Evaluation of Fungicide Rotations for Control of Powdery Mildew of Cantaloupe

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Abstract

A fungicide trial was established at The University of Arizona Marana Agricultural Center in April 2000 to evaluate rotation and timing of application for several fungicides used for control of powdery mildew on cantaloupe. Treatments included seven registered fungicides: azoxystrobin, micronized sulfur, neem extract, potassium bicarbonate, benomyl, thiophanate methyl and trifloxystrobin. Different rotations and timing of application of these fungicides were applied either before or immediately after initial signs of powdery mildew infection and up to three times thereafter depending on rotation scheme. By the second application, disease severity was mild but increased rapidly, and it was severe by the time of the last application. Powdery mildew was controlled to some degree on the upper leaf surface by all treatments. However, efficacy was more variable on the lower leaf surface and was reduced when applications were made only at dates 1 and 2. Results show the increased efficacy of fungicides with systemic or trans-laminar activity and the possibilities of rotations with contact fungicides for resistance management.

Introduction

Powdery mildew of cucurbits is caused by *Sphaerotheca fuliginea*, a powdery mildew fungus common in all cucurbit-growing areas of the world. It is the most important pathogen of cantaloupe and watermelon in Arizona. Although powdery mildew rarely causes death of plants, the foliar canopy may be reduced quickly causing reduced growth and production and fruit burn in mature vines. Numerous fungicides are registered for use on cucurbits for control of powdery mildew. However, several newly labeled materials have rotation requirements to prevent development of resistance by the fungus. Therefore, trials were conducted to demonstrate the efficacy of several different rotations or times of application of these fungicides.

Materials and Methods

'Topmark' cantaloupe was direct seeded into furrow-irrigated beds spaced 80 inches on center on April 18, 2000 at the Marana Agricultural Center. Plants were thinned to one foot spacing. During the trials, maximum and minimum temperature ranges in ^{o}F, respectively, were 75-100 and 44-60 between April 18-30, 81-109 and 48-67 in May, 93-108 and 60-79 in June, and 95-103 and 63-75 between July 1-13. Rainfall in inches was 0 in April, 0 in May, 0.99 in June, and 0.16 between July 1-13. The trial was terminated on July 13.

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Fungicides used in these studies were azoxystrobin (Quadris 2.08F) at 15.3 fl oz prod/A, micronized sulfur (Microthiol Special 80DF) at 5 lb prod/A, potassium bicarbonate (Armicarb100) at 5 lb prod/A, benomyl (Benlate 50WP) at 0.5 lb prod/A, thiophanate methyl (Topsin-M 70W) at 0.5 lb/A, trifloxystorbin (Flint) at 2.0 oz prod/A and neem extract (Trilogy 70EC) at 0.5 lb/A. Ten treatments, based on previous studies (Matheron and Porchas, 2000; Olsen and Rasmussen, unpublished data) and current field practices, were made up of different rotations, combinations and timing of applications (Table 1). Fungicide treatments were applied with a CO2 pressurized sprayer (R&D Sprayers, Inc.) at 30 lb psi using four fine screen hollow cone nozzles spaced 16 inches apart on the boom in 30 gal water/A, except Armicarb 100 applied in 100 gal water/A. Foliar applications of fungicides were made June 8, June 20, June 27 and July 6. Fungicide treatments were replicated four times in a randomized complete block design, and each replicate treatment consisted of 25 ft of row. Treatment rows were separated by single, non-treated rows.

The first fungicide application was made before initial signs of disease. By the second application, disease severity was mild but increased rapidly thereafter. Powdery mildew incidence was severe by the time of the last application. Disease severity was rated on July 13 by collecting 10 leaves at random from the center 15 ft of each plot and recording the number of lesions per leaf on the upper and lower leaf surfaces.

Results

Powdery mildew was controlled to some degree on the upper leaf surface by all treatments. However, efficacy was more variable on the lower leaf surface and was reduced when applications were made only at dates 1 and 2. Results (Table 1) indicate that increased efficacy of fungicides with systemic (Benlate and Topsin-M) or trans-laminar activity (Quadris and Flint) give better control of powdery mildew on the lower leaf surface. Also, rotations with contact fungicides such as sulfur and potassium bicarbonate can be integrated into resistance management strategies. However, the rotation of Trilogy and Armicarb100 was not different from the control, so these products alone may not be efficacious under the conditions of this experiment. When combined with Trilogy, increased efficacy of Benlate and Topsin-M compared to their application alone has been shown in other studies (Bervejillo, et al., 1999; Olsen and Rasmussen, unpublished data). However, application of Trilogy combined with Quadris was not significantly different from Quadris alone or Quadris rotated with Microthiol Special. There were no phytotoxic effects of any treatments.

Literature cited

Bervejillo, J., K. J. Dell and W. D. Gubler. 1999. Evaluation of fungicides for control of cucurbits powdery mildew. Fungicide and Nematicide Tests, vol 54, American Phytopathological Society.

Matheron, M. and M. Porchas. 2000. Comparative efficacy of fungicides for control of powdery mildew on muskmelon. Fungicide and Nematicide Tests, vol 55, American Phytopathological Society.

Table 1. Efficacy of fungicide rotations and application dates based on average number of lesions per leaf on upper and lower leaf surfaces.

Treatment and rate of product/A	Application date*	Average number of lesions per leaf**	
		Upper leaf	Lower leaf
Quadris 2.08F 15.3 fl oz Armicarb100 5 lb	1, 3 2, 4	0.95 d	3.73 d
Quadris 2.08F 15.3 fl oz 1	2,4	2.33 cd	4.83 dc
Quadris 2.08F 15.3 fl oz Microthiol Special 80DF 5 lb	1, 3 2	2.05 bcd	7.65 c
Trilogy 70EC 0.5 gal + Quadris 2.08F 15. Microthiol Special 80DF 5 lb	1,3 2	3.15 bcd	7.58 c
Trilogy 70EC 0.5 gal + Benlate 50WP 0.5 Microthiol Special 80DF 5 lb	1, 3 2	5.05 bcd	11.50 bc
Trilogy 70EC 0.5 gal + Topsin M 70W 0.5 Microthiol Special 80DF 5 lb	1, 3 2	6.58 abc	14.85 bc
Flint 2 oz	2, 4	4.95 bc	15.00 bc
Flint 2 oz Microthiol Special 80DF 5 lb	1, 3 2	3.75 cd	15.53 bc
Quadris 2.08F 15.3 fl oz	1, 2	35.1 ab	58.65 ab
Trilogy 70EC 0.5 gal + Armicarb100 5 lb	1, 2, 3, 4	3.83 cd	66.23 ab
Untreated control		80.87 a	135.33 a

*Application dates: 1=8 June, 2=20 June, 3=27 June, 4=6 July

**Means within each column followed by the same letter are not significantly different (p=0.05)