

EXPERIMENTAL WORK WITH DDT ON APPLES IN ILLINOIS, 1945

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Experimental work on apples was designed primarily to study the control of codling moth, but observations were also made on the effect of DDT on other insects and on mites.

DDT (dichloro-diphenyl-trichloroethane) was used at the rate of 1 pound of the actual material (50, 60, and 75 percent inert ingredients in the compounds used) to 100 gallons of water with no other poison, and at $\frac{1}{4}$ pound or $\frac{1}{2}$ pound with 2 pounds of lead arsenate or with half-normal strength of fixed nicotine. Summer oil at 2 quarts per 100 gallons was used as a sticker and an ovicide. In some of the tests a weak Bordeaux was used as a safener for the lead arsenate where used in combination with lead arsenate.

Tests were conducted in 11 orchards in the following counties: Johnson, Jackson, St. Clair, Jefferson, Jersey, Calhoun, Pike, Adams, and Champaign. The final infestation data from all but the last one are given in Table 1. As will be seen from this table, DDT was used in comparison with blocks sprayed with lead arsenate or nicotine or both. In these standard blocks, lead arsenate was used at 4 pounds to 100 gallons in most applications. Nicotine in the standard blocks was either a commercially prepared fixed nicotine called Black Leaf 155, used generally at 3 pounds per 100 gallons, or a tank-mixed fixed nicotine in which 1 pint of nicotine sulfate is "fixed" with 8 pounds of Mississippi bentonite and 2 quarts of summer oil.

The number of applications varied somewhat in each plot. In general it was the plan to spray as many times in one plot as another, but in several instances the DDT plots received one or two fewer applications than the standard, yet as seen in the table, in every test the DDT plots were superior to the standard plots. The total number of sprays ranged from 8 to 15, depending on the general level of infestation and the schedule used in the orchard by the owner. However, in every orchard there were fewer DDT sprays than standard sprays because DDT was not started until the calyx spray of lead arsenate and two or three applications of standard materials had been applied to all plots. This was done because, for certain reasons, it is not considered advisable to use DDT continuously from first to last in the spray schedule on apples.

Partly counterbalancing the excellent control of codling moth obtained in these tests, certain disadvantages of the use of DDT on apples were brought out. The most general and obvious disadvantages were the injury from use of the combination of DDT and summer oil and the increase in red spiders and mites. Minor disadvantages were greener color of fruit at harvest and greater degree of russetting in a few instances.

The oil-DDT injury was quite general except on certain resistant varieties, and began after the third or fourth application of the DDT and oil. The resistant varieties which showed practically no injury

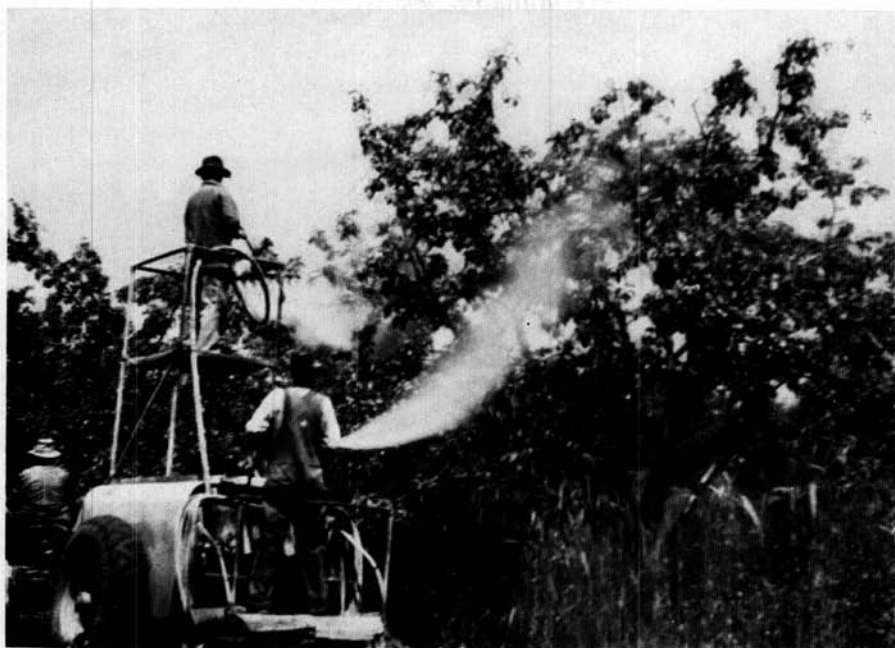


FIG. 1.—Spraying in DDT plots.

were Winesap, Stayman, York, and Maiden Blush. Tests are under way to determine the need for summer oil with DDT, the amounts needed, and a safener for the oil, and this problem may be worked out.

Red spiders and mites were found to increase in DDT plots because parasites and predators are reduced to a greater extent by DDT than are the hosts. Mites have never been much of a problem in Illinois apple orchards until the advent of DDT. The inclusion of DDT in our spray schedules will result in much study on the activities and control of these pests.

CONCLUSIONS

1. Control of codling moth and leafhopper was always better in DDT blocks than in the standard blocks used as a comparison, regardless of the fact that in some tests fewer applications of DDT were used.

2. There was considerable evidence to show that DDT with sum-

mer oil can be used at less frequent intervals than the standard materials or that the spray schedule of the season may be shortened where DDT is used.

3. The combination of $\frac{1}{4}$ and $\frac{1}{2}$ pound of DDT per 100 gallons with half strength lead arsenate or nicotine gave about as good control as 1 pound DDT alone.

4. Of these two combinations, the lead arsenate with DDT was somewhat more effective than the DDT-nicotine combination.

5. There was no significant difference in control with the various brands of DDT used.

6. DDT, as we used it with summer oil for several applications, caused injury somewhat in proportion to the amount of DDT used, being less severe in plots in which combinations of small amounts of DDT with lead arsenate or nicotine were used.

7. Mite injury was moderate to severe in all DDT plots, being less

severe in plots in which the smaller dosages were used.

8. In the 11 orchards in which these tests were conducted, there were 3 in which the fruit was greener at harvest in the DDT blocks

than in the standard, 2 in which it was smaller, and 3 in which it was more russeted.

These studies will be continued by the Natural History Survey for the coming season.

TABLE 1.—FINAL INFESTION RECORDS ON PICKED FRUIT IN DDT EXPERIMENTAL PLOTS IN ILLINOIS, 1945

Orchard	Plot No.	Materials Used Chiefly In Spray Schedule Amounts per 100 gal.	Percent Wormy Apples	Worms Per 100 Apples	Percent Stung Apples	Stings Per 100 Apples
Smith	1	DDT 1 lb. ¹	1.0	.....	1.6	.....
	2	DDT ½ lb. Lead Arsenate ..	.4	.....	1.4	.....
	3	Lead Arsenate.....	13.0	.....	10.7	.....
	4	Lead Arsenate, one DDT	16.1	.....	11.5	.....
Sauer	1	DDT 1 lb.....	1.0	1.0	2.8	3.2
	2	DDT ¼ lb. Lead Ars. 2 lb.....	6.6	9.0	5.9	8.7
	3	BL 155.....	2.4	2.7	3.5	4.7
	4	DDT with nicotine.....	9.2	11.4	7.9	10.1
	5	Lead Arsenate.....	4.0	5.1	11.9	16.7
Eekert Duchess Wealthy	1	DDT.....	0	.....	0	.....
	2	Tank mixed nicotine.....	.4	.....	.7	.....
	1	DDT.....	.1	.....	.3	.....
Jonathan		Nicotine, tank mix.....	.5	.....	.5	.....
	1	DDT.....	3.4	.....	2.6	.....
Gage- Hawkins	2	Nicotine, tank mix.....	16.4	.....	7.0	.....
	1	Lead Arsenate, nicotine.....	2.2	.....	6.6	.....
Nugent and Schapanski	2	DDT 1 lb.....	0	.....	.5	.....
	1	BL 155.....	11.8	18.3	5.3	7.6
	2	DDT (Dupont) 1 lb.....	2.6	2.7	2.2	2.4
	3	DDT (Dupont) ¼ lb. Lead 2	2.4	2.5	3.4	5.0
	4	HE 761-late Z39 and Lead..	68.3	180.9	11.1	62.5
	5	Z39 ½ lb. Lead 2.....	59.7	152.3	10.6	50.3
	6	DDT with nicotine.....	11.0	15.9	5.4	5.8
	7	DDT (Geigy) 1 lb.....	3.6	3.9	4.8	4.8
	8	DDT (Geigy) ¼ lb. Lead 2..	4.8	6.1	3.2	3.5
	9	Lead Arsenate.....	19.2	29.0	19.5	44.2
10	Lead Nicotine split.....	12.8	16.4	18.4	37.5	
Check		None treatment.....	92.0	247.0	6.0	19.8
Ringhausen	1	Lead Arsenate.....	2.4	.....	9.5	.....
	2	DDT 1 lb.....	.1	.....	1.4	.....
Coffman	1	Lead-nicotine split.....	7.6	.....	14.0	.....
		DDT 1 lb. from 5th cover...	4.0	.....	5.0	.....
Veihl	1	Lead Arsenate, nicotine.....	.7	.....	2.0	.....
	2	DDT ½ lb. Lead 2.....	0	.....	0	.....
Chatten	1	Lead Arsenate.....	3.0	.....	12.0	.....
	2	DDT ½ lb. BL 155.....	0	.....	0	.....
Thornton	1	Lead Arsenate, nicotine split.	45.2	.....	21.8	.....
	2	DDT 1 lb.....	3.6	.....	5.4	.....
	3	DDT ½ lb. Lead 2.....	7.2	.....	15.0	.....

¹ DDT amounts given are actual DDT.