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Snap beans, **Phaseolus vulgaris** L., are important to the economy of Tennessee. According to the publication, **Tennessee Agricultural Statistics,** 13,000 acres were grown in Tennessee in 1971 with a value of $2,984,000. Tennessee produces 5.9% of the beans grown in the United States and ranks fifth in the nation in snap bean production. Tennessee-grown beans are processed in Tennessee and in nearby states. In 1972 demand was up because of poor growing weather in the adjacent bean producing states. Most beans in Tennessee are grown on the Cumberland Plateau, Sequatchie Valley, and in extreme northeast Tennessee.

In recent years, looper infestations on the Cumberland Plateau have resulted in the abandonment of large acreages of snap beans. Infestations usually occur too late to cause much damage by defoliation (Figure 1), but their presence in harvested beans results in rejection by the processor.

Procedure

Experiment 1. This experiment utilized artificially-reared larvae and consisted of a field and laboratory experiment. Slenderwhite variety of beans was treated with chemicals and biological agents listed in Table 1. Treatments were replicated four times, and sprays were applied with a 2-gallon compressed air sprayer. Three middle to late instar (13 days of age) cabbage looper larvae, **Trichoplusia ni** (Hubner), were placed in paper cups which had been placed over bean leaves in the field. Four cups were used per replicate. In the laboratory test, a few of the above mentioned field-treated leaves were removed and returned to the laboratory. Two middle to late instar larvae were placed in a petri dish containing treated leaves. Each petri dish served as a replicate and each treatment was replicated four times. Mortality counts in the field and laboratory experiment were made daily for 3 days after treatment.

Experiment 2. This experiment was conducted at the Dixie Garden Farms near Crossville. Treatments listed in Table 2 were applied to mature Gallatin 50 beans on September 21, 1972 at the rate of 50 gallons of spray material per acre. Row width was 38 inches and row length was 15 feet. Treatments were replicated four times with three rows per replicate. Looper counts were made by sweeping one 15-foot row per replicate with an insect net just prior to treatment and two adjacent 15-foot rows 5 days after treatment.

Experiment 3. Experiment 3 was similar to Experiment 2 except for minor differences. The number of treatments was reduced as some of the chemicals which were ineffective in the second experiment were eliminated, and Orthene was added. The experiment was conducted at the Dixie Garden Farms near Pikeville on the Early Gallatin variety of beans. Treatments listed in Table 3 were applied on October 3, 1972, and post treatment sweep net counts were made 3 days after treatment. In both experiments 1 and 2 loopers were nearly full grown. In this experiment looper numbers were too low to separate by species, so the soybean (**Pseudoplusia includens** (Walker)) and cabbage loopers were combined for statistical calculations.

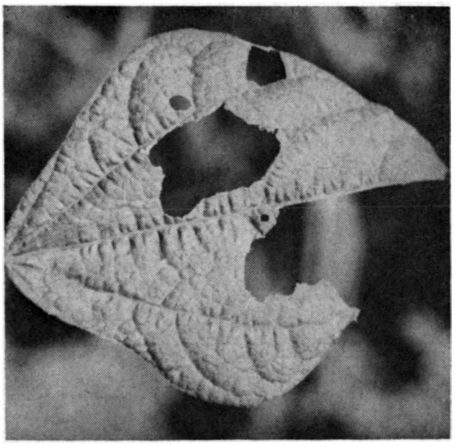

Figure 1. Cabbage looper feeding damage on a snap bean leaf.

Results

In the field test of the first experiment, all treatments except Viron/T provided control (Table 1). In the laboratory test Lannate, Dipel, and Orthene provided significantly better control than other treatments. In both the field and laboratory test, Lannate caused the quickest response with the field test resulting in 100% mortality 1 day

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Table 1. Mortality of cabbage loopers caged on treated snap bean leaves, Knoxville, 1972

Treatment	Rate per acre	Field test Percent Mortality (Days after treatment)[1] 1	2	3	Laboratory test Percent Mortality (Days after treatment)[1] 1	2	3
		Percent					
Lannate 90 WSP	2.5 lb a.i.[2]	100.0a	—a	—a	89.4a	97.9a	100.0a
Dipel 2.5 WP	1.0 lb formulation	37.2c	89.4a	100.0a	12.4c	53.9b	93.6ab
Orthene 75S	1.0 lb a.i.	76.8b	89.4a	100.0a	68.5b	93.6a	97.9ab
Thuricide HPC	1.0 qt formulation	28.9cd	74.7b	93.6a	2.0c	30.9c	76.8b
Sevin 80S	1.5 lb a.i.	43.4c	74.7b	91.6a	14.5c	22.8cd	28.9c
Viron/T	20 gm formulation	8.3e	14.4c	45.6b	0.0c	0.0e	10.3c
Check	—	14.4e	22.7c	41.4b	0.0c	6.2de	8.3c

[1] All means followed by the same letter within a column do not differ significantly at the 5% level of significance.
[2] Active ingredient.

Table 2. Number of cabbage and soybean loopers per 30 feet of row, 5 days after treatment, Crossville, 1972

Treatment	Rate per acre	Cabbage loopers[1,2]	Cabbage loopers[1,2]
Lannate 90 WSP	2.5 lb a.i.[3]	0.5a	0.0a
Dipel 2.5 WP	1.0 lb formulation	1.8ab	1.5ab
Phosdrin 4E	1.0 lb a.i.	2.5abcd	0.8a
Galecron 4E	1.0 lb a.i.	2.3abc	0.3a
Thuricide HPC	1.0 qt formulation	2.3abc	0.3a
Guthion 1.5E	0.5 lb a.i.	2.8abcde	0.3a
Sevin 80S + Toxaphene 6E	1.5 + 2.0 lb a.i.	2.5abcd	2.5abc
Sevin 80S + Thiodan 2E	1.5 + 1.0 lb a.i.	4.8bcde	1.0a
Thuricide HP 90M (Dust)	20 lb formulation	3.5abcde	4.0c
Thiodan 2D	1.0 lb a.i.	3.8bcde	0.8a
Sevin 80S	1.5 lb a.i.	5.8e	3.5abc
Dibrom 8E	0.5 lb a.i.	3.5abcde	1.5ab
Viron/T	40 gm formulation	3.0abcde	4.0c
Pyrenone 606	10 oz formulation	5.5de	0.5a
Check	—	5.3cde	2.0abc

[1] All means followed by the same letter within a column do not differ significantly at the 1% level of significance.
[2] Average number of cabbage and soybean loopers before treatment was 5.1 and 3.2, respectively.
[3] Active ingredient.

after treatment. The bacterial agents—Dipel and Thuricide HPC, both preparations of **Bacillus thuringiensis** Berliner—do not act as quickly as most chemical insecticides. However, feeding damage stops shortly after treatment while death occurs about 2 days later.

Experiment 2 consisted of 14 treatments plus the check (Table 2). Of these, only Lannate, Dipel, Thuricide, Phosdrin, and Thiodan are currently recommended for looper control on snap beans by the Institute of Agriculture. As indicated in Table 2, only Lannate and Dipel reduced cabbage looper numbers significantly below the check. Soybean looper populations were too low to show any significant statistical differences among treatments. However, Lannate reduced soybean looper populations from 3.2 to 0.0 per 30-foot row.

Cabbage loopers in Experiment 3 were five times as abundant as soybean loopers. Lannate and Orthene at the 2.0-pound per acre rate completely eliminated cabbage looper populations (Table 3). All treatments except Viron/T and Thuricide HPC were significantly better than the check. An infestation of corn earworms, **Heliothis zea** (Boddie), was present at Pikeville and data on their control were also recorded. Average number of corn earworms before treatment was 3.1 and Lannate and Orthene at the 2.0-pound per acre rate reduced the population to 0. However, due to the absence of any earworm larvae in a few of the replicates, no statistical differences occurred.

Conclusions

Lannate and Orthene were the most effective chemicals in the control of loopers and Dipel was the most effective biological agent. Neither Lannate nor Orthene are now labeled for looper control on snap beans but both, hopefully, will be labeled in the near future. In addition to its effectiveness in looper control, Orthene has the desirable attribute of having a low mammalian toxicity, near that of Malathion.

Dipel, a preparation of the bacterium **B. thuringiensis,** provided satisfactory control and is recommended for use on snap beans in Tennessee as a spray formulation. Being a bacterial agent specific to caterpillars, it is harmless to man and has no adverse effect on beneficial insects. No waiting period from application to harvest is required.

Table 3. Number of cabbage + soybean loopers per 30 feet of row, 3 days after treatment, Pikeville, 1972

Treatment	Rate per acre	Number of cabbage + soybean loopers[1,2,3]
Lannate 90 WSP	2.5 lb a.i.[4]	0.0a
Orthene 75S	2.0 lb a.i.	0.0a
Orthene 75S	1.0 lb a.i.	0.8abc
Dipel 2.5 WP	1.0 lb formulation	0.5ab
Galecron 4E	1.0 lb a.i.	1.0abc
Viron/T	40 gm formulation	2.0bcd
Thuricide HPC	1.0 qt formulation	2.3cd
Check	—	3.3d

[1] All means followed by the same letter within a column do not differ significantly at the 5% level of significance.
[2] Ratio of cabbage to soybean looper = 5:1.
[3] Average number of loopers prior to treatment was 8.
[4] Active ingredient.