazel, filbert, and carriers of the European corn borer, peach yellows, oriental fruit moth, and grape phylloxera. Special inspection and certification required for raspberry and blackberry plants.

F. E. DeSellem, Supervisor of Horticulture, Olympia, Wash.

West Virginia. Persons or concerns shall not ship nursery stock into this state unless such shipments have attached thereto tags furnished by the State Department of Agriculture to duly registered parties; the tags to be purchased at prices quoted to those interested. Plants, not commonly considered nursery stock, may be shipped into the state without restrictions. To register, a person or concern must file a copy of the certificate of inspection of their nursery and pay a fee of $15. Registered persons or concerns are required to file the names of their agents or representatives operating in the state. Transportation companies must report shipments of nursery stock violating these regulations.

J. B. McLaughlin, Commissioner of Agriculture, Charleston, W. Va.

Wisconsin. Each out-of-state nurseryman must file a valid certificate of inspection and obtain a state license before shipping stock into the state. Each car, or package, must bear certificate tags. Each agent selling nursery stock in the state must carry an agent's duplicate certificate bearing the same number and date as that of his principal. No fees are charged except for resident nurserymen.

Quarantines prohibit entrance of all barberry bushes, except Japanese barberry; nursery stock from gypsy moth infested areas except under Federal certificate; cranberry plants; raspberry plants unless certified to a special inspection for virus diseases.

E. L. Chambers, State Entomologist, Madison, Wis.

Wyoming. Each out-of-state nurseryman must file a valid certificate of inspection from the proper authority of his state, he then receives a license valid until the following July 1. Wyoming shipping tags are not necessary, provided shipments of nursery stock are accompanied by a tag or certificate of the state of origin stating that the material or the nursery has been inspected and found free from dangerously injurious insects and plant diseases. Reciprocal agreements.

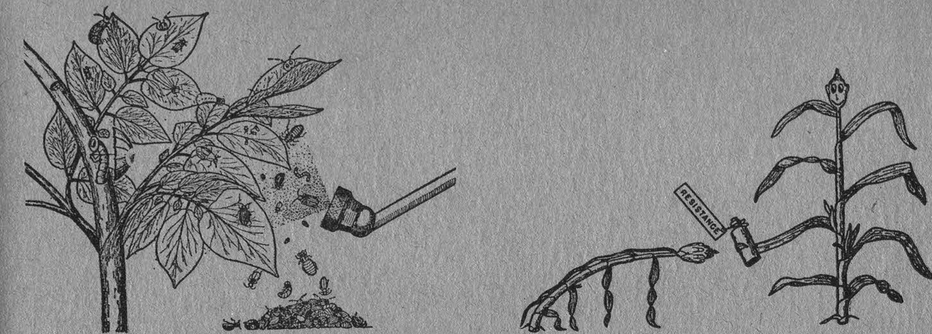
Host plants of European corn borer from the infested territory shall bear, as a condition for entry into the State of Wyoming, a certificate signed by an inspector of the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, or by an authorized inspector of the state of origin, certifying that the material contained in the shipment or lot has been treated under the supervision of said inspector by approved method or methods in such manner as to eliminate all risks of transmitting European corn borer. Black stem rust quarantine prevents shipment of certain barberries into Wyoming.

B. Thomas Snipes, State Entomologist, Powell, Wyo.

OFFICERS IN CHARGE OF INSPECTION AND QUARANTINE SERVICE

Alabama............B. P. Livingston, Chief, Division of Plant Industry, Montgomery, Ala.
Arizona............J. L. E. Lauderdale, State Entomologist, Box 2006, Phoenix, Ariz.
Arkansas............P. H. Millar, Chief Inspector, Little Rock, Ark.
California............D. B. Mackie, Chief, Quarantine Office, Sacramento, Calif.
Colorado............F. Herbert Gates, State Entomologist, Bureau of Plant and Insect Control, State Museum, Denver, 2, Colo.
Connecticut............R. B. Friend, State Entomologist, New Haven 4, Conn.
Delaware............S. L. Hopperstead, State Board of Agriculture, Newark, Del.
Florida............J. C. Goodwin, Nursery Inspector, Gainesville, Fla.
Georgia............C. H. Alden, Director of Entomology, Atlanta, Ga.
Idaho............D. A. Stubblefield, Director, Bureau of Plant Industry, Boise, Idaho.
Illinois............H. F. Seifert, Horticultural Inspection Supervisor, Division of Plant Industry, Glen Ellyn, Ill.
Indiana............Frank N. Wallace, State Entomologist, Department of Conservation, Indianapolis, Ind.
Iowa............Carl J. Drake, State Entomologist, Ames, Iowa.
Kansas............Geo. W. Kinkead, Secretary, Entomological Commission, Topeka, Kans.
Kentucky............W. A. Price, State Entomologist, Lexington, Ky.
Louisiana............W. E. Anderson, State Entomologist, Baton Rouge, La.
Maine............Stanley L. Painter, State Horticulturist, Augusta, Me.
Maryland............E. N. Cory, State Entomologist, College Park, Md.
Massachusetts............R. H. Allen, Director, Division of Plant Pest Control and Fairs, 24 State House, Boston, Mass.
Michigan............C. A. Boyer, Director of Orchard and Nursery Inspection Service, Department of Agriculture, Lansing, Mich.
Minnesota............T. L. Aamodt, State Entomologist, University Farm, St. Paul, Minn.
Mississippi............R. P. Colmer, Chief Inspector, State College, Miss.
Missouri............J. Allison Denning, State Entomologist, Jefferson City, Mo.
Montana............George L. Knight, Chief, Division of Horticulture, Missoula, Mont.
Nebraska............Rufus M. Howard, Director; L. M. Gates, Entomologist, State Department of Agriculture and Inspection, Lincoln, Nebr.
Nevada............George G. Schweis, Director, Division of Plant Industry, Box 1027, Reno, Nev.
New Hampshire............W. C. O'Kane, Deputy Commissioner of Agriculture, Durham, N. H.
New Jersey............Harry B. Weiss, Chief, Bureau of Plant Industry, State Department of Agriculture, Trenton, N. J.
New Mexico............R. F. Crawford, Plant Quarantine and Regulatory Office, State College, N. Mexico.
New York............A. B. Buchholz, Director, Bureau of Plant Industry, Department of Agriculture and Markets, Albany, N. Y.
North Carolina............C. H. Brannon, Entomologist, State Department of Agriculture, Raleigh, N. C.
North Dakota............J. A. Munro, State Entomologist, Experiment Station, State College Station, Fargo, N. D.
Ohio............John W. Baringer, Chief, Division of Plant Industry, Department of Agriculture, Columbus, O.
Oklahoma............Clyde A. Bower, Chief, Division of Entomology and Plant Industry, Oklahoma City, Okla.
Oregon............Frank McKennon, Chief, Division of Plant Industry, Department of Agriculture, Salem, Ore.
Pennsylvania............T. L. Guyton, Director, Bureau of Plant Industry, Harrisburg, Pa.
Rhode Island............Brayton Eddy, State Entomologist, State House, Providence, R. I.

South Carolina............South Carolina State Crop Pest Commission, Clemson College, S. C.
South Dakota............Norris M. Paulson, Director, Division of Plant Industry, Department of Agriculture, Pierre, S. D.; James L. Low, Nursery Inspector, Pierre, S. D.
Tennessee............G. M. Bentley, State Entomologist and Plant Pathologist, Knoxville, 16, Tenn.
Texas............J. M. Del Curto, Chief Entomologist, Department of Agriculture, Austin, Texas.
Utah............Earl Hutchings, Supervising Inspector, State Board of Agriculture, Salt Lake City, Utah.
Vermont............M. B. Cummings, State Nursery Inspector, Burlington, Vt.
Virginia............G. T. French, State Entomologist, Richmond, Va.
Washington............F. E. DeSellem, Supervisor of Horticulture, Olympia, Wash.
West Virginia............J. B. McLaughlin, Commissioner of Agriculture, Charleston, W. Va.
Wisconsin............E. L. Chambers, State Entomologist, Madison, Wis.
Wyoming............B. Thomas Snipes, State Entomologist, State Department of Agriculture, Powell, Wyo.
Federal Quarantines and District of Columbia............Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington 25, D. C.
Dominion of Canada..W. N. Keenan, Secretary, Destructive Insect and Pest Act Advisory Board, Department of Agriculture, Ottawa, Can.



CONTROLLING PESTS of WAR GARDENS

Connecticut
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New Haven

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Controlling Pests of War Gardens

By

Neely Turner and James G. Horsfall

Connecticut
Agricultural Experiment Station
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Circular 159 is a revision of Circular 155, issued in 1943, made necessary mainly by changes in available insecticides.

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Cover illustration by R. L. Beard, entomologist, Connecticut Agricultural Experiment Station.

Controlling Pests of War Gardens

NEELY TURNER AND JAMES G. HORSFALL

THIS circular has been prepared to provide the essential facts for successful pest control in the home garden. It aims at maximum production of food, rather than maximum control of pests.[1]

Like fleas on a dog, pests can be considered as normal in a garden. In extreme cases much production is lost to such pests. Fortunately, there are ways to outwit some pests and to reduce the damage from others by intelligent use of sprays, dusts, seed treatments and other methods. A well-diversified garden usually produces much edible food in spite of pests, although quality may be low and one or more crops may be a total loss.

To most gardeners pest control means application of sprays or dusts. Actually, such methods are effective in controlling only a small proportion of the ailments of plants. The root troubles, stem troubles and even many leaf pests cannot be touched by chemical treatment. The complete blueprint of pest control anticipates the pests as much as possible and uses preventive measures to the fullest extent.

There are, therefore, two types of pest control—the "armchair" method, which involves thoughtful planning and little work, and the "toil and sweat" method, which may involve less planning but certainly some physical effort. The former method is concerned with outwitting the pests; the latter, with besting them in combat. Both are necessary for the cleanest gardens.

ARMCHAIR CONTROL OF PESTS

Probably more pests can be controlled in an armchair in front of a February fire with a garden notebook and a seed catalog than can ever be knocked out in hand-to-hand combat in the garden with a spray or a dust gun. To that end we have classified garden crops on the basis of the damage that they can be expected to suffer. Then we have compiled a series of procedures by which the pests can be outwitted. And finally we have listed the decisions that must be made in order to spray and dust the crops properly.

Listing Crops by Damage

The first of the "armchair" procedures in pest control is to list those crops not usually afflicted, then those subject to pests that are easily controlled and, finally, those with pests difficult to control.

1. **Crops not usually afflicted** are:

Artichoke	Midseason sweet corn
Asparagus	Dandelion
Beets	Dill
Carrots	Endive
Chard	Leek
Chicory	Lettuce

[1] The classification of crops, dates of planting to avoid pests and dates for application of dusts or sprays are based on research conducted in Connecticut. They may not apply elsewhere.

Onions (from sets)	Sorrel
Parsley	Spinach
Parsnips	New Zealand spinach
Peppers	Strawberries
Raspberries	Sweet potatoes
Rhubarb	Turnips
Salsify	

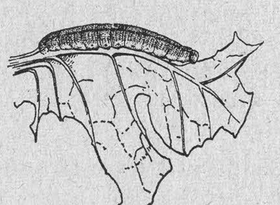
Essentially these crops need no treatments although the seeds of several of them, especially beets, chard and spinach, should be treated as described on page 55.

Occasionally a pest may cause loss of one or more of these crops, but this occurs so infrequently that any treatment is usually ignored. (The few pests of these crops that can be controlled will be mentioned on pages 58 to 61). Likewise, some of the crops in the list of those often seriously damaged by pests may come through a season with a fair yield without treatment.

2. **Crops with easily controlled pests:**

Two of the commonest vegetables, beans and early potatoes, require some, but not extensive, foliage treatment with pesticides.

3. **Crops with pests difficult to control:**



Imported cabbage worm

Cabbage, cauliflower, broccoli and brussels sprouts. Affected early in the season by cabbage maggots, later by cabbage worms and frequently by aphids, club root, black leg and black rot.

Celery. Often seriously attacked by leaf diseases. The yield of untreated celery may be fairly good but the appearance is poor, and the diseases develop in storage.

Extra early and **late sweet corn.** Seriously attacked by the European corn borer.

Cucumbers, melons and **squash.** Damaged by the striped cucumber beetle, squash vine borer and squash bug; and a whole catalog of diseases from foot rot to wilt and mildews.

Okra. Badly damaged by the Japanese beetle in some urban areas.

Onions from seed. Infected by pink root and attacked by thrips.

Peas. Seriously affected by root rots and occasionally by aphids.

Tip burn on potato leaf

Late potatoes (fall crop). Always seriously damaged by leafhoppers, flea beetles, tip burn and occasionally late blight and bird's-eye leaf spot.

Radishes. Early spring crop infested by the cabbage maggot.

Soybeans. Attractive to the Japanese beetle.

Tomatoes. Defoliated by leaf diseases just when the yield becomes heaviest, but maturing a reasonably satisfactory crop in spite of disease. After defoliation, fruits become insipid and flat.

Tomatoes were afflicted in 1943 with an unusual amount of leaf curl. This disease is not contagious. It seems to result from unbalanced growth, the exact nature of which is not understood. It is more serious on staked than on unstaked plants. It does not seem to be especially deleterious.

Many of these pests are described on pages 58 to 61.

Outwitting the Pests

CHOOSING RESISTANT VARIETIES.

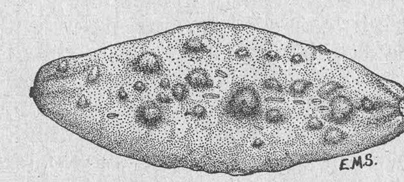
Many garden pests can be outwitted by choosing from the seed catalog varieties that will not take disease. It is true that many varieties are scarce, but the better results to be obtained from resistant varieties will usually repay a search.

Mary Washington and **Martha Washington** asparagus varieties are resistant to rust.

Bacterial leaf scorch is often serious on beans in Connecticut. **Robust** pea bean, yellow eye, the marrow type and the **Refugee** type such as **Tendergreen**, are resistant. Refugees in general are very susceptible, however, to mosaic, a disease which curls the leaves and pods. The **Great Northern** dry bean, **Idaho Refugee** and **Sensation Refugee** are resistant to mosaic. The following varieties are resistant to anthracnose or pod spot: **Idaho Refugee**, the red kidney type, the marrow type and most of the pea bean type.

Cabbage varieties resistant to the wilt or yellows disease are **Jersey Queen** (early), **Marion Market** and **Globe** (midseason) and **Wisconsin Ballhead Bugner** and **Red Hollander** (late).

Michigan Golden Celery is resistant to yellows.



Mosaic on cucumber fruit

Shamrock and **Chinese Long** cucumbers resist mosaic and downy mildew.

Stewart's wilt of corn may be serious in Connecticut unless resistant hybrid varieties like **Golden Cross Bantam, Spancross, Marcross** and **Carmelcross** are used.

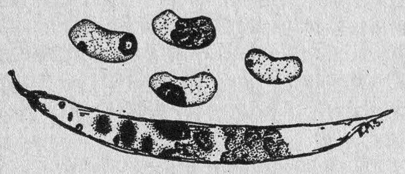
Potato varieties resistant to late blight are **Sequoia** and **Sebago. Sequoia** is resistant to leafhoppers and the resulting tip burn. **Sebago** potatoes resist scab.

Tomato varieties resistant to wilt are **Marglobe, Rutgers** and **Pritchard** (Scarlet Topper).

Cosberg and **Great Lakes** lettuce varieties are resistant to tip burn.

PURCHASING DISEASE-FREE SEED.

Many vegetable diseases get through a hard winter on the seed in the comparative comfort of a warehouse and then they ride into the garden on these seeds in the spring. Obviously, one can outwit seed-borne diseases by purchasing disease-free seeds or treated seeds.



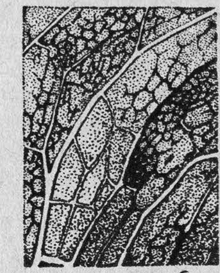
Anthracnose on bean pod and seed

Anthracnose or pod spot, bacterial leaf scorch and halo leaf spot of beans can be controlled by specifying that the seed must have been grown in California or the Twin Falls area of Idaho. Seeds of any vegetable should be grown as far north as possible. Northern seed will eliminate much of the disease from eggplants, tomatoes, sweet corn and potatoes.

Sometimes seedsmen cannot find disease-free areas for seed production. In those cases they can buy certified seed which has been examined in the field by a competent inspector. Certified seed is available for tomatoes and potatoes. Certified potato seed is usually a "must" in Connecticut, but Maine-grown table stock will serve in an emergency.

PURCHASING TREATED SEED.

Failing certification, seedsmen can rid certain seeds of disease by treatment. An increasing number of seedsmen sell treated seeds. Many seedsmen, however, are loath to treat seeds they sell because consumers are likely to feel that their seeds are basically poor and that they have been treated to cover up weaknesses. Such is not the case. Reputable seed specialists should be encouraged to treat seeds because there are no sources of naturally disease-free seeds of some crops and seed treatment is excellent insurance.



Black rot on cabbage leaf

DISINFECTIVE SEED TREATMENTS.

Some seed treatments are designed to rid the seeds of diseases carried thereon. Seeds of cabbage and other cole crops carry the black rot and black leg diseases which can be eliminated if the seedsman will pasteurize the seeds in hot water. Pasteurization will also eliminate celery blights from celery seeds, and some of the bacterial canker, bacterial fruit spot, anthracnose, small leaf spot and bird's-eye leaf spot from tomato seeds. Details are not pertinent here since the procedure is so complex that it cannot be handled by the gardener.

Late blight on celery leaf

Seeds of the cucurbit family should be treated with corrosive sublimate to control scab disease on the fruit, angular leaf spot and some anthracnose or fruit spot. Eggplant seed also should be treated with corrosive sublimate to control leaf blight and fruit rot

disease. The material should be used at the rate of 1-1,000, or one tablet in one pint of water. Seeds should be soaked for five minutes, rinsed in clean water and dried.

Celery seeds carry large and small leaf spots, so-called early and late blights. Two years' storage of seed will cause these diseases to die out of celery seeds.

The foot rot disease of summer squash is also seed-borne, but it also will die out if the seeds are held two years before planting.

Seed disinfection is valueless unless the seeds so treated are sown on land that did not support a sick crop of the same vegetable the previous year. This involves rotation, as mentioned on page 52.

PROTECTIVE SEED TREATMENTS.

Gardeners hear much of treatments designed to protect seeds and seedlings against decay in the soil and against damping-off. Since it is easy for gardeners to overdose seeds with these chemicals, it is simpler to purchase them pretreated. The desirable treatments are listed on pages 50 and 51.

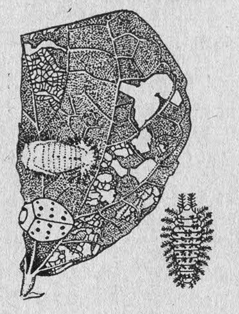
ADJUSTMENT OF PLANTING DATES.

1. **Radishes** planted before April 1 and after May 20 usually miss the cabbage maggot. There is no adequate home garden control method available for plantings between these dates, except covering the row with cheesecloth.

2. **Cabbage** set after June 1 avoids maggots.

3. **Peas** (early varieties) planted as early as possible and not later than April 15 usually mature a crop before root rot and mosaic ruin the vines.

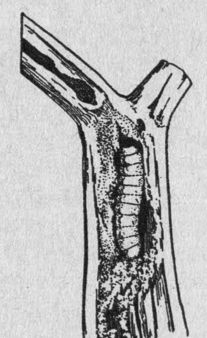
4. The **cucurbit crops,** such as melons, cucumbers and squash, planted after June 1 are not so seriously damaged by striped cucumber beetle or wilt. Mosaic and other diseases may come in later, of course. Reasonable crops may be expected, however.



Mexican bean beetle larvae and adult

5. **Beans** (bush snap varieties) planted between June 1 and 25 usually escape the Mexican bean beetle.

6. **Sweet corn** planted between May 20 and June 15 matures when few corn borers are present.



Squash vine borer

7. **Summer squash** planted after July 1 as a second crop will bear after the early plantings have been killed by vine borers, foot rot and wilt.

8. **Hubbard squash** planted on or before May 15 will be so well

established by July that it ordinarily escapes serious damage by squash vine borers.

9. **Tomatoes** grown in succession provide a means of escaping the effects of the defoliation disease (leaf destruction disease) that causes orange-colored, insipid fruits. The first two crops may be from plants transplanted May 20 and June 15. Seed for the last crop should be sown right in the field about June 1.

10. **Early potatoes** (Irish Cobbler variety) planted as early as possible in April usually mature a good crop before the leafhopper and tip burn season arrives.

11. **Beans, corn, squash** and occasionally **beets** planted after June 1 usually avoid serious damage by the seed corn maggot, which shreds germinating seeds. Shallow planting for quick emergence also helps.

ROTATION OF CROP FAMILIES.

Crops breed their own diseases in the soil. Therefore, they should not follow each other on the same spot for two consecutive years and preferably not for three or four years. The gardener should remember, too, that this applies to plant families as well as to specific crops. The plant families concerned are as follows: the cucurbit family includes melons, cucumbers and squash; the cole or cabbage family includes cabbage, cauliflower, brussels sprouts, kohlrabi, broccoli, radishes and turnips; the tomato family includes tomatoes, eggplant and peppers. Rotation is difficult in the 1,000 square foot garden, but it is feasible in larger ones.

Several root diseases like black-root of strawberries and pink-root on onions can be reduced if care is taken not to plant on sod or following a rye cover crop.

FERTILIZING.

A heavy application of fertilizer, 15 pounds per 100 feet of row, at the sides of the row, (not touching the seeds), will help to control root rot of peas and onion pink-root. A caution should be introduced here against applying fertilizer in the row with seeds. This is sometimes done to stimulate early growth, but in a dry season, seed damage with consequent poor stands, is likely to occur. This is especially true for peas, beans and potatoes.

Planning to Spray or Dust

After the gardener has taken advantage of all the armchair methods of control, there will still be pests to be controlled by direct application of chemicals. The use of such direct methods can be planned before the garden is actually planted. It is simple to prepare a list of the crops needing treatment and to select equipment and materials to be ready when the pests arrive.

EQUIPMENT.

Gardeners who have both a sprayer and duster on hand can use either or both to advantage. If no equipment is already available, the choice of spraying or dusting depends largely on whether a sprayer or a duster can be purchased. Most gardeners consider dusting less work than spraying. Dusting controls some insects as well as spraying. Spraying is highly superior to dusting for plant diseases and for control of leafhoppers and tip burn on potatoes.

Sprayers designed for use on a garden hose save much labor. In the cartridge type the water from the hose passes through the hole in the cartridge of a specially prepared material. The concentration of the material is greater when the cartridge is new and it decreases with use. The reservoir type mixes water with a liquid concentrate of standard materials. This sort of garden hose sprayer seems to offer a very satisfactory and labor-saving method of spraying, but neither type works properly if the water pressure is low.

AMOUNTS.

A pound of dust applied efficiently is enough to treat 400 feet of row once. One gallon of spray material should cover from 50 to 75 feet of row with hand sprayers. The average war garden of 1,000 square feet should require not more than two pounds of dust for the season. Enough spray material for 10 gallons of finished spray should accomplish the same results.

MATERIALS AVAILABLE.[2]

No restrictions of crops on which **rotenone** products may be used in war gardens have been issued for 1944. However, conservative estimates of the supply which may be available indicate that gardeners will not be able to find enough rotenone for use on all crops. It is suggested that rotenone products be saved for use on snap beans after the pods form and cauliflower, brussels sprouts, broccoli and cabbage within two weeks of harvest. Cryolite may be used for earlier treatment of these vegetables and for other crops.

Most of the dusts of this type can be purchased by asking for rotenone dust, although a few products have trade names. On the other hand, spray materials containing rotenone are usually sold under a trade name.

No regulations for use of **pyrethrum** have been issued for 1944. However, the supply is expected to be very small and none may be available for war gardeners. If available, it can be substituted for rotenone.

Nicotine sulfate sprays and dusts are available in large quantities and can be used successfully for many garden pests. The most common pests controlled by nicotine are aphids. Nicotine dust can be made at home by adding one fluid ounce of nicotine sulfate to one pound of hydrated lime and mixing thoroughly by shaking or rolling in a jar or can with a tight-fitting lid. Two or three small stones may be used to insure better mixing. The dust should be stored in a tight container.

Vegetables to be eaten without cooking should not be sprayed or dusted with nicotine within a week of use.

Cryolite (Kryocide and Alorco) and **barium fluosilicate** (Dutox) are highly effective in controlling many chewing insects. They are particularly valuable for dusting potatoes, tomatoes (early in the season), beans and cabbage. Care should be taken to avoid drifting of dust or spray to leafy

[2] Information on materials available is as of January 1, 1944.

green vegetables, and treatment of beans and cabbage just before harvest should be avoided.

The dust materials just mentioned should be purchased ready for use in dusts. For sprays, the directions on the package may be followed.

Bordeaux mixture is an excellent spray for diseases but it is difficult to prepare. One gallon should cover 50 to 75 feet of row with hand sprayers. It is prepared by mixing one ounce of copper sulfate in ½ gallon of water with ½ ounce of fresh hydrated lime in ½ gallon of water. The copper sulfate should be dissolved the day before use, in a glass container. The two materials are then mixed together and are ready for use. The mixture cannot be stored for use later, but should be prepared fresh for each application.

Manufacturers now sell many types of factory-made **copper** sprays that are less injurious to most vegetables than Bordeaux mixture and are much easier to handle. These include Copper A Compound, Cupro-K, C. O. C. S., Tribasic Copper Sulfate and Cuprocide. Only Bordeaux mixture should be used on late potatoes in Connecticut, however.

It is not necessary to have all the materials mentioned. Any one of the combinations listed below will suffice.

1. Cryolite dust or spray for all chewing insects and nicotine dust or spray for aphids.

2. Rotenone dust (or spray) for all foliage insects.

3. Pyrethrum dust (or spray), if available, for all foliage insects.

In addition prepared cutworm bait is usually needed. If late potatoes are grown, materials for making Bordeaux mixture should be included.

TOIL AND SWEAT CONTROL OF PESTS

Despite any amount of mental manipulation of a pest control program, some pests will still remain to be combated by toil and sweat in the garden. For convenience this portion of pest control will be divided into preseason, growing season, and postseason treatments.

Preseason Treatments

SOIL TREATMENT.

Seeds grown indoors should be sown in new-washed sand in new or sterilized flats or boxes to prevent damping-off. If sand is used it must be watered with a solution of complete fertilizer to prevent seedling starvation. Soil, if used, should be cooked, either by flooding with boiling water (which puddles the soil) or by steaming in flats in a covered kettle without pressure until temperature reaches 125° or 130° F. on a meat thermometer inserted into the soil. Treated soil should be placed only in sterilized flats and worked only with sterilized tools.

DISINFECTIVE SEED TREATMENTS.

Since it may be difficult to purchase pretreated seeds, some gardeners will desire to treat their own. Pasteurization is too complex a treatment for home use, but the corrosive sublimate treatment can be applied by the gardener. Seeds of the cucurbit family should be treated with corrosive sublimate to control scab disease on the fruit, angular leaf spot and some anthracnose or fruit spot.

The material should be used at the rate of 1-1,000, or one tablet in one pint of water. Seeds should be soaked for five minutes, rinsed in clean water and dried. Corrosive sublimate can be used also to some extent as a substitute for the hot water pasteurization of seeds of the cabbage family and of tomatoes.

PROTECTIVE SEED TREATMENTS.

Protective seed treatments can be applied by any gardener, especially if he is careful not to overdose.

This Station has participated in a nationwide testing of these materials. Results indicate that Arasan, a new material just reaching the market, is good for beets, onions and peas. Red Cuprocide is first choice for spinach, the cucumber family, lettuce, endive, beets, chard and the tomato family. It injures the cabbage family. Semesan is first choice for the cabbage family and Semesan Jr. for sweet corn. It injures the tomato family. Spergon is first choice for peas, snap beans and lima beans. It injures beets and chard.

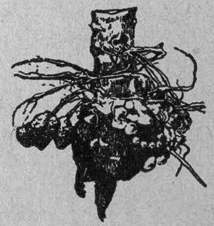
The quantity of material necessary varies with the seed size. Big seeds like peas, beans, corn, the cucumber family, beets and chard, should require ¼ teaspoonful per pound of seed (0.25 percent by weight). Small seeds should have one teaspoonful per pound of seed (1.0 per cent by weight).

Seeds should be shaken with the chemical in a small jar or can. Usually, excess dosage can be removed if the seed is screened vigorously after treatment.

Scab on potato tuber

ADJUSTMENT OF SOIL ACIDITY.

1. **Potato scab** develops in soil that has been limed suitably for spinach, beans and other vegetables. Most Connecticut soils are normally very acid. If land has not been limed in the past five years, 40 pounds to 1,000 square feet should not be enough to encourage scab.



Club root on cabbage seedling

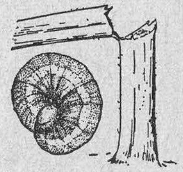
2. **Club root** of cabbage and allied crops develops mostly in highly acid soils. Normal applications of lime (50 to 100 pounds to 1,000 square feet) should be used for these crops. If club root develops on the early crops, a second application of lime should be made before later plantings.

These diseases cannot both be controlled in the same soil. In land not cultivated recently scab is more likely to occur than club root.

POISONED BAITS.

Cutworms are hairless caterpillars hiding in the soil near plants during the day and feeding at night. They cut off newly-set plants near the surface of the ground. They are most destructive to tomato, pepper, cabbage and lettuce plants.

Paper collars wrapped around the stems of newly-set plants are very effective; or use prepared cutworm bait as directed.



Cutworm and damaged plant

Home-mixed bait: one pound of wheat bran and one ounce of Paris green, mixed dry and later moistened until damp (not enough to drip when squeezed lightly). Scatter in the evening. One pound is enough for 2,000 square feet. Paris green is a poison, so handle with care.

Growing Season Treatments

Celery worm

HAND PICKING OF INSECTS.

The old-fashioned method of hand picking such pests as the Mexican bean beetle, Colorado potato beetle, hornworms on tomatoes, celery caterpillar on parsley, parsnips, carrots and other crops, and even cabbage worms on broccoli and kale is entirely practical. The adults and larvae can be killed by dropping them into a can containing some water and a film of kerosene. Egg masses can be crushed without harming the leaves. Any diseased or dead plants that appear should be pulled and burned.

DESTROYING WEED HOSTS.

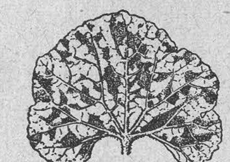
Many common weeds are host to many garden pests. This is especially true for the virus or mosaic diseases, those diseases that distort leaves or fruits and make them look mottled. However clean a gardener keeps his own premises, his neighbors can grow weeds for him. The important weeds are the mustard family, milkweeds, nightshade, mother wort, and groundcherry or husk tomatoes. Some ornamentals like petunia and flowering tobacco carry the mosaic disease of the cucurbit family and tomatoes or peppers. These may serve to infect tomato seedlings in the greenhouse before the gardener purchases them.

NO SMOKING.

Tobacco is commonly afflicted by the mosaic disease which is not killed by the curing process. Hence if tomatoes or peppers are pruned, staked or picked after handling tobacco, they may be inoculated with mosaic.

TOUCHING WET FOLIAGE.

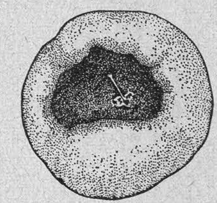
The fungi and bacteria that produce disease on leaves, pods or fruits enjoy moisture. In fact they move from leaf to leaf only during rainy periods. Obviously, the gardener should not encourage them by picking or cultivating vegetables when the foliage is wet with rain or dew. This is particularly true of beans, tomatoes, cucurbits, eggplants and strawberries.



Downy mildew on melon leaf

IRRIGATION.

Wilt diseases of tomato, cucurbits, eggplant and cabbage, pea root rot and blossom-end rot of tomato fruits are all more destructive in dry than in moist periods. Hence irrigation to keep up the soil moisture level is helpful.



Blossom-end rot on tomato fruit

SHADING.

The defoliation disease or bird's-eye leaf spot of tomatoes is one of the worrisome pests of the garden. Spraying or dusting is not especially effective against it. If the plants are covered with a tobacco cloth shade between June 1 and September 1, the disease can be markedly reduced.

COMBATING ANIMAL PESTS.

Rabbits and **woodchucks** frequently damage growing vegetables in rural and suburban areas. Fencing will protect gardens from these pests. Persistent applications of sulphur or tobacco dust are said to be effective in preventing damage. Spraying with nicotine sulfate also helps. Woodchucks should be eliminated early in the season before vegetation hides the openings of the dens used by these animals. Woodchuck "bombs" are perhaps the most satisfactory means of controlling this pest. They may be obtained from the county agents at a cost of a few cents each.

Moles do some damage to gardens, but are believed to eat animals and not plants. **Mice** frequently live and feed in old mole burrows, doing much damage to crops. Methods of poisoning mice and suggestions for controlling rabbits, woodchucks and moles may be obtained from Francis B. Schuler, Fish and Wildlife Service, University of Connecticut, Storrs, Connecticut.

Birds are serious pests of small fruits and especially blueberries. Covering the entire vines with coarse cheesecloth or tobacco tent cloth protects the ripening fruit.

VEGETABLE PESTS CONTROLLED BY SPRAYING AND DUSTING.

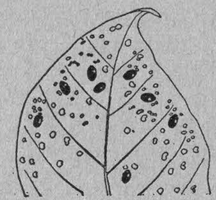
Some general suggestions for application of materials can be made. Pesticides at best may injure plants. They show a beneficial effect only when the gain from pest control outweighs the damage from the chemicals. Therefore an overload or an excessive number of applications should be avoided. In fact, a fine even coat of either sprays or dusts is sufficient for control. For many insects and all diseases, *both surfaces* of all leaves must be covered for best results. For insects feeding only on the under sides of the leaves, treatment may be limited to that surface. Either sprays or dusts must be applied with the nozzle pointing to the surface to be covered. Dusts can be applied most effectively late in the evening when no wind is blowing and before dew is present. A pound of dust applied efficiently is enough to treat 400 feet of row once. One gallon of spray should cover from 50 to 75 feet of row with hand sprayers.

Aphids on potato leaf

Aphids. Small red, green, brown or black sucking insects on the stems and leaves of various plants. Destructive most commonly to broccoli, cabbage, tomatoes and potatoes. Also occur on spinach, chard, peppers, brussels sprouts, kale, peas, corn, etc.

Any good contact insecticide, such as nicotine sulfate for sprays or dusts. Applications are most successful in the warm part of the day. Repeated treatments may be necessary.

Flea beetles. Small black beetles that jump when disturbed. Feeding marks are small round holes in the leaves of tomatoes, eggplants, potatoes and sometimes peppers.



Flea beetles on potato leaf

Cryolite or rotenone dusts or sprays. Damage is usually worst in May and June, and two or three treatments may be needed about May 15, May 25 and June 5.

Defoliation diseases. Many vegetables are afflicted by fungous diseases that produce spots on leaves followed by defoliation. Most seriously affected are tomatoe and potatoes. Attack also celery, cucurbits, beets, carrots, eggplants and sometimes beans. The eggplant disease may also produce a fruit rot. There is no passing of disease from one crop to another except between tomatoes and potatoes.

Usually copper sprays such as Bordeaux mixture are suggested. These seldom pay unless unremitting attention is given to the spraying. Several applications should be put on, beginning about July 4. If a gardener takes pride in good foliage and quality of production, it is desirable to spray, but he will seldom find an increased yield to pay for his trouble. Dusting with commercial copper dust is easier, but distinctly less effective. Dusts must be applied to damp foliage. Crops liable to defoliation diseases must on no account be picked or cultivated when wet, because the diseases are spread on wet foliage.

Mexican bean beetle. Attacks snap, shell and lima beans. A yellow to brown beetle about

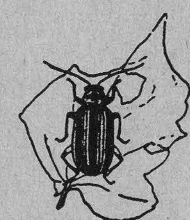
one-fourth of an inch long, oval in shape. Has eight small black spots on each wing cover. Eggs are yellow and laid in groups on the under surface of the leaves. Larvae are light yellow and feed on the under surface of the leaves.

Persistant hand picking of adults and crushing the egg masses is practical in the home garden. Dusts or sprays of rotenone, pyrethrum or cryolite should be applied to the under surface of the leaves.

Early beans need treatment about June 7 and 21.

As previously mentioned, midseason snap beans planted between June 1 and 25 seldom require treatment.

Late beans need treatment about July 29, August 9 and August 20. Pole and lima beans may need all treatments.



Striped cucumber beetle

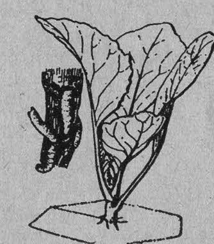
Striped cucumber beetles. Feed on cucumbers, melons and squash. About one-fourth of an inch long, yellow with three longitudinal black stripes and a black head. Beetles appear in May or early June when seedlings are just getting started. The beetles eat leaves, and carry the wilt disease from plant to plant.

Dusts or sprays of cryolite, rotenone or nicotine as soon as the first beetles appear and repeated about twice a week until the plants are well started.

Bacterial wilt of squash vine

Small screen wire cages may be used to protect seedlings.

Cabbage maggots are small white maggots feeding on the tap root just below the surface of the ground. Larvae from eggs laid in May attack early cabbage, allied crops and radishes. The injury in radishes appears as rusty streaks.

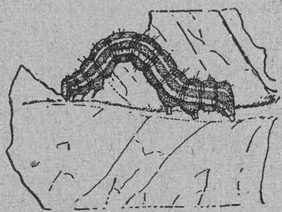


Paper disc on cabbage plant

Set a tar paper disc around each plant immediately after planting. The edges of the disc can be held down with some soil. The discs must fit the stem tightly so that the adult fly cannot lay her eggs in the soil at the base of the plants. They should remain in place until June 1. Ready-made discs are available and are preferred because the paper is soft enough to fit well around the stems. Kraft paper or ordinary building paper warps when it is alternately wet and dried and allows the flies to deposit eggs around the stem of the plant.

Maggots from eggs laid in August may attack late turnips.

Cabbage worms of at least three species may attack any planting of cabbage or allied crops. Damage is usually noticed first as comparatively large holes in the outer leaves. More serious on late crops.

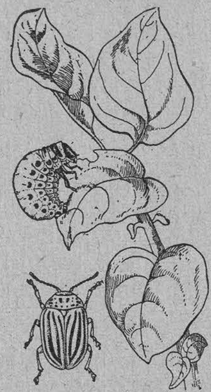


Cabbage looper

Cryolite or rotenone dusts or sprays. Needed on early crop about June 20 and on later plantings once in 10 days, starting late in July. Rotenone is preferred for any application necessary just before harvest.

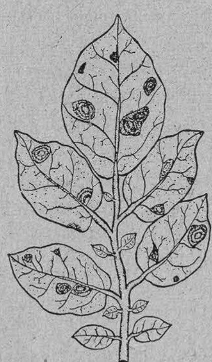
European corn borer attacks sweet corn maturing early in July and late in August or September. Dusting methods are available (see Circular No. 147 of the Connecticut Agricultural Experiment Station). Also attacks potato vines in some seasons, and has damaged tomatoes growing near corn or potatoes. Dusts of cryolite applied about June 1, 8, 15, and 22 will control the corn borer on potatoes. Dusting should not be necessary on tomatoes. Cryolite should not be used on corn as it burns the foliage.

Colorado potato beetle. The black and yellow striped Colorado potato beetle attacks both early and late potatoes early in the season. Applications of cryolite to control flea beetles (about May 15 and June 1) also control this pest.



Colorado potato beetle

Potato leafhopper. The pale green potato leafhopper is the most destructive pest of late potatoes. A sucking insect, about one-eighth of an inch long, feeding on the under surface of the leaves. The leafhopper and other factors bring about tip burn, a dying of leaves beginning at the tips. **Late blight** of potato may kill foliage badly every few years and cause the tubers to rot. **Bird's-eye leaf spot** sometimes peppers the foliage with black spots that have rings in them, hence the name.

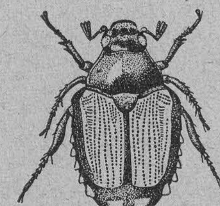


Bird's-eye leaf spot on potato

Both leafhoppers and late blight are controlled by Bordeaux mixture spray applied the first week in July and every 10 days thereafter until the vines die. Thorough spraying of both surfaces of the leaves is necessary. This is a "must" for all late potato varieties except Sequoia which resists leafhopper attacks. Even Sequoia should yield better if sprayed.

Late blight on potato leaf

The **Japanese beetle** is a serious pest in urban areas, feeding freely on soybeans, okra, blueberries, raspberries and grapes, and less abundantly on sweet potatoes, and foliage and silks of sweet corn. Frequent dusts or sprays of rotenone materials or hydrated lime reduce foliage feeding.

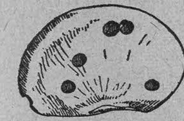


Japanese beetle

Corn silks can be protected by dusting the silks with rotenone dusts or hydrated lime three times at intervals of three days.

Postseason Treatments

Weevils that lay their eggs in the pods before harvest frequently destroy dried peas and beans.



Bean weevil injury

Heating the dried peas or beans to 120° F. for four hours should kill the eggs and young larvae. The heat treatment may harden some of the beans.

The beans may be mixed with one pound of hydrated lime for each two pounds of beans.

Fumigation with carbon bisulfide at the rate of ½ ounce for each bushel of seed is effective. This material is highly explosive in the gaseous state and should be used where there is no danger of fire. An ash can covered with heavy paper makes a good fumigation chamber. It should be left closed overnight and works most efficiently when the temperature is 60° F. or more.

Storage rot of sweet potatoes can be prevented by drying the roots at a temperature of 80° F. for a week and then storing in a warm, dry place. Care should be taken not to injure the potatoes.

Mold of dried beans (in the pod) can be avoided by spreading the pods thinly until thoroughly dry.

The **leaf spot** or **blight disease** of celery increases in storage. The best control is to spray with copper fungicides during the season and to remove spotted leaves at harvest time.

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Circular 160

Reprinted March, 1945

POISON IVY and ITS ERADICATION

E. M. Stoddard

Poison Ivy

Connecticut
Agricultural Experiment Station
New Haven

Poison Ivy and Its Eradication

E. M. Stoddard

It is safe to assume that most people are more interested in the methods of eradicating poison ivy than they are in its botanical classification. The main purpose of this circular is to supply information on eradication methods, but a brief outline of the family history and distinguishing characteristics of the plant seems appropriate.

Description and Occurrence

Poison ivy is a common wild plant growing over most of North America south of Nova Scotia. It belongs to a small family of plants represented in the Northeastern United States by seven species, two of which are poisonous, *Rhus venenata* DC., poison sumac, and *Rhus Toxicodendron* L., poison ivy. Poison ivy is also called poison oak, Mercury and three-leaved ivy.

Poison ivy grows on all types of soil, wet or dry, fertile or poor, under all conditions of light and shade, and in successful competition with all and sundry other plants. It may grow as a trailing vine in grassland, climb on fence posts, stonewalls, trees, and even buildings, or appear as an upright shrub without benefit of auxiliary support. But it is all the same poison ivy with a common distinguishing characteristic of shiny green leaflets in sets of three. The leaflets are pointed and the edges may be lobed, variously notched, wavy, or entire.

Poisonous Action

The poisonous principle of poison ivy is urushiol, a material found in all parts of the plant including the roots. Contact with the plant, or with something that has been in contact with the plant, is necessary to produce injury. The possible exception to this is contact with smoke of the burning plant, although there seems to be some disagreement among authorities on this point. It is not our proper function to prescribe treatment, but we can say that prompt washing with laundry soap after contact with poison ivy will help materially in preventing injury.

Methods of Eradication

Poison ivy can be eradicated by removal of the plant and by the application of herbicides. Hard work and the danger of poisoning at once preclude the general application of the first method. The use of herbicides is by far the safest and easiest method of eradication and the one to which we will devote our attention. There are three herbicides which we know from experience will eradicate poison ivy,

"Atlacide", "Ammate" and borax. A new herbicide, 2-4 dichlorophenoxyacetic acid, will probably be on the market soon under various trade names. This new material is a plant hormone inducing unfavorable growth responses which result in the eventual death of the plant. The reports of the experimental work on this material indicate that it will be useful as a poison ivy eradicant. It will be used as a spray at a concentration of about 1 part to 1000 parts of water, applied to the growing plants at the rate of 5 gallons per 1000 square feet.

"Atlacide" is the trade name for a preparation of sodium chlorate combined with some material to eliminate the fire hazard. It is a granular compound which is dissolved in water at the rate of one pound per gallon and sprayed on the foliage. One gallon will spray approximately 100 square feet.

"Ammate" is a commercial preparation of ammonium sulfamate and, like "Atlacide", is sprayed on the foliage at a concentration of one pound per gallon of water.

The borax used is the common commercial borax and is applied dry to the soil, where the poison ivy is growing, at the rate of ten pounds per square rod.

It should be remembered that all these materials will kill nearly all other plants just as effectively as they do poison ivy and care must be taken in using them around useful plants, shrubs or trees. It is safe to spray poison ivy under trees and shrubs with "Atlacide" or "Ammate", provided none of the material gets directly on such trees or shrubs. It is *not* safe to put borax on the soil around trees or shrubs.

Both "Atlacide" and "Ammate" are absorbed by the plant through the leaves and the resultant killing is accomplished by the herbicide being distributed throughout the entire plant from the leaves. This action makes it necessary to give the poison ivy a very thorough spraying, but it is not necessary to soak the soil. A better kill results if the poison ivy plant is left standing until the next spring, rather than mowing it off as soon as the leaves are dead. Borax is absorbed by the plant through the roots and it is not necessary to apply the borax to the foliage to kill the plant.

"Ammate" and "Atlacide" are more effective if used in August or very early September, although a good kill will result if they are applied at any time the poison ivy plant is in full leaf. Our experiments and observations indicate that they are more effective if applied on a cloudy day because there is a better chance for the materials to be absorbed under these conditions than on a hot, dry day when the solution dries quickly on the leaves. The time of year or weather conditions at time of application do not seem important where borax is used, except that it be used some time during the growing season.

None of these materials is dangerous to handle nor are they considered poisons. It is suggested, however, that reasonable care be taken when using them and that they not be used where livstock can feed on the treated plants. If either "Ammate" or "Atlacide" is used in a sprayer that will later be used for spraying crop plants, it will be necessary to clean the sprayer *very carefully* with several washings of clean water to prevent injury to such plants from residue left anywhere in the sprayer. *Do not forget to do this.* On this account it is suggested that fruit growers may find it better to use a knapsack pump and man power than risk injury to their trees from residue left in the power sprayer.

Summary

The following table summarizes our experience and experiments with three of the herbicides discussed in this circular.

Availability—"Ammate" scarce. "Atlacide" probably not available for the duration of the war. Borax plentiful.

Cost—Borax is cheaper than the other two materials.

Ease of Application—Borax requires no special equipment for applying. Others require spray apparatus.

Effectiveness—In our experiments borax has given more complete original kill at 10 pounds per square rod than "Ammate" or "Atlacide" at 1 pound per gallon applied at the rate of 1 gallon per 100 square feet.

Safety—All equally safe to use in respect to injury to person or clothes. "Ammate" may be corrosive to spray machinery if not carefully cleaned after using. They are not especially poisonous, but we suggest that animals should not be allowed to feed on treated areas.

General—It is not safe to use borax around trees and shrubs. The other materials can be used safely if not applied directly to such plants. Borax will have some temporary residual effect on the soil which will disappear with weathering or application of lime.

Effectiveness of Control Materials

In conclusion, may we say that these materials are not possessed of magic qualities and are effective only when correctly and thoroughly applied. They will not result in a 100 per cent kill on the first application under ordinary conditions. It will probably take two seasons' work to eradicate well-established poison ivy. But we can say that these materials, together with perseverance, will eradicate poison ivy, as well as a wide variety of other undesirable plants. The materials mentioned in this circular are not necessarily the only ones that will eradicate poison ivy, but they are the ones which we know by experience or from reliable information will do the job successfully.

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GENERAL INDEX

For the Year Ending October 31, 1943