

Cotton Insects Investigations

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EARLY-SEASON HOST PLANTS OF HELIOTHIS SPP.

Since the tobacco budworm, Heliothis virescens (F.), has become an important pest of cotton in mid- to late-summer in the southwest, a study was conducted in the springs of 1979 and 1980 to determine host plants that might contribute to later infestations in cotton. During April and May 1979, large Heliothis spp. populations were found on redstem filaree, Erodium cicutarium (L.), a common desert weed. Yellow bird-of-paradise, Caesalpinia gilliesii Wall., and garbanzo bean, Cicer arietinum L., were primary spring hosts in 1980. An obscure species, Heliothis phloxiphaga (Grote and Robinson), was collected on daisy fleabone, Erigeron divergens Torr. and Gray, in large numbers in 1979 and on Erodium cicutarium in 1979 and 1980. In all, tobacco budworm and cotton bollworm were collected from nine plant species.

GARBANZO BEAN: AN EARLY-SEASON TRAP CROP OF TOBACCO BUDWORM

As a result of observations of commercial garbanzo beans in south Yuma County, it appeared that this cultivated crop was an excellent host of the tobacco budworm. Therefore, a small plot of garbanzo beans was planted on the Yuma Valley Experiment Station in 1981 to determine the feasibility of using this crop as a trap crop for the tobacco budworm and to explore the possibility of controlling the pest with microbial insecticides.

The trap-crop effect of this host was demonstrated quite conclusively as large populations developed on this crop. However, satisfactory control was not achieved with several microbial insecticide treatments. At termination of the experiment, emergence cages placed over the untreated check plots yielded a mean of 23,667 tobacco budworm moths per acre. In addition to the moth yield, an average of 26.3 larvae was collected from plants taken from 1 meter of row under each cage at the end of the test.

EARLY-SEASON PINK BOLLWORM SUPPRESSION WITH BACILLUS THURINGIENSIS

Pink bollworm moths, emerging from overwintering larvae, oviposit more randomly over the cotton plant than during later generations when bolls are available. This necessitates greater larval movement in search of the young fruiting buds.

This test was designated to determine the possibility of suppressing the first square generation with Bacillus thuringiensis, thereby, preserving the beneficial insect complex in the field at that time.

Unusually high pink bollworm populations emerged in the spring of 1981. Although some suppression was achieved in the early squares with the B.t. applications, it was not considered adequate.

TOBACCO BUDWORM CONTROL WITH MICROBIAL INSECTICIDE STUDIES WITH BACILLUS THURINGIENSIS

- a. Efficacy of Dipel[®] and Geocoris punctipes (Say) against the tobacco budworm.

The efficacy of Dipel in combination with Geocoris punctipes (Say) for control of Heliothis virescens (F.) on cotton was studied under greenhouse and field-cage conditions. Various rates of Dipel (141, 282, 561, and 1121 g/ha) were evaluated in combination with predator densities ranging from one Geocoris nymph/plant to one/4 plants. Results indicated potential for good control with rates as low as 282 g/ha of Dipel and one Geocoris nymph/4 plants.

- b. Survival of tobacco budworm larvae following short-term feeding periods on cotton treated with Bacillus thuringiensis.

Studies were conducted to determine if any adverse effects ensued when larvae of Heliothis virescens (F.) survived various feeding periods on cotton treated with Bacillus thuringiensis (B.t.). Some of the second-instars that were fed B.t.-treated terminals for 6, 18, or 30 h and then transferred to an untreated diet survived. The ability of larvae to recover decreased with increases in dosage rate or exposure time. After feeding periods of 18 or 30 h, duration of the larval stage was significantly increased. Effects on pupae were similar. No effects on adult longevity, fecundity, egg viability, or F₁ larval survival were detected.

- c. Effects of Bacillus thuringiensis var. kurstaki on tobacco budworm adult and egg stages.

Efficacy of Bacillus thuringiensis var. kurstaki (B.t.) against the adult and egg stages of Heliothis virescens (F.) was studied under laboratory conditions. The longevity and fecundity of adults were significantly reduced when a 5% sucrose solution containing 32,000 IUs of B.t./ml was provided as a food source. Tobacco budworm eggs sprayed directly with B.t. hatched normally, but larval survival was significantly affected, indicating some larvae had consumed a lethal dose during eclosion. Mortality was directly related to dosage level and age of egg.

- d. Effectiveness of Dipel[®] against the tobacco budworm on cotton in Arizona.

Effectiveness of Dipel (= Bacillus thuringiensis var. kurstaki) against the first 3 larval instars of the tobacco budworm, Heliothis virescens (F.), was studied under both greenhouse and field conditions. Both studies showed that 1st-instar larvae were most susceptible to all dosages (141, 282, 561, and 1121 g/ha) of Dipel tested. The higher rates of 561 and 1121 g/ha gave better control and remained effective for longer periods against all three instars than did the two lower rates. The efficacy of all rates declined significantly with each subsequent post-application date for which bioassay data were obtained. Only the two higher Dipel rates remained effective through the 2-day residue period in the field.

- e. Influence of the feeding stimulant COAX on the effectiveness of Bacillus thuringiensis against tobacco budworm larvae.

Efficacy of Bacillus thuringiensis, with and without the feeding stimulant COAX, was evaluated against the first 3 instars of the tobacco budworm, Heliothis virescens (F.), under field conditions. The addition of COAX at 282 g/ha to all Dipel treatments resulted in significant increases in larval mortality of all three instars; the first instar was most susceptible.

- f. Effect of Bacillus thuringiensis on certain biological characteristics of larvae, pupae, and adult tobacco budworms.

The effect of Bacillus thuringiensis on certain biological characteristics of the tobacco budworm was studied in the laboratory. Results showed that larval and pupal development was delayed, pupal weight was reduced, and fecundity was lowered. Changes were directly related to dosage rate and length of larval exposure time. No effect was shown relative to adult longevity or egg viability for those surviving B.t. treatments as larvae.

TOBACCO BUDWORM CONTROL WITH MICROBIAL INSECTICIDES

In 1981, a tobacco budworm control experiment was conducted at the Yuma Experiment Farm. Cotton was planted June 15 in order to have cotton in a favorable condition for oviposition at the expected time of greatest population pressure. Plot size was 4 rows wide by 60 ft. long with 4 replications. Two, side by side, identical experiments were conducted except that in one, pink bollworms were controlled using azinphosmethyl; none was employed in the other.

Consistent oviposition began on August 10 and infestation levels were sufficient to initiate the treatments on August 19. High tobacco budworm population pressure persisted for the duration of the experiment which was terminated on October 4. A total of 12 applications was made with an average interval of 5.5 days between applications.

Results of this experiment indicated that no microbial treatment, either with or without COAX, compared favorably with the standard, Pydrin. In general, yields in the microbial treatments (Dipel, SOK-B.t., Thuricide, Elcar, and various combinations) were approximately half that in the Pydrin treatment. Further, in the test receiving no pink bollworm control, yields were halved again, in both cases showing the damaging potential of these two pests. In treatments where comparisons were made with and without COAX, no significant differences occurred in yields.