

# New Fungicides Evaluated for Control of Powdery Mildew of Cantaloupe in 1998

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## **Abstract**

*Powdery mildew of cucurbits, which include cantaloupe, honeydew, watermelon, cucumber and squash, occurs every year in Arizona. Moderate temperatures and relative humidity, succulent plant growth and reduced light intensity brought about by a dense plant canopy are factors that promote development of powdery mildew, which is caused by the pathogenic fungus *Sphaerotheca fuliginea*. Potential new fungicides were evaluated and compared to existing chemicals for control of powdery mildew of cantaloupe in a field trial conducted during the spring of 1998 at the Yuma Agricultural Center. A high level of disease had developed by crop maturity (June 23). On the upper leaf surface where spray coverage was good and disease severity on nontreated leaves was moderate (24% of upper leaf surface infected), all treatments significantly reduced the severity of powdery mildew. These treatments included Sovran, Flint, Procure, Topsin M, Quadris, Benlate, quinoxifen, Rally, Trilogy, Actigard, Bravo, JMS stylet oil, Kaligreen and Bayleton. In contrast, on the lower leaf surface where spray coverage was not as good and disease severity on nontreated leaves was very high (94% of lower leaf surface infected), the best disease control was achieved with chemistries that have systemic properties. Treatments that held the infected lower leaf surface to 20% or less included Sovran, Flint, Procure, Topsin + Microthiol, and Quadris. The potential availability of new chemistries for management of powdery mildew of cantaloupe and other cucurbits could help improve overall control of powdery mildew as well as the implementation of fungicide resistance management strategies, which strive to minimize the risk of resistance development by the pathogen to these compounds.*

*Keywords: cucurbits, *Sphaerotheca fuliginea*, plant protection compounds, vegetable diseases.*

## **Introduction**

Powdery mildew is a concern to melon growers in Arizona. The disease on cantaloupes, which is caused by the fungus *Sphaerotheca fuliginea*, first appears as small, white, superficial spots on leaves and stems. These spots will enlarge, become powdery in appearance, increase in number and eventually cover stems and both surfaces of leaves. Young infected leaves may turn chlorotic and die. Severely infected leaves turn brown, desiccate and detach from the plant. Cantaloupe fruit are free of infections; however, fruit on severely infected plants may ripen prematurely, be of poor quality and become sunburned due to the reduced plant canopy. Development of powdery mildew is favored by moderate temperatures and relative humidity, dry soil conditions, reduced light intensity and succulent plant growth.

These conditions often exist within the plant canopy of actively growing cantaloupe plantings. The same pathogen causes powdery mildew on watermelons, honeydews, squash and other cucurbits.

When available, effective control of powdery mildew can be achieved by planting cultivars that are tolerant or resistant to the pathogen. If susceptible cultivars are grown, it is extremely important to have fungicidal protection in place when environmental conditions become favorable for disease development. The life cycle of the pathogen, going from spore germination on the plant to subsequent release of spores from this infection site, can be as short as 4 to 5 days. By the time the first spots are visible on plant leaves, numerous additional infection sites are already developing but not yet visible. Sulfur is an excellent powdery mildew fungicide, but can cause serious leaf burn in the high temperatures that often occur in desert production areas when environmental and cultural conditions favor disease. Other compounds, such as Benlate (benomyl), Topsin M (thiophanate-methyl) and Bravo (chlorothalonil), are available for management of powdery mildew on melons as well.

Several new agrochemicals are in development that have activity on fungi related to those that cause powdery mildew. A fungicide trial was initiated in the spring of 1998 to test the potential efficacy of these new chemistries on powdery mildew of cantaloupe.

## Materials and Methods

This fungicide study was conducted at the Yuma Valley Agricultural Center. The soil was a silty clay loam (7-56-37 sand-silt-clay, pH 7.2, O.M. 0.7%). Cantaloupe 'Topmark' was seeded and watered March 10 on beds with 80 inches between row centers. Treatments were replicated five times in a randomized complete block design. Each replicate consisted of 25 feet of row with a plant spacing of 12 inches. Treatment beds were separated by single nontreated beds. Fungicide treatments were applied with a tractor-mounted boom sprayer that delivered 50 gal/acre at 100 psi to flat-fan nozzles spaced 12 inches apart. Foliar application of fungicides were made May 21, June 5, 15 and 25. Maximum and minimum ranges of air temperature (°F) were as follows: Mar, 61-92, 37-56; Apr, 66-98, 41-62; May, 76-96, 51-69; Jun, 83-110, 56-78; Jul 1-8, 102-109, 69-79. Total rainfall (inches) was as follows: Mar, 0.41; Apr, 0.01; May-Jul 8, 0.00. Furrow irrigation was used for the duration of the study. Disease severity was determined June 23 and 24 by collecting 10 leaves at random from each plot and recording the percentage of the upper and lower leaf surface infected with the powdery mildew fungus. Yield was evaluated July 8 by recording the number of fruit in each replicate plot within certain size categories and those fruit that were culls.

## Results and Discussion

Powdery mildew was not evident at the first application of fungicides. Beginnings of disease were noticed by the second application and a high level of disease had developed by crop maturity (June 23). Yield reductions resulting from increased levels of culled fruit did not occur in this trial, probably because temperatures during the growing season were abnormally mild, without a long duration of high temperatures in June to hasten drying of infected leaves and cause sunburning of fruit. On the upper leaf surface where spray coverage was good and disease severity on nontreated leaves was moderate (24% of upper leaf surface covered with powdery mildew), all treatments significantly reduced the severity of powdery mildew. These treatments included Sovran, Flint, Procure, Topsin M, Quadris, Benlate, quinoxyfen, Rally, Trilogy, Actigard, Bravo, JMS stylet oil, Kaligreen and Bayleton. In contrast, on the lower leaf surface where spray coverage was not as good and disease severity on nontreated leaves was very high (94% of lower leaf surface covered with powdery mildew), the best disease control was achieved with chemistries that have systemic properties. Treatments that held the infected lower leaf surface to 20% or less included Sovran, Flint, Procure, Topsin + Microthiol, and Quadris.

No symptoms of phytotoxicity were observed with any treatment; however, it should be noted that the variety of cantaloupe used in this trial (Topmark) is tolerant to sulfur, whereas other melon varieties may not be. Two different genera of fungi are reported to cause powdery mildew on cantaloupe, *Erysiphe cichoracearum* and *Sphaerotheca fuliginea*. Microscopic examination of spores from diseased cantaloupe leaves revealed well-developed fibrosin bodies,

which suggests that we were dealing with *Sphaerotheca fuliginea* in this field study.

Fungicide resistance management, which strives to minimize the risk of a plant pathogen population becoming resistant to one or more fungicides, is imperative for the preservation of fungicide effectiveness. Resistance management is achieved by applying mixtures of fungicides or alternating between different classes of chemistries to prevent or minimize a shift in the pathogen population toward tolerance or insensitivity to one or more disease control compounds. The future registration and subsequent availability of some of these new chemistries for cantaloupe and related crops could help in the implementation of an effective fungicide resistance management program.

Table 1. 1998 Powdery mildew of cantaloupe fungicide trial.

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Treatment	Rate (ai./A)	Appl. dates*	% of leaf surface infected**	
			Upper	Lower
Sovran 50WG or Rally 40W	0.10 lb 0.125 lb	1,3 2,4	0	5.6
Flint 50WG	0.09 lb	1,2,3,4	0	10.6
Sovran 50WG or Bayleton 50WP	0.10 lb 0.125 lb	1,3 2,4	0	10.6
Flint 50WG + Actigard 50WG	0.09 lb + 0.03 lb	1,2,3,4	0	12.0
Procure 50WS	0.1875 lb	1,2,3,4	0	17.0
Topsin M 70W + Microthiol 80DF	0.35 lb + 4.0 lb	1,2,3,4	0	18.2
Quadris 2.08F + Latron B-1956 or Bravo Weather Stik 720L	0.25 lb + 0.24 pt 1.5 lb	1,2,4 3	0	18.4
Topsin M 70W + JMS Stylet Oil	0.35 lb +1,376 ml	1,2,3,4	0	25.6
Quadris 2.08F + Latron B-1956 or Bravo Weather Stik 720L	0.18 lb + 0.24 pt 1.5 lb	1,2,4 3	0	28.4
Benlate 50WP + Bayleton	0.25 lb + 0.125 lb	1,2,3,4	0	30.2
Topsin M 70W + Trilogy 70EC	0.35 lb + 0.7 gal	1,2,3,4	0	30.4

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Treatment	Rate (ai./A)	Appl. dates*	% of leaf surface infected**	
			Upper	Lower
TABLE CONTINUED FROM PRECEDING PAGE				
Kaligreen 82WP + Latron B-1956 or Rally 40WP	2.05 lb +0.24 lb 0.075 lb	1,3 2,4	0	31.2
Quadris 65WG + Latron B-1956 or Bravo Weather Stik 720L	0.18 lb + 0.24 pt 1.5 lb	1,2,4 3	0	31.8
Quinoxifen (250 g/L) or Rally 40WP	0.031 lb 0.075 lb	1,3 2,4	0	35.2
Rally 40WP	0.075 lb	1,2,3,4	0	39.4
Quadris 65WG + Latron B-1956 or Bravo Weather Stik 720L	0.25 lb + 0.24 pt 1.5 lb	1,2,4 3	0	39.6
Procure 50WS	0.125 lb	1,2,3,4	0.4	42.4
Quinoxifen (250 g/L)	0.062 lb	1,2,3,4	0	45.2
Quinoxifen (250 g/L) or Rally 40WP	0.062 lb 0.075 lb	1,3 2,4	0	46.4
Sovran 50WG or Bravo Ultrex 82.5WG	0.10 lb 2.25 lb	1,3 2,4	0	56.0
Trilogy 70EC	0.35 gal	1,2,3,4	1.6	66.4
Topsin M 70W	0.35 lb	1,2,3,4	0	67.0
Actigard 50WG	0.03 lb	1,2,3,4	0	77.0

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Treatment	Rate (ai./A)	Appl. dates*	% of leaf surface infected**	
			Upper	Lower
TABLE CONTINUED FROM PRECEDING PAGE				
Trilogy 70EC	0.70 gal	1,2,3,4	1.4	80.4
Quinoxifen (250 g/L)	0.031 lb	1,2,3,4	1.2	81.2
Bravo 90DG	2.25 lb	1,2,3,4	0	85.0
Bravo Ultrex 82.5WG	2.23 lb	1,2,3,4	0.4	86.6
JMS Stylet Oil	1,376 ml	1,2,3,4	1.6	88.6
Kaligreen 82WP + Latron B-1956	2.05 lb +0.24 lb	1,2,3,4	0.8	88.6
Bayleton 50WG	0.125 lb	1,2,3,4	7.4	88.8
Nontreated control	-----	-----	24.2	94.2
LSD (Least significant difference, $P=0.05$ )			4.0	13.3

\* Application dates: 1=May 21; 2=June 5; 3=June 15; 4=June 25, 1998.

\*\* The average percentage of leaf surface infected with powdery mildew on 10 leaves randomly collected from each of the five replicate plots of each treatment.