

Evaluation of Fungicides for Management of Powdery Mildew on Lettuce in 2007

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Abstract

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, as the crop nears maturity, when moderate to warm temperatures and dry environmental conditions prevail. The first signs of disease can occur as early as December or January. Successful chemical control of powdery mildew requires the presence of an effective fungicide on plants before disease onset, followed by successive applications of materials to maintain disease control until harvest. A field trial was conducted in 2007 to test and compare the efficacy of some registered as well as new fungicides, applied alone or in a rotational treatment program, for management of powdery mildew. Foliar applications of treatments were made Jan 24, Feb 1, Feb 16 and Feb 28, 2007. Among treatments, the degree of powdery mildew control ranged from virtually complete to minimal; however, all treatments significantly reduced disease severity compared to untreated plants. Treatments that reduced the severity of powdery mildew more than 90% compared to untreated plants included Procure alternated with Quintec, Quintec, Microthiol Disperss, and Procure alternated with Microthiol Disperss. Yield loss due to rejected lettuce heads usually would begin to occur when the powdery mildew disease rating exceeds 2.0. Fungicide treatments that kept disease severity below this level (in addition to the treatments already listed) include V-10118, Procure alternated with Quadris, Procure, Switch, Forum + Cabrio, Endorse, Maneb + Reason, and Endura. This trial was initiated as a combined downy and powdery mildew trial; therefore, some of the products were placed in the test specifically for downy mildew. Due to low humidity levels and no rainfall during the trial, no downy mildew developed; however, some of these downy mildew fungicides, such as Forum, Maneb, and Reason, significantly suppressed powdery mildew. Phytotoxicity symptoms were not noted on lettuce for any of the materials tested.

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, as the crop nears maturity, when moderate to warm temperatures and dry environmental conditions prevail. The first signs of disease can occur as early as December or January. Successful chemical control of powdery mildew requires the presence of an effective fungicide on plants before disease onset, followed by successive applications of materials to maintain disease control until harvest. This field trial was initiated to test the efficacy of some new fungicides not registered for use on lettuce and compare these chemistries to existing products, combinations of materials, and rotational treatment programs for management of powdery mildew.

Materials and Methods

This study was conducted at The University of Arizona, 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 Nov 8, 2006 in double rows 12 in. apart on beds with 40 in. between bed centers, then germinated with sprinkler irrigation for 48 hr. Additional furrow irrigations were performed Nov 22, Dec 22, Jan 12, 2007, Feb 2 and 19, and Mar 5. 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 at the 3-4 leaf stage (Dec 12) to a 12 in. spacing. Treatment beds were separated by single nontreated beds. Treatments were applied with a tractor-mounted boom sprayer that delivered 50 gal/acre at 100 psi to hollow-cone nozzles spaced 12 in. apart. Foliar applications of treatments were made Jan 24, Feb 1, Feb 16 and Feb 28, 2007. Maximum and minimum ranges (°F) of air temperature were as follows: Dec, 2006, 58-77, 29-50; Jan, 2007, 49-77, 22-50; Feb, 63-83, 36-53; Mar 1 to 15, 66-94, 33-56. Maximum and minimum ranges (%) for relative humidity were as follows: Dec 2006, 20-94, 4-38; Jan 2007, 36-96, 8-34; Feb, 58-90, 7-31; Mar 1 to 15, 44-85, 5-12. No rainfall occurred during this trial. Downy mildew, caused by *Bremia lactucae*, did not develop during the course of this trial; however, small colonies of powdery mildew, caused by *Erysiphe cichoracearum*, were first detected on Jan 31. The severity of powdery mildew was determined Mar 13 to 15 by rating 10 plants in the middle of 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. For powdery mildew, yield loss due to rejected lettuce heads would normally begin to occur on plants with a rating above 2.0.

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. Among treatments, the degree of powdery mildew control ranged from virtually complete to minimal; however, all treatments significantly reduced disease severity compared to untreated plants. Treatments that reduced the severity of powdery mildew more than 90% compared to untreated plants included Procure alternated with Quintec, Quintec, Microthiol Disperss, and Procure alternated with Microthiol Disperss. Yield loss due to rejected lettuce heads usually would begin to occur when the powdery mildew disease rating exceeds 2.0. Fungicide treatments that kept disease severity below this level (in addition to the treatments already listed) include V-10118, Procure alternated with Quadris, Procure, Switch, Forum + Cabrio, Endorse, Maneb + Reason, and Endura. This trial was initiated as a combined downy and powdery mildew trial; therefore, some of the products were placed in the test specifically for downy mildew. Due to low humidity levels and no rainfall during the trial, no downy mildew developed; however, some of these downy mildew fungicides, such as Forum, Maneb, and Reason, significantly suppressed powdery mildew. Phytotoxicity symptoms were not noted on lettuce for any of the materials tested.

2006-2007 Powdery Mildew of Lettuce Fungicide Trial

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Treatment	Rate of product per acre	Treatment dates¹	Disease rating²
Procure 480SC	8.0 fl oz	1,3	
Quintec 250SC	6.0 fl oz	2,4	0.1
Quintec 250SC	6.0 fl oz	1,2,3,4	0.2
Microthiol Disperss 80DF	10.0 lb	1,2,3,4	0.3
Procure 480SC	8.0 fl oz	1,3	
Microthiol Disperss 80DF	10.0 lb	2,4	0.3
V-10118 0.41EC	9.7 fl oz	1,2,3,4	0.8
V-10118 0.41EC	13.0 fl oz	1,2,3,4	1.0
Procure 480SC	8.0 fl oz	1,3	
Quadris 2.08SC	15.4 fl oz	2,4	1.1
Procure 480SC	8.0 fl oz	1,2,3,4	1.3
V-10118 0.41EC	6.5 fl oz	1,2,3,4	1.4
Switch 62.5WG	0.875	1,2,3,4	1.4
V-10161 4FL + V-10118 0.41EC	3.0 fl oz + 6.5 fl oz	1,2,3,4	1.6
Forum 500SC + Cabrio 20EG + Penetrator	6.0 fl oz + 0.75 lb + 6.0 fl oz	1,2,3,4	1.8
Endorse	12.5 oz	1,2,3,4	1.8
Endorse	6.2 oz	1,2,3,4	1.8
Maneb 75DF	2.0 lb	1,3	
Reason (500 g/l)	8.2 fl oz	2,4	1.8
V-10161 4FL + V-10118 0.41EC	4.0 fl oz + 6.5 fl oz	1,2,3,4	1.8
Endura 70WG	0.69 lb	1,2,3,4	1.9
V-10161 4FL + Aliette 80WDG	4.0 fl oz + 2.0 lb	1,2,3,4	2.2
Evito + Silwet L-77	5.7 fl oz + 4.0 fl oz	1,2,3,4	2.4
V-10161 4FL + Maneb 75DF	4.0 fl oz + 1.6 lb	1,2,3,4	2.4
Previcur Flex	2.0 pt	1,3	
Maneb 75DF	2.0 lb	2,4	2.5
Rovral 4F	1.0 qt	1,2,3,4	2.5
V-10161 4FL + Maneb 75DF	3.0 fl oz + 1.6 lb	1,2,3,4	2.5
V-10161 4FL + Aliette 80WDG	3.0 fl oz + 2.0 lb	1,2,3,4	2.5
Forum 500SC + Penetrator	6.0 fl oz + 6.0 fl oz	1,2,3,4	2.7
V-10161 4FL	3.0 fl oz	1,2,3,4	2.8
Aliette 80WDG	5.0 lb	1,2,3,4	2.8
V-10161 4FL	4.0 fl oz	1,2,3,4	2.9
Ridomil Gold EC	1.0 qt	1,2,3,4	2.9
Maneb 75DF	2.0 lb	1,2,3,4	3.1
Evito + Silwet L-77	3.8 fl oz + 4.0 fl oz	1,2,3,4	3.2
Companion	16.0 fl oz	1,2,3,4	3.2
Companion	8.0 fl oz	1,2,3,4	3.3
Actinovate SP + Silwet L-77	6.0 fl oz + 4.0 fl oz	1,2,3,4	3.4
Untreated control	-----	-----	4.1
LSD (Least Significant Statistical Difference, P=0.05)			0.1³
Footnotes on next page			

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| 1 | Treatment dates: 1 = Jan 24; 2 = Feb 1; 3 = Feb 16; 4 = Feb 28, 2007. Small powdery mildew colonies (2 to 3 mm in diameter) were first observed on some plants Jan 31. |
| 2 | Disease ratings were performed Mar 13-15. 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.
Yield loss due to rejected lettuce heads would normally begin to occur on plants with a rating greater than 2.0 |
| 3 | Least Significant Difference at $P = 0.05$. Values in this column differing by more than the LSD are significantly different. |