

Examination of New Chemistries to Control Powdery Mildew of Cantaloupe in 2000

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Abstract

*Powdery mildew can occur on melons annually in Arizona. *Sphaerotheca fuliginea* is the plant pathogenic fungus that causes powdery mildew of cucurbits, such as cantaloupe, honeydew, watermelon, cucumber and squash. When environmental conditions are favorable, disease incidence and severity can reach economically significant levels. 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. 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 2000 at the Yuma Agricultural Center. A moderately high level of disease had developed by crop maturity (June 22) on nontreated plants. All treatments significantly reduced the level of powdery mildew on both sides of leaves, compared to nontreated plants. The best treatments among those tested with respect to disease control on the underside of leaves, where disease is more difficult to control than on the tops of leaves, included Actigard, Armicarb+Quadris, BAS 500, Benlate+Microthiol, Flint, Flint+Trilogy, Microthiol, Quadris+Actigard, Quadris+Benlate, Quinoxifen, Nova, Nova+KHHUBF, Topsin, Topsin+Trilogy, Benlate, Benlate+Trilogy, Folicur, Quadris and Topsin+Microthiol. 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 facilitate the development of fungicide resistance management strategies, which strive to minimize the risk of resistance development by the pathogen to these compounds.*

Introduction

Powdery mildew is an annual concern to melon growers in Arizona. The disease on cantaloupes, 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 initial colonies 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 on many melon cultivars in the high temperatures that often occur in desert production areas when environmental and cultural conditions favor disease. Other compounds, such as azoxystrobin (Quadris), benomyl (Benlate), chlorothalonil (Bravo), myclobutanil (Nova, Rally), neem oil (Trilogy), potassium carbonate (Armicarb, Kaligreen), thiophanate-methyl (Topsin M), and trifloxystrobin (Flint), 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 2000 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 31, 2000 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 applications of fungicides were made May 18 and 25 and June 5 and 12. Maximum and minimum ranges of air temperature (EF) were as follows: Mar, 60-88, 37-56; Apr, 76-101, 45-65; May, 85-111, 51-69; Jun 1 to 22, 90-109, 61-76. Measurable rainfall occurred in Apr (0.22 in.) and June (0.04 in.). Furrow irrigation was used for the duration of the study. Disease severity was determined June 22 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 the leaf surface; 2=6 to 10 powdery mildew colonies on the leaf surface; 3=more than 10 colonies to 25% of the 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.

Results and Discussion

Powdery mildew was not evident at the first or second application of fungicides. Initial signs of powdery mildew were not detected until May 30. A moderately high level of disease developed by crop maturity (June 22), when disease development among the different treatments was evaluated. All treatments significantly reduced the level of powdery mildew on both sides of leaves, compared to nontreated plants. Some treatments were much more effective than others. The best treatments (with a disease rating at or below 1.0) among those tested, with respect to disease control on the underside of leaves where disease is more difficult to control than on the tops of leaves, included Actigard, Armicarb+Quadris, BAS 500, Benlate+Microthiol, Flint, Flint+Trilogy, Microthiol, Quadris+Actigard, Quadris+Benlate, Quinoxifen, Nova, Nova+KHHUBF, Topsin, Topsin+Trilogy, Benlate, Benlate+Trilogy, Folicur, Quadris and Topsin+Microthiol.

The level of disease control achieved on the upper leaf surface suggests that all tested materials can significantly reduce powdery mildew, compared to no treatment at all, when the test compound is applied directly to the leaf surface with good coverage. On the other hand, disease control on the underside of leaves, where coverage by the fungicide is less than that achieved on the top of leaves, demonstrates the efficacy of chemistries that have a degree of systemic movement within the leaf.

No symptoms of phytotoxicity were observed with any treatment; however, it should be noted that the cantaloupe cultivar used in this trial (Topmark) is tolerant to sulfur, whereas other melon varieties may not be. Also, the pathogen *Sphaerotheca fuliginea* has had a name change to *Podosphaera xanthii*. In the future, you may see this new name in reference to powdery mildew on cucurbits.

A fungicide resistance management program, 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. Several of the products registered for use on melons must be alternated with a different chemistry, as directed by the label, to carry out this fungicide resistance management objective. The future registration and subsequent availability of additional new chemistries for cantaloupe and other cucurbits will facilitate the implementation of an effective fungicide resistance management program.

Cantaloupe powdery mildew fungicide trial, 2000.

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Treatment	Rate (a.i./acre)	Application dates ¹	Disease rating ²	
			Upper leaf	Lower leaf
Actigard 50WP	0.03 lb	1,2,3,4	0	0.1
Armcarb 100 85WP	4.2 lb	1,3		
alt. with Quadris 25SC + Latron B-1956	0.25 lb + 0.24 pt	2,4	0	0.2
BAS 500 20WG	0.2 lb	1,2,3,4	0	0.2
Benlate 50WP + Microthiol 80DG	0.25 lb + 8.0 lb	1,2,3,4	0	0
Flint 50WG	0.06 lb	1,2,3,4	0	0.2
Flint 50WG	0.06 lb	1,3		
alt. with Trilogy 70EC	0.35 gal	2,4	0	1.0
Microthiol 80DG	8.0 lb	1,2,3,4	0	0.6
Quadris 25SC + Latron B-1956	0.25 lb + 0.24 pt	1,3		
alt. with Actigard 50WP	0.03 lb	2,4	0	0.2
Quadris 25SC + Latron B-1956 + Actigard 50WP	0.25 lb + 0.24 pt + 0.03 lb	1,2,3,4	0	0.3
Quadris 25SC + Latron B-1956	0.25 lb + 0.24 pt	1,3		
alt. with Benlate 50WP	0.25 lb	2,4	0	0.1
Quinoxifen (250 g/l)	0.083 lb	1,2,3,4	0	0.1
Quinoxifen (250 g/l)	0.167 lb	1,2,3,4	0	0
Nova 40W	0.1 lb	1,2,3,4	0	0
Nova 40W	0.1 lb	1,3		
alt. with KHHUBF-99-001	0.5 gal	2,4	0	0.4
Topsin M 70W	0.35 lb	1,2,3,4	0	0.1
Topsin M 70W + Trilogy 70EC	0.35 lb + 0.35 gal	1,2,3,4	0	0
Benlate 50WP	0.25 lb	1,2,3,4	0.1	0.3
Benlate 50WP + Trilogy 70EC	0.25 lb + 0.35 gal	1,2,3,4	0.1	0.3
Folicur 3.6F + Latron B-1956	0.34 lb + 0.24 pt	1,2,3,4	0.1	0.6
KHHUBF-99-001	0.25 gal	1,2,3,4	0.1	1.4
Quadris 25SC + Latron B-1956	0.25 lb + 0.24 pt	1,2,3,4	0.1	0.4
Topsin M 70W + Microthiol 80DF	0.35 lb + 8.0 lb	1,2,3,4	0.1	0.3

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Treatment	Rate (a.i./acre)	Application dates ¹	Disease rating ²	
			Upper leaf	Lower leaf
TABLE CONTINUED FROM PRECEDING PAGE				
BAS 500 20WG	0.1	1,2,3,4	0.2	1.6
Folicur 3.6F + Latron B-1956	0.45 lb + 0.24 pt	1,2,3,4	0.2	1.0
Trilogy 70EC	0.35 gal	1,2,3,4	0.3	1.4
Microthiol 80DF	8.0 lb	1		
alt. with AQ 10 + JMS Stylet Oil	0.036 lb + 2.4 pt	2,3		
alt. with Benlate 50WP	0.25 lb	4	0.4	1.5
Quinoxifen (250 g/l) + Kinetic	0.083 lb + 0.2 pt	1,2,3,4	0.4	0.4
Quinoxifen (250 g/l) + Kinetic	0.167 lb + 0.2 pt	1,2,3,4	0.4	0.3
Kaligreen 82WP + Latron B-1956	4.1 lb + 0.24 pt	1,3		
alt. with Kaligreen 82WP + Latron B-1956 + Nova 40WP	4.1 lb + 0.24 pt + 0.1 lb	2,4	0.6	1.1
Kaligreen 82WP + Latron B-1956	4.1 lb + 0.24 pt	1,2,3,4	0.8	2.0
BAS 500 20WG	0.15 lb	1,2,3,4	0.9	1.2
JMS Stylet Oil	2.4 pt	1,2,3,4	0.9	1.2
AQ 10 58WDG + JMS Stylet Oil	0.036 lb + 2.4 pt	1,2,3,4	1.2	1.6
Armcarb 100 85WP	4.2 lb	1,2,3,4	1.2	1.5
KHHUBF-99-001	0.5 gal	1,2,3,4	1.3	2.1
Serenade WP	8.0 lb	1,2,3,4	1.7	2.2
Nontreated control	-----	-----	3.4	3.3
LSD (Least Significant Difference, $P = 0.05$) ³			0.2	0.4

1 Application dates: 1 = May 18; 2 = May 26; 3 = Jun 5; 4 = Jun 12, 2000. Small powdery mildew colonies (1 to 2 mm in diam.) were first observed on plants on May 30.

2 Each value was determined at plant maturity (Jun 22) by rating 10 leaves randomly selected from each of the five replicate plots per treatment using the rating system described in the text.

3 Least Significant Difference at $P = 0.05$. Values in each column differing by more than the least significant difference are significantly different from each other according to the Duncan-Waller K-ratio test.