

Examination of Fungicides for Management of Powdery Mildew on Cantaloupe in 2007

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Abstract

*Powdery mildew occurs annually on melons in Arizona. *Podosphaera xanthii* (*Sphaerotheca fuliginea*) is the plant pathogenic fungus that causes powdery mildew on cucurbits, such as cantaloupe, honeydew, watermelon, cucumber and squash. Development of powdery mildew on melons is favored by moderate temperatures and relative humidity, succulent plant growth and reduced light intensity brought about by a dense plant canopy. Existing products as well as materials under development were evaluated and compared for efficacy in management of powdery mildew on cantaloupe in a field trial conducted during the spring of 2007 at the University of Arizona, Yuma Valley Agricultural Center. A moderately-high level of disease had developed when disease severity data was recorded at crop maturity in mid-June. Among treatments, the degree of powdery mildew control ranged from essentially 0 to 100%. Materials that reduced the severity of disease on both the top and bottom of leaves by an average amount of at least 90% included Microthiol Disperss, Procure, Quintec, V-10118, Inspire Super, Endura, Cabrio, and Pristine, when applied on a 7-day spray interval. Other treatments that reduced powdery mildew by at least 80% compared to untreated plants included alternation between the conventional fungicide Procure and the biopesticides, Serenade Max, Sonata, or Actinovate as well as alternation among the two biopesticides Actinovate and Kaligreen. Alternating applications of products with different modes of action is imperative to minimize the development of insensitivity in the pathogen population to one or more of these active ingredients. Among the products evaluated this year, several are registered for use in Arizona for control of powdery mildew on melons.*

Introduction

Powdery mildew is an annual concern to melon growers in Arizona. The disease on cantaloupes, caused by the fungus *Podosphaera xanthii* (formerly known as *Sphaerotheca fuliginea*), first appears as small, white, superficial spots on leaves and stems. These spots 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 and desiccate. Cantaloupe 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 an actively growing cantaloupe planting. The same pathogen causes powdery mildew on watermelons, honeydews, squash and other cucurbits.

Effective control of powdery mildew may be achieved by planting cultivars that are 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 surface to subsequent release of spores from this infection site, can be as short as four to five days. By the time that initial colonies are visible on plant leaves, numerous additional infection sites are already developing but not yet visible.

Several compounds are available for management of powdery mildew on melons, such as azoxystrobin (Quadris), chlorothalonil (Bravo), myclobutanil (Rally), neem oil (Trilogy), potassium bicarbonate (Armicarb, Kaligreen), pyraclostrobin (Cabrio), pyraclostrobin+boscalid (Pristine), quinoxifen (Quintec), sulfur, thiophanate-methyl (Topsin M), trifloxystrobin (Flint), and triflumizole (Procure). A fungicide trial was initiated in the spring of 2007 to compare the efficacy of some available fungicides as well as new compounds under development for management of powdery mildew on cantaloupe.

Materials and Methods

This study was conducted at The University of Arizona, Yuma Agricultural Center in a silty clay loam soil (7-56-37 sand-silt-clay, pH 7.2, O.M. 0.7%). Cantaloupe 'Topmark' was seeded Mar 6, 2007 on beds with 80 inches between bed centers, then sprinkler irrigated to germinate seed. Subsequent irrigations were made by furrow irrigation. Treatments were replicated five times in a randomized complete block design with each replicate plot consisting of 25 ft. of row. A single bed at the north and south boundary of the trial was planted to "Juane canary" melon. Depending on treatment, foliar application of materials was made May 17, May 24, May 31, Jun 8 and Jun 15 with a tractor-mounted boom sprayer (hollow-cone nozzles spaced 12 in. apart) that delivered 50 gal/acre at 100 psi. Maximum and minimum ranges (°F) of air temperature were as follows: Mar 6 to 31, 2007, 71-100, 40-56; Apr, 68-99, 45-63; May, 83-102, 49-67; Jun 1 to 23, 87-109, 56-70. Maximum and minimum ranges of relative humidity were as follows: Mar 6 to 31, 52-87, 5-36; Apr, 48-85, 5-26; May, 43-83, 5-27; Jun 1 to 23, 41-77, 5-15. No significant rainfall (over 0.01 inch) occurred during this experiment. Disease severity was determined Jun 20 to 23 by collecting 10 leaves at random from each plot and rating the severity of powdery mildew on the upper and lower leaf surfaces using the following rating system: 0 = no powdery mildew present; 1 = 1 to 5 powdery mildew colonies on leaf surface; 2 = 6 to 10 powdery mildew colonies on leaf surface; 3 = more than 10 colonies to 25% of leaf surface covered with powdery mildew; 4 = 26 to 50% of leaf surface covered with powdery mildew; 5 = 51 to 100% of leaf surface covered with powdery mildew. Yield was determined by counting the number of cantaloupes in each plot that were marketable.

Results and Discussion

The data in the following table illustrate the degree of control obtained by applications of the various materials tested in this trial. Powdery mildew was first detected in plots on May 31, when the third application of treatments occurred. The "Juane canary" melon is very susceptible to powdery mildew and was planted to serve as a nursery for production of powdery mildew fungal spores once these plants became infected. A moderately-high level of disease developed on untreated cantaloupe plants by the time they reached maturity and were rated for disease severity. Among treatments, the degree of powdery mildew control ranged from essentially 0 to 100%. Materials that reduced the severity of disease on both the top and bottom of leaves by an average amount of at least 90% compared to untreated plants included Microthiol Disperss, Procure, Quintec, V-10118, Inspire Super, Endura, Cabrio, and Pristine, when applied on a 7-day spray interval. Other treatments that reduced powdery mildew by at least 80% included alternation between the conventional fungicide Procure and the biopesticides Serenade Max, Sonata, or Actinovate as well as alternation among the two biopesticides Actinovate and Kaligreen. Alternating applications of products with different modes of action is imperative to minimize the development of insensitivity in the pathogen population to one or more of these active ingredients. Among the products evaluated this year, several are registered for use in Arizona for control of powdery mildew on melons.

Powdery mildew in this trial was caused by *Podosphaera xanthii* (formerly known as *Sphaerotheca fuliginea*). Disease control observed on the upper leaf surface suggests that tested materials can significantly reduce powdery mildew compared to no treatment when the test compound is applied directly to the leaf surface with relatively good coverage. On the other hand, effective disease control on the underside of leaves, where coverage by the fungicide is far from optimal, often demonstrates the efficacy of chemistries that can move within the leaf or redistribute after application.

Due to the late onset of powdery mildew, there were no significant differences in the yield of marketable melons among treatments; therefore, yield data is not presented.

2007 Powdery Mildew of Cantaloupe Fungicide Trial				
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Treatment	Rate of product per acre	Treatment dates¹	Disease rating²	
			Upper leaf surface	Lower leaf surface
Procure 480SC	8.0 fl oz	1,2,3,4,5	0	0
Procure 480SC + Quintec 250SC + Silwet L-77	4.0 + 4.0 + 4.0 fl oz	1,2,3,4,5	0	0
Quintec 250SC	6.0 fl oz	1,2,3,4,5	0	0
Quintec 250SC	6.0 fl oz	1,3,5		
Procure 480SC + Silwet L-77	8.0 fl oz + 4.0 fl oz	2,4	0	0
V-10118 0.41EC	12.4 fl oz	1,2,3,4,5	0	0
Microthiol Disperss 80DF	10.0 lb	1,2,3,4,5	0	0.3
Topsin M 4.5FL + Microthiol Disperss 80DF	10.0 fl oz + 10.0 lb	1,2,3,4,5	0	0.4
V-10118 0.41EC	6.2 fl oz	1,2,3,4,5	0	0.6
Endura 70WG + Kinetic	0.28 lb + 12.0 fl oz	1,2,3,4,5	0	0.8
Inspire Super	20.1 fl oz	1,2,3,4,5	0	0.9
Inspire	7.0 fl oz	1,2,4,5		
Bravo Weather Stik 6SC	2.0 pt	3	0	1.0
Cabrio 20WG + Kinetic	1.0 lb + 12.0 fl oz	1,2,3,4,5	0.1	0.7
Pristine 38G + Kinetic	1.16 lb + 12.0 fl oz	1,2,3,4,5	0.2	0.7
Procure 480SC	8.0 fl oz	1,3,5		
Kaligreen 82WP	5.0 lb	2,4	0.5	0.7
Procure 480SC	8.0 fl oz	1,3,5	0.5	1.0
Procure 480SC	8.0 fl oz	1,3,5		
Actinovate SP + Silwet L-77	0.38 lb + 2.0 fl oz	2,4	0.7	0.7
Procure 480SC	8.0 fl oz	1,3,5		
Serenade Max + Silwet L-77	2.0 lb + 4.0 fl oz	2,4	0.7	0.9
Procure 480SC	8.0 fl oz	1,3,5		
Sonata AS + Silwet L-77	4.0 qt + 4.0 fl oz	2,4	0.7	0.9
Actinovate SP + Silwet L-77	0.38 lb + 2.0 fl oz	1,3,5		
Kaligreen 82WP	5.0 lb	2,4	0.8	0.8
Sovran 50WG	0.3 lb	1,4		
Endura 70WG + Kinetic	0.28 lb + 12.0 fl oz	2,5		
Procure 480SC	8.0 fl oz	3	1.0	1.0

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2007 Powdery Mildew of Cantaloupe Fungicide Trial				
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Treatment	Rate (lb a.i./A, unless noted as product)	Treatment dates¹	Disease rating²	
			Upper leaf surface	Lower leaf surface
Continued from preceding page				
Actinovate SP + Silwet L-77	0.38 lb + 2.0 fl oz	1,2,3,4,5	1.1	1.1
Topsin M 4.5 FL	10.0 fl oz	1,2,3,4,5	1.1	1.2
Serenade Max + Silwet L-77	2.0 lb + 4.0 fl oz	1,2,3,4,5	1.5	2.1
Procure 480SC	8.0 fl oz	1,5		
Cabrio 20WG + Kinetic	1.0 lb	2		
Quintec 250SC	6.0 fl oz	3		
Topsin M 4.5FL	10.0 fl oz	4	1.6	1.3
Companion	1.0 qt	1,2,3,4	1.8	1.7
Kaligreen 82WP	5.0 lb	1,2,3,4,5	1.8	1.3
Sovran 50WG	0.3 lb	1,2,3,4,5	2.0	2.2
Rally 40W	0.31 lb	1,2,3,4,5	2.0	1.6
Companion	4.0 qt	1,2,3,4,5	2.1	2.0
Kaligreen 82WP	5.0 lb	1,3,5		
Serenade Max + Silwet L-77	2.0 lb + 4.0 fl oz	2,4	2.1	1.3
Serenade Max + Silwet L-77	2.0 lb + 4.0 fl oz	2,4	2.1	2.1
Procure 480SC	8.0 fl oz	1,5		
Serenade Max + Silwet L-77	2.0 lb + 4.0 fl oz	2		
Quintec	6.0 fl oz	3		
Cabrio 20WG + Kinetic	1.0 lb + 12.0 fl oz	4	2.3	2.9
Silwet L-77	4.0 fl oz	1,2,3,4,5	2.4	1.0
Endorse (11.3%)	0.78 lb	1,2,3,4,5	2.4	2.1
Kaligreen 82WP	5.0 lb	1,3,5		
Sonata AS + Silwet L-77	4.0 qt + 4.0 fl oz	2,4	2.6	2.7
Flint 50WG	0.125 lb	1,2,3,4,5	2.7	2.6
Sonata AS + Silwet L-77	4.0 qt + 4.0 fl oz	1,2,3,4,5	2.7	2.4
Quadris 25SC + Kinetic	15.0 fl oz + 16.0 fl oz	1,2,3,4,5	2.7	1.6
Bravo Weather Stik 6.0SC	3.0 pt	1,2,3,4,5	2.8	2.9
Kinetic	12.0 fl oz	1,2,3,4,5	2.9	1.5
Kaligreen 82WP	5.0 lb	2,4	3.0	2.9
Sonata AS + Silwet L-77	4.0 qt + 4.0 fl oz	2,4	3.1	2.9
Actinovate SP + Silwet L-77	0.38 lb + 2.0 fl oz	2,4	3.1	3.9
Untreated control	-----	-----	3.9	3.9
LSD (Least significant difference, $P = 0.05$)³			0.2	0.2
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- 1 Treatment dates: 1 = May 17; 2 = May 24; 3 = May 31; 4 = Jun 8; 5 = Jun 15. Small powdery mildew colonies (2 to 3 mm in diameter) were first observed on some plants May 31.
- 2 Disease ratings were performed on June 20 to 23 by collecting 10 leaves at random from each plot and rating the severity of powdery mildew on the upper and lower leaf surfaces using the following rating system: 0 = No powdery mildew colonies present on plant; 1 = 1 to 5 powdery mildew colonies on leaf surface; 2 = 6 to 10 powdery mildew colonies on leaf surface; 3 = More than 10 colonies up to 25% of leaf surface covered with powdery mildew; 4 = 26 to 50% of leaf surface covered with powdery mildew; 5 = 51 to 100% of leaf surface covered with powdery mildew.
- 3 Least Significant Difference at $P = 0.05$. Values in each column differing by more than the LSD are significantly different.