Table 4. Effect of a 4 hr photoperiod and various incubation temperatures on development of Verticillium wilt symptoms on the Ve gene cultivar 'Tropic' and on the reisolation of *V. albo-atrum*.

| Incubation temp (°C) | Percent inoculated plants | | |
|---|---|---|---|
| | Devloping wilt symptoms | Moderately diseased to dead | Yielding Verticillium colonies |
| 20 | 10 | 0 | 40 |
| 24 | 32 | 2 | 68 |
| 28 | 61 | 11 | 78 |
| 32 | 88 | 38 | 92 |

the pathogen decreased, so that at 32 C, 88% of the inoculated plants were wilted and *V. albo-atrum* was isolated from 92% of the inoculated plants. Apparently at the cooler temp (i.e. 20 C) the pathogen invaded the hypocotyl of resistant seedlings but was unable to incited disease. This phenomenon is similar to Fusarium wilt of tomato where nonpathogen races are routinely isolated from symptomless plants of resistant cultivars (3).

Wilt-like symptoms developed on 10, 8, 15, and 13% of the noninoculated seedlings incubated at 20, 24, 28, and 32 C, respectively. However, *V. albo-atrum* was isolated only from 2.5, 5.0, 7.5, and 0% of the noninoculated seedlings incubated at 20, 24, 28, and 32 C, respectively.

*General:* It is apparent that elevated temp, coupled with short day conditions, favored development of susceptible and tolerant cultivars.

Resistance to Verticillium wilt conferred by the Ve gene in 'Tropic' also was greatly reduced by the severe environmental conditions of these experiments. Perhaps this should not be surprising since high soil temp have been shown to reduce monogenic resistance to several diseases (5). Nonetheless, the reduction of resistance conferred by the Ve gene by high temp was not anticipated because Verticillium wilt has been considered a cool weather disease and with the exception of one paper (1) no report was found indicating that the Ve gene ever failed to control Verticillium wilt incited by *V. albo-atrum* race 1.

In Florida, and perhaps elsewhere, the environmental range for expression of Verticillium wilt on tomato seedlings seems to be so narrow that many escapes occur and susceptibility expression is suppressed. Consequently, it is very important to provide uniform evaluating conditions from season to season. Root-dip inoculating tomato seedlings with *V. albo-atrum* race 1 and incubating these seedlings 2 weeks at 27 C with a 4 hour daily photoperiod gives screening results (Table 2) that correlate very well to results obtained by screening mature plants under field conditions. The very precise method results in the detection of polygenic tolerance, monogenic resistance, and susceptibility, especially if carried out with standard resistant, tolerant, and susceptible tester lines.

## Literature Cited


1. Alexander, L. J. 1962. Susceptibility of certain Verticillium-resistant tomato varieties to an Ohio isolate of the pathogen. *Phytopathology* 52:998-1000.
2. Jones, J. P., P. Crill, and R. B. Volin. 1975. Effect of light duration on Verticillium wilt of tomato. *Phytopathology* 65:647-648.
3. ———, and S. S. Woltz. 1972. Effect of amino acids on development of Fusarium wilt of resistant and susceptible tomato cultivars. *Proc. Fla. State Hort. Soc.* 85:148-151.
4. Strobel, J. W., and J. M. Walter. 1969. Tropic, a new disease resistant indeterminate tomato for pink harvest. *Fla. Agric. Exp. Stn. Circ.* S-198.
5. Walker, J. C. 1950. Plant Pathology. McGraw-Hill Book Company, Inc. 699 pp.
6. Wellman, F. L. 1939. A technique for studying host resistance and pathogenicity in tomato Fusarium wilt. *Phytopathology* 29:945-956.


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# PICKLEWORM CONTROL ON CANTALOUPE AND SUMMER SQUASH


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*Abstract.* **In 3 insecticide tests for the control of pickleworm,** Diaphania nitidalis **(Stall), Lannate, Nudrin, Bolstar, Sevin, and Dylox gave consistently good control. In tests that were not repeated, good results were obtained with Thiodan, Phosvel, and the synthetic pyrethroid Pydrin. Results with Furadan, Orthene, and Imidan were inconsistent and with Fundal and Sumithion were inconclusive. 'Burpee Hybrid Zucchini' squash was more susceptible to pickleworm damage, and thus harder to protect than 'Early Golden Summer Crookneck'. On zucchini best results were with Lannate, Nudrin, and Bolstar. Worm free yield of 3 untreated honeydew-type melons exceeded 90%.**

Pickleworm, *Diaphania nitidalis* (Stall) overwinters in south Florida (4) and moves northward each year usually arriving in central Florida in March or early April. Squash, cucumber, and cantaloupe may be seriously affected, especially when planted in the fall. Flower and leaf buds are eaten, and fruits and vines are tunneled. Yields may be markedly reduced unless the crop is protected by insecticides. Alternative control methods are not available, and parasites and predators are apparently of no significant benefit (3). Chemical control experiments on cantaloupe and summer squash are described herein.

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## Materials and Methods

In the spring and fall of 1975, and in the fall of 1976 chemical control experiments were conducted on cantaloupe and honeydew type melons, cucumbers, and summer squash. All were planted in hills spaced 2.5 ft apart in rows 10 ft apart. All plots had paired rows of 2 cultivars, 9 hills per row. The pairs were 'Gulfcoast' cantaloupe—'Morgan' melon, 'Edisto' cantaloupe—'Poinsett' cucumber, and 'Early Golden Summer Crookneck'—'Burpee Hybrid Zucchini' squash. All experiments were in randomized blocks. The 'Morgan' melon sustained little damage and 'Poinsett' cucumber data were incomplete, so only cantaloupe and squash insecticide records are presented.

Chemicals were applied to cantaloupes with a tractor mounted PTO-powered boom sprayer. Application rates were 100 gallons per acre at about 150 psi[1] through 10 Teejet hollow cone nozzles (D2-25). In the spring, plots were sprayed 7 times between May 2 and June 19. Plots were harvested 3 times weekly from June 2 to July 2. In the fall, plots were sprayed 4 times from September 24 to October 15 and harvested October 15 to 22. Ripe melons without pickleworm holes were counted as marketable yield.

Insecticides were applied to squash with a tractor-mounted, PTO-powered sprayer. Applications were made to 1 row at a time with an inverted U-shaped boom with 3 Teejet hollow cone nozzles (D2-25) mounted to spray plants from the top and 2 sides of the row. Insecticides were applied 4 times between September 9 and 28. Control was evaluated by comparing yields of worm-free squash.

## Results and Discussion

Honeydew melons are generally more resistant than cantaloupes to pickleworm attack. In the comparison 'Morgan' vs. 'Gulfcoast' in the spring of 1975, the average worm free yield of untreated 'Morgan' was 92% while that for 'Gulfcoast' was 68%. Insecticides raised the minimum average worm free yield of 'Morgan' to 94%, while the maximum attained from 'Gulfcoast' was 93%. While the increased yield of 'Morgan' following insecticide was not significant, the percentage of marketable 'Gulfcoast' cantaloupe was significantly increased by all insecticides (Table 1). Furadan treatment resulted in the highest marketable yields, but differences among insecticides were limited due to the relatively small population of pickleworms.

Table 1. Control of pickleworm on 'Gulfcoast' canteloupe at Leesburg, spring 1975.

| Insecticide and formulation | Lb AI/100 gal. | % worm free melons |
|---|---|---|
| Furadan 4 | 1.0 | 93 a[z] |
| Lannate L | 0.9 | 89 ab |
| Orthene 75SP | 1.0 | 86 ab |
| Sevin 80W | 1.0 | 85 ab |
| Fundal SP | 0.98 | 83 ab |
| Imidan 70W | 1.0 | 82 ab |
| Dylox 4 | 1.0 | 81 ab |
| Sumithion 40W | 1.0 | 81 ab |
| Monitor 4S | 1.0 | 79 b |
| Untreated | — | 68 c |

[z]Mean separation by Duncan's multiple range test, 5% level.

Associated with the experiment was an unreplicated observation of 2 honeydew-type melons, 'Tamdew', and 'Asgrow Honeydew', the latter a parent of 'Morgan'. The percentage of marketable melons from 'Tamdew' and 'Asgrow Honeydew' untreated plots averaged 95% and 94%, comparable to the 92% of 'Morgan'.

In the fall of 1975 cantaloupe test the pickleworm population was larger. Only 24% of 'Edisto' cantaloupes from untreated plots were marketable (Table 2). Sevin, Lannate, Nudrin, Dylox, Bolstar and the now unavailable Phosvel all gave significant pickleworm control and increased yields. Furadan and Orthene results were inconsistent with results from the spring test.

Brett et al. (1) in 1961 found summer crookneck and straightneck squashes susceptible to pickleworm damage, but more resistant to damage than zucchini types. The same relative susceptibilities were evident in tests at Leesburg, where 'Burpee Hybrid Zucchini' was much more susceptible to worm damage than 'Early Golden Summer Crookneck'. Zucchini leaf stalks were badly mined, plant size reduced, and yield sharply reduced in untreated plots.

[1]For metric conversions see Table near the front of this Volume, Ed.

Table 2. Control of pickleworm on 'Edisto' cantaloupe at Leesburg, fall 1975.

| Insecticide and formulation | Lb AI/100 gal. | % worm free melons |
|---|---|---|
| Sevin 80W | 1.0 | 89 a[z] |
| Phosvel 45W | 1.0 | 84 ab |
| Lannate L | 0.9 | 77 ab |
| Dylox 4 | 1.0 | 72 ab |
| Nudrin 1.8 | 0.9 | 67 ab |
| Bolstar | 1.0 | 62 abc |
| San 197I | 1.0 | 52 bcd |
| Furadan 4 | 1.0 | 52 bcd |
| Orthene 75SP | 1.0 | 32 cd |
| Untreated | — | 24 d |

[z]Mean separation by Duncan's multiple range test, 5% level.

The difference in varietal response to insecticidal control was significant. More insecticides were effective on crookneck than on zucchini. Of the 10 insecticides applied to crookneck squash, only Pounce was significantly less effective than the leading insecticide, Thiodan (Table 3). Six insecticides performed well on zucchini squash, and 2 of the best (Lannate, Nudrin) were different formulations of methomyl.

Table 3. Control of pickleworm in zucchini and crookneck squash, fall 1976.

| Insecticide and formulation | Lb AI/ 100 gal. | Pounds of worm free squash/100 ft of row: Zucchini | Crookneck |
|---|---|---|---|
| Nudrin 1.8S | 1.00 | 23.8 a[z] | 10.3 abc |
| Lannate L | 1.00 | 23.1 a | 11.3 ab |
| Bolstar | 1.00 | 22.0 a | 11.7 ab |
| Pydrin | 0.20 | 19.5 ab | 11.1 ab |
| Sevin 80W | 1.00 | 18.9 ab | 11.2 ab |
| Thiodan 2E | 1.00 | 18.9 ab | 13.3 a |
| Lindane 25W | 0.25 | 16.2 b | 11.8 ab |
| Imidan 70W | 1.00 | 14.0 bc | 11.3 ab |
| Pydrin | 0.10 | 9.6 cd | 11.8 ab |
| Pounce | 0.10 | 8.5 d | 9.1 c |
| Pounce | 0.05 | 6.7 d | 9.4 bc |
| Untreated | — | 1.3 e | 5.8 d |

[z]Mean separation by Duncan's multiple range test, 5% level.

Sevin, Lindane, Thiodan, Dylox, Orthene, and Furadan performed well in tests reported by Canerday in 1967 (2) and by Waites and Habeck in 1968 (5). These insecticides also performed well in tests reported here although Furadan was inconsistent. On zucchini, the most pickleworm susceptible squash, Sevin and Thiodan were still among the most effective insecticides.

## Literature Cited


1. Brett, C. H., C. L. McCombs, and D. M. Daugherty. 1961. Resistance of squash varieties to the pickleworm and the value of resistance to insecticidal control. *J. Econ. Entomol.* 54:1191-1197.
2. Canerday, T. D. 1967. Control of pickleworm on cucurbits. *J. Econ. Entomol.* 60:1705-1708.
3. Dupree, M., T. L. Bissell, and C. M. Bukham. 1955. The pickleworm and its control. *Ga. Agr. Exp. Sta. Bull. N.S.* 5.
4. Reid, W. J. and F. P. Cuthbert. 1956. Biology studies of the pickleworm. *J. Econ. Entomol.* 49:870-873.
5. Waites, R. E. and D. H. Habeck. 1968. Evaluation of insecticides for control of pickleworm on summer squash. *J. Econ. Entomol.* 61.1097-1099.