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CONNECTICUT AGRICULTURAL EXPERIMENT STATION

NEW HAVEN, CONN.

Report on Commercial Insecticides and Fungicides

I. TEXT OF THE INSECTICIDE LAW OF CONNECTICUT AND REGULATIONS FOR ITS ENFORCEMENT.

II. EXAMINATION OF INSECTICIDES, FUNGICIDES, ETC.

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June, 1924.

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Rules and Regulations for Carrying Out the Provisions of the Insecticide and Fungicide Law.

By authority of Section 5 of the Insecticide and Fungicide Act, Chapter 258, Public Acts of 1923, the following rules and regulations have been adopted for carrying out the provisions of the act.

As further provided in said Section these rules and regulations conform, so far as possible, to those laid down by the Secretary of Agriculture of the United States for the enforcement of the Federal Insecticide Act.

Sections cited under each regulation refer to the section of the State law wherein the term defined, or the clause interpreted, occurs; and the citation following each regulation refers to the Federal regulation which corresponds thereto.

WM. L. SLATE, JR.
Director of the Conn. Agricultural Experiment Station.

THOMAS HOLT.
Dairy and Food Commissioner.

REGULATION 1. ORIGINAL UNBROKEN PACKAGE.

(Section 5.)

The term "original unbroken package" as used in Section 5 of the act, and in these regulations, is the original package, carton, case, can, box, barrel, bottle or other container put up by the manufacturer or dealer, to which the label is attached or which may be suitable for the attachment of a label, making one complete package of the article of insecticide or fungicide. The original package contemplated includes both the wholesale and the retail package.

REGULATION 2. DEFINITIONS OF INSECT AND FUNGI.

(Section 2.)

Insect. The term "insect" as used in Section 2, or elsewhere in the act, and in these regulations, is held to mean any of the numerous small invertebrate animals generally having the body more or less obviously segmented, for the most part belonging to the class *Insecta*, comprising six-legged, usually winged forms, as beetles, bugs, bees, flies, etc., and to other allied classes of arthropods whose members are wingless and usually have more

than six legs, as spiders, mites, ticks, centipedes, wood lice, etc. (F. R. 14.)

Fungi. The term "fungi", as used in Section 2, or elsewhere in the act, and in these regulations, is held to mean all nonchlorophyll-bearing plants of a lower order than mosses and liverworts (i.e. nonchlorophyll-bearing thallophytes), comprising rusts, smuts, mildews, molds, yeasts, bacteria, etc. (F.R. 14a.)

Regulation 3. Concerning Labels.

(Section 4.)

(a) The term "label" as used in Section 4, or elsewhere in the act, and in these regulations, is held to include any legend, descriptive matter or design printed, stenciled, stamped, seared or impressed upon the article or its container and also to include circulars, pamphlets, etc., which are packed and go with the article to the purchaser. (F.R.10.)

(b) Whenever, by the terms of the act, information is required to be stated upon the label of an insecticide or fungicide, such as the statement of percentage of arsenic contained therein, a label must be placed on the article in order that the statement can be made and the omission of a label does not excuse the absence of the required statement. (F.R.11.)

(c) All information required to be given on the label must be plainly and correctly stated in type sufficiently clear and in position sufficiently prominent to attract the immediate attention of the purchaser. (F.R.12.)

(d) Descriptive matter upon the label must be free from any statement, design or device regarding the article or the ingredients or substances contained therein, or regarding the quality or effects thereof, which is false or misleading in any particular. (F.R.15.)

(e) The use of any false or misleading statement, design or device appearing upon the label shall not be justified by any statement given as the opinion of an expert or other person, nor by any descriptive matter explaining the use of the false or misleading statement, design or device. (F.R.17.)

Regulation 4. Concerning the Name and Address of the Manufacturer.

(Section 5.)

The name of the manufacturer or producer or the place of manufacture is not required to be given upon the label, but if given it must be the true name and true place. If the name appearing upon the label is not that of the actual manufacturer or producer it shall be preceded by the words "Packed for....," "Distributed by....," or some equivalent phrase. In case

no name appears the dealer is held responsible unless he can furnish a guaranty from the wholesaler, jobber or manufacturer as provided in Section 5 of the act.

Regulation 5. Concerning the Collection of Samples.

(Section 7.)

Section 7 of the act provides that duly authorized agents of the Connecticut Agricultural Experiment Station or of the Dairy and Food Commissioner may take duplicate samples of any insecticide or fungicide upon tendering the market price thereof.

Such samples shall be representative of the lot or parcel sampled. In the case of bulk goods the sample shall be divided in two parts each sealed, dated and marked for identification. In case of goods in package form if each package be 2 pounds or less in weight or 1 quart or less in volume, two packages may be taken each sealed, dated and marked for identification. If packages are more than 2 pounds in weight or more than 1 quart in volume, a sample may be taken in whatever way is most practicable, divided into two parts, each sealed, dated and marked for identification. In all cases one of the duplicate samples shall be delivered by the sampling agent to the Connecticut Agricultural Experiment Station for analysis and the other left with the person whose stock is sampled.

Regulation 6. Concerning Methods of Analysis.

(Section 7.)

The methods of analysis employed shall be those prescribed by the Association of Official Agricultural Chemists or other approved methods.

An Act Concerning the Manufacture, Sale and Transportation of Adulterated or Misbranded Insecticides and Fungicides.

(Chapter 258, Public Acts of 1923.)

Section 1. No person shall manufacture, sell, offer or expose for sale any Paris green, lead arsenate or other insecticide or any fungicide which is adulterated or misbranded within the meaning of this act.

Sec. 2. The Term "insecticide" shall include any substance or mixture of substances intended to destroy or repel insects. The term "Paris green" shall include the product commercially known as Paris green and chemically known as aceto-arsenite of copper. The term "lead arsenate" shall include the products commercially known as lead arsenate consisting chemically of products derived from arsenic acid (H_3AsO_4) by replacing one or more hydrogen atoms by lead. The term "fungicide" shall include any substance or mixture of substances intended to lessen the growth of or destroy fungi.

Sec. 3. Paris green shall be deemed adulterated: (a) when it shall not contain at least fifty per centum of arsenious oxide (As_2O_3); (b) when it shall contain arsenic in water-soluble forms equivalent to more than

three and one-half per centum arsenious oxide (As_2O_3); or (c) when any substance shall have been mixed and packed with it so as to reduce, lower or injuriously affect its quality or strength. Lead arsenate, not dry or powdered, shall be deemed adulterated: (a) When it shall contain more than fifty per centum of water; (b) when it shall contain total arsenic equivalent to less than twelve and one-half per centum arsenic oxide (As_2O_5); (c) when it shall contain arsenic in water-soluble forms equivalent to more than seventy-five one-hundredths per centum arsenic oxide (As_2O_5); or (d) when any substance shall have been mixed and packed with it so as to reduce, lower or injuriously affect its quality or strength; provided lead arsenate and water shall not be deemed to be adulterated when such mixture shall contain more than fifty per centum of water if such mixture shall be labeled lead arsenate and water and the percentage of water shall be plainly and correctly stated on the label. Dry or powdered lead arsenate shall be deemed adulterated when it shall contain total arsenic equivalent to less than twenty-five per centum of arsenic oxide (As_2O_5) and arsenic in water-soluable forms equivalent to more than one and one-half per centum of arsenic oxide (As_2O_5). Insecticides and fungicides other than Paris green and lead arsenate shall be deemed adulterated: (a) When the strength or purity shall fall below the standard or quality under which it shall be sold; (b) when any substance shall have been substituted wholly or in part for the article described; (c) when any valuable constituent of the article shall have been wholly or in part abstracted; or (d) when it shall be intended for use on vegetation and shall contain any substance which, although destroying or repelling insects or lessening the growth of or destroying fungi, shall be injurious to vegetation upon which it may be used.

Sec. 4. The term "misbranded," as used in this act, shall apply to any insecticide or fungicide, or any article which shall enter into the composition of any insecticide or fungicide, the package or label of which shall bear any statement, design or device regarding such article or any ingredient or substance contained therein which shall be false or misleading in any particular, including any statement, design or device which shall be false or misleading as to the place of manufacture thereof. Any insecticide, other than Paris green or lead arsenate, and any fungicide shall be deemed misbranded: (a) When it shall contain arsenic in any of its combinations or in the elemental form and the amount of arsenic present shall not be stated on the label as the per centum of metallic arsenic; (b) when it shall contain arsenic in any of its combinations or in the elemental form and the amount of arsenic in water-soluble forms shall not be stated on the label as the per centum of metallic arsenic; (c) when it shall consist partially or completely of any inert ingredient which shall not destroy or repel insects or lessen the growth of or destroy fungi and shall not have the name and percentage amount of each of such inert ingredients plainly and correctly stated on the label; provided, in lieu of naming and stating the percentage amount of each inert ingredient, the producer may, at his discretion, state plainly on the label the correct name and percentage amount of each ingredient of the insecticide or fungicide having insecticidal or fungicidal properties and, make no mention of the inert ingredients except to state the total percentage thereof.

Sec. 5. The dairy and food commissioner and the director of the Connecticut Agricultural Experiment Station, acting jointly, shall make all necessary rules and regulations for carrying out the provisions of this act, such rules and regulations to conform, where possible, to the rules and regulations of the government of the United States authorized by the federal insecticide act of 1910. Upon complaint or information of a violation of any provision of this act, submitted by the Connecticut Agricultural Experiment Station, said commissioner and said director shall hold a hearing thereon, giving reasonable notice and opportunity

to any person accused of any violation hereof to be present and be heard. If said commissioner and said director shall be of the opinion that any person shall have committed a violation of any provision of this act, they shall place all evidence thereof which they shall have secured with any prosecuting authority having jurisdiction; but no person shall be penalized under the provisions of this act for selling or offering for sale any article of insecticide or fungicide in the original unbroken package in which it was received by him, provided he shall establish a guaranty by the wholesaler, jobber, manufacturer or other person residing in the United States, from whom any such article shall have been purchased, that such article is not adulterated or misbranded within the meaning of this act, which guaranty shall contain the name and address of the guarantor, but such guarantor shall be amenable to prosecution and penalties.

Sec. 6. Any person manufacturing, selling, offering or exposing for sale any insecticide or fungicide in violation of any provision of this act shall be fined not more than two hundred dollars for the first offense and not more than three hundred dollars for each subsequent offense.

Sec. 7. The Connecticut Agricultural Experiment Station or the dairy and food commissioner, or both, or their deputies, may, upon tendering the market price thereof, take duplicate samples from any lot, parcel or package of insecticide or fungicide which may be in the possession of any person. Each such sample shall be taken in the presence of the owner or his representative, and shall be sealed and properly marked for identification. One of such samples shall be left with the person from whom taken and the other shall be retained by the official taking the same. The Connecticut Agricultural Experiment Station shall annually analyze at least one sample of each brand of insecticide or fungicide so collected and such analysis shall include determinations of the active ingredients which the article contains, with such other determinations as may be deemed advisable. Results of such analyses shall be published in the bulletins of said Connecticut Agricultural Experiment Station, with such information regarding the character, composition and use thereof as may be of interest or importance. Such bulletins shall be issued annually or at such other intervals as may be deemed advisable.

Part II. 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 Part I of this report. 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.

An inspection was made in 1922 the results of which have been published.[1] Since then no general official inspection has been made but a few samples have been collected by our Station agent and others have been submitted by the departments of Entomology and of Botany of this Station and by others interested. Part II of this report gives the results of the examination of these samples.

The report includes a special analytical study of healthy and of diseased plants, chiefly tobacco. This work was done in collaboration with the Department of Botany in connection with their studies in vegetable pathology. Though not immediately connected with the purpose of this bulletin the results are recorded here as of interest.

CLASSIFICATION OF MATERIALS.

The samples analyzed may be classified as follows:

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*With the collaboration of Messrs. Andrew, Fisher, Nolan and Shepard.

1. Conn. Exp. Sta., Bull. 242, 1922.

Material	No. of samples.
Lead arsenate	3
Casein spreaders	5
Copper dusts, etc	4
Sulphur preparations	6
Nicotine preparations and tobacco	18
Tobacco, etc. healthy and diseased	12
Lime, for spraying	4
Miscellaneous	15
Total	**67**

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.

21588. A sample of dry arsenate of lead was submitted by the department of Botany in connection with an investigation of foliage injury after spraying. The sample was of normal composition and the amount of water-soluble arsenic was not excessive.

Analysis: Total lead oxide (PbO), 63.34 per cent; total arsenic (As_2O_5), 32.16 per cent; water-soluble arsenic (As_2O_5), 0.30 per cent.

Two other samples were examined. One, **21437,** contained an excess of water-soluble arsenic, viz., 1.78 per cent. as As_2O_5, the limit for water-soluble arsenic being 1.50 per cent. The other sample, **23303,** was submitted for identification. It was shown to be lead arsenate containing only 0.50 per cent. of water-soluble arsenic as As_2O_5.

Casein Spreaders, "Calcium Caseinate."

Five samples representing three different brands have been examined.

Table I. Analyses of "Calcium Caseinate".

No.	Brand and Manufacturer	Nitrogen %	Casein (N x 6.38)	Lime (CaO)
22487	*A-7-ML* Casein Mfg. Co., New York	7.92	50.53	27.27
22601	*Kayso* California Central Creameries, San Francisco, Cal.	3.26	20.80	48.25
22602	*Red Diamond* Rosin & Co., Philadelphia, Pa.	2.98	19.01	55.26
22731	*Red Diamond* Rosin & Co., Philadelphia, Pa.	3.36	21.44	52.56
22614	*Red Diamond* Rosin & Co., Philadelphia, Pa.	3.59	22.90	44.11

These materials are mechanical mixtures of casein and lime in varying proportions and are not caseinates in the chemical sense of that term. They are used to facilitate the distribution of spray materials uniformly over the surface of foliage.

Four of the samples examined contain casein and lime in roughly the same proportions; the other sample shows a much greater proportion of casein.

Copper Dusts, Etc.

21416. *Niagara, D 25 Potato Dust.* Made by the Niagara Sprayer Co., Middleport, N. Y. This was guaranteed to contain 8.6 per cent. of copper (metallic), equivalent to 24.0 per cent. monohydrated copper sulphate; inert 76 per cent. Copper found was 8.9 per cent.

21414. *Dosch B-12 Green Copper Arsenic Dust.* Made by the Dosch Chemical Co., Louisville, Ky. The active ingredients guaranteed are copper (as metallic), not less than 5.75 per cent. and arsenic (as metallic), not less than 2.75 per cent. Copper found was 5.79 per cent. and arsenic 3.39 per cent. Arsenic is present as calcium arsenate.

20903. *Sanders' Dust.* Sample was submitted by a purchaser. It contained 6.10 per cent. of copper (as metallic), and 2.93 per cent. of arsenic (as metallic). Arsenic was found to be combined with calcium.

21264. *Bordeaux powder.* Sample sent by County Agent J. H. Fay. It was found to contain 14.34 per cent. of copper (as metallic).

Sulphur Preparations.

21415. *Niagara 90-10 Dusting Mixture (Pomodust).* Made by the Niagara Sprayer Co., Middleport, N. Y. The active ingredients declared were sulphur not less than 88 per cent., lead arsenate not less than 9.80 per cent., total arsenic (as metallic), not less than 1.95 per cent, and water-soluble arsenic (as metallic), not over 0.5 per cent.

Partial analysis showed 87.79 per cent. of sulphur, 1.84 per cent. of total arsenic (as metallic), and 0.24 per cent. of water-soluble arsenic (as metallic), which conforms substantially with the guaranty.

21413. *Niagara Soluble Sulphur Compound.* Made by the Niagara Sprayer Co., Middleport, N. Y. The sample examined was not an original package and the analysis does not fairly represent the composition of the fresh material. Polysulphides readily oxidize on exposure to air and pass into less active combinations. The composition of the original material was declared to be: sodium polysulphide 40 per cent., sodium thiosulphate, 18 per cent., free sulphur 3 per cent. and inert ingredients, 39 per cent. The amount of total sulphur found (41.4 per cent.), agreed closely

with that calculated from the ingredients declared, assuming polysulphide to be as pentasulphide, but its distribution was largely as thiosulphate and free sulphur. Directions properly caution against undue exposure of the material before using.

21417. *Niagara Dusting Sulphur. Sulfodust.* Made by the Niagara Sprayer Co., Middleport, N. Y. The material contained 92.4 per cent. of sulphur which conformed substantially to the guaranty of 93 per cent. with inert ingredients, 7 per cent.

22645. *Solbar.* Made by Bayer Company, New York. This is a "brand of barium sulphide compound for plant protection (polysulphide of barium)."

Analysis: Soluble in cold water 59.58 per cent; sulphide sulphur 15.04 per cent; thiosulphate sulphur 2.55 per cent; total soluble sulphur 17.59 per cent; total soluble barium (BaO), 43.42 per cent; insoluble sulphur 6.13 per cent; insoluble barium 9.35 per cent.

The soluble portion consists chiefly of barium sulphide or polysulphide and barium thiosulphate.

22697. *Colloidal Sulphur.* This was a sulphur paste, manufacturer unknown, containing 36.3 per cent. of sulphur.

22532. *Lime-sulphur solution.* This sample submitted by a purchaser was of average composition. It had a specific gravity at 15.6° C of 32 (Baumé), and contained 25.53 per cent. of sulphur.

Nicotine Products.

21258. *Niagara New Nicotine Contact Mixture D-1.* Made by the Niagara Sprayer Co., Middleport, N. Y. This dusting mixture is guaranteed to contain 1.25 per cent. of nicotine and 98.75 per cent. of inert ingredients. It contained 1.43 per cent. of nicotine (as alkaloid).

21129 and **21130.** *Nicotine dusts.* Samples were submitted by a purchaser. No. **21129** was a white powder containing 1.51 per cent. of nicotine (alkaloid); 96 per cent. of the material passed a 200 mesh sieve. No. **21130** was a brown powder which contained 0.72 per cent. of nicotine (alkaloid); 77.5 per cent. passed a 200 mesh sieve.

21831. *Axfixo.* Heightstown Hardware Co., Heightstown, N. J. Declared to contain not less than 1.25 per cent. nicotine; inert 98.75 per cent.

Analysis: Total ash 96.50 per cent; insoluble ash 1.28 per cent; lime (CaO), 31.85 per cent; magnesia (MgO), 23.57 per cent; nicotine 1.47 per cent.

On exposure to air in open container at room temperature the following amounts of nicotine were found at the intervals stated: After 24 hours 1.07 per cent.; 5 days, 0.35 per cent.; 10 days 0.18 per cent.; 15 days 0.12 per cent.

Tobacco.

Four samples of tobacco grown at the Tobacco Station at Windsor were examined as follows:

Table II. Analyses of Tobacco.

(Air-dry material)

No.	Material	Moisture	Nitrogen	Nicotine	Potash (K_2O)	Phosphoric acid (P_2O_5)
		%	%	%	%	%
19917	Broadleaf suckers..	4.06	3.85	0.68	....	1.00
19918	Leaves, shade grown	5.09	3.85	0.78	5.37	0.86
19920	Stalks, shade grown	5.09	1.72	0.26	3.69	0.45
19919	Havana.....	3.61	3.02	0.60	4.53	0.90

Six samples of tobacco grown at Storrs were analyzed for ash, nitrogen and nicotine. Results are given in Table III.

Table III. Analyses of Tobacco.

(Moisture-free basis).

No.	Material	Ash	Nitrogen	Nicotine
		%	%	%
22576	Rustica, without tops or suckers....	23.63	3.89	6.57
22577	Rustica, tops and suckers.....	29.16	3.05	2.49
22578	Rustica, with tops, without suckers.	25.52	3.22	4.90
22579	Rustica, without tops or suckers....	16.08	3.78	1.65
22580	Rustica, with tops, without suckers.	13.91	3.38	1.44
22581	Rustica, tops and suckers.....	17.68	4.13	1.38

Four other samples of tobacco were analyzed in connection with the study of a method for determining nicotine. One of these was smoking tobacco (Bull Durham), the analysis of which is as follows:

20175. Moisture 7.23 per cent; ash 14.03 per cent; ash insoluble in acid 1.42 per cent; phosphoric acid in soluble ash 3.68 per cent; nitrogen 2.20 per cent; nicotine 2.60 per cent.

Comparative Analyses of Healthy and of Diseased (Calicoed) Leaves of Tobacco, Tomato and Petunia.

These analyses of normal and of calicoed leaves were made primarily for the benefit of the Department of Botany of this Station in connection with their studies in plant pathology.

The leaves were selected from relatively the same positions on the stalks in order that they might be of as nearly equal age and development as possible. The material was then dried in a current of warm air and the air dry substance used for analysis. Results were calculated (a) to the basis of the fresh green leaf, and (b) to the water-free material.

Generalities cannot, of course, be based upon such a limited number of analyses. The natural variations which may occur in the composition of healthy leaves and of diseased leaves must be

reasonably established before attempting to compare the one type with the other too minutely. However, the analytical data, which is in some detail, is of interest. The nitrogen content of all the diseased plants was found to to be higher than that of the healthy leaves; and it generally holds that the carbohydrates are lower in the diseased leaves. Making allowance for ash insoluble in acid (sand, etc.), the results indicate that the diseased leaves are somewhat poorer in mineral constituents than the healthy leaves but the evidence is not altogether consistent. Differences between the separate ash constituents are either so inconspicuous as to magnitude, or so inconsistent as to value (+ or −), that no exact conclusions seem warranted. Analyses are given in Table IV.

Two other samples of healthy and of diseased leaves of tobacco were analyzed less completely as follows:

	Healthy leaves 19992 %	Calicoed leaves 19993 %
Moisture	4.88	4.98
Ash	23.33	18.82
Nitrogen	3.36	5.34
Nicotine	0.96	0.92

Lime for Spraying.

Four samples were submitted by purchasers chiefly to determine whether they contained much magnesia. For spraying purposes calcitic lime is preferred. Three of the samples examined were of the dolomitic type, containing 28 to 32 per cent. of magnesia (MgO).

Miscellaneous Materials.

20808. *Schnarr's Insecticide.* Made by the Van Antwerp Drug Corporation, Mobile, Ala.

Analysis: Moisture 33.68 per cent; ash 1.44 per cent; total fatty acids 8.25 per cent; free fatty acids (as oleic acid), 0.77 per cent; mineral oil 49.13 per cent.

The preparation is a paste consisting of, or containing, mineral oil emulsified with soap. Other active ingredients, if present, not identified.

20715. *Keresol.* Claasen, Murfit and Co., Philadelphia.

Analysis: Ash 1.30 per cent; phenol 4.15 per cent; light oil (kerosene), 80 per cent; residual (largely soap), 12 per cent (approx.).

The partial analysis indicates that the preparation consists essentially of an emulsion of kerosene and soap containing phenol.

20716. *Sun Miscible Oil.* Sun Co., Boston and New York.

Analysis: Ash 2.85 per cent; unsaponifiable 79 per cent; saponified fatty material 16 per cent.

TABLE IV. ANALYSES OF HEALTHY AND DISEASED LEAVES.

	Havana Tobacco				Cuban Tobacco			
	Healthy 21790A		Calicoed 21791A		Healthy 21792A		Calicoed 21793A	
	% Fresh	% Water-free	% Fresh	% Water-free	% Fresh	% Water-free	% Fresh	% Water-free
Moisture	88.91	00.00	88.36	00.00	84.72	00.00	84.21	00.00
Ash	2.32	20.91	2.34	20.06	3.18	20.79	3.38	21.41
Nitrogen	0.43	3.88	0.56	4.84	0.63	4.09	0.74	4.67
Nicotine	0.21	1.88	0.21	1.79	0.34	2.25	*	*
Carbohydrate:								
Starch	....	....	0.24	2.03	0.26	1.71	0.24	1.54
Sol. carbohydrate as dextrose	0.70	6.33	0.72	6.16	1.26	8.23	1.03	6.54
Insoluble in acid	0.11	0.95	0.08	0.68	0.49	3.18	0.72	4.57
Iron and Aluminum ($Fe_2O_3+Al_2O_3$)	0.04	0.32	0.02	0.21	0.09	0.60	0.11	0.67
Manganese (Mn_3O_4)	0.02	0.15	0.01	0.09	0.02	0.10	0.01	0.06
Magnesium (MgO)	0.17	1.49	0.16	1.36	0.20	1.31	0.21	1.30
Calcium (CaO)	0.54	4.90	0.53	4.58	0.70	4.59	0.70	4.42
Potassium (K_2O)	0.72	6.53	0.72	6.23	0.77	5.03	0.71	4.52
Phosphoric acid (P_2O_5)	0.09	0.78	0.10	0.88	0.13	0.84	0.14	0.90
Sulphuric acid (SO_3)	0.20	1.81	0.16	1.35	0.21	1.39	0.19	1.22

* Sample too small, all used for other determinations.

TABLE IV. ANALYSES OF HEALTHY AND DISEASED LEAVES—(*Continued*)

	Broad Leaf Tobacco				Tomato				Petunia			
	Healthy 21794		Calicoed 21795		Healthy 21803		Calicoed 21804		Healthy 21856		Calicoed 21855	
	% Fresh	% Water-free	% Fresh	% Water-free	% Fresh	% Water-free	% Fresh	% Water-free	% Fresh	% Water-free	% Fresh	% Water-free
Moisture	86.61	00.00	86.73	00.00	84.72	00.00	85.23	00.00	80.26	00.00	81.01	00.00
Ash	2.46	18.33	2.58	19.45	3.85	25.20	3.18	21.50	4.38	22.14	4.74	25.07
Nitrogen	0.60	4.49	0.67	5.07	0.54	3.52	0.68	4.61	0.45	2.28	0.55	2.92
Nicotine	0.35	2.63	0.36	2.70	....	....	....	....	....	....	....	....
Carbohydrate:												
Starch	0.26	1.97	0.20	1.51	0.19	1.24	0.15	1.01	0.14	0.73	0.12	0.62
Sol. carbohydrate as dextrose	0.84	6.28	0.66	4.95	0.77	5.05	0.76	5.17	0.99	5.01	0.69	3.65
Insoluble in acid	0.12	0.92	0.28	2.12	0.23	1.53	0.31	2.11	2.46	12.44	2.63	13.91
Iron and Aluminum ($Fe_2O_3+Al_2O_3$)	0.03	0.23	0.05	0.40	0.05	0.34	0.03	0.21	0.39	1.96	0.38	1.99
Manganese (Mn_3O_4)	0.01	0.07	0.01	0.08	0.01	0.09	0.01	0.08	0.01	0.06	0.03	0.14
Magnesium (MgO)	0.16	1.20	0.17	1.29	0.24	1.55	0.21	1.41	0.12	0.61	0.13	0.69
Calcium (CaO)	0.52	3.88	0.57	4.27	1.06	6.95	0.82	5.53	0.26	1.31	0.23	1.24
Potassium (K_2O)	0.79	5.90	0.70	5.27	0.80	5.24	0.77	5.20	0.69	3.51	0.81	4.29
Phosphoric acid (P_2O_5)	0.10	0.76	0.10	0.75	0.09	0.62	0.12	0.82	0.14	0.73	0.16	0.84
Sulphuric acid (SO_3)	0.14	1.06	0.13	0.99	0.52	3.41	0.42	2.83	0.08	0.42	0.08	0.43

This preparation appears to be a mixture of mineral oil and a sodium soap.

22855. *Verm-O-Spray.* Verm-O-Spray Products Co., West Haven, Conn.

Analysis: Sp. Gr. at 15.6° C. 0.8825; ash trace; flash point 61.0°C (142°F); fire point 64°C. (147°F); salicylate present.

This preparation consists of, or contains, chiefly kerosene and methyl salicylate. Other active ingredients, if present, not identified.

20811. *Roach Liquid.* The Pied Piper Service, Providence, R. I.

The sample submitted appeared to be largely kerosene and methyl salicylate. Other active ingredients, if present, were not identified.

20809. *Roach Powder.* The Pied Piper Service, Providence, R. I.

Analysis: Moisture 14.57 per cent; nitrogen 0.5 per cent, equivalent to protein 3.13 per cent; starch 13.73 per cent; ash 40.60 per cent; sodium oxide (Na_2O), 18.89 per cent; boron oxide (B_2O_3), 18.32 per cent; chlorine 5.12 per cent; silica, iron, sulphate, phosphate, traces.

The preparation consists essentially of a cereal, or other starchy material, with borax and salt. Active ingredients other than borax, if present, were not detected.

20112. *Herbicide.* Reade Manufacturing Co., Jersey City, N. J. This is sold as a weed exterminator. It is a green alkaline solution.

Analysis: Solids 31.09 per cent; arsenic (as As_2O_3), 24.30 per cent; sodium arsenite ($NaAsO_2$), calculated from $As_2O_3 = 31.9$ per cent.

The preparation is essentially a solution of sodium arsenite.

21127. *Be-Health.* General Laboratories, Madison, Wis. This is a special sodium hypochlorite solution prepared for treating foul brood in bees. Active ingredients declared 8.50 per cent; inert 91.50 per cent.

Analysis: Available chlorine 3.77 gms. per 100 cc.; total chlorine 3.81 gms. per 100 cc; sodium hypochlorite (NaOCL), equivalent to available chlorine 3.96 gms. per 100 cc.; sulphates trace; calcium none.

Available chlorine determined 33 days after the first analysis was made showed 3.70 gms. per 100 cc., indicating practically no deterioration in that length of time. During the interval the solution remained corked in the original container at ordinary room temperature. Assuming the active ingredient to be sodium hypochlorite the guaranty is more than twice as high as it should be.

20391 and **20404.** *Qykade.* The Chlorine Products Co., New York. Solution of chlorine.

Analysis: **20391.** Total solids 1.26 gms. per 100 cc.; available chlorine 0.40 gm. per 100 cc; total chlorine 0.71 gm. per 100 cc; lime (CaO), 0.64 gm. per 100 cc. **20404.** Available chlorine 0.37 gm. per 100 cc.

Available chlorine determined in **20391** about 40 days after the first analysis showed available chlorine of 0.37 gm. per 100 cc. The solution contains a mixture of calcium hypochlorite and calcium chloride.

21714, 21834. *Star Water*; and **21837** *Wescco Bleaching Water.* These are disinfectant and bleaching solutions the active agent being the available chlorine which was determined to be 2.43, 2.84 and 2.89 gms. per 100 cc., in the order named. The Wescco product bore no statement of active ingredient.

20459. *Unknown material* submitted for identification was found to be copper cyanide.

20810. *Rat exterminator.* This was a preparation with a cereal or starchy base in which the active ingredient was not identified. No alkaloidal poisons were detected.