

Residual Versus Non-residual Insecticides to Control Leafhoppers on Alfalfa

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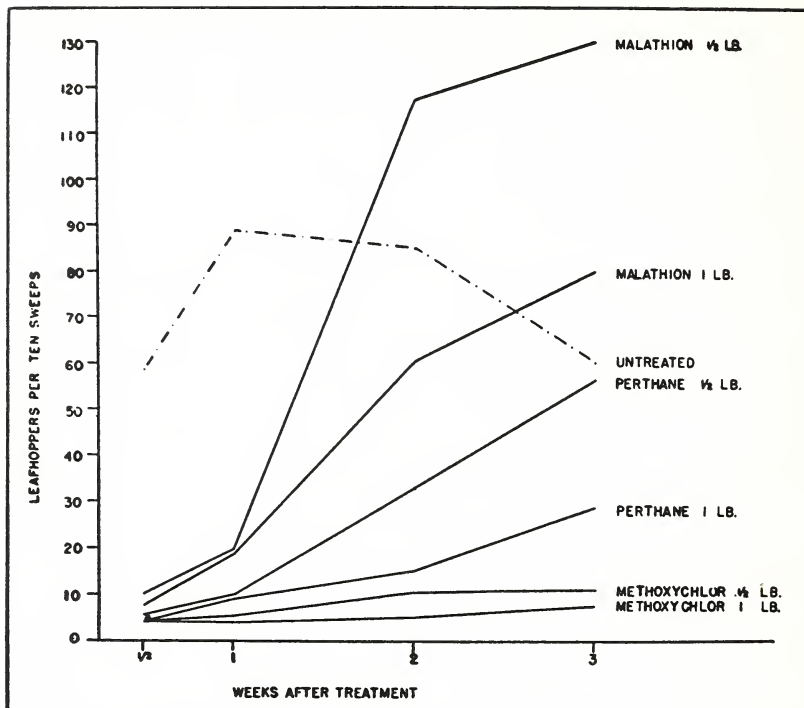
The potato leafhopper, *Empoasca fabae* Harris, is recognized as one of the most important insect pests damaging alfalfa. Following World War II when DDT was released for use, investigators studied the use of this material as an insect toxicant on many crops. Poos (1) found it to be effective against the potato leafhopper. In 1948 studies were initiated at the Purdue University Agricultural Experiment Station to evaluate new insecticides for the control of injurious insects of alfalfa. Wilson (2), and Wilson and Davis (3) (4), showed that several insecticides were effective toxicants for controlling leafhoppers on alfalfa.

At comparable dosages, no material has been found to be superior to DDT for controlling the potato leafhopper. However, because of contaminating residues left on the crop by DDT, the use of the insecticide has limitations. Since it was found that effective control could be obtained with methoxychlor and since the material was regarded as safe for use, it has been recommended for the control of leafhoppers in pastures and in hay crops.

In 1953, 1954, and 1955, studies were continued to compare some of the newer materials with methoxychlor. Table 1 compares methoxychlor at dosage rates of 1, 0.5, and 0.25 pounds per acre with 1 pound of malathion and 2 pounds of strobane. Strobane was dropped from the 1954 tests, but malathion, because it had shown a high initial kill, though low residual effect, and was also a superior aphicide, was tested quite extensively along with perthane. Materials and dosages tested are shown in table 2.

Two tests were designed, one applied before peak hatch of leafhopper nymphs and the other applied a week later after the peak hatch. The same treatments were applied in both tests. Both tests were applied to third growth alfalfa at Culver, Indiana. Test 1, applied before peak hatch was applied to three replicates, each consisting of a strip of alfalfa 40 feet wide surrounded by corn. Each strip was divided into plots 40 x 40 feet for 11 treatments. Test 2 was applied in the same manner with the exception that replicates were not separated by corn.

Because of the difference in the time of application of materials in the two tests, data could not be combined for analysis. In Test 2 where treatments were applied at peak of hatch, leafhoppers were controlled with all dosages of malathion, methoxychlor, and perthane used, without a rebuilding of the insect population. However, Test 1 shows the importance of a residual insecticide in leafhopper control. Although malathion is a highly effective leafhopper toxicant, it has little residual effect. In this test, the material being applied before peak hatch was not effective against the large number of eggs which



hatched later. The development of leafhopper populations is shown in Figure 1, while table 2 compares the effect of sprays applied before peak hatch with those applied at peak hatch.

Preliminary field tests with Compound 528 (a dithiophosphate of dioxane), an experimental material developed by the Hercules Powder Company primarily as a miticide, indicated high residual toxicity to leafhoppers on alfalfa in 1955. The material was used not only by itself, but in combination with methoxychlor. There was a trend in all plots for per acre dosages of $\frac{1}{2}$ pound of methoxychlor, $\frac{1}{2}$ or $\frac{1}{4}$ pound of Compound 528 to be superior when used separately to combinations of the two materials. Data are shown in table 3.

Summary and Conclusions

Tests show methoxychlor, malathion, and perthane at comparable dosages to be equally effective toxicants for initial kill of the potato leafhopper on alfalfa. However, data show that the residual effect of methoxychlor is superior to perthane, while there is practically no residual effect obtained from malathion. For this reason, effective control with malathion is dependent upon careful timing of the spray so that it is applied at the time of peak hatch of the leafhopper nymphs.

Preliminary tests with Compound 528 indicate a residual effect comparable to methoxychlor against the potato leafhopper.

Table 1. Comparison of the Residual Effect of Insecticides
Two Weeks After Treatment, Culver, Indiana, 1953.

Treatment	Pounds Per Acre	Insects Per Ten Sweeps		
		Adults	Leafhoppers Nymphs	Pea Aphids ¹
1. Untreated		13.6	16.6	11.4
2. Methoxychlor	1.00	5.6	3.7	10.0
3. Methoxychlor	0.50	5.5	5.2	17.3
4. Methoxychlor	0.25	7.3	6.6	12.2
5. Strobane	2.00	7.1	9.4	9.8
6. Malathion	1.00	5.3	10.7	2.8
L.S.D. 5% Level		3.0	4.7	5.2
1% Level		4.1	6.4	7.0

1. *Macrosiphum pisi* (Kltb.).

Table 2. The Effect of Spray Applications on Alfalfa to Control the
Potato Leafhopper Two and Three Weeks after Treatment,
Culver, Indiana, 1954.

Insecticide	Pounds Per Acre	Leafhoppers Per 10 Sweeps			
		Treatment Applied Before Peak Hatch		Treatment Applied After Peak Hatch	
		2 Weeks	3 Weeks	2 Weeks	3 Weeks
1. Untreated		90.0	52.0	72.0	60.0
2. Malathion	1.00	60.0	80.0	25.0	45.0
3. Malathion	0.75	90.0	110.0	20.0	30.0
4. Malathion	0.66	120.0	120.0	24.0	40.0
5. Malathion	0.50	120.0	130.0	21.0	30.0
6. Malathion	0.33	110.0	130.0	25.0	32.0
7. Malathion	0.25	90.0	120.0	32.0	24.0
8. Methoxychlor	1.00	6.0	9.0	7.0	6.0
9. Methoxychlor	0.50	11.0	14.0	7.0	12.0
10. Perthane	1.00	14.0	27.0	12.0	15.0
11. Perthane	0.50	33.0	57.0	13.0	27.0

Table 3. Comparison of Leafhopper Populations on Treated Plots With Untreated Plots Following Treatment, Culver, Indiana, 1955.

Treatment	Pounds Per Acre	Leafhoppers 72 Hours	Per Ten Sweeps 1 Week	4 Weeks
1. Untreated		21.7	12.5	57.7
2. Methoxychlor	0.50	1.1	5.0	7.0
3. Methoxychlor	0.25	3.6	9.2	19.2
4. Methoxychlor	0.25			
Malathion	0.25	0.9	6.7	7.5
5. Methoxychlor	0.50			
Compound 528 ¹	0.50	1.0	7.2	13.5
6. Methoxychlor	0.25			
Compound 528	0.50	8.8	12.5	16.5
7. Methoxychlor	0.25			
Compound 528	0.25	6.2	8.7	11.7
8. Compound 528	0.50	0.7	3.7	5.2
9. Compound 528	0.25	0.8	5.7	9.0
L.S.D. 5%		5.9	4.7	15.9
1%		7.9	6.4	21.5

1. *Hercules Powder Company* Experimental Material, a dithiophosphate of dioxane.

Literature Cited

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