

Potential of ACNPV and the bait formulation for use in controlling Heliothis spp. in cotton.-- Nuclear polyhedrosis virus (NPV) from the alfalfa looper applied to cotton (2 applications) in August 1977, in a spray adjuvant, reduced the larval population of Heliothis spp. (91% H. virescens) in bolls or squares 73% within 12 days compared to untreated cotton. The cotton in this test was nearing maturity and the Heliothis numbers were low (<0.5 larvae/plant). The percentage boll damage in the treated field was 2.3% compared to 11.0% in the untreated cotton (79% reduction in boll damage). Thus, the treatment could increase yield only 44 lbs. lint/acre based on the number of green bolls present. Larvae (59%) collected from the treated area 3 days after the first application died of virus infection, and 75% of the larvae less than 20 mg in size were infected.

In a second test in October, the virus (ACNPV) was applied to late-planted cotton with and without the spray adjuvant developed by this laboratory. The adjuvant significantly increased the effectiveness of the virus. The average mortality due to virus infection (at 7 days) of larvae collected from plots treated with virus plus adjuvant was 71% compared to 47% of those from plots treated with the virus alone, and 1.8% of those from untreated cotton. At 14 days after first treatment, the average number of undamaged bolls per plant was 13.0, 9.8, and 6.7 in plots treated with virus plus adjuvant, virus alone, and untreated, respectively. Also, the average number of live larvae per plant was 1.4, 2.4, and 6.5, respectively. The number of larvae in fruiting forms was reduced 84.7% in the virus plus adjuvant plots compared to the untreated control. The results also demonstrated a faster reduction of the population when the adjuvant was used; thus, less damage to the plants after larval infection.

The spray adjuvant was also field tested at the University of Arkansas on cotton for Heliothis control. Results indicated this adjuvant to be equal or superior to the adjuvant currently produced by industry. The spray adjuvant also increased virus persistence. At 3 days after application, virus applied in adjuvant had 54% activity remaining, whereas virus applied in water had 20% activity. (M. R. Bell)

#### HOST-PLANT RESISTANCE

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##### Pink Bollworm:

At Isabela, Puerto Rico, only Texas 17 (T-17) and T-158 among 58 primitive race stocks had significantly lower seed damage caused by pink bollworm than the check Deltapine and Stoneville cultivars. Only 1 of 57 cultivar X race stock hybrids, Deltapine 61 X T-226, had less seed damage than its cultivar parent. Four of 14 race stocks, T-55, T-99, T-101, and T-214, had no more seed damage than AET-5..., a resistant upland breeding stock.

At Tempe, Ariz., 8 of 32 race stocks had less seed damage than the check cultivar, as follows: T-17, T-39, T-58, T-65, T-218, T-226, T-570, and T-703.

At Tempe and Phoenix, AET-5... had significantly less seed damage than the check cultivars in 4 separate tests. In a 6 X 6 complete diallel experiment, AET-5... and T-167, for the second year, showed significant general combining ability for low seed damage. Pupation percentages in pink bollworm were 23% lower in AET-5... and 26% lower in T-167 than in the Deltapine check in a greenhouse experiment where cotton bolls had been hand-infested with pink bollworm larvae.

Other cottons that had less seed damage than the check cultivars in the field at Phoenix were 1 X 6-56, 'SP-37' (early maturity), ORS-75-75, ORMAR-S-2-75, and ORS-13 (Okra-leaf, frego-bract, Smooth-leaf), ORH-77-75 (Okra-leaf, frego-bract, pubescent-leaf), and AET Br 2-1, a sister stock of AET-5....

In a comparison of seed damage in selections of Okra-leaf, frego-bract, Smooth-leaf in all combinations in a La 71-7 background, there was consistently but not significantly higher seed damage in combinations with frego-bract and Smooth-leaf, and lower damage in combinations with Okra-leaf.

None of 7 high-gossypol stocks or of 2 Heliothis-tolerant PD-breeding stocks had less seed damage than the check cultivar. Pima glandless had less seed damage than 'Pima S-5' but both Pima entries had more damage than the upland check cultivar, 'Deltapine 61'.

At one point in the season, pink bollworm survival was lower, and boll temperatures were higher, in Okra-leaf than in normal-leaf cotton, but this trend was not consistent.

### Cotton leafperforator:

At Tempe and Phoenix in 1978, significant differences in cotton leafperforator "horseshoes" (CLP) per gram of leaf tissue were observed in two tests. The combinations normal leaf shape, normal bract shape, hairy leaf, and normal leaf shape, frego-bract, hairy leaf had more CLP than the combinations normal leaf shape, normal bract shape, Smooth-leaf, and Okra-leaf, frego-bract, Smooth-leaf. Four primitive race stocks, (T-86 mut DPL, T-218, T-570, and T-1125), had fewer CLP than the 'Deltapine 16' check. No other cultivar, breeding stock, or primitive race stock had fewer CLP than both the Deltapine and Stoneville check cultivars. ('Stoneville 256', however, had fewer CLP than Deltapine 61), Pima S-5, sprayed with carbaryl/kelthane for pink bollworm and spider mite control, had significantly more CLP than unsprayed Pima S-5. Sprayed Deltapine 61 and AET-5... had slightly, but not significantly more, CLP than their unsprayed counterparts.

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### Dosage-Mortality Studies of Synthetic Pyrethroids and O-P Insecticides on the Tobacco Budworm

Dosage-mortality lines were established for methyl parathion, Bolstar, and 3 synthetic pyrethroids against larvae of the tobacco budworm, Heliothis virescens (F.).

### Procedures:

Tobacco budworm cultures were established in the laboratory during the latter part of the growing season in 1976, 1977 and 1978. Newly-hatched larvae were introduced into 8 oz. cups at the rate of 40 larvae/container and held at a temperature of 30°C. After a feeding period of 5-7 days, larvae were transferred to individual 1 oz. media-filled cups for insecticide treatments. Insecticide applications and mortality counts were made by the standard test method for determining resistance in Heliothis spp. Insecticides employed in one or more of the tests were technical grades of methyl parathion, Bolstar, Pydrin, Pounce and Ambush. Mortality counts were made at 24, 48 and 72 hr. The 48 hr count was used to compute the LD<sub>50</sub>'s.

### Results:

Levels of tolerance to methyl parathion have increased since 1972. All 3 pyrethroids were more effective than methyl parathion, but decreased susceptibility to these pyrethroids was indicated where insects already possessed high levels of tolerance to methyl parathion. Additionally, the LD<sub>50</sub>'s to the pyrethroids increased significantly from 1977 to 1978.

### Effects of Molasses or Toxaphene on Residual Life and Efficacy of Methyl Parathion on Cotton

Methyl parathion residues on cotton can be protected and their efficacy against Heliothis virescens substantially extended by application at dusk in preference to dawn. Adding molasses or toxaphene to methyl parathion sprays further extends its residual life with both dusk and dawn applications. Although H. virescens is highly resistant to methyl parathion in most areas of the state, the extension of the effective life of other insecticides with dusk applications should occur in a similar manner.

### Laboratory and Field Studies on the Tobacco Budworm

#### 1. Biology:

A laboratory study was conducted to determine the effects of temperature on rate of development, longevity and fecundity of Heliothis virescens. Temperatures studied were 15°, 20°, 25°, 30° and 35°C. Of particular concern in this and related studies was the effect of high temperatures, such as 35°C, on egg fertility. Purportedly, the tobacco budworm would be of little consequence during mid-summer because of sterility. Moths originating from the 35°C rearing chamber did, in fact, lay sterile eggs. However, those originating from a lower temperature but held at 35°C for hatching resulted in approximately a 50% hatch.