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REPORT OF ANALYSES OF PARIS GREEN AND
OTHER INSECTICIDES IN 1901.

L. L. VAN SLYKE AND W. H. ANDREWS.



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* Connected with Fertilizer Control.

† At Second Judicial Department Branch Station, Jamaica, N. Y.

‡ Absent on leave.

REPORT OF ANALYSES OF PARIS GREEN AND OTHER INSECTICIDES IN 1901.*

L. L. VAN SLYKE AND W. H. ANDREWS.

SUMMARY.

In accordance with the provisions of a law designed to protect purchasers of Paris Green, samples were secured during 1901 and the results are published in this bulletin.

In the 40 samples of Paris Green examined, the arsenious oxide varied from 56.13 to 62.87 per ct. and averaged 58.10 per ct. The water-soluble arsenious oxide varied from 0.88 to 2.64 per ct. and averaged 1.28 per ct.

The copper oxide varied from 26.53 to 31.14 per ct. and averaged 29.88 per ct. The amount of arsenious oxide in combination with copper varied from 49.70 to 57.72 per ct. and averaged 55.98 per ct. The general result of the examination is to show a good quality of Paris Green in the market at the time the samples were taken.

There are given, in addition, analyses of English Bug Compound, Laurel Green, London Purple, and Paris-Green-Bordeaux-Mixture.

INTRODUCTION.

During the year 1901, there were collected for analysis forty samples of materials sold as Paris Green, and also two samples of Laurel Green and one sample each of English Bug Compound, London Purple, Paragrene and Paris-Green-

*Printed by the authority and under the direction of the Commissioner of Agriculture.

Bordeaux Mixture. The forty samples of Paris green represent twenty different manufacturers, eight of whom were not represented in the samples examined by us in 1900.

For a discussion of the chemistry of Paris green and for a statement of the methods of chemical analysis used, see Bulletin No. 190, p. 284.

ANALYSES OF SAMPLES OF PARIS GREEN IN 1901.

No.	Manufacturer	Total arsen- oxide.	Water soluble arsen- ous oxide.	Copper oxide.	Arsen- ous oxide in com- bination with copper.
		<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>	<i>Per ct.</i>
61	Acme Color Works	57.11	1.47	30.04	56.27
353	" " "	57.66	1.47	30.04	56.27
57	Adler Color & Chemical Co.	57.97	0.88	30.29	56.74
347	" " "	56.93	2.64	30.10	56.38
59	A. B. Ansbacher & Co.	57.11	0.88	30.23	56.63
301	" " "	57.84	1.47	30.48	57.10
302	" " "	56.93	1.10	30.35	56.85
60	James A. Blanchard.	57.42	1.53	28.54	53.46
303	" " "	57.11	1.53	29.22	54.73
305	" " "	57.35	1.53	29.66	55.56
362	George C. Buell & Co.	57.72	1.65	29.41	55.09
65	Cawley, Clark & Co.	57.42	1.35	31.23	57.42
63	Charles M. Childs & Co.	57.85	1.23	30.08	56.35
357	" " "	58.76	0.98	30.41	56.97
355	Hampden Paint Co.	58.82	1.10	30.16	56.50
66	Morris Herrmann & Co.	61.40	1.78	27.47	51.46
310	" " "	62.87	2.21	26.78	50.17
340	" " "	62.69	1.53	26.53	49.70
69	Fred L. Lavanburg	57.91	0.98	30.16	56.50
304	" " "	57.91	0.98	30.48	57.10
307	" " "	58.82	1.15	29.91	56.03
361	George E. Laverack	58.03	1.23	29.85	55.91
56	Leggett & Bros.	57.11	0.98	30.01	56.21
342	" " "	56.13	1.23	29.54	55.34
343	" " "	57.42	1.23	30.50	57.13
345	" " "	57.42	0.98	30.41	56.97
68	N. Y. Enamel Paint Co.	57.11	1.47	30.04	56.27
356	" " "	58.09	1.72	30.23	56.63
358	" " "	58.46	0.98	30.35	56.85
62	I. Pfeiffer	57.35	1.10	30.04	56.27
350	" " "	57.72	0.88	30.73	57.57
354	" " "	58.09	1.35	30.29	56.74
54	C. T. Reynolds & Co.	60.72	1.40	28.35	53.11
306	Reynolds (Devos, Reynolds & Co.)	57.29	1.10	30.54	57.21
311	Solomon & Schwartz	57.60	0.88	30.85	57.60
308	Sondheim, Alsborg & Co.	57.84	0.88	30.48	57.10
360	Stanley, Jordan & Co.	58.58	1.40	29.60	55.45
341	John L. Thompson Sons	57.60	0.88	30.29	56.74
67	Unknown	57.72	0.98	31.14	57.72
351	"	58.09	0.98	30.16	56.50

ANALYSES OF SAMPLES OF OTHER INSECTICIDES.

359	English Bug Compound, English Compound Co.	1.46	—	0.60
55	Laurel Green, Nichols Chemical Co.	4.85	0	12.68
309	" " " " " "	5.45	0	12.05
64	London Purple, Hemingway's London Purple Co.	32.32	12.21	—
348	Paragrene, Fred. L. Lavanburg	41.73	0.88	21.06
344	Paris-Green-Bordeaux-Mixture, Leggett Bros.	15.49	1.72	16.02

DISCUSSION OF RESULTS OF CHEMICAL ANALYSIS.

1. *Total arsenious oxide*.—In the 40 samples of materials sold as Paris green, examined by us, the amount of arsenic equivalent to arsenious oxide, varies from 56.13 to 62.87 per ct., one averages 38.10 per ct. This average is over one per ct. higher than that found last year, and is about one-half per ct. below the equivalent of arsenious oxide contained in pure copper aceto-arsenite. So far as the total arsenic content is concerned, the amount found indicates a high quality of Paris green. The variation is about the same as last year and, excepting four samples, is within surprisingly narrow limits. Were the total amount of arsenic present in Paris green the only point to be considered, the quality would be regarded as very satisfactory, but we must consider at the same time the amount of water-soluble compounds of arsenic present in Paris green.

2. *Water-soluble compounds of arsenic*.—The presence of water-soluble arsenic in Paris green is seriously objectionable owing to the fact that soluble arsenic compounds injure foliage. Hilgard, of California, states that in the dry climate of California, Paris green injures foliage when it contains an equivalent of more than four per ct. of arsenious oxide in the form of soluble arsenic compounds. The water-soluble arsenic most commonly occurring in Paris green is in the form of arsenious oxide, commercially known as common white arsenic.

The method of analysis used by us in determining the amount of water-soluble arsenic compounds in Paris green should show the full amount of such compounds that would

be found in actual field work where Paris green is mixed with water at the rate of one part by weight of Paris green to 1000 parts of water and the mixture used soon after preparation. By longer extraction with water, larger quantities of soluble arsenic compounds can be obtained; but for our purpose, it is desirable to approximate the amount likely to be found in actual field practice in the use of Paris green under the conditions commonly employed. It would, in our judgment, be proper to condemn for use as an insecticide Paris green or other similar materials that yield more than $3\frac{1}{2}$ per ct. of water-soluble arsenic compounds expressed as arsenious oxide, when treated for 24 hours with distilled water at the rate of 1000 parts of water for one part of Paris green or arsenic-containing materials.

The water-soluble arsenious oxide varies in the 40 samples of Paris green examined from 0.88 to 2.64 per ct., and averages 1.28, which is far below the limit of harm prescribed for use as an insecticide and the limit fixed by law.

3. *Copper in Paris green determined as copper oxide.*—The amount of copper expressed as the equivalent of copper oxide, varies in the 40 samples of Paris green examined from 26.53 to 31.14 per ct. and averages 29.88 per ct., which is about the same as last year.

4. *Amount of arsenious oxide in combination with copper.*—The law relating to Paris green in this State was amended in 1901, so as to correct certain defects existing in the original law with reference to the definition of Paris green. The original law required that Paris green should contain the equivalent of 50 per ct. of arsenious oxide. This provision was needlessly low and was also open to the very serious objection that it permitted indefinite adulteration by common white arsenic. This defect has been corrected by requiring that Paris green shall contain arsenic *in combination with copper*, equivalent to not less than 50 per ct. of arsenious oxide. In ascertaining the amount of copper in combination with arsenic, it has been assumed that all the copper present was so combined, except when found in excess. While

this assumption is not strictly accurate, it answers the purpose, especially when the precaution is taken to examine the Paris green for water-soluble forms of copper compounds.

In the 40 samples of Paris green examined the amount of arsenious oxide in combination with copper varied from 49.70 to 57.72 per ct. and averaged 55.98 per ct., which is about 6 per ct. higher than the minimum required by law. Only one sample fell below the limit and this was only slightly below.

5. *General conclusion as to purity of Paris green in market.*—

Our results indicate a satisfactory condition as to the arsenic content of Paris green found in the market during 1901, and the same can be said as to the amount of water-soluble compounds present in the samples examined.

AMENDMENT TO PARIS GREEN LAW.

In accordance with the suggestions made by us last year, that portion of the Paris green law which related to the definition of Paris green was changed. The essential portion of the amended law embodying this change is as follows:

“§ 112. Composition of Paris green or analogous products. Paris green, or any product analogous to it, when sold, offered or exposed for sale, as such, in this state, shall comply with the following requirements:

First. It shall contain arsenic in combination with copper, equivalent to not less than fifty percentum arsenious oxide.

Second. It shall not contain arsenic in water-soluble forms equivalent to more than three and one-half per centum of arsenious oxide.”

LIST OF PARTIES WHO RECEIVED PARIS GREEN
CERTIFICATES IN 1901.

Acme Color Works, 5 Hanover St., New York.
Adler Color and Chemical Works, 100 William St., New York.
A. B. Ansbacher & Co., 4 Murray St., New York.
Louis Berger & Sons of America, Lim., 100 William St., New York.
Jas. A. Blanchard, 66 Maiden Lane, New York.
Chas. M. Childs & Co., 225 Pearl St., New York.
O. W. Clark & Son, 59 Seneca St., Buffalo, N. Y.
F. W. Devoe & C. T. Reynolds Co., 101 Fulton St., New York.
Hampden Paint and Chemical Co., Springfield, Mass.
J. M. Huber, 275 Water St., New York.
Fred L. Lavanburg, 165 William St., New York.
Leggett & Bros., 301 Pearl St., New York.
John Lucas & Co., 89 Maiden Lane, New York.
Morris, Herman & Co., 255 Pearl St., New York.
I. Pfeiffer, 174 Fulton St., New York.