EFFECT OF INSECTICIDES ON TUBER YIELD

By

Richard L. Post[1], Wayne J. Colberg[2] and J. A. Munro[3]

The object of the 1947 insecticidal tests was to obtain information concerning the newer insecticides, the frequency of applications and concentrations as affecting tuber yield.

The plots were near Grand Forks on land furnished by the Ole Flaat Farms, Inc. The research was conducted cooperatively by the NDAC Experiment Station and the State Seed Department. The sixteen treatments, replicated six times, were arranged according to the triple lattice design, Table 1.

Table 1.—Arrangement of Triple Lattice Design

(a) Arrangement of Plots:

13	7	10	4	1	16	11	6	14	9	3	8	5	15	2	12
					Replicate 1										
14	2	6	10	7	15	3	11	4	12	16	8	13	1	9	5
					Replicate 2										
16	14	13	15	7	5	6	8	1	4	3	2	10	11	12	9
					Replicate 3										
7	15	11	3	5	13	1	9	2	14	10	6	16	12	8	4
					Replicate 4										
13	16	15	14	2	4	1	3	12	11	10	9	6	8	5	7
					Replicate 5										
15	5	12	2	7	10	13	4	3	14	8	9	1	16	6	11
					Replicate 6										

(b) Arrangement of Replicates:

4	5	6
1	2	3

Each of the ninety-six plots was two rows wide and eighty feet long with two untreated buffer rows on each side. The buffer rows permitted the development and build-up of insect populations and received some drift from adjacent insecticidal plots, especially with the dusts. The necessity for buffer rows was particularly evident in the 1946 plots. Half of certain buffer rows, especially those adjacent to dust plots stood out very green while the other half of the row showed marked insect damage. Without the separation by buffer rows, the insecticides of low insect toxicity would have demonstrated better insect control than would have been warranted.

The sprays were applied at 400 pounds pressure at the rate of 100 gallons per acre by a tractor drawn, power take-off, Bean sprayer. The dusts were applied at the rate of twenty pounds per acre by a tractor-mounted Niagara power duster. Applications of insecticides were made after 8:00 p. m. or between 8:00 p. m. and 4:00 a. m. when there was no drift from wind. The tractor was driven through the check plots at the time of insecticide applications so that any wheel damage would be the same in all plots. Fungicides were not incorporated with the insecticides and all plots received one application of Dithane D-14 upon the recommendation

[1]Associate Entomologist, NDAC Experiment Station and State Seed Department
[2]Student field assistant
[3]Entomologist

of W. G. Hoyman, Plant Pathologist, following the appearance of early blight August 19.

In 1946 both U. S. No. 1 and total yield data were obtained. The differences between the adjusted means of both yields obtained from the analysis of variance were uniformly constant for all plots. Therefore, only the total yields were taken in 1947. The treatments applied and the adjusted mean yield are listed in Table 2.

Table 2.—Insecticidal Treatments and Tuber Yields

Plot	Treatment	Adjusted Mean Yield Bushels per Acre
Dusts: Applied at 20 pounds per acre on July 2, 15, 29 and August 12, 25		
1D	DDT 5%	259.0
2D	DDT 3%	260.7
3D	DDD 3%	263.4
5D	DDD 3% and HE 761 2%	273.6**
6D	Piperonyl Butoxide 1.25%	254.4
7D	Piperonyl Cyclohexanone .625%	258.6
8D	Benzene Hexachloride (1% gamma isomer)	245.6
9D	Chlordane 5%	260.0
10D	Aryl Alkyl Thionophosphate 1%	258.9
Sprays: Applied at 100 gallons per acre; 1 pound actual lethal ingredient (such as DDT, etc.) per 100 gallons		
4S	Toxaphene (a chlorinated camphene)	248.1
11S	DDT 50% Wettable Powder	264.6*
12S	DDT 25% Emulsion	258.6
13S	Hexaethyl Tetraphosphate 9%; other phosphates 16%	259.2
14S	Benzene Hexachloride 50% Wettable Powder	250.9
15S	Methoxy Chloro Composition 50% Wettable Powder	259.8
16	Check—No treatment	239.9

* Indicates significant difference at 5% level as compared with Check Plot No. 16.
**Indicates highly significant difference at 1% level as compared with Check Plot No. 16. Least significant difference between any two adjusted means at the 5% level is 24.62; at the 1% level, 32.74.

Insecticides Donated by:	Plot Number
Agricultural Supply Company Grand Forks, N. Dakota	1D, 2D, 8D
American Cyanamid & Chemical Corporation, New York, N. Y.	10D
California Spray & Chemical Corporation, Richmond, Calif.	13S
Dodge & Olcott Company, New York, N. Y.	6D, 7D
E. I. Dupont de Nemours Company, Wilmington, Del.	11S, 12S, 14S, 15S
Hercules Powder Company, Wilmington, Del., through Agricultural Supply Company, Grand Forks, N. Dakota	4S
Rohm & Haas Company, Philadelphia, Pa., through Agricultural Supply Company, Grand Forks, N. Dakota	3D, 5D
Velsicol Corporation, Chicago, Illinois	9D

A Summary of 1947 Tests

Two treatments showed significantly higher yields as compared with Check Plot No. 16 receiving no treatment. Plot No. 11S (DDT 50% wettable powder) was significant at the 5% level and Plot No. 5D (DDD 3% and HE 761 2%) was highly significant at the 1% level.

The yields for 1947 generally compared with the results in 1946. DDT 3% dusts again yielded more than DDT 5% dusts although only 1.7 bushels per acre as compared to 28 bushels for 1946.

The combination DDD 3% and HE 761 2% dusts was highly significant at the 1% level and the highest yielding plot. This combination was not available in 1946 when DDD alone gave significant results at the 5% level. In the 1947 plots DDD was third highest in tuber yield and lacked but 1.1 bushels in yield to attain significant yield at the 5% level.

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POTATO FUNGICIDE EXPERIMENTS IN 1947 [1]

By

Wm. G. Hoyman[2]

Experiments with potato fungicides were started in 1945 to determine the effectiveness of some of the newer materials for controlling the fungi, *Alternaria solani* and *Phytophthora infestans*, causing respectively early and late blights of potatoes. Attention was also given to the time and frequency of application and the effect of the various treatments on yield. The results obtained in 1945 (2) indicated Dithane D-14 and Zerlate were very effective for controlling early blight. This disease was not present on the plots during 1946 and late blight has never been observed during the course of this work. A few new fungicides and the most promising of those used in 1945 were included among those tested in 1947.

Certified Bliss Triumph seed was cut and treated May 12, 1947. The treatment consisted of a 5-minute dip in a solution containing 6 ounces of mercuric chloride, 1 quart of commercial hydrochloric acid and 25 gallons of water. An assisted feed planter was used to plant the 3½-acre plot May 14 and 15 on land donated by the Flaat Farms Company and located approximately 3½ miles south of Grand Forks, North Dakota, on Washington avenue. The soil at this particular location was Bearden silt loam. A triple lattice design was used for arranging the 16 different treatments. Each treatment was replicated 6 times and each of the 96 plots was 2 rows wide and 80 feet long with 2 untreated rows on each side.

The dusts were applied with a 2-row, tractor-mounted, Niagara duster having 3 nozzles to the row. A 2-row, power-take-off, Bean sprayer, having 3 nozzles to the row was used for applying the sprays at a pressure of 350 pounds. In order to minimize the

[1]Commercial cooperators included the Agricultural Supply Company, Grand Forks, N. Dak., Tennessee Copper Company, Rohm and Haas Company, E. I. du Pont de Nemours and Company, United States Rubber Company and Harshaw Chemical Company.

[2]Associate Plant Pathologist, North Dakota Agricultural Experiment Station and State Seed Department.