Comparison of New Fungicides for Management of Powdery Mildew of Cantaloupe in 1997

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Abstract

Powdery mildew of cucurbits, which include cantaloupe, honeydew and watermelon as well as cucumbers and squash, occurs every year in Arizona. Moderate temperatures and relative humidity, succulent plant growth and reduced light intensity are factors that favor the 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 in the spring of 1997 at the Yuma Agricultural Center. The top performer in this study for disease control as well as reduction in culled fruit was a combination of Topsin-M + Trilogy. Other effective materials included BAS 490, Quadris, Procure, Benlate, Microthiol Special and Rally. Bayleton significantly reduced the amount of culled fruit, but did not significantly reduce the severity of powdery mildew. Compared to nontreated plots, a gain of up to $973 per acre could have been realized due to the reduction in amount of culled fruit in plots treated with fungicides. The potential availability of new chemistries for management of powdery mildew of cantaloupe and other cucurbits could help in the implementation of fungicide resistance management strategies, which strive to minimize the risk of resistance development by the pathogen to these compounds.

Introduction

The incidence and severity of powdery mildew appears to be increasing in Arizona melon fields. The disease on cantaloupes, which is caused by the pathogenic 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 disease. 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 when environmental and cultural conditions favor disease. Other compounds, such as benomyl, thiophanate-methyl and chlorothalonil, are available for management of powdery mildew on melons.

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 1997 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 February 26 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 100 gal/acre at 100 psi to D2-31 fine-screen hollow cone nozzles spaced 12 inches apart. Foliar application of fungicides were made May 16 and 28 and June 11. Maximum and minimum ranges of air temperature (F) were as follows: Mar, 68-97, 36-60; Apr, 60-97, 46-64; May, 90-107, 57-71; and Jun, 84-106, 60-73. Total rainfall (inches) was as follows: Mar, 0.00; Apr, 0.06; May, 0.00; Jun, 0.12. Furrow irrigation was used for the duration of the study. Disease severity was determined June 19 by collecting 25 leaves from each replicate of each treatment and counting the number of powdery mildew lesions on each leaf. Each leaf was scored from 0 to 10, with scores of 0 to 9 corresponding to lesion counts of 0 to 9 and a score of 10 equivalent to lesion counts of 10 or more. The number of fruit in each replicate plot that were culls was also recorded. To estimate the benefit of applying fungicides to manage powdery mildew of cantaloupe, the market value for the smallest grade of fruit was used to calculate an approximate gain in revenue per acre that could be realized by applying fungicides for disease control compared to no treatment.

Results and Discussion

A very low level of powdery mildew already was established when the first application of fungicides was performed, building to a high level of disease at crop maturity (June 19). All tested materials except Bayleton at 0.125 lb a.i./acre and Reach at 2.2 lb a.i/acre significantly reduced the level of powdery mildew in this trial (Table 1). All treatments significantly reduced the percentage of culled melons except Quadris at 0.2 lb a.i./acre applied May 16 and 28 plus Bravo Weather Stik at 1.5 lb a.i./acre applied June 11 or three applications of Bravo Ultrex at 2.25 lb a.i./acre applied May 16 and 28 and June 11. The degree of disease suppression did not appear to correlate well with the percentage of culled fruit for each treatment. Compared to nontreated plots, a gain of up to $973 per acre could have been realized due to the reduction in amount of culled fruit in plots treated with fungicides. 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. Effect of fungicides on development of powdery mildew of cantaloupe in 1997 field trial. Michael Matheron and Martin Porchas, Yuma Agricultural Center, University of Arizona.

Treatment and rate of a.i./acre	Application dates[1]	Mildew rating[2]	Percent culls	Treatment value($)[3]
Topsin M 70W 0.35 lb + Trilogy 90 EC 0.9 gal	1,2,3	84 a[4]	1.2 ab[4]	913
Topsin M 70W 0.35 lb + Microthiol Special 80DF 4.0 lb	1,2,3	114 b	0.0 a	973
BAS490 50WG 0.15 lb +Bravo Ultrex 82.5WG 2.25 lb	1,2,3	120 b	7.6 c-f	973
Quadris 2.08F 0.1 lb + Latron B-1956 0.48 pt Bravo Weather Stik 720L 1.5 lb	1,2 3	162 c	7.8 c-f	548
Procure 50W 0.19 lb	1,2,3	168 c	0.0 a	973
BAS490 50WG 0.15 lb + Bravo Ultrex 82.5WG 1.5 lb	1,2,3	172 cd	3.4 a-d	831
Quadris 2.08F 0.25 lb + Latron B-1956 0.48 pt Bravo Weather Stik 720L 1.5 lb	1,2 3	176 cd	7.2 b-e	629
Benlate 50WP 0.25 lb	1,2,3	180 c-e	4.2 a-d	730
Quadris 2.08F 0.15 lb + Latron B-1956 0.48 pt Bravo Weather Stik 720L 1.5 lb	1,2 3	180 c-e	0.0 a	973
BAS490 50WG 0.10 lb + Bravo Ultrex 82.5WG 1.5 lb	1,2,3	182 c-f	6.2 b-e	608
Quadris 2.08F 0.20 lb + Latron B-1956 0.48 pt Bravo Weather Stik 720L 1.5 lb	1,2 3	186 c-g	13.6 f-h	264
Topsin M 70W 0.35 lb	1,2,3	190 d-h	3.2 a-d	831
Procure 50W Experimental 0.12 lb	1,2,3	192 d-h	1.2 ab	913
Procure 50W 0.12 lb	1,2,3	192 d-h	3.0 a-d	831
Trilogy 90EC 0.9 gal	1,2,3	196 d-i	9.0 d-f	466
BAS490 50WG 0.15 lb	1,2,3	196 d-i	6.2 b-e	608
BAS490 50WG 0.10 lb + Bravo Ultrex 82.5WG 1.0 lb	1,2,3	204 e-i	8.0 c-f	466
Microthiol Special 80DF 4.0 lb	1,2,3	206 f-j	8.6 d-f	466
BAS 500 .20 lb	1,2,3	206 f-j	7.0 b-e	629
Procure 50W 0.06 lb	1,2,3	208 g-j	3.0 a-d	831

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Table 1 (continued). Effect of fungicides on development of powdery mildew of cantaloupe in 1997 field trial. Michael Matheron and Martin Porchas, Yuma Agricultural Center, University of Arizona.

Treatment and rate of a.i./acre	Application dates[1]	Mildew rating[2]	Percent culls	Treatment value($)[3]
TABLE CONTINUED FROM PRECEDING PAGE				
Rally 40WP 0.075 lb	1,2,3	212 h-j	2.2 a-c	852
Bravo Ultrex 82.5WG 2.25 lb	1,2,3	212 h-j	15.8 gh	41
Bravo Weather Stik 720L 1.5 lb	1,2,3	220 ij	12.0 e-g	264
Bayleton 50WG 0.125 lb	1,2,3	230 jk	7.8 c-f	548
Reach 4.4F 2.2 lb	1,2,3	230 jk	9.6 d-f	466
Nontreated control	------	250 k	19.2 h	----
LSD (Least significant difference, P=0.05)		25	6.1	

1. Application dates were as follows: 1=May 16; 2=May 28; 3=June 11.

2. Each mildew rating value was determined by collecting 25 leaves from each replicate plot of each treatment and counting the number of powdery mildew lesions on each leaf. Each leaf was scored from 0 to 10, with scores of 0 to 9 corresponding to lesion counts of 0 to 9 on each leaf and a score of 10 was equivalent to 10 or more powdery mildew lesions per leaf.

3. To estimate the financial benefit of applying fungicides to manage powdery mildew of cantaloupe, the market value for the smallest grade of fruit was used to calculate an approximate gain in revenue per acre that could be realized by applying fungicides for disease control compared to no treatment.

4. Numbers in each column followed by a different letter are significantly different (P = 0.05) according to the Duncan-Waller K-Ratio (LSD) test.