

TESTS OF NEW INSECTICIDES FOR WEBWORMS, BLISTER BEETLES
AND FLEA BEETLES.

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INTRODUCTION

The recent developments in powerful chemicals useful as insecticides afford new opportunities for quick and efficient relief from the ravages of insects. Generally, there was no extensive epidemic of any serious insect pest for the Great Western area during the year 1946. There were, however, several localized concentrations of flea beetles, webworms, and blister beetles sufficient to offer some rather good opportunities to test out the effectiveness of some of these newer products. It is the purpose of this paper to report the results of these tests.

MATERIALS

In order that one may become familiar, at the outset, with the materials used in one or more of the individual tests, they are listed here as follows:

DDT: 50, 25, 15, and 5 percent concentration with balance consisting of inert ingredients except in one case in which a fused mixture of DDT and sulphur, containing 5% DDT, was used.

Pyrocide: "Dry Pyrocide," 10%, Dusting Sulphur 50%, inert 40%.

Multicide: "Formula 514" 10% (contains Pyrethrins and DDT), Pyrax (inert) 90%.

Multicide: "Dry Multicide" 10% (contains DDT), Pyrax 90%.

Rotenone: Commercial package. Active ingredient 0.50%.

Gammexane: English product containing 0.5% active gamma isomer diluted with interts 1:2 resulting in a final strength of only 0.17%.

Gammexane: Obtained later than preceding item and containing 1.50% active gamma isomer.

Paris Green: 40% and 20% with balance consisting of Pyrax.

Paris Green: 20%, Dusting Sulphur 80%.

Cryolite: 50%, balance Pyrax.

Cryolite: 25%, balance Dusting Sulphur.

Calgreen: Containing cuprous arsenite, not less than 7.00%, tricalcium arsenate, not less than 64.43% and balance of inert ingredients. This was mixed for use with dehydrated lime in proportions 1:5.

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METHODS AND RESULTS

Webworms

Laboratory tests, Longmont Experiment Station, July, 1946

These tests were carried out in large jars with wide mouths. After introduction of the larvae the entire inside of the jars was exposed as evenly as possible to respective dusts applied with a small hand gun. Dusted fresh beet leaves finally were introduced. The jars were closed with porous cloth which permitted considerable circulation of air and were kept lying on the side to further prevent stagnation of air and moisture.

Test I

The treatments used and the percentage of worms dead after 17 and 48 hours are given in Table 1.

Table 1. Sugar beet webworms. Lab. test, July, 1946, I.
No. of worms after treatment.

<u>Treatment</u>	<u>Total No.</u>	<u>% dead after</u>	
		<u>17 hrs.</u>	<u>48 hrs.</u>
1. DDT 5%	70	0	3*
2. DDT 5% fused with S	75	0	9*
3. Rotenone 0.5%	68	0	31
4. Gammexane 0.17%	48	0	77*
5. Pyrocide 10%	40	95	100

* Some feeding observed.

Pyrocide was outstandingly effective both after 17 and 48 hours with 95 and 100 percent kill, respectively.

Gammexane, in the low concentration used, was rather slow in action but performed fairly well for the 48-hour count with 77 percent kill. The Rotenone did not perform satisfactorily under the conditions of the test, and the 5 percent DDT compounds, both with and without Sulphur, were even less effective.

Some feeding was observed after the two DDT compounds and the Gammexane applications.

Test II

The treatments used and the results obtained in this test are given in Table 2.

Table 2. Sugar beet webworms. Lab. test, July 1946 II.
Worms after treatment

<u>Treatment</u>	<u>Total No.</u>	<u>% dead after</u>	
		<u>20 hrs.</u>	<u>37 hrs.</u>
1. Calgreen 10-50	42	10*	12
2. Multicide "514" 10%	53	100	100
3. Multicide "Dry" 10%	53	98	100

Table 2 continued on following page.

Table 2 continued.

Treatment	Total No.	% dead after	
		20 hrs.	37 hrs.
4. DDT 50%	51	14*	39
5. DDT 25%	58	9*	31
6. Pyrocide 10%	57	100	100
7. Rotenone 0.5%	54	9*	32
8. Gammexane 0.17%	57	28*	46
9. Check	58	0*	0

* Some feeding observed.

Pyrocide and the two Multicide compounds led in effectiveness with 100 percent kill or nearly so after both 20 and 37 hours.

Gammexane again rated rather high with 28 and 46 percent kill, followed by 50 percent DDT, and by Rotenone and 25 percent DDT, which two latter compounds were practically equal in performance.

Calgreen showed low effectiveness.

It should be mentioned that when observed after 68 hours the 50 and 25 percent DDT compounds gave 86 and 72 percent kill, respectively, Rotenone gave 76, Gammexane 70, and Calgreen, 19 percent. At the same time, however, a somewhat unexpected mortality of 12 percent was noted in the check, apparently because somewhat too much waste, and perhaps too high humidity, had resulted from the great activity and feeding of the larvae. For that reason, the figures given should perhaps be discounted to some extent, although hardly as much as called for theoretically.

Some feeding was observed at the 20-hour count after all treatments, except the Pyrocide and the two Multicide compounds. Besides in the check it was most noticeable in the Gammexane and the Calgreen treatments, while it was rather insignificant in the two DDT and the Rotenone treatments.

Field tests, Minatare, Nebraska, August, 1946

This test was carried out in cages of regular painted window screen, approximately 10 inches in diameter and 24 inches high. The top was closed up with sugar liner material, and each cage was anchored by means of three or four pieces of extra heavy lath. The bottom edge of the cages was placed about three inches below the rather firmly trimmed soil surface. Each cage contained one beet plant.

Worms were collected and introduced into the cages. The treatments were then applied to both worms and plants and also to a considerable extent to the cages by means of a small hand gun. The aim was to apply the treatments evenly and at a moderate rate.

The worms were found to burrow and travel very considerably in the soil and this fact no doubt accounts for some discrepancies in observed total number between the two counts.

The treatments used and the results obtained after 24 and 68 hours are given in Table 3.

Table 3. Sugar beet webworms. Minatare, Nebraska, August, 1946. No. worms after treatment.

Treatment	24 hrs.		68 hrs.	
	Total	% Dead	Total	% Dead
1. Multicide "514" 10%	48	85	48	88
2. Multicide "Dry" 10%	39	15	25	48
3. Pyroc. 10% + S 50%	48	92	48	94
4. DDT 50%	86	35	73	99
5. DDT 25%	57	28	47	96
6. Paris Green 20%	79	28	61	79
7. Cryolite 50%	45	29	47	83
8. Cry. 25% + S 75%	40	25	40	93
9. Paris Green 40%	75	39	76	76
10. Paris Green 20%	37	57	36	92
11. Gammexane (1.5%)	68	38	50	74
12. Check	32	0	34	3

Twenty-four hours after dusting Pyroicide gave 92 percent kill.

Multicide, "form 514", 10 percent reached 85 percent, while the Multicide compound designated characterized by "Dry" Multicide, 10 percent, gave only a 15 percent kill.

DDT, 50 percent, gave 35 percent kill while the 25 percent DDT gave 28 percent kill.

After 68 hours all the treatments in Table 3 showed excellent kills with the exception of the "Dry" Multicide which gave a kill of only 48 percent. It has been learned that "Formula 514" contains Pyrethrins, while the "Dry" Multicide formula does not contain these very rapidly acting ingredients.

After 24 hours, Paris Green, 20 percent, with Pyrax, gave a 57 percent kill, while the similar combination 40 percent strength gave a 39 percent kill. This stronger mixture was perhaps less attractive to the larvae than the weaker one, the result being less feeding. The same reason may account for the even lesser kill by the combination of 20 percent Paris Green with Sulphur.

Gammexane, with 1.5 percent active gamma isomer gave a 38 percent kill or at least as good as the 50 percent DDT just mentioned.

Cryolite, 50 percent, with Pyrax, and Cryolite, 25 percent, with Sulphur, were practically equal in effect with the 25% DDT mentioned above, all ranging 25-29 in percent kill.

After 68 hours Paris Green, 20 percent, with Pyrax, gave a kill of 92 percent in line with all the better treatments on Table 3.

Also quite high were Cryolite, 50 percent, with Pyrax, Paris Green, 20 percent with Sulphur, Paris Green, 40 percent with Pyrax, and Gammexane, in the order mentioned, the lowest figure denoting 74 percent kill.

A rather insignificant mortality of 3 percent was observed in the check.

Facts to be noted concerning the treatments used in this webworm control work:

1. The great and rapid effectiveness of Pyrocide and Multicide, Formula 514, both treatments containing Pyrethrins.
2. The good performance of the "Dry" Multicide in the laboratory test contrasted with its unsatisfactory performance in the field cages (no Pyrethrins present in this formula).
3. The good results from the strong DDT compounds at the late count in the cage test.
4. The promising results from the Paris Green and Cryolite compounds, particularly the 20 percent Paris Green and Pyrax combination.

Blister Beetles.

A very heavy infestation with the Black Spotted Blister Beetle in a beet field approximately 7 miles north of Fort Morgan gave the opportunity to carry out this study.

The test was carried out in cages of painted window screen designed and used as described in the report on Webworm Control Studies at Minatare, Nebraska.

Worms were collected and introduced into the cages, whereupon the treatments were dusted onto both the worms and the enclosed beet plants and at least partly to the cages.

The treatments used and the results obtained after 24 and 48 hours are given in Tables 4 and 5 for two tests designated as A and B, respectively.

Table 4. Black-spotted Blister Beetles, Fort Morgan, Colorado, July, 1946. Test A.

Treatment	Total No.	% dead after	
		24 hrs.	48 hrs.
1. Calgreen	135	3	16
2. Multicide "514" 10%	222	33	82
3. Multicide "Dry" 10%	325	30	83
4. Pyroc. 10% + S 50%	265	45	73
5. DDT 50%	260	100	100
6. DDT 25%	300	100	100
7. Gammexane 0.17%	265	16	17
8. Check	375	0	0

In this test the two DDT compounds of 50 and 25 percent concentration gave 100 percent kill both after 24 and 48 hours.

Pyrocide was next in effectiveness at 24 hours with 45 percent kill. Multicide, "Formula 514," and "Dry" Multicide as well were next, after 48 hours, with 82 and 83 percent kills, while Pyrocide reached 73 percent in that time.

Gammexane in the strength used, as well as Calgreen, appeared unsatisfactory in this test.

The excellent results obtained with the strong DDT compounds in Test A prompted the study of the effectiveness of lower concentrations as used in Test B, and reported in Table 5.

Table 5. Black-spotted Blister Beetles, Fort Morgan, Colorado, July, 1946. Test B.

Treatment	Total No.	% dead after	
		24 hrs.	48 hrs.
1. DDT 25%	198	100	100
2. DDT 15%	211	100	100
3. DDT 5%	217	92	100
4. Check	200	0	0

The figures show that under the condition of this test a 15 percent concentration was fully as effective as any higher, and that a 5 percent concentration must be considered satisfactory from a practical point of view.

Flea Beetles

Several small and scattered infestations with Flea Beetles in beet fields occurred in the Longmont district during the early part of the 1946 season. On June 12 a sufficient number of the Striped Flea Beetle was collected for a small test. The treatments used and the results obtained are given in Table 6.

Table 6. Flea Beetles. Longmont, Colorado. June, 1946.
No. of Beetles after Treatment.

Treatment	Total No.	% dead after
		16 hrs.
1. DDT 5% applied to bugs and plant.	38	100
2. DDT 5% applied to cage and plant.	60	100
3. Pyrocide 10% + S 50%	70	100
4. Check	65	0

It will be noted that a perfect kill was obtained by the 5 percent DDT compound (balance Pyrax) whether applied directly to the beetles or not, when the plant and the cage had been dusted. The Pyrocide was applied to the insects as well as to plant and cage and gave perfect kill. However, the results from the DDT are the most interesting due to the lower cost of this treatment.