Leafminer control increases summer squash yields

Twenty-seven growers produced summer squash valued at approximately $750,000 in 1978 on 536 acres in California's Imperial Valley. In the same year the California squash crop, which is in high demand, was worth $12 million. The intensive labor requirements of this crop make it especially attractive to the small grower, who uses family labor for its production.

Several insect pests attack squash plants. Lepidopterous pests, mites, and aphids seldom build up to damaging numbers and are easily controlled. However, a tiny agromyzid fly called the leafminer, Liriomyza sativae, has been quite troublesome in recent years. Because this leafminer has a wide host range and is continuously exposed to insecticides, it has become very resistant and hence difficult to kill. During the two squash-production seasons in the Imperial Valley, the leafminer is more prevalent in the fall than in the spring; large populations build up on cotton and spill into cucurbits when cotton is ready for harvest.

Leafminer larvae damage squash leaves by mining between the upper and lower leaf surfaces. In some years, heavy miner infestations remove the chlorophyll from the...
entire leaf area, which interferes with photosynthesis. In the fall of 1979, when squash was selling for $14 a carton, some fields had to be abandoned because of uncontrollable miner infestations.

The adult leafminer fly is about 2.5 millimeters (1/10 inch) long. These shiny black flies with yellow markings deposit pale white oval eggs just underneath the upper epidermis of the leaf. The eggs hatch in an average of 4 days, and the larval stage lasts about 9 days. The larvae later change into pupae in pupal cases (puparia), which fall to the soil surface or sometimes lodge on the upper surfaces of the leaves. In about 10 days the flies emerge to start the cycle again. The average period for the entire life cycle is 23 days.

**1976 experiments**

In 1976 the effect of leafminer control on squash yield was investigated to determine the necessity for such practices in an overall pest management program. These studies were conducted in the Imperial Valley at the University of California Meloland Field Station. There were four replicates of each treated and check plot; each replicate was one bed by 36 feet long. Parathion, Phosdrin, Vydate, Orthene, and Diazinon were applied on September 2, 13, and 20 by a CO₂ pressurized hand sprayer at the rate of 30 gallons of finished spray per acre. The bioassay method consisted of taking five leaves on each sampling date, placing these leaves as bouquets in water, and incubating them in ice cream cartons. Leafminers in leaves were allowed to complete their life cycles before the pupae and emerging adults were counted. Fruit yields were taken by picking 6-inch fruit every other day until production markedly declined.

Vydate, Orthene, and Diazinon significantly reduced leafminer populations one day after application but rapidly lost efficacy; no subsequent yield increases were evident. Control with Parathion and Phosdrin was not obtained. These studies indicated that current control practices for leafminer on squash in the Imperial Valley are not effective and may be of no economic benefit to the growers. However, our trials were conducted on small plots, and better control may result when larger fields are treated.

### 1977 experiments

The methods were the same as for the 1976 experiments, but only one insecticide was used — Lorsban (unregistered) at the rate of 1 pound active ingredient per acre sprayed (A) twice a week, (B) once a week, and (C) once every 15 days.

Lorsban decreased the pupa population by 32 to 62 percent when compared with nontreated plots, and yield gains amounted to 1,324, 1,279, and 533 pounds in treated plots A, B, and C, respectively. Although twice weekly Lorsban sprays reduced pupae only 62 percent, this was enough to increase squash yield 46 percent.

Summer squash at harvest time in 1977 was selling for $10 a carton. Considering the cost of insecticide applications, the farmer realized gains of $1,174 for spraying weekly, $1,199 for spraying weekly, and $483 per acre for spraying every 15 days.

### Conclusion

In 1976 experiments, leafminer control with available insecticides on squash was no more than poor. Consequently, no yield increases were evident.

Leafminer control with Lorsban in 1977 ranged from 32 to 62 percent, which was not outstanding but gave yield gains over nontreated plots of 533 to 1,324 pounds per acre, amounting to $483 to $1,199 per acre.