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CONNCTICUT AGRICULTURAL EXPERIMENT STATION
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December, 1925

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N. T. Nelson, Ph.D., Assistant Physiologist.
Examination of Insecticides, Fungicides, Etc.

E. M. Bailey*

INTRODUCTION.

The Legislature of 1923 passed an act concerning the manufacture, sale and transportation of adulterated insecticides and fungicides. The text of the law and regulations, made as provided therein for its enforcement, are given in Bulletin 258 issued by the station in 1924. Both the law and such regulations as have been made are substantially the same as the federal law and regulations so that articles of this class which satisfy the requirements of interstate commerce will be accepted in this State.

The law requires this station to make analyses of samples which may be collected by the Dairy Commissioner or by our station agent. Evidence of adulteration or misbranding is required to be reported to the Dairy Commissioner who is responsible for enforcement of the law. Analyses and such other information regarding the character, composition and use of these materials as may be of interest are required to be published in bulletins of this station, either annually or at other intervals as may be advisable. The law carries no specific appropriation for the inspection work and a complete survey of the entire field of insecticides and fungicides each year is not thought to be advisable or necessary.

During the past year our agent has collected samples of lead arsenate and other arsenicals, and miscellaneous materials; examinations have been made also of products submitted from time to time by the Department of Entomology, and the Department of Botany of this station.

CLASSIFICATION OF MATERIALS.

The samples analyzed may be classified as follows:

<table>
<thead>
<tr>
<th>Materials</th>
<th>No. of samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead Arsenate</td>
<td>15</td>
</tr>
<tr>
<td>Bordeaux-Lead Mixtures</td>
<td>5</td>
</tr>
<tr>
<td>Sulphur Preparations</td>
<td>6</td>
</tr>
<tr>
<td>Nicotine Preparations</td>
<td>7</td>
</tr>
<tr>
<td>Emulsions</td>
<td>3</td>
</tr>
<tr>
<td>Miscellaneous (including A. O. A. C. collaborative samples)</td>
<td>13</td>
</tr>
</tbody>
</table>

*Analytical data are by Messrs. Andrew and Fisher. Inspection and sampling by Mr. Churchill.*
METHODS OF ANALYSIS.

The methods of analysis employed are those authorized by the Association of Official Agricultural Chemists unless otherwise stated.

RESULTS OF INSPECTION AND ANALYSIS.

ARSENATE OF LEAD.

The specifications for arsenate of lead as defined in the law of this State are the same as those required by the Federal Insecticide Act.

Dry arsenate of lead must contain not less than twenty-five per cent of total arsenic oxide (As₂O₅), and arsenic in water-soluble forms not exceeding one and one-half per cent.

Arsenate of lead, not dry or powdered, may contain not more than fifty per cent of water; not more than seventy-five one-hundredths per cent of arsenic in water-soluble forms, expressed as arsenic oxide (As₂O₃); and not less than twelve and one-half per cent of total arsenic oxide (As₂O₅).

Analyses of the products examined are given in Table I.
## Table I. Analyses of Arsenate of Lead.

<table>
<thead>
<tr>
<th>Station No.</th>
<th>Brand, Manufacturer or Distributor</th>
<th>Water.</th>
<th>Arsenic Oxide, As₂O₃</th>
<th>Lead-Oxide, PbO.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Found.</td>
<td>Guaranteed not more than.</td>
<td>Found.</td>
</tr>
<tr>
<td>2479</td>
<td>Bowker's Insecticide Co., New York. Bowker</td>
<td>49.45</td>
<td>50.00</td>
<td>15.60</td>
</tr>
<tr>
<td>2480</td>
<td>Chipman Chemical Eng. Co., New York. Chipman</td>
<td></td>
<td></td>
<td>31.10</td>
</tr>
<tr>
<td>2483</td>
<td>Chipman Chemical Eng. Co., New York. Chipman</td>
<td></td>
<td></td>
<td>30.89</td>
</tr>
<tr>
<td>2474</td>
<td>Grasselli Chem. Co., New York</td>
<td></td>
<td></td>
<td>31.32</td>
</tr>
<tr>
<td>2478</td>
<td>Grasselli Chem. Co., New York</td>
<td></td>
<td></td>
<td>30.67</td>
</tr>
<tr>
<td>2477</td>
<td>Interstate Chem. Co., Jersey City, N. J. Key-Dry</td>
<td></td>
<td></td>
<td>30.02</td>
</tr>
<tr>
<td>2484</td>
<td>The Kil-tone Company, Vineland, N. J.</td>
<td></td>
<td></td>
<td>30.24</td>
</tr>
<tr>
<td>2464</td>
<td>Niagara Sprayer Co., Middleport, N. Y. Niagara</td>
<td></td>
<td></td>
<td>31.54</td>
</tr>
<tr>
<td>2470</td>
<td>Nitrate Agencies Co., New York. Naco</td>
<td></td>
<td></td>
<td>30.24</td>
</tr>
<tr>
<td>2525</td>
<td>Pittsburgh Plate Glass Co., Newark, N. J. Corona Dry</td>
<td></td>
<td></td>
<td>31.86</td>
</tr>
<tr>
<td>2471</td>
<td>Riches Piver &amp; Co., New York</td>
<td>35.17</td>
<td>50.00</td>
<td>20.02</td>
</tr>
<tr>
<td>2473</td>
<td>Sherwin-Williams Co., Cleveland, Ohio</td>
<td></td>
<td></td>
<td>31.86</td>
</tr>
<tr>
<td>2472</td>
<td>D. B. Smith &amp; Co., Utica, N. Y. Lightening</td>
<td></td>
<td></td>
<td>31.05</td>
</tr>
<tr>
<td>2482</td>
<td>Vreeland Chemical Mfg. Co., Little Falls, N. Y. Electro. Mfr's sample</td>
<td></td>
<td></td>
<td>30.24</td>
</tr>
<tr>
<td>2390</td>
<td>G. A. Clyne, Waterbury. Purchaser's sample</td>
<td></td>
<td></td>
<td>30.24</td>
</tr>
</tbody>
</table>

1 Calculated from amount guaranteed as metallic arsenic.
Bordeaux-Lead Arsenate, etc.


Analyses are given in Table II.

**Table II. Analyses of Bordeaux-Lead Arsenate, etc.**

<table>
<thead>
<tr>
<th>No.</th>
<th>Condition</th>
<th>Water</th>
<th>Arsenic Oxide, As₂O₃</th>
<th>Copper Oxide, CuO</th>
<th>Lead Oxide, PbO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total (Found)</td>
<td>Guaranteed, not less than (%)</td>
<td>Water-Soluble (Found)</td>
</tr>
<tr>
<td>2465</td>
<td>Paste</td>
<td>65.05</td>
<td>5.57</td>
<td>5.00</td>
<td>0.06</td>
</tr>
<tr>
<td>2467</td>
<td>Dry</td>
<td>8.37</td>
<td>6.00</td>
<td>0.28</td>
<td>0.50</td>
</tr>
<tr>
<td>2481</td>
<td>Dry</td>
<td>14.77</td>
<td>5.00</td>
<td>0.18</td>
<td>0.38</td>
</tr>
<tr>
<td>2466</td>
<td>Paste</td>
<td>44.23</td>
<td>8.91</td>
<td>5.58</td>
<td>0.11</td>
</tr>
</tbody>
</table>

1. Calculated from amount guaranteed as metallic arsenic.

**Sulphur Preparations.**

2506. Sulfooxide. B. S. Pratt Co., New York. This product was labeled: Sodium polysulphide 39-40 per cent; sodium thiosulphate 1-2 per cent; inert ingredients 58-60 per cent.

Analysis showed the following composition:

Total sulphur .......... 33.78 per cent  
Sulphur as monosulphide .......... 7.79 " "  
Sulphur as thiosulphate .......... 2.56 " "  
Sulphur as sulphate .......... 0.25 " "  
Polysulphide sulphur (by difference) .......... 23.18 " "  
Equivalent to sodium polysulphide .......... 38.48 " "

Sodium polysulphide is assumed to be the pentasulphide in the above calculation.

2518. Niagara Pomodust. Niagara Sprayer Co., Middleport, N. Y. The active ingredients claimed are sulphur not less than 87 per cent; arsenic (metallic), not less than 1.76 per cent; arsenic, water-soluble (metallic), not more than 0.50 per cent.

Analysis showed the following:

Total arsenic (metallic) .......... 1.84 per cent  
Water soluble arsenic (metallic) .......... 0.12 " "  
Total sulphur .......... 89.73 " "

NICOTINE PREPARATIONS

22695. Sulphur-Arsenate Dust 90-10; and 22696, Sulphur-Arsenate Dust 83-15. John Bacon, Gasport, N. Y.
Analyses were made as follows:

<table>
<thead>
<tr>
<th></th>
<th>22695 Found.</th>
<th>22695 Guaranteed</th>
<th>22696 Found.</th>
<th>22696 Guaranteed</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Total arsenic as As₂O₅</td>
<td>2.85</td>
<td>3.74</td>
<td>1.86</td>
<td>2.44</td>
</tr>
<tr>
<td>as As</td>
<td>0.17</td>
<td>0.22</td>
<td>0.11</td>
<td>0.14</td>
</tr>
<tr>
<td>Water sol. arsenic as As₂O₅</td>
<td>0.11</td>
<td>0.10</td>
<td>0.14</td>
<td>0.15</td>
</tr>
<tr>
<td>as As</td>
<td>0.11</td>
<td>0.10</td>
<td>0.14</td>
<td>0.15</td>
</tr>
<tr>
<td>Total sulphur¹</td>
<td>88.27</td>
<td>88.50</td>
<td>84.75</td>
<td>83.00</td>
</tr>
</tbody>
</table>

¹ Sulphur determined by the U. S. P. method IX, and sulphur in the undissolved residue by the A. O. A. C. method, Sec. 19, p. 20.

2551. Sulphur Dust. Sample submitted by Department of Entomology and examined for presence of lead arsenate. Qualitative tests showed presence of both arsenic and lead.

1855. Lime-sulphur. (Blanchard's). 1856. Grasselli's. Samples were submitted by a purchaser and the following determinations were made.

<table>
<thead>
<tr>
<th></th>
<th>No. 1855</th>
<th>No. 1856</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific gravity at 22° C.</td>
<td>1.2333</td>
<td>1.3080</td>
</tr>
<tr>
<td>Baumé degrees</td>
<td>27.4</td>
<td>34.10</td>
</tr>
<tr>
<td>Total sulphur</td>
<td>19.62</td>
<td>25.35</td>
</tr>
</tbody>
</table>

Nicotine Preparations.

2476. Black Leaf 40. Tobacco By-Products and Chemical Corporation, Louisville, Ky. Active ingredient nicotine, 40 per cent. Nicotine found 40.93 per cent.

2517. Niagara A I Dust. Niagara Sprayer Co., Middleport, N. Y. Claimed to contain 2.7 per cent of nicotine. Nicotine found 2.78 per cent.

2469. Hall's Nicotine Sulphate Solution, 40 per cent nicotine. Hall Tobacco Chemical Co., St. Louis, Mo. Nicotine found 40.61 per cent.

2919. Nico Fume (Liquid). Tobacco By-Products and Chemical Corporation, Inc., Louisville, Ky. Claimed to contain 40 per cent free nicotine. The product contained 42.90 per cent.

2920. Nico Fume Tobacco Powder. Tobacco By-Products and Chemical Corporation, Inc., Louisville, Ky. This product was guaranteed to contain 12.5 per cent nicotine and the package was dated to indicate the time after which the above guaranty would not hold. The sample was purchased after the expiration of the period indicated, but attention was called to that fact by the dealer and the article was sold at a reduced price. The nicotine
found was 12.71 per cent, indicating that the precaution on the label gave the manufacturer an ample margin of safety.


Analysis:
- Nicotine found .................... 0.71%
- Passed 200 mesh .................... 96.00%

1300. Nicotine Dust. (Old Sample.) Submitted by Department of Entomology.

Analysis:  Nicotine found 1.96%

SPRAY EMULSIONS.

1465. Soluble Spray Oil for dormant spraying. Clarkson & Ford, New York. Sample submitted by the Lyman Farm, Middlefield, Conn.

Partial analysis was made as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Found</th>
<th>Guaranteed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific gravity 25° C.</td>
<td>0.9333</td>
<td></td>
</tr>
<tr>
<td>Unsaponifiable</td>
<td>85.10</td>
<td></td>
</tr>
<tr>
<td>Rosin</td>
<td>present</td>
<td></td>
</tr>
</tbody>
</table>

The mixture is a light petroleum oil containing a sodium soap, probably sodium rosinate.

2507. Pratt's Carboleine. B. G. Pratt, 50 Church St., N. Y. Sample submitted by the Department of Entomology of this Station.

Analysis:

<table>
<thead>
<tr>
<th>Component</th>
<th>Found</th>
<th>Guaranteed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil</td>
<td>88.74</td>
<td>86.00</td>
</tr>
<tr>
<td>Phenol</td>
<td>present</td>
<td>3.00</td>
</tr>
<tr>
<td>Ash</td>
<td>1.22</td>
<td></td>
</tr>
<tr>
<td>Water, determined by xylol, 11.17, by difference</td>
<td>10.04</td>
<td></td>
</tr>
</tbody>
</table>

The product was claimed to contain 83 per cent mineral oil and 3 per cent saponifiable oil. Potassium oxide was claimed to be 1 per cent.

2508. Anthracene Oil Emulsion. The Sherwin-Williams Co. Sample submitted by Department of Entomology. Claimed to contain anthracene oil 75 per cent, fish oil soap 3 per cent, water 22 per cent.

Analysis:

<table>
<thead>
<tr>
<th>Component</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total oil</td>
<td>72.63 per cent</td>
</tr>
<tr>
<td>Water (xylol method)</td>
<td>25.08</td>
</tr>
<tr>
<td>Soap and undetermined</td>
<td>2.29</td>
</tr>
</tbody>
</table>
MISCELLANEOUS PRODUCTS

MISCELLANEOUS.


Analysis:
- Nitrogen .................................. 3.30%
- Casein (N x 6.38) ....................... 21.05
- Lime (CaO) .............................. 44.32

1600. Lead arsenate coated with lead stearate for experimental purposes (by Department of Entomology) was found not to have increased in water-soluble arsenic during the period of one year. At the two intervals the results for water-soluble arsenic (as As₂O₃) found were 0.09 in both cases.


Partial analysis was made as follows:
- Phosphorus pentoxide (P₂O₅) .......... 28.37%
- Calcium oxide (CaO) .................. 21.80
- Iron and aluminum oxides (Al₂O₃Fe₂O₃) 20.60
- Silica (SiO₂) .......................... 11.00
- Flourine (F) ............................ 11.95


Analysis:
- Total arsenic found (as metallic) ...... 23.67%
- Calc. as sodium arsenite (Na₅HasO₅) .... 53.64

23420, 23421, 23422, 23423 and 23426. Experimental mixtures examined for the Department of Entomology. Water-soluble arsenic only was determined.

2591 and 2592. Fish Oil Soaps; and 2593 and 2594. Engine oil emulsion and Kerosene emulsion respectively. These were examined in collaboration with the A. O. A. C. referee’s program for study of methods of analysis. The results obtained are reported elsewhere but they are summarized here for reference.

<table>
<thead>
<tr>
<th></th>
<th>2591</th>
<th>2592</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water, Xylo method</td>
<td>29.95</td>
<td>32.66</td>
</tr>
<tr>
<td>Official method</td>
<td>30.00</td>
<td>32.08</td>
</tr>
</tbody>
</table>

1 Proceedings, A. O. A. C. 1925.
<table>
<thead>
<tr>
<th></th>
<th>2593</th>
<th>2594</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>1.04</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>1.08</td>
<td>0.28</td>
</tr>
<tr>
<td>Water (xylol method)</td>
<td>33.22</td>
<td>36.71</td>
</tr>
<tr>
<td></td>
<td>33.28</td>
<td>36.93</td>
</tr>
<tr>
<td>Total Oil</td>
<td>65.26</td>
<td>63.40</td>
</tr>
<tr>
<td></td>
<td>65.90</td>
<td>62.70</td>
</tr>
<tr>
<td>Potash (K₂O)</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td>Soda (Na₂O)</td>
<td></td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.15</td>
</tr>
</tbody>
</table>
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<td>Interstate Chem. Co., Key, Bordo-Lead,</td>
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</tr>
<tr>
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<td>153</td>
</tr>
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<td>Nitrate Agencies Co., Bordeaux-Paris-green, '22, 153</td>
<td></td>
</tr>
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<td>146</td>
</tr>
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