CORN EARWORM CONTROL—
SUMMARY AND RECOMMENDATIONS

J. W. Wilson, Walter H. Thames, and Norman C. Hayslip

Summary

I—Spraying Methods.—Two experiments at Sanford, Florida, one on Ioana and the second on Calumet Sweet Corn, were conducted for the purpose of determining the most efficient methods in applying sprays for control of the corn earworm. Using a high clearance power sprayer and a standard DDT-mineral oil spray, the following factors were studied: (1) amount of liquid spray per acre, (2) kind of spray nozzles, (3) number of nozzles per row, and (4) operating pressure.

The data obtained show that nozzles should not be of a type which breaks the liquid into very fine droplets, the coarser sprays being more effective in depositing the insecticide on the silks. Wide angle nozzles, producing either hollow cone or fan spray patterns, are desirable from the standpoint of improving coverage. Four and five nozzles per row were superior to two and three, and in one of the tests five nozzles were superior to four. Pressure differences were not significant in the amount of control obtained, indicating that pressures as low as 60 pounds per square inch would be satisfactory.

In the Ioana planting the plots sprayed with the DDT-mineral oil formulation were noticeably yellow in color when compared with the untreated plots. This difference did not appear in the Calumet planting. Total yield figures for both varieties of corn did not indicate a yield reduction due to the effects of the DDT-oil spray.

II—Time, Interval and Number of Applications.—Ioana sweet corn was used for a detailed experiment at Belle Glade, Florida, in May, 1951. Factors under study included (1) the number of spray applications, (2) the interval between applications, and (3) the time of beginning and discontinuing treatments. A uniform DDT-mineral oil emulsion was applied with a knapsack type compression sprayer fitted with a pressure gage and a 65 degree Teejet fishtail nozzle. Two 5% DDT dust schedules were included for comparison with the spray. A rotary hand duster was used for applying the dust.

---

1 Florida Agricultural Experiment Station Journal Series, No. 59.
The corn earworm population was moderately heavy, as indicated by egg counts and the untreated check plots. The data show a definite interaction between the three factors investigated. Many of the spray treatments were far superior to the two dust treatments. From the information obtained in this experiment it appears that daily spray applications are not justified. Where 5 or 6 applications were made, the two-day interval between treatments was more effective; however, with 3 or 4 applications, the three-day interval was more satisfactory. There was evidence that the sprays should be applied over a period of at least 12 to 14 days.

III—FORMULATIONS.—An experiment on Ioana sweet corn at Fort Pierce, Florida, during a severe corn earworm infestation was conducted for the purpose of investigating several DDT spray formulations. Factors included (1) the amount of 25 percent DDT emulsion per acre, (2) the amount and types of mineral oil, (3) the effect of three emulsifiers and two solvents, and (4) a comparison between DDT dust and the spray formulations.

In a comparison of 2, 3 and 4 quarts of 25% DDT emulsion per acre with 2.5 gallons of Blandol, the amount of control increased with an increase in the dosage, giving 22, 43 and 61% worm-free ears, respectively. Treatments of DDT emulsion, DDT emulsion plus 1.2 gallons of Blandol and DDT emulsion plus 2.5 gallons of Blandol showed that the addition of this mineral oil increased the control, giving 13, 30 and 43% worm-free ears respectively. However, there was some indication that the mineral oil reduced the yield. One type of oil gave no increase in control above the DDT emulsion without oil. There was evidence that low viscosity oils were inferior to oils of intermediate viscosity. One formulation containing Sonneborn Sons "Emulsifier B" produced 71% worm-free ears, as compared to 40% with this Company's "Emulsifier A" and 43% with Rohm and Haas's "Triton X-155". Propylene dichloride solvent gave 60% worm-free ears, as compared with 43% for xylene. The use of propylene dichloride resulted in some pollination injury. All of the sprays containing oils caused some yellowing of the plants.

A laboratory preparation of DDT emulsions was used in all of the experiments reported on in these papers. For the purpose of this coordinated study it was desirable to use a uniform emulsion of known composition.
Recommendations

I—Spraying Methods.—A high clearance power sprayer with adjustable boom and nozzles, a good agitator and an efficient strainer is suggested for large acreages. The construction of the sprayer and the preparation of the soil should be such as to eliminate vertical and horizontal fluctuations of the spray nozzles. Rough and irregular rows make efficient spraying impossible, and loose or swinging booms and drop pipes seriously decrease the uniformity of coverage. Since the sprayer may be used for budworm and disease control, the pump and spray tank capacity should be adequate to deliver up to 150 gallons of liquid per acre.

Four wide angle hollow cone or fan type nozzles per row are suggested. Nozzles and pump pressure which produce a rather coarse spray should be selected. The proper placement of these nozzles will give adequate coverage for the corn earworms on the silks. Drop pipes should be centered between rows, with two pairs of nozzles attached to spray into the side of each row. The higher pair of nozzles should be well above the general silking zone, and directed downward to spray into the ear tips. The second pair of nozzles should be 9 to 12 inches below the higher pair, and directed to spray into the sides of the ears. Place both pairs of nozzles slightly high in order to take care of fluctuations in corn heights within the field. The best spray pressure will vary with the type of nozzles used. Some will work satisfactorily at low pressures.

These remarks on spraying methods are intended as a guide only; there is no substitute for following behind the sprayer to see if it is thoroughly wetting all ears and silks.

II—Time, Interval and Number of Spray Applications.—Since the time of beginning and discontinuing treatments, the interval between treatments, and the number of treatments are interrelated, any recommendation must be based upon all three factors. The fluctuations in the time of maximum egg deposition from crop to crop, and the silking variations between varieties and between different plantings of the same variety further complicate the issuance of a general recommendation.

It seems most desirable, therefore, to make suggestions aimed at giving the maximum amount of protection over as long a period as is practical and safe. Four to five applications at three-day intervals are suggested. The first treatment should be made on the day the first silks appear, or when about one percent of the silks are showing. It is suggested that budworm
sprays continue until the earworm sprays are begun in order to prevent migration of worms from the tassels, leaves and stalks into the ear tips before the silks appear. If corn-silk flies are present when the tassels begin to show, a treatment of parathion or chlordane is suggested.

III—FORMULATIONS.—Due to the variations in formulations of commercial DDT emulsion concentrates, it is not possible to recommend simply 25% DDT emulsion mixed with white mineral oil. Some of the commercial products may be satisfactory while others would not, depending upon the type and amount of the emulsifier and solvent. Since it is not generally the practice of chemical companies to supply complete formulation data on their emulsion concentrates, tests of various commercial products would not add to the needed information on emulsifiers and solvents.

Investigations on the amount and types of insecticides, emulsifiers, solvents and mineral oils going into the corn earworm formula have resulted in some interesting leads; however, this formulation work is not complete enough to make a recommendation at this time. It can be stated that xylene (70%), Triton X-155 (5%), and technical DDT (25%) by weight in each case has been used satisfactorily and has caused no noticeable injury to the plants. This emulsion, however, when mixed with mineral oil and diluted with water makes a very unstable mixture requiring vigorous agitation. The most recent experiment on formulations indicates that Sonneborn’s “Emulsifier B” may be superior to “Triton X-155” and it gives better control and results in a more satisfactory emulsion when mixed with white mineral oil and diluted with water. Propylene dichloride solvent was superior to xylene in worm control, but caused some pollination damage. The addition of mineral oil increased the control, but in some cases it has caused reduced yields. After taking the above statements into consideration, the following suggestions are presented.

(1) When DDT dusts are producing a high percentage of worm-free ears (80 to 100%), it usually means that the corn is growing during relatively low populations of adult earworm moths, and it is suggested that DDT dusts may be continued, since they are satisfactory under light infestations. Low populations have occurred most often during the Fall and early Spring. Apply 35 pounds per acre of 5% DDT dust every other day, beginning when the first silks appear, and discontinuing when the silks turn brown.
(2) For moderate corn earworm infestations, where dusts normally produce 60 to 80% worm-free ears, a spray delivering 3 to 4 quarts of 25% DDT emulsion per acre per treatment is suggested. Attention is called to the fact that some emulsions may cause injury at these high rates of application. Apply the DDT emulsion in about 50 gallons of water per acre.

(3) For severe infestations, where neither dusts nor sprays with DDT emulsion are expected to produce the desired results, it is suggested that four quarts of 25% DDT emulsion be mixed with 2.5 gallons of highly refined white mineral oil (80 to 95 viscosity) and then mixed with 50 gallons of water, applying this amount to one acre. It is pointed out that some yield reduction may occur with this formulation; however, if the corn is healthy and vigorous before treatments begin, the reduction should be slight, provided the DDT emulsion used has been previously tested for this purpose and found to be non-phytotoxic.

Most growers would prefer a slight yield reduction to the worms. If examinations are made for eggs on the stalks and husks before silking and on the very first silks, this should act as a guide in determining the degree of infestation. Since this is generally too late to begin treatments, it would serve only to indicate what to expect on younger plantings. If a few rows of corn were seeded 4 to 5 days before the main planting was made these rows could be used for determining the degree of the infestation in time to begin treatments. This method would not be infallible, but should prove beneficial in many instances.