Results of Insecticide Applications to Control Leafminer in Summer Squash, 1977		
Treatment	Mean number of pupae*†	Squash yield/acre†**
		lb
A. Lorsban (twice weekly) 15 treatments	311 c	4,196 a
B. Lorsban (weekly) 8 treatments	477 bc	4,151 a
C. Lorsban (every 15 days) 4 treatments	567 ab	3,405 ab
D. Nontreated check	826 a	2,872 b

*Analysis based on the square root transformation.
†Numbers followed by the same letter are not significantly different at the 5 percent level (Duncan's multiple range test).

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 CO_2 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 twice 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.

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New fungicide

Downy mildew, an onion disease caused by the fungus *Peronospora destructor*, is a sporadic but potentially serious threat to both seed and bulb onion crops. Wind currents carry sporangia (the spores) of the fungus into a field from volunteers or neighboring plants and then spread the fungus from plant to plant. Cool, wet, or humid weather during spring, as is common in coastal regions, inland valleys, low-lying areas, and plantings near rivers, favors disease development and spread. Extensive fog, mist, and dews, as well as rain, can provide sufficient moisture for mildew activity.

Control of downy mildew is based on early and repeated fungicide application during damp weather. Many materials are registered for use against onion downy mildew, but none has demonstrated consistent effective control, especially when conditions favor disease establishment. A new material, Ridomil (CGA 48988), which has shown great promise in controlling downy mildew on other crops, was tested along with selected other materials for control of the disease on seed and bulb onions grown in the San Joaquin Valley.

Fungicides were applied with a Chapin compressed air sprayer in water approximately equivalent to 100 gallons per acre with 1 milliliter (ml) of X77 spreader per gallon. Care was taken to ensure complete coverage of foliage and seed stalks. First treatments were made after mildew was found, except for preventive treatments of Ridomil in 1979 in the Delhi seed field. Contact fungicides were applied approximately every 7 to 10 days or Ridomil at 14-day intervals. Treatments were replicated four times in 1978 trials, six times in 1979.

The foliage of bulb onions and flower stalks of seed onions were evaluated for disease by counting the number of plants with active mildew lesions. Active lesions had a light violet growth as visible evidence of fungus sporulation. All plants in each plot were scored in 1978, 25 and 50 plants within each plot of the Delhi and Fresno trials, respectively, in 1979.

apparently controls onion mildew

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Onion downy mildew was rampant and severe during the unusually wet spring of 1978, and serious in 1979 in fields near rivers or streams. In all instances, only Ridomil at 8 ounces active ingredient (a.i.) per acre controlled downy mildew (table 1). Dithane M45 gave some measure of protection against mildew in the 1979 Fresno field but not in 1978. One or two Ridomil applications were sufficient to control downy mildew leaf infections on bulb onions in 1978. Two applications of Ridomil at a 14-day interval in 1979 in the Fresno seed field, where disease incidence was high, did not control mildew as well as in 1978.

Use of Ridomil alleviated the severity of mildew, even where infection rates were near 100 percent. This was reflected in the 1979 Fresno trial by the lower percentage of Ridomil-treated stalks (4.0) that had more than half the tissue infected, as compared with the check (90.6) or all other materials (30.6 to 83.3).

Mildew remained active and was so severe in this field that an additional application of all fungicides was made 2 days after the readings reported here were taken, and 3 weeks after this final application most seed stalks had collapsed. At that time, all stalks that had not bent or fallen over were counted. The average number of stalks remaining upright in each 15-foot plot was 67.6 in the 8-ounce-a.i. Ridomil treatments, 10.6 in the untreated check, and 12.0 to 40.3 in the other treatments. Ridomil at 8 ounces a.i. per acre was significantly better than any other treatment (P = 0.01).

The trial at Delhi was designed to test Ridomil at several rates and times of application, including a preventive spray. Excellent control was achieved with all treatments except 2 ounces a.i. per acre applied when mildew was first found, and even that was significantly better than the check (table 2). No mildew lesions on flower stalks or foliage were found all season where a preventive spray of 8 ounces a.i. per acre was followed by repeated applications at 14-day intervals until the weather became warm and dry.

These experiments demonstrate that no currently registered material can be used with confidence in control of onion downy mildew. In contrast, the unregistered material, Ridomil, with several choices of rates and timing, apparently controls downy mildew. Even so, the severity of mildew in the 1979 Fresno trial suggests that two applications of Ridomil at 8 ounces a.i. per acre may not be sufficient to control the disease, especially when treatments are begun after mildew has become established and conditions favor mildew development.

TABLE 1. Efficacy of Fungicide Treatments for Control of Onion Downy Mildew.

		Bulb onions 1978*		Seed onions, Fresno 1979*†	
		Percent plants with active lesions		Percent primary flower stalks having:	
Treatment	Rate/A (a.i.)	Field A‡	Field B§	Any mildew lesions	Lesions on >½ of stalk
Check		31.7 a	78.4 a	98.9 c	90.6 d
Ridomil 50 WP	4 oz	—	0 b	—	—
Ridomil 50 WP	8 oz	—	0 b	—	—
Ridomil 2 lb/gal	8 oz	—	—	40.6 a	4.0 a
Dithane M45 80 W	2.4 lb	—	100.0 a	59.3 b	30.6 b
Bravo 6F	1.1 lb	—	88.9 a	—	—
Bravo 6F	2.3 lb	43.6 a	—	—	—
Bravo 500	2.1 lb	—	—	92.6 c	70.0 cd
Dyrene 50 W	2.0 lb	40.4 a	—	91.3 c	76.6 cd
Difolatan 4F	2.5 lb	—	—	97.3 c	78.0 cd
Kocide 101	1.54 lb	31.5 a	—	98.3 c	83.3 cd
Previcur 6.3 lb/gal	1.0 lb	—	—	86.3 c	65.3 c

*Treatments with different letters are significantly different (P = 0.05).
†Applications of Ridomil made March 31, April 13; all others March 31, April 6, 13, 20, 27.
‡Treatments applied November 23, December 29, February 16, April 11, 19, 27, May 8, 17.
§All treatments applied March 28 and April 11; additional applications of Bravo and Dithane M45 made April 5, 19, 27.

TABLE 2. Control of Downy Mildew of Seed Onions Using Ridomil, 1979

Ridomil treatment		Percent primary stalks with sporulating lesions*	
Rate/A (a.i.)	Time applied	Delhi†	Fresno‡
Check	—	63.6 c	100.0 c
2 oz.	1st mildew	30.3 b	—
2 oz.	1st mildew + 14d§	9.6 a	84.6 b
8 oz.	Preventive**	9.3 a	—
4 oz.	1st mildew	8.6 a	100.0 c
8 oz.	1st mildew	7.6 a	94.0 bc
8 oz.	Preventive + 1st mildew	2.3 a	—
4 oz.	1st mildew + 14d	2.0 a	86.0 b
8 oz.	1st mildew + 14d	< 1 a	60.0 a
8 oz.	Preventive + 14d + 28d	< 1 a	—
8 oz.	Preventive + 14d + 28d + 42d	0 a	—

*Treatments with different letters are significantly different (P = 0.05).
†Mildew found April 18, applications except for preventive treatment begun April 20. Readings made June 7, 1979.
‡Mildew found March 27, treatments applied March 31, April 13. Readings made May 2, 1979.
§1st mildew signifies treatments begun when mildew first found in field; 14d means next application made 14 days later.
**Preventive application made March 21, 1979, before mildew found.

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