Management of Downy and Powdery Mildew on Lettuce: Efficacy of Fungicides in 1996 Field Trial

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Abstract

Downy and powdery mildew are caused by the plant pathogenic fungi Bremia lactucae and Erysiphe cichoracearum, respectively. Cool and moist environmental conditions favor development of downy mildew, while warmer and dry weather is conducive for development of powdery mildew. Potential new fungicides were evaluated for management of these diseases in 1996. Both downy and powdery mildew developed in the test plots. All tested materials significantly reduced the severity of downy mildew compared to plants not treated with a fungicide. Compared to nontreated control plants as well as some tested materials and rates, significant reduction of powdery mildew was achieved with Azoxystrobin 80WDG + Latron B-1956, BAS 490 02F, Ciba G/MZ + Mancozeb 75DF, Dithane 75DF + Latron CS-7, Propamocarb 6EC (high rate), RH-7281 2F + Latron CS-7, and Microthiol 80WDG.

Introduction

Downy mildew of lettuce, caused by *Bremia lactucae*, can cause serious losses when environmental conditions favor the disease. Development of this disease is favored by cool to mild and moist conditions. The severity of downy mildew is influenced by the duration of moist weather conditions, which encourage pathogen growth, sporulation, and infection of host leaf tissue. On the other hand, powdery mildew, caused by *Erysiphe cichoracearum*, develops on spring lettuce, when warm and dry environmental conditions predominate. Lettuce planted in November in western Arizona is subject to both downy mildew during periods of moist mild weather and to powdery mildew at crop maturity, when warm dry weather conducive to this disease may prevail.

For both downy and powdery mildew, optimum disease management requires the presence of fungicidal protection when environmental conditions become favorable for disease development. In an attempt to increase the number of fungicides available to growers for management of these diseases, a field trial was initiated to test the efficacy of potential new fungicides.

Materials and Methods

This trial was conducted at the Yuma Valley Agricultural Center. Lettuce (Winterhaven) was seeded in early November on double rows 12 inches apart on beds 40 inches between bed centers. Treatments were replicated five times in a randomized complete block design. Each replicate consisted of 25 feet of bed, which contained two 25 foot rows of lettuce. Plants were thinned at the 3-4 leaf stage to a 12 inch spacing in mid-December. Treatment beds were separated by single nontreated beds. Fungicides were applied to the downy and powdery mildew plots on January 18 and February 6 and 26, 1996. Fungicide treatments were applied with a tractor-mounted boom sprayer that delivered 100 gallons/acre at 100 psi to nozzles spaced 12 inches apart. Maximum and minimum

ranges of air temperature (°F) in the downy and powdery mildew plots were as follows: December, 1995, 56-80, 35-53; January, 1996, 62-81, 33-54; February, 59-90, 35-57. Total rainfall (in.) was as follows: December, 0.00; January, 0.00; February, 0.03. Furrow irrigation was used until January 18, when sprinkler irrigation was initiated and continued for the duration of the trial.

The severity of downy mildew caused by *Bremia lactucae* was determined at plant maturity (March 3) by rating 10 plants randomly selected from each of the five replicate plots per treatment using the following rating system: 0 = no downy mildew present; 1 = downy mildew on 1-2 wrapper leaves; 2 = downy mildew on 3-4 wrapper leaves; 3 = downy mildew on 5-6 wrapper leaves; 4 = downy mildew on more than 6 wrapper leaves; 5 = downy mildew on cap leaf. The severity of powdery mildew caused by *Erysiphe cichoracearum* was determined at plant maturity 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 = some colonies of powdery mildew present, with light infection on a few leaves; 2 = moderate colonization of several leaves; 3 = heavy colonization of many leaves.

Results and Discussion

Results of this trial are presented in Table 1. Downy mildew appeared in plots as lettuce heads and a dense leaf canopy developed. As the crop neared maturity in late February, powdery mildew began to develop. All tested materials significantly reduced the severity of downy mildew compared to plants not treated with a fungicide. Compared to nontreated control plants as well as some tested materials and rates, significant reduction of powdery mildew was achieved with Azoxystrobin 80WG + Latron B-1956, BAS 490 02F, Ciba G/MZ + Mancozeb 75DF, Dithane 75DF + Latron CS-7, Propamocarb 6EC (high rate), RH-7281 2F + Latron CS-7, and Microthiol 80WDG.

The fungus that causes downy mildew is very different than the fungus that causes powdery mildew, and normally a fungicide with activity against one organism will have no effect against the other pathogen. However, our study indicates that BAS-490 has strong activity against both the downy and the powdery mildew pathogens. This trial has identified some new materials that might increase the chemical disease management options for lettuce in the future. Further evaluation of potential new fungicides for management of downy and powdery mildew is planned for next year.

Table 1. Effect of fungicide treatments on development of downy and powdery mildew of lettuce. Michael Matheron and Martin Porchas, Yuma Agricultural Center, University of Arizona.

Treatment	Rate of a.i./A	Mean downy mildew severity rating per plant *	Mean powdery mildew severity rating per plant *
Ciba G	high rate	0.2 a	1.9 hij
+ Mancozeb 75DF	1.6 lb		
Ciba G	low rate	0.2 a	1.5 fghi
+ Mancozeb 75DF	1.6 lb		
Ciba G/MZ prepack	?	0.4 ab	1.4 def
+ Mancozeb 75DF	1.6 lb		
Ridomil MZ72	1.8 lb	0.6 ab	1.5 efg
Curzate M-8 72WP	1.08 lb	0.7 bc	1.9 hij
+ Manzate 200DF	0.75 lb		
+ Buffer PS	1.0 pt		
Acrobat MZ	1.65 lb	1.1 cd	2.0 j
Curzate M-8 72WP	0.9 lb	1.1 cd	1.9 hij
+ Manzate 200DF	0.56 lb		
+ Buffer PS	1.0 pt		
Acrobat MZ	1.24 lb	1.1 cd	2.0 j
Dithane 75DF	1.6 lb	1.5 de	1.1 cde
+ Latron CS-7	1.0 pt		
Acrobat MZ	2.07 lb	1.6 ef	1.8 ghij
BAS 490 02F 50W	0.2 lb	1.7 ef	0.4 b
RH-7281 2F	0.125 lb	1.8 efg	1.6 fghij
+ Dithane 75DF	1.2 lb		
+ Latron CS-7	1.0 pt		
Aliette 80WDG	4.0 lb	1.9 efg	1.7 fghij
BAS 490 02F 50W	0.1 lb	2.0 fgh	0.3 ab
BAS 490 02F 50W	0.3 lb	2.1 gh	0.1 a
Azoxystrobin 80WG	0.25 lb	2.1 gh	1.1 cd
+ Latron B-1956	0.5 pt		
RH-7281 2F	0.25 lb	2.4 hi	1.4 def
+ Latron CS-7	1.0 pt		
RH-7281 2F	0.125 lb	2.6 ij	1.6 fghi
+ Latron CS-7	1.0 pt		
Propamocarb 6EC	0.75 lb	3.0 jk	1.9 ij
Propamocarb 6EC	1.12 lb	3.0 jk	1.5 fgh
Propamocarb 6EC	1.5 lb	3.1 k	1.4 def
Microthiol 80 WDG	4.8 lb	3.3 k	1.0 c
Nontreated control	-------	4.7 l	1.8 ghij

* Values in each column followed by a different letter are significantly different ($P=0.05$) according to the Duncan-Waller K-ratio test.