

CONTROL OF POWDERY MILDEW... in cucumber... in squash

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CUCUMBER

TRIALS WERE ESTABLISHED on a grower's field in Chula Vista in 1966 to determine the effectiveness of some of the newer fungicides for the control of powdery mildew of cucumber. Karathane and sulfur have been the standard fungicidal treatments used in past years. The cucumber variety, Triumph, was used in the experimental trials. Plots were 25 ft long and were replicated five times. The materials and rates used (per 100 gallons of fungicidal mixture) were as follows: Morestan (6-methyl-2,3-quinoxalinedithiol cyclic carbonate) 1 lb 25% WP; Karathane (dinitro(1-methylheptyl) phenyl crotonate and other nitro phenols) ¾ lb 25% WP; Morocide (2-sec-butyl-4,6-dinitrophenyl-3-methyl-2-butenate) binapacryl 1 lb 50% WP; and ammonium polysulfide 2 pints 65%; and the check plot with no treatment. Four ounces of Triton B-1956 spreader-sticker per 100 gallons were used with the Karathane spray. All materials were applied at the rate of 200 gallons per acre at a pressure of 250 psi. Spray applications were made on September 13 and 27, and October 11, 1966.

Plots were rated on a scale of 0 to 5 with "5" indicating dead plants, and those rated "1" consisting of plants with at least 1 colony of mildew (table below).

Spray materials	Disease rating	
	October 10	October 24
Morestan 1 lb 25% WP	1.0 a	1.1 a
Morocide 1 lb 50% WP	1.2 a	2.1 b
Karathane ¾ lb 25% WP	1.5 a	2.3 b
Ammonium polysulfide 2 pints 65%	2.8 b	4.5 c
Check (no treatment)	4.0 c	4.8 c

Duncan's Multiple Range test used at 1% level. Treatments with same letter are not significantly different. All treatments except Karathane, Morestan and sulfur are considered experimental and not recommended for use on cucumber at this time.

The check plots supported luxuriant growth of the powdery mildew fungus, and the cucumber plants began to decline in vigor about the middle of September. The check plants were almost completely dead on October 24.

Ammonium polysulfide appeared to be toxic shortly after application of the first spray on September 13. Leaves began to turn a light yellow color and to dry up. Plants were severely damaged by both powdery mildew and toxicity of the material by the end of the season. At this time ammonium polysulfide was not significantly different from the check.

Morestan, Morocide, and Karathane gave excellent control of the powdery mildew during the early part of the season when inoculum was light. However, late in the season, under heavy inoculum pressure, Morestan was significantly better than either Morocide or Karathane. Morestan gave excellent control of powdery mildew throughout the fall cucumber growing season on host plants exposed to constant reinfection from nearby check plots.

Cooperative trials were established at the USDA Horticultural Field Station, La Jolla, in the fall of 1967 to test several other new materials for the control of powdery mildew of cucumber. Triumph cucumber was again used in these experiments. Six plants were used per plot and all treatments were replicated five times. The materials and rates (per 100 gallons of fungicidal mixture) were as follows: Morestan 1 lb 25% WP; DuPont 1991 (1-butylcarbamoyl)-2-benzimidazole carbamic acid, methyl ester) 8 oz 50% WP plus 4 oz of Surfactant F; E1-241 (bis(4-chlorophenyl)-3-pyridylmethanol) 200 cc 4% EC; Daconil 2787 (tetrachloroisophthalonitrile) 2 lbs 75% WP; and the check treatment. All materials were applied at the rate of 100 gallons per acre at a pressure of 300 psi when the plants were young, and 150 gallons per acre as the plants grew larger. Spray applications were made every 14 days, on July 28, August 11 and 25, and September 8, 1967.

Plots were rated on a scale of 0 to 5 with "5" indicating dead plants, and those rated "1" consisting of plants with at least one colony of mildew (table follows).

Spray material	Disease rating	
	Sept. 7	Sept. 17
DuPont 1991 8 oz 50% WP plus 4 oz Surfactant F	0.0 a	0.0 a
Morestan 1 lb 25% WP	0.0 a	0.5 a
E1 241 200 cc 4% EC	0.2 a	2.2 b
Daconil 2787 2 lbs 75% WP	2.3 b	3.9 c
Check (no treatment)	3.2 c	4.3 d

Duncan's Multiple Range test used at 1% level. Treatments with same letter are not significantly different. All treatments except Morestan are considered experimental and not recommended for use on cucumber at this time.

The check plots again supported luxuriant growth of the powdery mildew fungus and caused yellowing and senescence of the leaves. Invasion of damaged tissue by secondary organisms completed the collapse of the check plants by the end of the season.

Daconil 2787 reduced growth of the powdery mildew fungus slightly during the early part of the season when inoculum pressure was light. Under heavy inoculum pressure during the latter part of the season Daconil 2787 was not much different from the check. Heavy growth of the fungus was always apparent on many of the leaves of the Daconil plots.

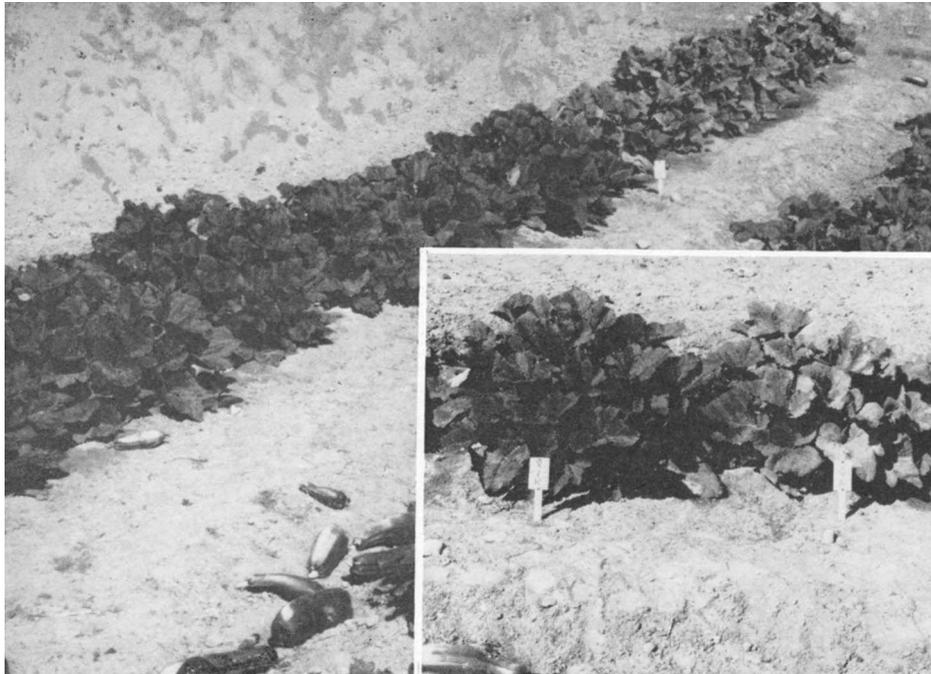
E1 241 controlled mildew during the early part of the season and was not significantly different from Morestan or DuPont 1991 in effectiveness. The material produced only moderate control during the latter part of the fall cucumber season, however. Active colonies of mildew were apparent on many cucumber leaves in mid-September.

DuPont 1991 and Morestan gave excellent control of the powdery mildew fungus throughout the cucumber growing season. Inoculum pressure was especially high from the adjacent unsprayed cucumber plants during the latter part of the season. Colonies of mildew were almost nonexistent on plots sprayed with these two materials.

Summary

The fungicides Morestan and DuPont 1991, applied on a 2-week schedule gave almost perfect control of powdery mildew,

Powdery mildew (caused by the fungus *Sphaerotheca fuliginea*) of squash and cucumber can be a serious economic problem wherever these plants are grown in California. Heavily infected plants may decline in vigor prematurely with subsequent loss of yield. The studies reported here are of experiments with fungicides used for control of powdery mildew in both squash and cucumber. Some of the materials mentioned are not registered for use in these crops and the information is not to be considered a recommendation of the University of California or USDA.



Squash plants treated with Morestan are seen in foreground of row to left in photo above, as compared with plants not treated and covered with powdery mildew to right. Inset photo shows plant treated, to left, as compared with no treatment of plant to right.

Sphaerotheca fuliginea, and cucumber plants remained healthy throughout the test period. El 241 gave excellent control under light inoculum pressure, but reduced mildew only moderately when mildew inoculum was abundant later in the trial period. Karathane and Morocide reduced mildew moderately. Daconil 2787 reduced mildew slightly but numerous active colonies of the fungus were apparent on many leaves. Ammonium polysulfide was toxic to cucumber plants, caused premature decline of the foliage, and failed to control powdery mildew (treated plants were not significantly different from the check plants). Morocide, DuPont 1991, El 241, and Daconil 2787 cannot be recommended at present since they are not registered for use on cucumber.

SQUASH

COOPERATIVE TRIALS were established at the USDA Horticultural Field Station, La Jolla, to determine the effectiveness of some of the newer fungicides for the control of powdery mildew of squash. Karathane and sulfur have been the standard fungicidal treatments used in past years. The squash variety, Zucchini, was used in the experimental trials. Seed was planted in the greenhouse in peat pots on May 8, 1967, and transplanted to the field on May 22. Six plants were used per plot and all treatments were replicated five times. The materials and rates (per 100 gallons of fungicidal mixture) were as follows: Morestan (6-methyl-2,3-quinoxalinedithiol cyclic car-

bonate) 1 lb 25% WP; Karathane (dinitro(1-methylheptyl) phenyl crotonate and other nitro phenols) ½ pint EC plus 6 oz of spreader-sticker Triton B-1956; Bay 79770 (N-1-3,4-dichlorophenyl-amino-2,2,2-trichloro-ethyl-formamide) ½ pint EC 12.5%; Daconil 2787 (tetrachloroisophthalonitrile) 2 lbs 75% WP; and DuPont 1991 (1-(butylcarbonyl)-2-benzimidazole carbamic acid, methyl ester) 8 oz 50% WP plus 4 oz of Surfactant F. All materials were applied at the rate of 150 gallons per acre at a pressure of 300 psi. Spray applications were made every fourteen days, on June 2, 16, 30, and July 14.

Plots were rated on a scale of 0 to 5 with "5" indicating dead plants, and those rated "1" consisting of plants with at least one colony of mildew. The results were as follows:

Spray materials	Disease rating July 23
DuPont 1991 8 oz 50% WP plus 4 oz Surfactant F	0.06 a
Morestan 1 lb 25% WP	0.21 a
Karathane EC ½ pint plus 6 oz B-1956	1.30 b
Bay 79770 EC ½ pint	2.65 c
Daconil 2787 2 lbs 75% WP	2.98 c
Check (no treatment)	4.02 d

Duncan's Multiple Range test used at 1% level. Treatments with same letter are not significantly different. All treatments except Karathane are considered experimental and not recommended for use on squash at this time.

The check plots supported luxuriant growth of the powdery mildew fungus and the squash plants suffered severe decline in vigor when attacked by secondary organisms. The test measured control in an environment with a severe disease epidemic of long duration.

Daconil 2787 and Bay 79770, on a 14-day spray schedule at recommended dosages, reduced powdery mildew growth slightly, but did not prevent severe decline of the plant.

Karathane reduced powdery mildew growth significantly more than either Bay 79770 or Daconil 2787.

Morestan and DuPont 1991 gave excellent control of powdery mildew and reduced growth of the fungus to nearly zero on host plants exposed to constant reinfection from nearby check plots. The plants were very healthy throughout the production season and they suffered no apparent injury from either powdery mildew or spray residue.

Daconil 2787 and Bay 79770, applied at recommended dosages on a two-week schedule reduced powdery mildew fungus, *Sphaerotheca fuliginea*, on zucchini squash only slightly. Karathane reduced mildew moderately. Morestan and DuPont 1991 gave nearly complete control of the fungus. DuPont 1991, Morestan, Bay 79770 and Daconil 2787 are not registered for use in squash and are not recommended by University of California or USDA.

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