Fungicide Performance for Control of Powdery Mildew on Lettuce in 2003

Michael E. Matheron and Martin Porchas

Abstract

Powdery mildew on lettuce is caused by the fungus Golovinomyces cichoracearum (*Erysiphe cichoracearum*). *This disease is favored by moderate to warm temperatures and dry weather conditions. Several potential new fungicides were evaluated for control of powdery mildew on lettuce in 2003. Powdery mildew appeared in our plots by Jan 9 and reached high levels by plant maturity on Feb 19. Compared to non-treated plants, all treatments significantly reduced the final severity of powdery mildew on lettuce statistically. However, only a limited number of compounds, such as Rally, Microthiol Disperss, Quinoxyfen, Flint, Zoxamide, Maneb, Pristine and Cabrio, provided the degree of disease control that would be of value to growers. The trial was intended to be a downy and powdery mildew trial; therefore, some of the treatments within this study were specifically included for downy mildew. No downy mildew developed; however, the downy mildew test products did offer some protection against powdery mildew.*

Introduction

Powdery mildew, caused by the fungus *Golovinomyces cichoracearum* (*formerly known as Erysiphe cichoracearum*), can develop rapidly in spring lettuce during March and April in western Arizona, when moderate to warm temperatures and dry environmental conditions prevail. The first signs of the disease can occur as early as December or January. Successful control of powdery mildew requires the presence of an effective fungicide on plants before disease onset. Successive applications of fungicides are required to maintain disease control until harvest. Sulfur can provide a significant degree of protection against powdery mildew if applied early and often; however, possible burning of lettuce leaves may occur when this product is applied at temperatures at or above 90 to 95EF. Several new plant disease control compounds are in development that have activity on the fungi that cause powdery mildew on lettuce and other vegetable crops. This field trial was initiated to test the potential efficacy of these new chemistries on powdery mildew of lettuce.

Materials and Methods

This 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%). Lettuce 'Winterhaven' was seeded and watered October 30, 2002 in double rows, 12 in. apart on beds with 40 in. between bed centers. Treatments were replicated five times in a randomized complete block design. Each replicate consisted of 25 ft of bed, which contained two 25-ft rows of lettuce. Plants were thinned November 23 to a 12 in. spacing. Treatment beds were separated by single non-treated beds. Treatments were applied with a tractor-mounted boom sprayer that delivered 50 gal/acre at 100 psi to flat-fan nozzles spaced 12 in. apart. Foliar applications of test materials were made January 9 and 20 and February 4, 2003. Maximum and

---

This is a part of the 2003 Vegetable Report, The University of Arizona College of Agriculture and Life Sciences, index at http://ag.arizona.edu/pubs/crops/az1323

minimum ranges (EF) of air temperature were as follows: December (2002), 53-75, 30-50; January (2003), 68-87, 37-52; February 1 to 21, 62-84, 31-55. Maximum and minimum ranges (%) for relative humidity were as follows: December (2002), 72-100, 19-66; January (2003), 60-100, 13-46; February 1 to 21, 67-100, 9-89. Total rainfall in inches was as follows: December, 0.00; January, 0.03; 1 to 21 February, 0.57. Furrow irrigation was used for the duration of the trial. The severity of powdery mildew caused by *Golovinomyces cichoracearum* was determined at plant maturity (19-21 Feb) by rating 10 plants randomly selected from each of the five replicate plots per treatment using the following rating system: 0 = no powdery mildew present; 1 = powdery mildew present on bottom leaves of plant; 2 = powdery mildew present on bottom leaves and lower wrapper leaves; 3 = powdery mildew present on bottom leaves and all wrapper leaves; 4 = powdery mildew present on bottom leaves, wrapper leaves and cap leaf; 5 = powdery mildew present on entire head. Yield loss due to rejected lettuce heads would normally begin to occur on plants with a rating above 2.0.

Results and Discussion

Compared to non-treated plants, all treatments significantly reduced the final severity of powdery mildew on lettuce statistically. However, only a limited number of these treatments provided a level of disease control that would be desirable and useful to growers, as shown in the data table. The trial was intended to be a downy and powdery mildew trial, so some of the treatments within this study were specifically included for downy mildew. No downy mildew developed; however, the downy mildew test products did offer some protection against powdery mildew.

Some compounds (Actigard, Microthiol Disperss, and Quadris) were applied only on the second application date, so that the efficacy of these materials could be compared to an alternation with another chemical during the first and third application dates. For example, Actigard applied only at the second application date produced a disease rating of 3.1. When Quadris at the first and third application date was alternated with Actigard at the second application date, the disease rating was 2.3. Three applications of Quadris alone also resulted in a disease rating of 2.3. For resistance management, the Quadris label does not allow three sequential applications. The data from this trial suggests that an alternation of Quadris with Actigard would provide equivalent disease protection and allow alternation of chemistries as well. Such alternation programs will need to be tested over a multiyear period to determine if these preliminary results are consistently achieved.

Fungicide resistance management, which seeks 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 possible availability of one or more of these chemistries under development could help in efforts to control powdery mildew of lettuce and to establish and maintain a fungicide resistance management program for plant disease control chemicals of importance for this crop.

Powdery mildew of lettuce fungicide trial, 2003.

Michael Matheron and Martin Porchas, Yuma Agricultural Center, University of Arizona.

Treatment	Rate (lb a.i./A)	Treatment dates [1]	Disease rating [2]
Rally 40W	0.1	1,2,3	0.0
Maneb 75DF + Microthiol Disperss 80DF	1.5 + 4.0	1,2,3	0.0
Microthiol Disperss 80DF	4.8	1,2,3	0.0
Quinoxyfen (250 g/l)	0.167	1,2,3	0.0
Flint 50WG	0.125	1,2,3	0.0
Quinoxyfen (250 g/l)	0.11	1,2,3	0.4
Zoxamide 80WP	0.2	1,2,3	0.8
Maneb 75DF	1.5	1,2,3	1.2
Pristine 38WG (BAS 516)	0.4	1,2,3	1.3
Cabrio 20WG (BAS 500)	0.18	1,2,3	1.3
Foliar Supreme	3.0 qt. product	1,2,3	1.4
Actigard 50WG	0.03	1,3	
alternated with Quadris 2.08SC	0.25	2	1.7
Reason (500 g/l)	0.27	1,2,3	2.1
Quadris 2.08SC	0.25	1,3	
alternated with Actigard 50WG	0.03	2	2.3
Curzate 60DF + Maneb 75DF	0.187 + 1.12	1,2,3	2.3
Quadris 2.08SC	0.25	1,2,3	2.3
Curzate 60DF	0.187	1,2,3	2.3
Acrobat 50WP + Maneb 75DF	0.2 + 1.5	1,3	
alternated with Maneb 75DF	1.5	2	2.6
Acrobat 50WP + Maneb 75DF	0.2 + 1.5	1,3	
alternated with Aliette 80WDG	4.0	2	2.6
Reason (500 g/l)	0.18	1,2,3	2.7
Quadris 2.08SC	0.25	2	2.9
Microthiol Disperss 80DF	4.8	2	3.0
Milsana (0.5% v/v) + Tween 20 (0.02%)	0.25 gal + 19 ml prod.	1,3	
alternated with Microthiol Disperss 80DF	4.8	2	3.0
Actigard 50WG	0.03	2	3.1
DPX-KP481 50DF	0.375	1,2,3	3.1
Curzate 60DF + Maneb 75DF	0.187 + 1.5	1,2,3	3.2
Milsana (0.5% v/v) + Tween 20 (0.02%)	0.25 gal + 19 ml prod.	1,3	
alternated with Quadris 2.08SC	0.25	2	3.2
Acrobat 50WP	0.2	1,2,3	3.4
Actigard 50WG	0.03	1,2,3	3.5
Milsana (0.5% v/v) + Tween 20 (0.02%)	0.25 gal + 19 ml prod.	1,3	3.6
BAS 545 (400 g/l)	0.07	1,2,3	3.6

TABLE CONTINUED ON NEXT PAGE

Powdery mildew of lettuce fungicide trial, 2003.

Michael Matheron and Martin Porchas, Yuma Agricultural Center, University of Arizona.

Treatment	Rate (lb a.i./A)	Treatment dates [1]	Disease rating [2]
CONTINUATION OF TABLE FROM PRECEDING PAGE			
Actigard 50WG	0.03	1,3	3.7
Phortress	3.0 qt. product	1,2,3	4.0
Milsana (0.5% v/v) + Tween 20 (0.02%)	0.25 gal + 19 ml prod.	1,2,3	4.0
BAS 545 (400 g/l) + Kinetic	0.07 + 1.0 fl. oz.	1,2,3	4.0
DPX-KP481 50DF	0.25	1,2,3	4.1
BAS 545 (400 g/l)	0.05	1,2,3	4.1
Serenade AS	4.0 qt. prod.	1,2,3	4.1
Sonata AS	4.0 qt. prod.	1,2,3	4.1
Milsana (0.5% v/v) + Tween 20 (0.02%)	0.25 gal + 19 ml prod.	1,3	
alternated with Actigard 50WG	0.03	2	4.2
Non-treated control	-------	-------	4.4
LSD (Least Significant Difference, *P*=0.05) [3]			0.2

1 Treatments were applied on 1) Jan 9; 2) Jan 20; 3) Feb 4, 2003. Small powdery mildew colonies (2 to 3 mm in diameter) were first observed on some plants Jan 9.

2 Disease ratings were performed Feb 19 to 21. The severity of powdery mildew was determined by using the following rating system:

0 = No powdery mildew colonies present on plant.
1 = Powdery mildew present on bottom leaves.
2 = Powdery mildew present on bottom leaves and lower wrapper leaves.
3 = Powdery mildew present on bottom leaves and all wrapper leaves.
4 = Powdery mildew present on bottom leaves, wrapper leaves, and cap leaf.
5 = Powdery mildew present on entire head.

3 Values differing by more than the least significant difference are significantly different from each other according to the Duncan-Waller K-ratio test.