

Evaluation of Fungicides for Control of Powdery Mildew of Greenhouse Pepper

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Abstract

A fungicide trial was established in a commercial style greenhouse at The University of Arizona Campus Agricultural Center in November 2000 to evaluate efficacy of several fungicides for control of powdery mildew on bell pepper. Treatments included five registered fungicides: Microthiol Special (micronized sulfur), Trilogy (neem extract), Flint (trifloxystrobin), Serenade (*Bacillus subtilis* QST713) and AQ10 (*Ampelomyces quisqualis*) applied as single treatments every 10-14 days to each of four replicates. In samples to determine the percentage of leaf area affected by powdery mildew lesions and the number of leaves infected within different treatments, Microthiol Special and Serenade were significantly different from non-treated controls, while Flint and AQ10 had fewer lesions and number of leaves infected but were not significantly different from the control. Although Trilogy was not different from the control, this treatment had more lesions and number of leaves infected than all treatments.

Introduction

Powdery mildew of pepper is caused by the fungus *Oidiopsis taurica* (perfect stage *Leveillula taurica*). It has been a serious problem on bell peppers grown in greenhouses and under shade for several years in Arizona. *O. taurica* is an unusual powdery mildew because the mycelium grows inside the leaf, and the white powdery growth on upper leaf surfaces, typical of many other powdery mildews, is not present. Symptoms on pepper include pale yellow lesions on the upper leaf surface and white powdery growth on the bottom of the leaf consisting of masses of conidiophores and conidia that emerge through stomatal openings. Powdery mildew infections begin as a plant canopy develops and may become a problem before fruit development. Fruits and stems are not affected. Disease can be prevented with early applications of sulfur. However, if powdery mildew becomes so severe that frequent applications of sulfur are necessary, applications may be difficult to maintain throughout the entire growing season. Several other fungicides are now registered, but since there is little or no information about their use in Arizona, trials were conducted to determine their efficacy under production greenhouse conditions.

Materials and Methods

In August 2000, golden bell pepper seedlings (var. 'Kelvin') were transplanted into rock wool bags in the newly constructed Controlled Environment Agriculture Program greenhouse at The University of Arizona Campus

Agricultural Center in Tucson. Seventy-two pepper plants, three in each of 24 bags, were placed in a single row along the east wall of the greenhouse. All cultural practices were according to standard practices used in the greenhouse, and least toxic methods were used for pest control.

Five fungicide treatments and a control treated with water only were used in a randomized block design with four replications. Blocks consisted of 6 bags with three plants each. Fungicides and rates in prod/A were Microthiol Special (micronized sulfur) 5.0 lb., Trilogy (neem extract) 0.5 gal, Flint (trifloxystrobin) 2.0 oz, Serenade (*Bacillus subtilis* QST713) 1% w/w, and AQ10 (*Ampelomyces quisqualis*) 1.0 oz. mixed with Agri-dex surfactant 4.0 pint. Fungicides were applied with a hand-held pressurized sprayer. The amount of water used was based on predetermined coverage of the water control, increasing from 600 ml to 1.0 L as plants grew. Fungicide treatments were initiated October 20, 2000 and plants were treated every 10 days to two weeks until May 2001. On January 24, 2001, 10 leaves of approximately the same age were sampled from each plant. Percent coverage of the lower surface of each leaf by powdery mildew was determined visually, and the number of leaves infected was recorded. A standard assessment key (James, 1971) was used to standardize percent coverage determinations. Means of each replication within each treatment were subjected to ANOVA and Tukey test in Systat 8. Although fungicide treatments were continued until May 8, no changes in disease incidence and severity were observed.

Results and Discussion

Disease symptoms were first observed in early November 2000 at the south end of the greenhouse. This area is warmer than the north end and nearer the door. Powdery mildew progressed only sporadically to the north end of the greenhouse throughout the season. Treatments of Microthiol Special, Serenade and Flint significantly reduced the percent coverage and the number of leaves infected with powdery mildew compared to the non-treated control (Table 1). AQ10 was moderately effective, but was not significantly different from the control. Plants treated with Trilogy had both higher percent leaf area covered with lesions and more leaves infected than all other treatments. There were no phytotoxic effects of any treatments. Because the effective fungicides in this trial have different modes of action, rotations of different chemistries for resistance management are available and highly recommended for use in greenhouse pepper production.

Literature cited

James, Clive. 1971. A Manual of Assessment keys for Plant Diseases. Canada Department of Agriculture, Publication No. 1458.

Table 1. Percent leaf area covered by powdery mildew lesions and number of leaves infected in different fungicide treatments in the greenhouse. Values are means of 10 leaves in each of 4 replications of each treatment.

| Treatment and rate of product/A | Percent leaf area covered* | Number of leaves infected* |
|---------------------------------|----------------------------|----------------------------|
| Serenade 1% w/w | 2.4 a | 1.8 a |
| Microthiol Special 5.0 lb | 1.3 a | 2.3 a |
| Flint 2.0 oz | 3.8 ab | 1.5 a |
| AQ10 1.0 oz + Agri-dex 4.0 pint | 11.8 b | 3.5 ab |
| Trilogy 0.5 gal | 25.4 c | 8.0 b |
| Non-treated control | 20.3 bc | 5.8 ab |

*Numbers followed by the same letter in a column are not significantly different ($p=0.05$) using the Tukey test in Systat 8.