BUDWORM CONTROL STUDIES ON SWEET CORN
IN THE EVERGLADES 1, 2

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One quart of 25 percent DDT emulsifiable concentrate (0.5 pound actual toxicant) and 2.5 pounds of 40 percent toxaphene wettable powder (1.0 pound actual toxicant) per 100 gallons of spray were recommended for the control of budworms on sweet corn in Florida (Anonymous, 1956; Kelsheimer et al., 1950). In recent years it became apparent that these treatments were not controlling budworms effectively. Many Everglades sweet corn growers either increased the dosages or used heptachlor, toxaphene, or DDT in combination with parathion. It seemed necessary to re-evaluate the recommended chemicals and compare them with other insecticides in common use.

Data reported by Hayslip and Genung (1950), Kelsheimer et al. (1950), and Wene (1954) indicated that parathion effectively controlled budworms on corn. Wilson (1949) reported that 1 quart of 25 percent DDT emulsifiable concentrate was superior to 1 pound of 15 percent parathion wettable powder in 100 gallons of spray. Hayslip and Genung (1950) reported that DDT emulsion was superior to toxaphene emulsion or wettable powder suspension. Wene (1954) reported that parathion and DDT at 0.25 and 1 pound per acre, respectively, were slightly more effective than toxaphene at 1 pound for the control of budworms on sweet corn. He reported effective control with heptachlor, toxaphene, and parathion. Kelsheimer (1951) reported that heptachlor gave excellent budworm control. At present, DDT is recommended at 2 pounds of 50 percent wettable powder and toxaphene at 4 pounds of 40 percent wettable powder per 100 gallons (Brogdon and Marvel, 1959).

In each experiment plots were 2 rows wide, 50 feet long and separated by single unsprayed buffer rows. Sixty-Pak sweet corn was planted in rows that were 36 inches apart. Treatments were applied with a custom-made self-propelled small plot sprayer with an outrigger boom equipped to spray 2 rows (Harrison et al. 1958). Sprays were applied weekly. Initial spray applications were made with 2 overhead nozzles to each row. Nozzles were added to drops between the rows to give complete coverage as the corn grew taller. Sprays were applied at the rate of 25 gallons per acre per nozzle or 50, 100, and 150 gallons per acre, respectively, with 2, 4, and 6 nozzles per row.

PHOSPHATES, CHLORINATED HYDROCARBONS, AND COMBINATIONS OF PHOSPHATES AND CHLORINATED HYDROCARBONS

An experiment was conducted to compare toxaphene, DDT, heptachlor, parathion, and phosphamidon and to determine if combinations of parathion

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or phosphamidon with the other materials were more effective than the respective insecticides when applied alone.

All of the insecticides were applied in emulsions. Parathion and phosphamidon were applied at the dosage of 0.25 pound of actual toxicant per 100 gallons of spray, using an emulsifiable concentrate that contained 4 pounds of actual toxicant per gallon. DDT and heptachlor emulsifiable concentrates that contained 2 pounds of actual toxicant per gallon were used to make emulsions that contained 0.5 pound of actual toxicant per 100 gallons. The toxaphene emulsifiable concentrate contained 6 pounds of actual toxicant per gallon and was used in sprays that contained 1 pound of actual toxicant per 100 gallons. Each treatment was replicated 4 times in a randomized complete block design.

Sprays were applied at 150 psi using 8002 Spraying Systems Teejet nozzles with the sprayer driven at approximately 2.4 mph. The first spray application was made October 21 to corn that had been planted October 7, 1958. The first 2 sprays were applied with 2 nozzles over each row. A nozzle was added to each side of the row for the next 2 applications. The last 2 sprays were applied with a second nozzle added to each side of the row.

An examination for budworm damage was made on all of the plants in each plot on the fourth day following each of the 6 weekly applications. Those plants showing evidence of recent budworm feeding in the whorl, or at the top of the plant, were considered damaged. On October 10 and 11, 100 larvae were collected from unsprayed buffer rows and all were identified as the fall armyworm, *Spodoptera frugiperda* (J. E. Smith).

![Graph showing control of budworms on sweet corn on 6 dates with phosphates, chlorinated hydrocarbons, and combinations of phosphates and chlorinated hydrocarbons.]

The results for each observation date are shown in Figure 1. Treatments were compared by the Student-Newman-Keuls test (Federer, 1955).
After the first spray, treatments were not significantly different from each other but each resulted in significantly fewer budworms than the untreated check. After the second application, parathion and the parathion toxaphene combination resulted in significantly fewer budworms than toxaphene or phosphamidon. For each of the four remaining observation dates, parathion and combinations of parathion gave significantly better budworm control than DDT, toxaphene, phosphamidon, and phosphamidon combined with toxaphene or DDT. The heptachlor-parathion combination was superior to heptachlor following each of the last 3 sprays. Following the fifth spray, the heptachlor-parathion combination was significantly better than parathion. This was the only instance in which a parathion combination gave significantly better budworm control than parathion alone.

When the examinations following each of the 6 sprays were averaged, there were no significant differences among the treatments that contained parathion (Figure 2). Parathion, alone or in combination, gave significantly better control than all other treatments except the heptachlor-phosphamidon combination. Only the toxaphene-parathion and the heptachlor-parathion combinations were significantly better than the heptachlor-phosphamidon combination.

![Figure 2](image)

**Fig. 2.** Control of budworms on sweet corn with phosphates, chlorinated hydrocarbons, and combinations of phosphates and chlorinated hydrocarbons. Averages of 6 dates. Treatments that are bordered by the same vertical line are not significantly different; others are significantly different.

This experiment strongly indicated that toxaphene and DDT would not efficiently control budworms at the rates recommended at that time when applied on a weekly schedule. Parathion compared excellently with the other insecticides. Its short residual effectiveness is probably of little importance in the corn whorl where untreated leaf surface is soon exposed because of rapid growth.
The preceding experiment indicated that toxaphene and DDT were inefficient for the control of budworms at the recommended dosages. This experiment was designed to determine the approximate dosage at which each chemical would control budworms on sweet corn. Each material was applied at a dosage of 0.5, 1.0, 1.5, and 2.0 pounds of actual toxicant per 100 gallons of emulsion to corn that was planted on January 26, 1959. The toxaphene and DDT emulsifiable concentrates contained 6 and 2 pounds of actual toxicant per gallon, respectively. Each treatment was replicated 8 times in a randomized complete block design.

Four sprays were applied at weekly intervals beginning February 4, 1959, using Spraying Systems Teejet D2-25 nozzles at 250 psi. The sprayer was driven at approximately 2.4 mph.

Two overhead nozzles per row were used in the first 3 applications. In the fourth application, one nozzle was added to each side of the row.

Of 61 caterpillars collected from untreated buffer rows March 3, 1959, 59 were fall armyworms and one was a corn earworm, *Heliothis zea* (Boddie). The remaining larva was a southern armyworm, *Prodenia eridania* (Cram.).

Examinations were made February 24 and March 3, six days after the third and fourth spray applications, by counting the number of budworm damaged plants among 25 plants in each row of the 2-row plots. The results are summarized in Figure 3.

On February 24, when 25 percent of the plants in untreated check plots were infested, the 2 lower rates of toxaphene gave significantly poorer budworm control than the other treatments. On March 3 and when the 2 examinations were averaged, the lower rate of DDT and the 2 lower
rates of toxaphene gave significantly poorer results than other rates of either material. Thirty-three percent of the plants in untreated check plots were damaged March 3. For each material there was a significant linear regression of percent budworm damaged plants on dosage. The shapes of the curves indicate that a dosage of either insecticide exceeding 1.5 pounds per 100 gallons would probably be unprofitable.

LITERATURE CITED


