

*The
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Agricultural
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Station,
New Haven*

**Quality and Quantity
of Pesticides Sold
in Connecticut 1988**

BY LESTER HANKIN
AND PAUL E. WAGGONER

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SUMMARY

Sales of restricted pesticides in Connecticut have been recorded since 1979. These data show that the quantities of restricted pesticides sold have declined markedly. From the 100 to 120 metric tons sold during each year from 1979 to 1984, the quantity fell to only 43 metric tons in 1988. The quantity intended to control soil pests was always more than half the total. The greatest decline in 1988 was in chlordane, formerly used for termite control and now banned. Other noteworthy declines were in the sales of Vorlex, a soil pesticide; alachlor, an herbicide; methyl bromide, a fumigant; and carbofuran, an insecticide/nematocide.

Samples tested during 1988 showed that 8% of the 226 examined were in violation of at least one active ingredient. In all, 3.7% of all the 374 active ingredients declared were deficient, 0.5% excessive, and 1.1% contained an unlisted ingredient.



The Connecticut Agricultural Experiment Station,

founded in 1875, is the first experiment station in America. It is chartered by the General Assembly to make scientific inquiries and experiments regarding plants and their pests, insects, soil and water, and to perform analyses for State agencies. The laboratories of the Station are in New Haven and Windsor; its Lockwood Farm is in Hamden. Single copies of bulletins are available free upon request to Publications; Box 1106; New Haven, Connecticut 06504.

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Quality and Quantity of Pesticides

Sold in Connecticut 1987

BY LESTER HANKIN
AND PAUL E. WAGGONER

Among environmental worries, worry about pesticides is a persistent one. To avoid pesticides, people would like a miraculous removal of insects that plague them as when a tiny wasp removed the elm spanworm from Connecticut in the 1970's (Kaya 1972), or a miracle like the removal of the gypsy moth in 1989 by a combination of rain and a pathogenic fungus that was discovered by T. Andreadis of this Station and cited by Grant (1989).

Day in and day out, however, people must still use pesticides to control pests--the insects, microbes, weeds, nematodes and rodents that plague them or their plants and possessions. Thus they want to know how much pesticide is being used and whether the label on a bottle or tank of pesticide matches the contents. The Connecticut General Assembly has authorized analyses and then this public report on the quantity and quality of pesticides sold in the state.

QUANTITY AND HAZARD OF RESTRICTED PESTICIDES SOLD

Section 22a-50 of the Connecticut general statutes specifies that pesticides that may adversely affect the environment be classified for "restricted use" by the Commissioner of Environmental protection. The statute states: "In the event that the Commissioner determines that the pesticide, when applied in accordance with its direction for use, warning, and cautions and for the use for which it is registered, or for one or more of such uses, or in accordance with a widespread and commonly recognized practice, may generally cause, without additional regulatory restrictions, unreasonable adverse effects on the environment, including injury to the applicator, he shall classify the pesticide, or the particular use or uses to which the determination applies, for restricted use...." Thus, examining the restricted pesticides is examining the potent ones.

Since 1979, Stephen Hitchcock and Bradford Robinson of the Department of Environmental Protection have faithfully recorded sales of restricted pesticides in the State, and they have generously supplied the data to us. The quantity of pesticides sold does not precisely reveal use. Use is the sales in the State, plus the pesticides bought outside the State and used here, minus the pesticides bought here and used elsewhere.

Although sales are not precisely the use, the sales do show where large quantities are used and indicate the trend in use of potent pesticides. Bulletins 831, 849, and 862 report use and sales during 1979-80. In Table 1 is shown the use of each restricted pesticide sold in Connecticut in 1988.

QUANTITY

The reports of the quantities of restricted pesticides from 1979 through 1988 make a decade-long series, Fig. 1. The trend is clearly down. The tops of the bars in Fig. 1 show the total of all restricted pesticides sold. From the 100 to 120 metric tons sold during 1979-84, the quantity fell to only 43 tons in 1988.

Segments of the bars show the quantity of broad classes according to the pest they were intended to control. The top, white segment indicates gaseous fumigants, mostly methyl bromide, sold for controlling a variety of pests. The black segment indicates the fungicides for fungi, and it was so small after 1982 that it could not be shown on the graph. The segment of small dots indicates the insecticides for insects. The segment of large dots indicates the herbicides for weeds. Finally the granular segment at the bottom indicates pesticides for such pests in the soil as nematodes and insects, which are controlled by injection or drenching of the soil. Too small to show on the graph were the quantities sold for controlling rodents and a miscellany of compounds,

including bird repellants and creosote. The quantity intended to control soil pests was always more than half the total.

During the decade, 118 restricted pesticide ingredients were sold. The ingredients in each class were: weeds-27, fungi-12, insects-40, soil pests-23, fumigants-2, rodents-9; miscellany-5.

A trend of the quantity can be summarized as percentage change per year. The logarithm of the quantities of all, and of the classes for controlling weeds and insects are shown on Fig. 2. The uppermost straight

line represents a trend of 8% less per year in the total quantity. The line drawn through the herbicides for controlling weeds is down 13% per year. The bottom line in the graph falls 2% per year; although it passes through the insecticides, the trend in this class is not clear.

Pesticides to control pests in the soil were sold in largest quantity of any class, and their downward trend of 6% per year is much like that of the total. Fungicides declined fully 26% per year. Rodenticides rose from less than 70 kg per year during 1979-82 to 130 to 200 kg per year during 1983-88. Fumigants showed no trend.

Table 1. The active ingredients in restricted pesticides sold in Connecticut during 1988. The ingredients are classified according to their targets. The uses of the 75 ingredients were found in the Handbook of Farm Chemicals published by Meister Publishing Co., Willoughby OH. Subcategories within the target "Soil" are shown. An ingredient used against soil pests is not listed in another category. The ingredients listed under "Fungi" and "Insects" are generally sprayed whereas the "Soil" ingredients are generally injected or incorporated into the soil. The category "Other" includes the bird repellants avitrol and methiocarb, the fumigant methyl bromide, and the growth-regulator daminozide. Some ingredients below are found in non-restricted pesticides in formulations not deemed hazardous when used according to directions.

Soil	Insects	Weeds	Fungi	Rodents	Other
	acephate	2,4-D	captafol	chlorophacinone	avitrol
Fungi:	amitraz	alachlor	chlorothalonil	diphacinone	methiocarb
banrot	bendiocarb	amitrole	dodemorph acetate	zinc phosphide	methyl bromide
truban	carzol	aquashade	mercurous cl		
daminozide	cyfluthrin	cutrine	mercuric cl		
Insects:	cypermethrin	cyanazine			
chlordane	DDVP	diquat			
chlorpyrifos	dicrotophos	endothall			
disulfoton	dioxathion	fenoxaprop-ethyl			
isofenphos	endosulfan	fluridone			
metasystox R	fenvalerate	glyphosate			
	guthion	paraquat			
Insects &	lindane	picloram			
Nematodes:	methamidophos	prometon			
aldicarb	methomyl	simazine			
carbofuran	methyl parathion	tridiphane			
dasanit	naled	cu sulfate			
diazinon	nicotine				
isazophos	omite				
oxamyl	parathion				
terbufos	permethrin				
phorate					
	phosalone				
Fumigants:	phosphamidon				
vapam	propetamphos				
vorlex	propoxur				
	rotenone				
	vendex				
	sulfotep				

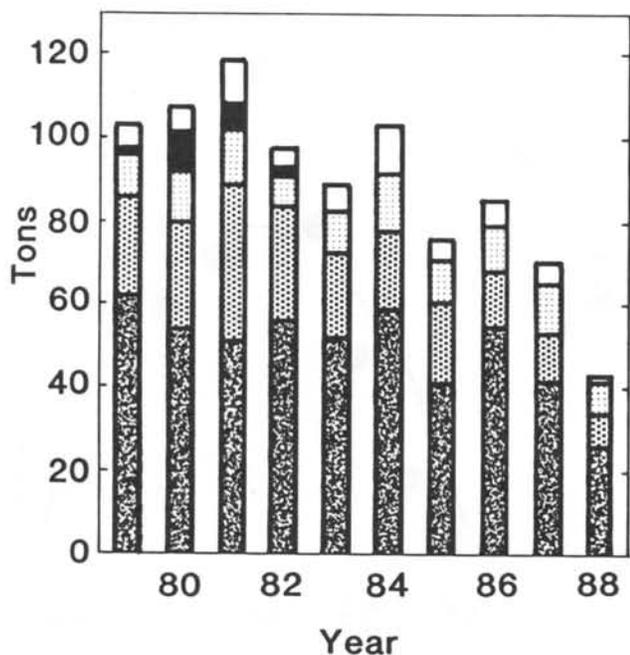


Figure 1. The quantities of restricted pesticides sold in Connecticut from 1979 through 1988. From the top of the bars, the broad classes of pesticides are: Fumigants (white), Fungicides (black), Insecticides, (small dots), Herbicides to control weeds (large dots), Pesticides to control organisms in the soil (granular). In all years the quantities of rodenticides and miscellaneous pesticides were too small and after 1982 the quantity of fungicide was too small to show on the graph.

Changes in sales of individual ingredients can be grasped by stating that in 1988 sales of 13 pesticides exceeded their *average* of 1979-87 by more than 0.1 ton. Noteworthy for their rises were the termite controllers chlorpyrifos and permethrin, the herbicide cyanazine, and the insecticide/nematocide isazaphos.

On the other hand, 1988 sales of fully 33 pesticides fell more than 0.1 below their *average* of 1979-87. The largest fall was in chlordane, formerly used for termite control and now banned. Other noteworthy falls were in the soil pesticide Vorlex, the herbicide alachlor, the fumigant methyl bromide, and the insecticide/nematocide carbofuran.

The trend in four pesticides exemplify trends in sales:

--The fall in Vorlex is shown in Fig. 3. It is a soil fumigant that controls weeds, fungi, insects and nematodes and has an LD50 of 489 mg/kg. When one of its components, 1,3-dichloropropane was found harmful, 2,3-dichloropropene was substituted. 1,3-Dichloropropane was discovered in

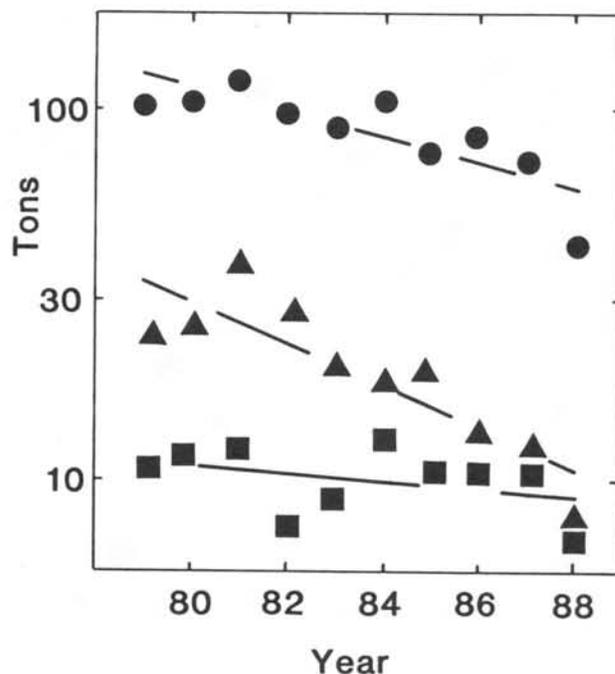


Figure 2. The quantity of all restricted pesticides and of the classes for controlling weeds and insects. The vertical coordinate is logarithmic. The line drawn through the dots for the total falls 8%, that through the triangles for herbicides falls 13%, and that through the squares for insecticides falls 2% per year.

groundwater (Frink and Hankin 1986). During the decade, sales of Vorlex fell about 2.5 tons per year. The falls of the systemic insecticide, acaricide, nematocide called aldicarb or Temik and of the herbicide alachlor were similar.

--The fall of chlordane and rise of chlorpyrifos is shown in Fig. 4. Both are soil insecticides, chlordane with an LD50 of about 400 mg/kg and chlorpyrifos with about 100. Early in the decade chlordane was applied to control plant pests, then it was restricted to termites, and in 1988 it was banned. Chlorpyrifos is one of the replacements for chlordane. Hence, chlorpyrifos rose as chlordane fell.

--Methyl parathion is an insecticide with an LD50 of only 5 mg/kg. When it is encapsulated, however, its toxicity to an applicator is less. The microcapsules are used in orchards and corn fields. When it was found killing bees (Anderson and Glowa 1984, Anderson and Wotjas 1986), its use was regulated, and sales fell (Fig. 5).

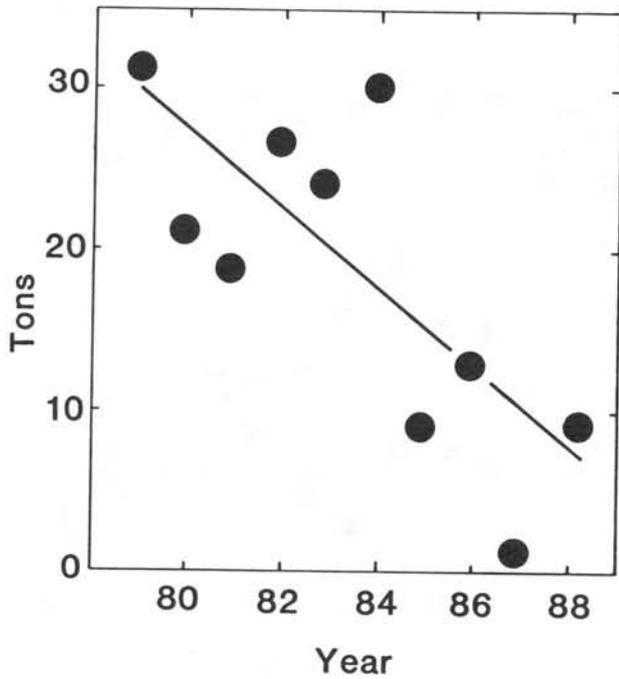


Figure 3. The quantity of the soil pesticide Vorlex sold. The line falls 2.5 tons per year.

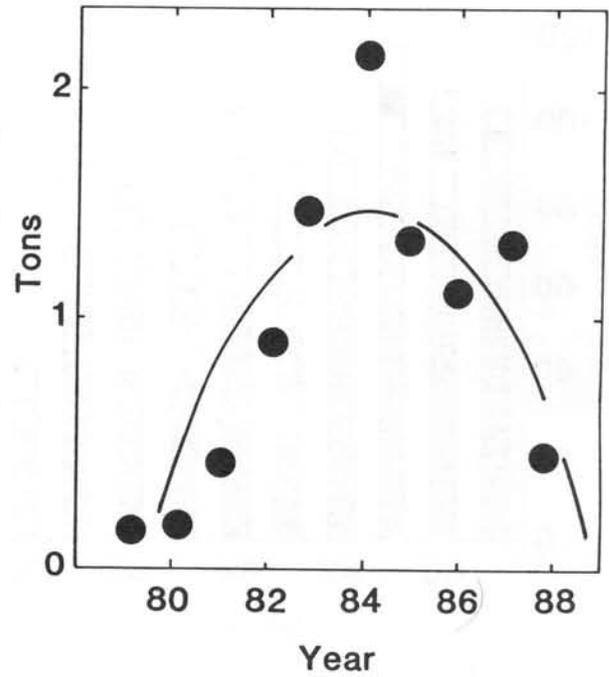


Figure 5. The rise and fall of the insecticide methyl parathion. In 1980 the curve fitted to the quantities sold rises 0.5, and in 1981 it falls 0.3 ton per year.

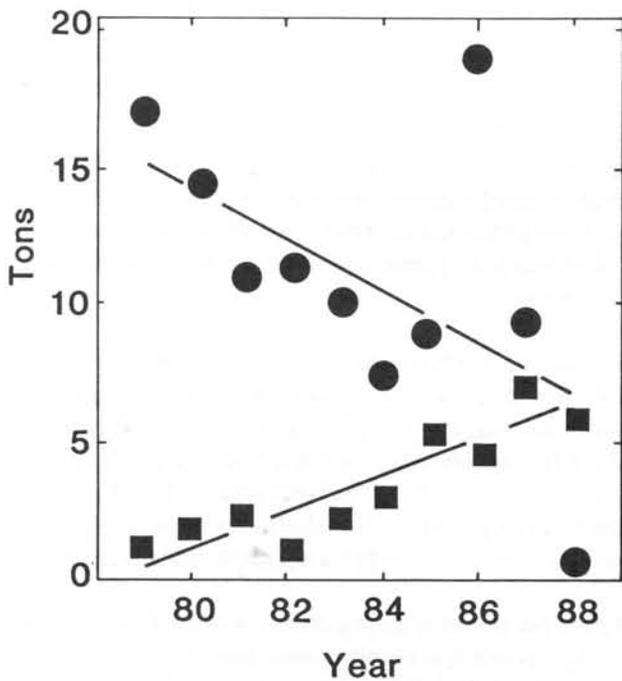


Figure 4. The fall of chlordane and rise of chlorpyrifos, two controls of termites. The line through the dots for chlordane falls 0.94 and the line through the squares for chlorpyrifos rises 0.67 ton per year.

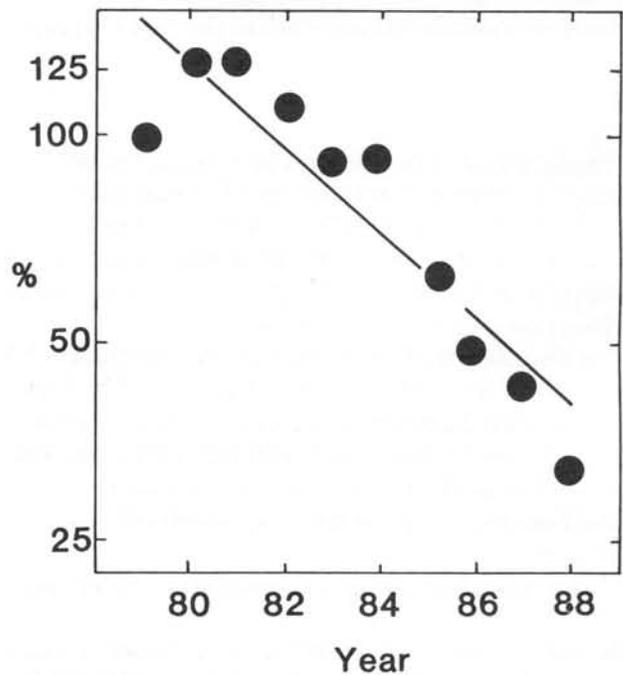


Figure 6. The total Hazard of restricted pesticides. The vertical scale is logarithmic and related to the Hazard in 1979. The line falls 14% per year.

TOXICITY

The examples of methyl parathion and of the change from chlordane to chlorpyrifos illustrate that toxicity as well as quantity must be examined. It would be wrong-headed to decrease quantity by replacing less harmful with more harmful chemicals. One measure of harm is toxicity to mammals.

So, a measure called "Hazard" was calculated by dividing the quantity of a pesticide ingredient sold by the LD50 or dose that is acutely toxic to 50% of a group of test animals (Waggoner 1986). For most ingredients, LD50 were found in a handbook (Meister Publishing Co. 1989). The LD50 of 3 mg/kg of warfarin was assigned to the other rodenticides, pival and valone. Methyl bromide was assigned its oral LD50. Creosote and three other ingredients sold in small quantities were omitted.

Sales of either smaller quantities or of less toxic ingredients both lower Hazard. The total Hazard fell 14% per year during the decade, Fig. 6. In 1979 the total Hazard was only 22% of that in 1979. The Hazard of the pesticides directed toward soil pests is a large portion of the total and hence its fall paralleled that of the total. Because its decline of 18% per year was slightly faster than that of others, the portion of the total Hazard from controls for soil pests declined from 79% in 1979 to 69% in 1988.

The next largest contributor to Hazard was insecticides. Their Hazard fell but less rapidly than soil pesticides and their contribution to the total rose from 18% in 1979 to 24% in 1988. The remaining classes together only contributed 8% of the 1988 Hazard. During the decade, this percentage contribution to Hazard rose because the Hazard of all these small classes except fumigants increased although still remaining small.

Clearly the general fall in tonnage of restricted pesticides sold is not being achieved by substituting more for less toxic ingredients.

DISCUSSION OF QUANTITY AND TOXICITY

Is the fall in pesticide sales seen in Fig. 1 from a high, low or medium level of use? The 44 tons of restricted pesticides sold in Connecticut in 1988 is small compared to the U. S. production of 535,000 tons of all synthetic organic pesticides in 1986 (U. S. Department of Commerce 1989). From the 1987 U. S. Census and from a publication of the Conservation Foundation (1987), Frink (1987) estimated 917 tons of all pesticides were used in Connecticut. Although the character of restricted pesticides makes them important, their 44 tons is only a few percent of all kinds of pesticides used in the state (Frink 1987).

Frink estimated that about a third of the 917 tons was

used in agriculture. Since this is a substantial fraction of the total use, a question comes to mind: "Are the falling sales evident in the Figures simply caused by shrinking cropland?" The acreage of harvested cropland in 1987 was fully 90% of that in 1978 (U. S. Department of Commerce 1988). This fall of 10% in cropland is much smaller than the halving of quantity of pesticide seen in the Figures.

Another question about the agricultural fraction of pesticide use is whether it is large or small compared to the recommendations by the Cooperative Extension System in Connecticut and elsewhere in the region. These recommendations evidently exceed actual use four fold Frink (1987). Thus pesticide use in agriculture is conservative, and the agricultural fractions of the falls seen in the Figures are from an already low level.

Another question concerns changes in classification of the pesticides. How much of the fall in quantity of restricted pesticides shown in the Figures is caused by changing classification? Bradford Robinson tabulated the changes of classification during the decade. Ten of the restricted pesticides sold during 1979 have since been banned or discontinued. Chlordane comprised 82% of the 1979 quantity of the ten later banned. The 1979 quantity of the ten is 35% of the total decrease from 1979 to 1988.

How much did simple removal of restriction by the State contribute to the decrease? Since 1979 the restriction has been removed from eighteen of the pesticides restricted in 1979. Their 1979 quantity, however, is only 14% of the total decrease from 1979 to 1988. On the other hand, the State adds as well as removes restriction, and pesticides restricted since 1979 comprised 4% of the sales in 1988. So, only a small part of the change in sales of restricted pesticides during the decade was caused by changing restrictions. Instead, the change was largely caused by banning or discontinuing ingredients and, especially, by voluntary use of less pesticide.

In 1986 the next strategic place to cut pesticide use was identified: "In the soil". More than half the weight and about three-fourths the Hazard was applied to the soil, and soil application was closest to the problem of contamination of soil and water (Waggoner 1986). The falling sales of soil pesticides evident in Fig. 1 caused 61% of the total decline in quantity. Further, the decline in Hazard of soil pesticides caused 83% of the total fall in Hazard.

So, the use of pesticides in Connecticut is low and falling. Further, scientists at The Connecticut Agricultural Experiment Station in New Haven and Windsor are at work on ways to cut pesticide use further. They are pursuing pest controls, especially biological controls and controls of pests in the soil, to allow further cuts in pesticide use while still protecting human health, forests and crops, homes and possessions.

QUALITY OF PESTICIDES SOLD

Results of chemical analysis of 226 official samples of pesticide, pool products, and pet preparations collected during 1988 by inspectors of the Connecticut Department of Environmental Protection are presented in this Bulletin.

Table 2 shows individual samples representing 374 guarantees for active ingredients from 45 manufacturers. Following the names of the manufacturers are the brands of the products and the active ingredients. The percent guarantee is then shown followed by the percent found. Values followed by a minus sign (-) are deficient in amount of active ingredient. Those followed by a plus sign (+) contain an excess of active ingredient and those followed by an asterisk (*) contain an active ingredient not listed on the label.

Two basic criteria are used to determine if samples are satisfactory. The first is that a samples cannot be deficient or excessive in amount of active ingredient. Deficiencies and excesses are based on Laboratory Verification Guidelines established by the U.S. Environmental Protection Agency. Overall, 8% of all samples were in violation of at least one active ingredient. In all 3.7% of all active ingredient were deficient, 0.5% excessive, and 1.1% contained an unlisted ingredient.

Table 3 summarizes the number of samples tested from each manufacturer, the number of guarantees for active ingredients, the number of deficiencies, excesses or unlisted ingredients, and the average percent of guarantee for each manufacturer.

Analyses were performed by Martha Fuzesi, Dennis Migneault, and Mary Alice Defrancesco. Samples were collected by Marshall Beott and Douglas Griswold. Pesticide laws are administered by the Commissioner of the Department of Environmental Protection.

The Station commends the work of Mrs. Martha Fuzesi who retired in 1989 after 25 years of performing excellent analytical analyses on pesticide formulations. Her analyses were always accurate and reliable and her results of EPA check samples were of the highest quality. She has published several updated methods for the testing of pesticides.

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Table 2. Analysis of individual samples.

Manufacturer, brand, and active ingredient	% Guarantee	% Found
Aeroxon Products, Inc.		
Roxo Magi-Kil Roach & Carpenter Ant Trap Baygon	1	0.90
Agway, Inc./Chemical Div.		
Agway 5% Sevin Dust Carbaryl	5.0	5.30
Agway Ant & Soil Insect Granules Diazinon	5	5.1
Agway Diazinon Insect Dust Diazinon	4	4.1
Agway Diazinon Insect Spray Diazinon	25.0	25.10
Agway Dog Dip Chlorpyrifos	3.84	3.80
Agway Home Pest Insect Control Chlorpyrifos	0.500	0.420
Piperonyl butoxide, tech.	0.260	0.250
Pyrethrins	0.052	0.062
Agway Liquid Sevin 4F Carbaryl	42.6	43.90
Agway Malathion Insect Spray Malathion	55.00	54.60
Agway Maneb 2F Maneb (as manganese)	3.8	4.42
Agway Organic Garden Spray with Pyrethrin Piperonyl butoxide, tech.	10.0	9.78
Pyrethrins	1.0	1.20
Agway Poison Ivy/Poison Oak Killer Glyphosate	0.96	1.00
Agway Professional Lawn Weed Control 2,4-D, butoxy ethyl ester	16.7	18.1
2,4-DP butoxy ethyl ester	16.4	15.9
Agway Rotenone Dust Rotenone	1.00	1.10
Agway Seed Potato Dust Maneb (as manganese)	1.37	2.38*
Agway Spot Weeder Dicamba, dimethylamine salt	0.066	0.060
MCPP, dimethylamine salt	0.287	0.314
2,4-D, dimethylamine salt	0.593	0.584
Banner Systems, Inc.		
Banner-Tops		
n-Alkyl dimethyl benzyl ammonium chloride	2.25	1.75-
n-Alkyl ethylbenzyl ammonium chloride	2.25	1.75-

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
Bonide Chemical Co., Inc.		
Agway Bulb Dust		
Methoxychlor	5.0	4.60
Thiram	10.0	10.40
Bonide A Complete Fruit Tree Spray		
Captan	12.0	12.80
Carbaryl	0.3	0.37
Malathion	6.0	7.30
Methoxychlor, tech	12.0	13.20
Bonide Benomyl 50% WP		
Benomyl	50	48.8
Bonide Borer-Miner Killer		
Lindane	20.0	21.00
Bonide Brushkill		
2,4-D, dimethylamine salt	13.0	13.40
Dicamba, dimethylamine salt	1.5	1.60
Bonide Captan-50% WP		
Captan	50	51.0
Bonide Carpenter Ant Control		
Chlorpyrifos	12.6	13.20
Bonide Chickweed & Clover Killer		
Dicamba, dimethylamine salt	13.0	12.8
Bonide DuPont Ammate X-NJ Weed & Brush Killer		
Ammonium sulfamate	95	100
Bonide Fruit Set Spray		
p-Chlorophenoxyacetic acid	0.005	0.0046
Bonide Garden, Turf & Ornamental Herbicide 5G		
Dacthal	5	4.30-
Bonide Lawn & Garden Insect Control with Diazinon		
Diazinon	12.5	12.75
Bonide Malathion 50% EC		
Malathion	5049.7	
Bonide Methoxychlor 25% E Insecticide		
Methoxychlor, tech.	25	26.5
Bonide Moletox II		
Zinc phosphide	2	1.83
Bonide Organic Greenhouse Houseplant & Vegetable Spray Concentrate		
Piperonyl butoxide, tech.	10.0	9.80
Pyrethrins	1.0	1.10
Bonide Rose & Flower Spray or Dust		
Captan	5.7	5.50
Carbaryl	0.5	0.57
Malathion	3.0	3.30
Methoxychlor, tech.	6.0	5.90
Bonide Rose & Flower Spray or Dust		
Captan	5.7	5.50
Carbaryl	0.5	0.52
Malathion	3.0	3.80
Methoxychlor, tech	6.0	5.90

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
Bonide Rose Spray Instant All Liquid		
Karathane	1.4	1.42
Malathion	9.4	10.60
Methoxychlor, tech.	9.5	10.00
Bonide Systemic Granules 1%		
Di-Syston	1	0.96
Bonide Systemic Insecticide		
Dimethoate	23.4	22.8
Bonide Tomato-Potato Vegetable Insecticide/ Fungicide Dust		
Endosulfan	3.00	3.30
Maneb	5.6	6.43
C & J Chemical, Inc.		
Enforcer Moth Proofer		
Phenothrin	0.200	0.203
Tetramethrin	0.200	0.195
Cadwell & Jones, Inc.		
Cadwell & Jones 20-10-10 with Balan		
n-Butyl-n-ethyl-a,a,a-trifluoro-2,6-dinitrotoluidine	1.00	0.98
Cadwell & Jones Surge 15-3-5 Turf Fertilizer with Team		
n-Butyl-n-ethyl-a,a,a-trifluoro-2,6-dinitro-p-toluidine	0.765	0.828
Trifluralin	0.385	0.395
Cadwell & Jones Turf Products 22-6-9 with Benefin		
n-Butyl-n-ethyl-a,a,a-trifluoro-2,6-dinitrotoluidine	1.90	1.88
Chacon Chemical Corp.		
Chacon Systemic Granular		
o,o,-Diethyl S-[2-(ethylthio)ethyl] phosphorodithioate	1	0.97
Chevron Chemical Co./Ortho Div.		
Isotox Insect Killer Formula II		
Acephate	9.4	9.90
Ortho Ant, Flea & Cricket Spray		
Dursban	5.3	5.20
Ortho Brush-B-Gon Brush Killer		
Triclopyr, triethylamine salt	8.0	8.48
Ortho Crabgrass & Nutgrass Killer		
Calcium acid methanearsenate (as elemental As)	0.25	0.243
Ortho Diazinon Granules		
Diazinon	2	2.1
Ortho Diazinon Insect Spray		
Diazinon	25	25.9
Ortho Flea-B-Gon Flea Killer Formula II		
Phenothrin	0.096	0.104
Tetramethrin	0.050	0.048
Ortho Grass-B-Gon Grass Killer		
Fusilade	0.50	0.44

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
Ortho Home & Garden Insect Killer Formula II		
Phenothrin	0.191	0.210
Tetramethrin	0.200	0.198
Ortho Home Orchard Spray		
Captan	14.2	16.00
Malathion	7.5	12.60+
Methoxychlor, tech.	15.0	15.60
Ortho Kleenup Grass & Weed Killer		
Acifluorfen	0.12	0.13
Glyphosate	0.50	0.50
Ortho Lindane Borer & Leafminer Spray		
Lindane	20	19.80
Ortho Liquid Sevin		
Carbaryl	27	28.0
Ortho Malathion 50 Insect Spray		
Malathion	50	52.9
Ortho Multi-Purpose Fungicide Daconil 2787		
Chlorothalonil	29.6	30.00
Ortho Orthenex Rose & Flower Spray		
Acephate	0.250	0.265
Resmethrin	0.100	0.120
Triforine	0.100	0.097
Ortho Ortho-Klor Soil Insect & Termite Killer		
Chlorpyrifos	12.6	12.80
Ortho Outdoor Insect Fogger		
2-Hydroxyethyl-n-octyl sulfide	0.950	1.000
Resmethrin	0.250	0.255
Ortho Pet Flea & Tick Spray Formula II		
Piperonyl butoxide	1.0	0.90
Pyrethrins	0.1	0.11
Ortho Poison Ivy & Poison Oak Killer Formula II		
Triclopyr, triethylamine salt	0.70	0.67
Ortho Roach Killer Powder		
Ortho boric acid	99	100
Ortho Rose & Floral Dust Formula III		
Diazinon	5.0	5.00
Folpet	7.5	8.00
Sulfur	10.0	11.2
Ortho Rose & Flower Insect Killer		
Piperonyl butoxide, tech.	0.20	0.190
Pyrethrins	0.02	0.020
Ortho Tomato & Vegetable Insect Killer		
Piperonyl	0.20	0.190
Pyrethrins	0.02	0.021
Ortho Tomato Vegetable Dust		
Captan	4.70	5.30
Methoxychlor, tech.	5.00	5.10
Rotenone	0.75	0.75
Ortho Triox Vegetation Killer		
Prometon	1.86	1.96

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
Ortho Weed-B-Gon Lawn Weed Killer		
2,4-D, dimethylamine salt	10.8	10.90
MCP, dimethylamine salt	11.6	11.10
Ortho White Fly & Mealybug Killer		
Resmethrin	0.050	0.049
Ciba-Geigy Corp./Spectrum Home & Garden Products		
Spectrum 33 Plus Lawn Weed Killer		
Dicamba, dimethylamine salt	1.20	1.15
MCP, dimethylamine salt	10.89	10.76
2,4-D, dimethylamine salt	5.87	5.80
Connecticut Aerosols, Inc.		
DRO #2 Bomb		
Piperonyl butoxide	0.8	0.79
Pyrethrins	0.2	0.196
DRO Roach and Insect Killer #4		
Fenvalerate	0.400	0.466
Tetramethrin	0.200	0.240
King Pine Spray Disinfectant		
n-Alkyl dimethyl benzyl ammonium chlorides	0.10	0.094
n-Alkyl dimethyl ethylbenzyl ammonium chloride	0.10	0.094
King Pine Spray Disinfectant		
n-Alkyl dimethyl benzyl ammonium chlorides	0.10	0.084
n-Alkyl dimethyl ethylbenzyl ammonium chlorides	0.10	0.084
No. 1500C Ozium Air Sanitizer		
Triethylene glycol	4.4	3.53-
Propylene glycol	4.4	3.58-
No. 1500C Ozium Air Sanitizer		
Triethylene glycol	4.4	3.53-
Propylene glycol	4.4	3.70-
Pronto Lice Killing Spray		
3-Phenoxybenzyl d-cis & trans 2,2-dimethyl-3-(2-methylpropenyl)cyclopropanecarboxylate	0.382	0.365
Pronto Lice Killing Spray		
3-Phenoxybenzyl d-cis & trans 2,2-dimethyl-3-(2-methylpropenyl)cyclopropanecarboxylate	0.382	0.367
Pronto Lice Killing Spray		
3-Phenoxybenzyl d-cis & trans 2,2-dimethyl-3-(2-methylpropenyl)cyclopropanecarboxylate	0.382	0.372
Pronto Lice Killing Spray		
3-Phenoxybenzyl d-cis & trans 2,2-dimethyl-3-(2-methylpropenyl)cyclopropanecarboxylate	0.382	0.357
Coulston Int'l. Corp.		
Permakill House & Garden Insecticide Spray		
Resmethrin	0.106	0.133
Tetramethrin	0.250	0.244

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
d-Con Co., Inc./Subsidiary of Sterling Drug, Inc.		
d-Con Exact Roach & Ant Killer Cyano (3-phenoxyphenyl) methyl 4-chloro-alpha- (1-methyl ethyl) benzeneacetate	5.00	5.12
d-Con LIM-N8 Rat Killer Brodifacoum	0.005	0.0049
d-Con Mouse Killing Station Brodifacoum	0.005	0.0049
Dexol Ind., Inc.		
Dexol Ant Killer Granules Chlorpyrifos	0.5	0.5
Dexol Ant, Roach & Spider Killer Diazinon	0.5	0.56
Dexol Crabgrass and Weed Preventor Bensulide	34.8	34.90
Dexol DEXA-Klor Insect Spray Chlorpyrifos	6.0	6.70
Dexol Diazinon 25% Insect Spray Diazinon	25	24.8
Dexol Malathion Insect Control Malathion	50	51.0
Dexol Mole Killer Pellets Zinc phosphide	2	2.07
Dexol Rose and Floral Insect Killer Piperonyl butoxide, tech. Pyrethrins	0.20 0.02	0.150 0.021
Dexol Spot Weeder 2,4-D, dimethylamine salt Dicamba, dimethylamine salt MCPP, dimethylamine salt	0.260 0.025 0.261	0.276 0.021 0.627+
Dexol Vegetable Insect Killer Piperonyl butoxide, tech. Pyrethrins	0.20 0.02	0.150 0.022
Dexol Weed-Out Lawn Weed Killer 2,4-D, dimethylamine salt Dicamba, dimethylamine salt MCPP, dimethylamine salt	7.59 0.84 3.66	7.70 0.85 3.38
Dow Chemical		
Dursban 2E Chlorpyrifos	24.1	24.5
EVESCO Pharmaceuticals/Affiliate of Immunogenetics, Inc.		
EVESCO Liqui-ban Flea Spray for Dogs Dursban	0.22	0.098-

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
Farnam Co., Inc./Daltek Labs		
Daltek Flea & Tick Shampoo for Dogs		
N-octyl bicycloheptene dicarboximide	0.165	0.158
Piperonyl butoxide, tech	0.100	0.094
Pyrethrins	0.050	0.51
Daltek Quick Kill Flea Powder		
Carbaryl	5.00	5.90
Piperonyl butoxide, tech.	0.10	0.095
Pyrethrins	0.01	0.013
Rotenone	0.12	0.11
Farnam Co., Inc./Farnam Pet Products Div.		
Farnam Cat Away Outdoor Cat Repellent		
Methyl nonyl ketone	1.97	1.94
Farnam Dip Quik II Dog Dip		
Chlorpyrifos	4.85	5.00
Equi-Trol Feed-Thru Fly Control		
2-Chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl	2.468	3.30
Farnam Rabbit Ear Miticide		
Piperonyl butoxide, tech.	0.50	0.380
Pyrethrins	0.05	0.036
Farnam Co./Sudbury Div.		
Sudbury Chaperone Rabbit and Deer Repellent		
Thiram	7.0	7.60
Sudbury Flea & Tick Dip Concentrate for Dogs		
Permethrin	3.20	3.26
Frank's Nursery Distributors, Inc.		
Frank's Insect Spray for House & Garden Plants		
Allethrin	0.150	0.130
Resmethrin	0.200	0.210
Frank's White Fly & Insect Spray		
Piperonyl butoxide, tech.	0.20	0.090-
Pyrethrins	0.02	0.016
Green Thumb Products/Nat'l. Packaging Div., Inc.		
Green Thumb Insect Spray for House Plants		
Piperonyl butoxide, tech.	0.20	0.078-
Pyrethrins	0.02	0.015
Greensweep Household Products		
Greensweep Pre-Emergent Crabgrass Preventer		
Bensulide	46.0	45.70
Greensweep Spray-On Liquid Weed & Feed		
2,4-D, dimethylamine salt	5.670	5.980
Dicamba, dimethylamine salt	0.619	0.650
MCPP, dimethylamine salt	2.736	2.870

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
J & L Adikes, Inc.		
Gro-Well 25% Methoxychlor Spray		
Methoxychlor	25.29	25.20
Gro-Well 50% Malathion Insect Spray		
Malathion	50.00	51.00
Gro-Well Benomyl 50W Systemic Fungicide		
Benomyl	50	50.6
Gro-Well Dandelion & Broadleaf Weed Killer Spray		
2,4-D, dimethylamine salt	0.177	0.186
MCP, dimethylamine salt	0.178	0.187
Dicamba, dimethylamine salt	0.016	0.015
Gro-Well Diazinon 25E Insect Spray		
Diazinon	25.00	24.40
Gro-Well Fruit Tree Spray		
Captan	5.7	3.05-
Malathion	6.0	6.20
Methoxychlor, tech.	10.0	10.60
Sulfur	25.0	25.70
Gro-Well Gypsy Moth & Caterpillar Spray		
Methoxychlor, tech.	25.40	26.70
Gro-Well Hornet & Wasp Spray		
Baygon	0.50	0.507
MGK 264	0.33	0.330
Piperonyl butoxide, tech.	0.20	0.197
Pyrethrins	0.10	0.120
Gro-Well Liquid Lawn Fungicide		
Dyrene	38	41.0
Gro-Well Pro-Tek "40" Insect Spray		
Diazinon	10.0	10.50
Methoxychlor, tech	20.0	21.70
Gro-Well Sevin Liquid		
Carbaryl	22.5	23.90
Gro-Well Tomato & Vegetable Dust		
Carbaryl	5.00	5.60
Zineb (as Zn)	0.92	1.05
Gro-Well Vegetable & Tomato Insect Spray		
Diazinon	10.0	10.10
Methoxychlor, tech	20.0	21.70
Gro-Well Yard & Patio Fogger		
(5-Benzyl-3-furyl) methyl 2,2-dimethyl-3-(2-methyl propenyl) cyclopropane carboxylate	0.250	0.256
Kemco Chemical & Mfg. Corp.		
Rid-A-Rat Rat & Mouse Killer		
Warfarin	0.025	0.024
Spectracide 33 Plus Spot Weed Killer		
2,4-D, dimethylamine salt	0.593	0.598
MCP, dimethylamine salt	0.287	0.294
Dicamba, dimethylamine salt	0.066	0.063

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
Spectracide Diazinon Liquid		
Diazinon	25.0	24.80
Spectracide Garden & Vegetable Spray		
Piperonyl butoxide, tech.	0.20	0.18
Pyrethrins	0.02	0.022
Spectracide Lawn & Garden Insect Control		
Diazinon	25.0	24.90
Spectracide Malathion 50 Liquid		
Malathion	50.00	50.70
Spectracide Professional Home Pest Control		
Diazinon	0.500	0.426
Piperonyl butoxide, tech.	0.261	0.248
Pyrethrins	0.052	0.057
Spectracide Sevin Liquid		
Carbaryl	22.5	22.40
Spectracide Wasp & Hornet Killer		
Resmethrin	0.250	0.269
Spectracide Yard Flea Killer		
Chlorpyrifos	6.00	5.90
 Kincaid Enterprises, Inc.		
Terraneb SP Turf Fungicide		
Chloroneb	65.0	66.6
Atrazine	-	0.09*
Terraneb SP Turf Fungicide		
Chloroneb	65.0	66.7
Atrazine	-	0.10*
 Lebanon Chemical Corp./Greenview Div.		
Greenview Preen		
Trifluralin	1.47	1.45
 Lynwood Laboratories, Inc.		
Shoo-Fly Ant & Roach Killer		
Diazinon	0.50	0.488
Piperonyl butoxide, tech.	0.261	0.250
Pyrethrins	0.052	0.059
Shoo-Fly Home & Garden Multi-Purpose Insect Killer		
(5-Benzyl-3-furyl) methyl 2,2-dimethyl-3-		
(2-methyl propenyl cyclopropane carboxylate)	0.106	0.108
Tetramethrin	0.250	0.230
Shoo-Fly Hornet Jet Bomb		
o,o-Dimethyl o-(2-isopropyl-4-methyl-6-		
pyrimidinyl) phosphorothioate	0.500	0.538
Piperonyl butoxide, tech	0.262	0.240
Pyrethrins	0.025	0.027

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
Micro-Flo Co. Teremec SP Chloroneb	65	65.8
Miller Chemical & Fert. Corp./Pratt-Gabriel Div. Pratt Bordo-Mix Bordeaux Mixture Copper	12.75	12.37
Pratt Cygon 2-E Systemic Insecticide Dimethoate	23.4	24.0
Pratt Fruit Tree Spray Captan	6.0	5.70
Malathion	6.0	7.60
Methoxychlor	10.0	10.80
Sulfur	25.0	25.00
Pratt House Plant Spray Bomb Pyrethrins	0.056	0.051
Rotenone	0.008	0.0082
Pratt Malathion-50 Spray Malathion	50.0	51.50
Pratt Red Arrow Insect Spray Piperonyl butoxide	3.0	2.97
Pyrethrins	0.50	0.48
Rotenone	1.5	1.44
Pratt Whitefly Spray (5-Benzyl-3-furyl) methyl 2,2-dimethyl-3-(2-methyl propenyl) cyclopropane carboxylate	0.250	0.227
Miller Chemical & Fert. Corp./Science Products Div. BG Pratt 5% Lindane Borer Spray Lindane	5.0	5.10
Science Gladiolas & Bulb Dust Methoxychlor	5	5.2
Thiram	50	48.6
Science Multi-Purpose Spray Malathion	7.50	7.70
Methoxychlor, tech.	19.75	20.00
Captan	15.00	15.20
Science Systemic Insecticide Granules Di-Syston	1	0.98
Monsanto Co./Agric. Products Round-Up L & G Ready-to-Use Grass & Weed Killer Glyphosate	0.96	1.10
National Products Div. Plant Pro Spray for Spider, Mite, Mealybug and Scale Phenothrin	0.065	<0.001-

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
Nortech Water & Energy, Inc. TB-66 Poly[oxyethylene(dimethyliminio)ethylene- (dimethyliminio)ethylene dichloride]	12.0	7.16-
Nutmeg Chemical Co. Nutmeg NC 53 Poly[oxyethylene(dimethylimino)ethylene- (dimethyliminio)ethylene dichloride]	20	19.06
Nutrico, Inc./Professional Div. Nutrico Custom Blend 32-3-5 with Team N-Butyl-N-ethyl-a,a,a-trifluoro-2,6-dinitro-p-toluidine a,a,a-trifluoro-2,6-dinitro-,N,N-dipropyl-p-toluidine	0.919 0.459	0.948 0.462
O. M. Scott & Sons Scotts Liquid Lawn Weed & Feed 2-Methyl-4-chlorophenoxy acetic acid, dimethylamine salt 2(2-Methyl-4-chlorophenoxy propionic acid, dimethylamine salt 2-(2,4 Dichlorophenoxy) propionic acid, dimethylamine salt	1.65 1.63 1.61	1.66 1.68 1.73
PBI Gordon Teremec SP Chloroneb Atrazine Teremec SP Chloroneb Atrazine	65.0 - 65.0 -	65.4 0.11* 66.5 0.08*
Petrokem Corp. Shoo Bird & Bat Repellent Napthalene	100	98.00
Plant Marvel Labs, Inc. Plant Marvel I-Bomb Insecticide Piperonyl butoxide, tech. Pyrethrins Rotenone	0.256 0.0255 0.128	0.240 0.0247 0.102
Prentiss Drug & Chemical Co., Inc. Malathion 80 E.C. Malathion	80	81.4
Reuter Laboratories, Inc. Reuter Aphid-Mite Attack Potassium salts of fatty acids	2.00	1.35-

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
Reuter Aphid-Mite Attack (Fruits and Vegetables)		
Potassium salts of fatty acids	2.00	2.18
Reuter Aphid-Mite Attack (Roses & Flowers)		
Potassium salts of fatty acids	1.50	1.47
Reuter Yard & Garden Insect Attack		
Piperonyl butoxide	0.40	0.39
Pyrethrins	0.04	0.038
S. C. Johnson & Son, Inc.		
Raid Crack & Crevice Roach Foam		
Chlorpyrifos	0.50	0.490
Raid Flying Insect Killer		
Piperonyl butoxide, tech.	1.60	1.52
Tetramethrin	0.72	0.73
Raid House & Garden Formula II, The Complete Bug Killer		
Piperonyl butoxide, tech	1.000	0.940
Pyrethrins	0.176	0.190
Tetramethrin	0.081	0.090
Raid Tree, Shrub & Flower Insect Killer		
(5-Benzyl-3-furyl) methyl 2,2-dimethyl-3-(2-methylpropenyl) cyclopropane-carboxylate	0.37	0.360
Raid Wasp & Hornet Killer IV		
Baygon	0.475	0.470
DDVP	0.465	0.460
Raid Yard Guard Outdoor Fogger Formula II		
Allethrin	0.190	0.209
2-Hydroxyethyl-n-octyl sulfide	0.950	1.080
Resmethrin	0.075	0.100
Safer, Inc.		
Safer African Violet Insect Killer		
Potassium salts of fatty acids	1.5	1.36
Safer Aphid, White Fly & Mealy Bug Killer		
Potassium salts of fatty acids	2.00	1.84
Safer Garden Fungicide-Miticide		
Sulfur	0.4	0.39
Safer Insecticidal Soap Concentrate		
Potassium salts of fatty acids	49.0	50.66
Safer Insecticidal Soap for Roses & Flowers		
Potassium salts of fatty acids	1.5	1.44
Security Lawn & Garden Products Co.		
Security 5% Garden Dust		
Carbaryl	5.0	5.20
Security Ant Killer		
Chlorpyrifos	0.50	0.49
Security Benomyl Spray		
Benomyl	50	50.8
Security Chlor-Gard Termite Proofer		
Chlorpyrifos	12.6	12.85

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
Security Cygon 2-E Systemic Insecticide		
Dimethoate	23.4	22.9
Security Diazinon Spray		
Diazinon	25.0	24.60
Security Ferbam Fungicide		
Ferbam	10.2	11.56
Security Indoor Insect Fogger		
N-octyl bicycloheptene dicarboximide	1.67	1.70
Piperonyl butoxide, tech.	1.00	1.00
Pyrethrins	0.50	0.57
Security Poison Oak and Poison Ivy Killer		
Dicamba, dimethylamine salt	0.066	0.057
MCPP, dimethylamine salt	0.287	0.308
2,4-D, dimethylamine salt	0.593	0.558
Security Sevin Spray		
Carbaryl	23.0	22.60
Security Weed Patrol Sport Weeder		
Dicamba, dimethylamine salt	0.066	0.060
MCPP, dimethylamine salt	0.287	0.275
2,4-D, dimethylamine salt	0.593	0.550
Stauffer Household Products		
Expire Mouse Bait Station		
Bromadiolone-Supercad	0.005	0.004
Special Delivery Spray On Liquid Broadleaf Weed Killer		
2,4-D, dimethylamine salt	4.34	4.60
Dicamba, dimethylamine salt	0.48	0.50
MCPP, dimethylamine salt	2.10	2.50
Special Delivery Spray On Liquid Crabgrass Preventer		
Bensulide	46.0	48.00
Special Delivery Spray On Liquid Lawn Insecticide		
Diazinon	25.0	25.6
Special Delivery Spray on Liquid Weed & Feed		
2,4-D, dimethylamine salt	5.670	6.03
Dicamba, dimethylamine salt	0.619	0.610
MCPP, dimethylamine salt	2.736	2.780
Vinings Industries, Inc.		
Chemtreat CL-2141		
Methylene bis thiocyanate	10	10.5
Walco-Linck Co.		
TAT Liquid Power-Jet Stream		
Baygon	0.500	0.490
n-Octyl bicycloheptene dicarboximide	0.166	0.163
Piperonyl butoxide, tech.	0.100	0.098
Pyrethrins	0.050	0.045

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
Wilson Laboratories, Inc.		
Wilson Ant & Roach Killer		
Diazinon	0.500	0.526
Piperonyl butoxide, tech.	0.261	0.290
Pyrethrins	0.052	0.060
Wilson Black Magic Rose and Flower Dust		
Captan	4.73	4.40
Carbaryl	5.00	5.40
Pyrethrins	0.05	0.057
Sulphur	25.00	26.80
Wilson Crabgrass Killer		
Disodium methanearsonate (as Arsenic)	7.65	7.57
Wilson Crop Maker Tomato and Vegetable Dust		
Copper	7.00	6.91
Rotenone	0.80	0.92
Wilson D-Ban Household Pest Control		
Piperonyl butoxide, tech.	0.260	0.256
Pyrethrins	0.052	0.057
Dursban	0.500	0.450
Wilson Dandelion Killer		
2,4-D, dimethylamine salt	25.5	25.75
Wilson Diazinon 12.5% Insect Spray		
Diazinon	12.5	12.70
Wilson Dormant Spray Oil		
Petroleum oil	96	98.9
Wilson Flea & Tick Killer		
Piperonyl butoxide, tech.	0.260	0.246
Pyrethrins	0.052	0.060
Diazinon	0.500	0.485
Wilson Flower Garden Spray		
Piperonyl butoxide, tech.	0.20	0.144
Pyrethrins	0.02	0.02
Wilson Granular Vegetation Killer		
Boron trioxide	22.7	24.17
Diuron	1.25	1.35
Wilson Green Earth House Plant Insect Killer		
Piperonyl butoxide, tech.	0.20	0.10
Pyrethrins	0.02	0.018
Wilson Malathion 50% Insect Spray		
Malathion	50	50.6
Wilson Malcap Fruit Tree Dust or Spray		
Captan	7.6	7.40
Methoxychlor, tech.	8.00	8.30
Malathion	4.00	3.96
Wilson Roach Destroyer Dust		
Orthoboric Acid	100	99.87
Wilson Rotenone 1% Dust		
Rotenone	1	1.04
Wilson Sevin 22.5%		
Carbaryl	22.5	23.00

Table 2. Analysis of individual samples (continued).

Manufacturer, brand, and active ingredient	% Guarantee	% Found
Wilson Slug Bait Pellets Snail & Slug Killer Metaldehyde	2.75	2.85
Wilson Vegetable Garden Spray Piperonyl butoxide, tech.	0.20	0.11-
Pyrethrins	0.02	0.02
Wilson Wasp & Hornet Killer Carbaryl	0.500	0.503
Piperonyl butoxide, tech.	0.188	0.182
Pyrethrins	0.075	0.079
Wilson Weed & Feed 2-(2-Methyl-4-chlorophenoxy) propionic acid, diethylamine salt	3.28 3.28	3.50 3.50
2-(2,4 Dichlorophenoxy) propionic acid, dimethylamine salt	3.22	3.25
Zoecon Corp.		
Zodiac 21 Day Flea Dust for Dogs n-(Mercaptomethyl)phtalimide S- (O,O-dimethyl phosphorodithioate)	5.0	5.10
Zodiac Clear Flea Collar for Dogs DDVP	8.37	8.54
Zodiac Flea & Tick Pump Spray 2,3,4,5-Bis(2-butylene) tetrahydro-2- furaldehyde	0.200	0.200
N-octyl bicycloheptene dicarboximide	0.333	0.360
Piperonyl butoxide, tech	1.500	1.480
Pyrethrins	0.150	0.158
Zodiac Flea & Tick Pump Spray Mist 2,3,4,5-Bis(2-butylene) tetrahydro-2- furaldehyde	0.200	0.210
N-octyl bicycloheptene dicarboximide	0.333	0.360
Piperonyl butoxide, tech	1.500	1.450
Pyrethrins	0.150	0.167
Zodiac Flea & Tick Spray for Dogs o-Isopropoxyphenyl methyl carbamate	0.25	0.240
Zodiac IGR Plus Fogger Methoprene	0.075	0.090
Permethrin	0.500	0.522

Table 3. Summary for each manufacturer of number of products tested, number of guarantees for active ingredients, number of guarantees deficient (def), excessive (exc) or unlisted (unl), and average percentage of guarantee.

Manufacturer	Products tested	Total guarantees	Guarantees def., exc. or unl.	Average % of guarantee
Aeroxon Products	1	1	0	90
Agway	15	21	1+	107
Banner Systems	1	2	2-	78
Bonide Chemical	22	37	1-	104
C & J Chemical	1	2	0	100
Cadwell & Jones	3	4	0	102
Chacon	1	1	0	97
Chevron	28	44	1+	104
Ciba-Geigy	1	3	0	98
Connecticut Aerosols	10	16	4-	94
Coulston	1	2	0	112
d-Con	3	3	0	100
Dexol	11	17	1+	107
Dow	1	1	0	102
Evesco	1	1	1-	45
Farnam/Daltek	2	7	0	104
Farnam/Pet Products	3	4	0	87
Farnam/Sudbury	3	3	0	115
Frank's Nursery	2	4	1-	79
Green Thumb Products	1	2	1-	57
Greensweep Products	2	4	0	104
J & L Adikes	14	25	1-	102
Kemco	10	15	0	99
Kincaid	2	2	2*	103
Lebanon	1	1	0	99
Lynwood	3	8	0	101
Micro-Flo	1	1	0	101
Miller/Pratt Gabriel	7	13	0	100
Miller/Science Products	4	7	0	101
Monsanto	1	1	0	115
National Products	1	1	1-	0
Nortech	1	1	1-	60
Nutmeg	1	1	0	95
Nutrico	1	2	0	102
O.M. Scott	1	3	0	104
PBI Gordon	2	2	2*	101
Petrokem	1	1	0	98
Plant Marvel	1	3	0	90
Prentiss	1	1	0	102
Reuter	4	5	1-	93
S.C. Johnson & Son	6	12	0	105
Safer	5	5	0	96
Security	11	17	0	100
Stauffer	5	9	0	103
Vinings	1	1	0	105
Walco-Linck	1	4	0	96
Wilson	21	41	3-	100
Zoecon	6	13	0	104
Totals	226	374	17-,3+,4*	