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POTATO SPRAYING IN EASTERN VIRGINIA IN 1938

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In 1938 potato spraying experiments were conducted in the vicinity of New Church and Onley, Virginia, for the purpose of comparing the effectiveness of several different insecticides for the control of the potato flea-beetle (*Epitrix cucumeris* Harris).

The potato growing season was unusual this year, in that pre-seasonal warm weather accompanied by normal rainfall caused the potato plants to emerge and start growing about two weeks ahead of their normal time. Also potato flea-beetles and Colorado potato beetles emerged from hiberation early and it appeared that it would be necessary to start the insect spray schedule earlier than usual. However, about the time for the first application, subnormally cool weather, accompanied by many damp and rainy days, prevailed and continued until the potatoes were about mature. The cool damp days seemed to check the abundance of the over-wintering potato flea-beetles and at the same time caused the potato plants to grow very rapidly. The continuance of this weather prevented the making of important spray applications just prior to the time for the new brood of potato flea-beetles to emerge. In many fields it also prevented the proper controlling of the Colorado potato beetle. Late blight also appeared in many of the potato fields and before the cool damp weather ceased practically all of the potato fields in eastern Virginia were affected and many were very severely injured. This was the most serious epidemic of late blight ever recorded on potatoes in this area (Cook 1938).

This unusual season seemed to cause a reduction in the flea-beetle population at Onley as the new brood of beetles was not very large. However, at New Church the new beetles emerged abundantly at approximately their normal time. Potato leafhoppers were only moderately abundant at both places.

These facts would indicate that any increase in yield obtained by spraying potatoes at Onley would be largely due to blight control, whereas at New Church it would be due to a combination of blight and insect control.

All of the spray applications in these tests were made with a gasoline engine power sprayer that covered four rows of potatoes with three nozzles to the row and maintained a pressure of nearly 250 pounds. The dust applications were made with a traction duster that covered four rows with two nozzles to the row. About 100 gallons of spray and 30 pounds of dust were applied to the acre. The potato flea-beetle foliage injury records were taken by the same methods as described by Anderson and Walker (1936 and 1937). Yield records were taken on two rows 100 feet long from the middle of each replication of the various treatments in each test. Colorado potato beetles were controlled on all check plats by spraying with calcium arsenate at a concentration of 2-50 when necessary.

In one experiment at New Church neutral copper-rotenone mixtures were tested in comparison with a calcium arsenate-Bordeaux and a calcium arsenate-Bordeaux-zinc sulphate-Pyrolene M. P. sprays. Pyrolene M. P. is a sodium salt of a synthetic wax prepared from a vegetable base. The colloidal red copper oxide-derris and the neutral copper-cube materials used in this test were commercially prepared products. The exact ingredients of the red copper oxide-derris mixture are not available. The neutral copper-cube material contained 46.3 per cent active ingredients including rotenone and other cube resins and with inactive ingredients of 20.4 per cent powdered cube root exclusive of resins, 32.4 per cent water and .7 per cent clay. Weather conditions permitted only three applications in this test. The materials used and the results obtained are given in table 1. From a study of these

TABLE 1.—*Results of testing four different spray materials on potatoes New Church, Virginia*

Materials Used	Flea-beetle Leaf Injury. Number Holes to the Sq. In. of Leaf Surface	Yield of U. S. No. 1 Potatoes to the Acre	Per Cent Increase in Yield
Calcium Arsenate — Bordeaux Zinc Sulphate—Pyrolene M. P. 2-4-6-4 (1/500)-50	4	377	34
Calcium Arsenate — Bordeaux 2-4-6-50	5	365	30
Neutral Copper—Cube 1/200	82	318	13
Colloidal Red Copper Oxide—Derris 1/400	62	301	7
Check	147	281	—
Difference Necessary to be Significant	36	29	—

results it may be said that the neutral copper sprays containing rotenone were not so effective in reducing the potato flea-beetle foliage injury and they resulted in significantly lower yields than did the two calcium arsenate-Bordeaux treatments. Although the addition of the zinc sulphate and Pyrolene M. P. to the calcium arsenate-Bordeaux spray did not give a significant increase in yield compared with the regular calcium arsenate-Bordeaux mixture it was observed in the field that the plats receiving this treatment appeared to be in a slightly healthier condition and remained green slightly longer.

Another experiment was conducted at New Church to test the effectiveness of calcium arsenate-Bordeaux in comparison with calcium arsenate (Calcide)-Pyrox and Arseno-Cop. Pyrox without poison is a commercially prepared Bordeaux with 11.15 per cent metallic copper. The Arseno-Cop is 50 per cent calcium arsenate and 50 per cent Basic Copper Sulphate (actually 25 per cent copper). Four applications were made with each material. The results of this test are given in table 2. It will be noted that the calcium arsenate-Bordeaux treatment resulted in less flea-beetle foliage injury and caused a significantly higher yield than did either of the other treatments.

TABLE 2.—*Results of testing three different spray materials on potatoes New Church, Virginia*

Materials Used	Flea-beetle Leaf Injury, Number of Holes to the Sq. In. of Leaf Surface	Yield of U. S. No. 1 Potatoes to the Acre
Calcium Arsenate—Bordeaux (2-4-6-50)	4	407
Calcide—Pyrox (2-8-50)	22	387
Arseno-Cop (8-50)	26	366
Difference Necessary to be Significant	6	12

At Onley four spray materials were tested in comparison with a check. The materials and proportions at which they were used and the results obtained are given in table 3. The Veget-ade is a rotenone product with not less than 3.6 per cent rotenone and not more than 10.8

TABLE 3.—*Results of testing four different spray materials on potatoes Onley, Virginia*

Materials Used	Flea-beetle Leaf Injury, Number of Holes to the Sq. In. of Leaf Surface	Yield of U. S. No. 1 Potatoes to the Acre	Per Cent Increase in Yield
Calcium Arsenate—Bordeaux (2-4-6-50)	1	353	15
Veget-ade—"34" Copper (2-4-50)	8	329	7
Calcium Arsenate (2-50)	15	308	—
Alorco Cryolite (2-50)	14	308	—
Check	17	307	—

per cent other ether extractives of Timbo. The "34" Copper used with the Veget-ade contains not less than 34.0 per cent metallic copper and not more than 66.0 per cent inert ingredients. The Alorco Cryolite is a synthetic sodium fluoaluminate, 40 per cent fluorine, equivalent to 85 per cent cryolite. It is evident from the number of potato flea-beetle feeding scars per square inch of leaf surface as given in the table that flea-beetles were not much of a factor in this test. It may be noted that calcium arsenate-Bordeaux treated plats gave much higher yields than did any of the other plats in this test. Also, it is of interest to compare the 15 per cent increase in yields of the calcium arsenate-Bordeaux-treated plats with the check plats at Onley where flea-beetles were not a serious factor, with the 30 per cent increase at New Church where potato flea-beetles were an important factor.

In another experiment at Onley two sprays and one dust were tested in comparison with a check. The materials and the proportions at which they were used and the results obtained are given in table 4. The Orchard Brand Potato Spray contains active ingredients

TABLE 4.—*Results of testing two spray and one dust materials on potatoes Onley, Virginia*

Materials Used	Yield in Bushels of U. S. No. 1 Potatoes to the Acre
Calcium Arsenate—Bordeaux (2-4-6-50)	280
Heim Dust	255
Orchard Brand Potato Spray	245
Check	238
Difference Necessary to be Significant	22

of not less than 23.4 per cent arsenate of zinc and not less than 18.0 per cent metallic copper, and inert ingredients of not more than 58.6 per cent. The Heim Dust, also known as a Fluorine Potato Dust, contains 10 per cent arsenic oxide or 7 per cent metallic arsenic less than 1 per cent water soluble. The Heim Dust treatment gave such poor control of the Colorado potato beetle that the plats receiving this treatment were also treated twice with calcium arsenate (2-50) spray. Comparing these treatments statistically, the calcium arsenate-Bordeaux spray was the only treatment that gave a significantly higher yield than the check. Potato flea-beetle foliage injury was so slight that it may be considered of no importance in this test. Therefore, the increases in yield may be attributed primarily to late blight control and probably to some extent to leafhopper control.

The increases in yield on the calcium arsenate-Bordeaux-treated plats at New Church are in accord with those previously described for this locality (Walker and Anderson 1932) (Anderson and Walker 1934-1936-1937-1938), and in accord with the unpublished results of the 1937 tests at New Church. During the last seven years 15 different tests have been made, with a total of 53 replications, comparing calcium arsenate-Bordeaux treated plats with check plats, on which the Colorado potato beetles were controlled by spraying with calcium arsenate at a concentration of 2-50 when necessary. Potato flea-beetles have been abundant to an injurious extent in this locality every season during this period and have caused large economic losses. Table 5 gives the results of the tests for the 7-year period, 1932 to 1938 inclusive.

TABLE 5.—*A seven-year comparison of yields from unsprayed potato plats with those sprayed with calcium arsenate bordeaux, New Church, Virginia*

(2-4-6-50)

Treatment Used	YIELD							
	Bushels of U. S. No. 1 Potatoes to the Acre							
	1932	1933	1934	1935	1936	1937	1938	Average
Calcium Arsenate Bordeaux (2-4-6-50)	232	243	180	227	268	284	365	257
Untreated Check	189	173	120	144	232	194	281	190
Increase:								
Bushels	43	70	60	83	36	90	84	67
Per Cent	23	40	50	58	16	46	30	35

In this table it will be noted that the calcium arsenate-Bordeaux treatment resulted in a highly significant average increase of 35 per cent or

67 bushels of prime potatoes to the acre. In view of these facts it is evident that the potato growers in this area would benefit materially if they would make it a standard practice to spray their potatoes with a calcium arsenate-Bordeaux mixture. If properly applied, this treatment will control Colorado potato beetles, potato leafhoppers and early and late blight, as well as potato flea-beetles.

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REPORT OF THE SEED CERTIFICATION COMMITTEE OF THE POTATO ASSOCIATION OF AMERICA

Progress of Seed Potato Industry During 1938

One of the most important items of progress that concerns the seed potato industry was the Baton Rouge conference on phytopathological problems and seed certification. The keynote of the conference was the address by J. G. Leach on "The Biological Basis for Certification of Seed Potatoes" which was published in the American Potato Journal, Volume 15, No. 5.

The seed certification conference, attended by producers and consumers of seed potatoes, as well as certification and quarantine officials, was held at the Louisiana State University, from the 5th to the 8th of April. As a result of this conference, a set of uniform rules and regulations was established and recommended for adoption by the various regulatory bodies in southern States, to cover the importation of seed potatoes. Generally speaking this set of regulations was considerably broader than the rules and regulations now in effect in northern certification states. Since it was primarily intended to cover the importation of seed potatoes, and also the likelihood of seed certification in southern states, it was necessarily broader, and more tolerant, than the northern state regulations covering seed certification.