Downy and Powdery Mildew of Lettuce: Comparison of Chemical Management Tools in 1997

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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 1997. A very low level of downy mildew occurred during this trial; however, all treatments significantly reduced the number of leaf lesions compared to nontreated lettuce plants. Powdery mildew was quite intense at crop maturity and was significantly lower, compared to nontreated lettuce, on plants treated with Microthiol Special, BAS 490 + Bravo Weather Stik, Quadris, and two additional treatments not usually found to reduce this disease.

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 management of disease is achieved by having fungicidal protection in place when environmental conditions become favorable for disease development and before the appearance of the pathogens on the leaves. In an attempt to increase the number of fungicides available to growers for management of these diseases, a field trial was initiated in 1996-97 to test the efficacy of potential new fungicides.

Materials and methods

This trial was conducted at the Yuma Valley Agricultural Center. Lettuce "Coolguard" was seeded October 30, 1996 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 on December 2, 1996. Treatment beds were separated by single nontreated beds. Fungicides were applied to the downy and powdery mildew plots on January 8, 24 and February 7, 1997. 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, 1996, 58-80, 31-66;

January, 1997, 58-80, 33-57; February, 66-82, 34-52; March 1-10, 68-92, 36-58. Total rainfall (in.) was as follows: December, 0.00; January, 0.44; February, 0.07, March 1-10, 0.00. Furrow irrigation was used until January 8, 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 (Mar 8) by counting the number of leaf lesions caused by the pathogen on 10 plants randomly selected from each of the five replicate plots per treatment. 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

The data generated from this study are presented in Table 1. This trial was initiated to evaluate fungicides for management of downy and powdery mildew of lettuce. A very low level of downy mildew occurred in this study; however, all treatments significantly reduced the level of disease compared to nontreated lettuce plants. Powdery mildew was quite severe and Microthiol Special, Quadris, BAS 490 + Bravo Weather Stik, Maneb + Propamocarb and Maneb + Dimethomorph significantly reduced the severity of this disease on lettuce compared to no treatment. A month elapsed between the last fungicide treatment and rating of powdery mildew disease severity at crop maturity. Application of an additional treatment during this time likely would have resulted in improved overall control of powdery mildew. No phytotoxicity was evident in any plots treated with fungicides.

The fungus that causes downy mildew is very different than the fungus that causes powdery mildew, and normally a fungicide with activity against one of these organisms will have no effect against the other pathogen. However, this study indicates that Quadris has strong activity against both the downy and the powdery mildew pathogens. These trials have 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. Results of 1997 field trial to evaluate fungicides for management of downy and powdery mildew of lettuce. Michael Matheron and Martin Porchas, Yuma Agricultural Center, University of Arizona.

Treatment	Rate (a.i./A)	Downy mildew leaf lesions per 10 plants	Powdery mildew disease rating
Dithane 75DF	1.6 lb.	0.0 a	2.2 efg
Maneb 75DF + Microthiol 80DF	1.5 lb. + 4.8 lb	0.0 a	1.6 ab
Microthiol 80DF	4.8 lb.	0.2 ab	1.5 a
Propamocarb 6EC + Maneb 75DF (First 2 applic.); Propamocarb 6EC (Third applic.)	1.0 lb. + 1.5 lb. 1.5 lb.	0.4 abc	1.9 cd
Curzate M-8 72WP + Manzate 200DF + Buffer PS	1.08 lb. + 0.75 lb. + 1.0 pt.	0.4 abc	2.3 fgh
Quadris 80WG + Latron B-1956 0.06% v/v	0.25 lb. + 0.48 pt.	0.4 abc	1.8 bc
RH-131946 50WDG + Dithane 75DF + Latron CS-7	0.1 lb + 1.6 lb. + 0.48 pt.	0.6 abc	2.4 gh
Ridomil Gold 45WP + Maneb 75DF	0.10 lb. + 1.5 lb.	0.8 abc	2.3 fgh
Maneb 75DF	1.5 lb.	0.8 abc	2.4 gh
Maneb 75DF (First 2 applic.); Propamocarb 6EC (Third applic.)	1.5 lb. 1.0 lb.	0.8 abc	1.9 cd
EXP10623A 4.17SC + Aliette 80WG + Potassium carbonate 100WP	0.178 lb. + 1.6 lb. + 1.2 lb.	0.8 abc	2.4 gh
Aliette 80WG + Potassium carbonate 100WP	1.6 lb. + 1.2 lb.	1.0 abc	2.3 fgh
EXP10623A 4.17SC + Aliette 80WG + Potassium carbonate 100WP	0.268 lb. + 1.6 lb. + 1.2 lb.	1.0 abc	2.5 h
Aliette 80WG + Maneb 75DF + Potassium carbonate 100WP	1.6 lb. + 1.5 lb. + 1.2 lb.	1.0 abc	2.3 fgh

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Table 1 (Continued). Results of 1997 field trial to evaluate fungicides for management of downy and powdery mildew of lettuce. Michael Matheron and Martin Porchas, Yuma Agricultural Center, University of Arizona.

Treatment	Rate (a.i./A)	Downy mildew leaf lesions per 10 plants	Powdery mildew disease rating
TABLE CONTINUED FROM PRECEDING PAGE			
Trilogy 90EC	0.9 gal.	1.2 abc	2.2 efg
EXP10623A 4.17SC + Aliette 80WG + Potassium carbonate 100WP	0.089 lb. + 1.6 lb. + 1.2 lb.	1.2 abc	2.4 gh
Maneb 75DF (First 2 applic.); Propamocarb (Third applic.)	1.5 lb. 1.5 lb.	1.2 abc	2.3 fgh
Acrobat MZ 69WP	1.55 lb.	1.2 abc	2.3 fgh
RH-131946 50WDG + Dithane 75DF + Latron CS-7	0.2 lb. + 1.6 lb. + 0.48 pt.	1.2 abc	2.1 def
Propamocarb 6EC	1.5 lb.	1.4 abc	1.7 abc
BAS 490 50WP	0.25 lb.	1.4 abc	2.1 def
Dimethomorph 50WP + Maneb 75DF	0.2 lb. + 1.5 lb.	1.4 abc	2.0 cde
BAS 490 50WP + Bravo Weather Stik 720L	0.15 lb. + 1.12 lb.	1.6 abc	1.5 a
RH-140195 80W	1.8 lb.	1.6 abc	2.3 fgh
Maneb 75DF (First 2 applic.); Aliette 80WG (Third applic.)	1.5 lb. 3.2 lb.	1.8 bc	2.3 fgh
Curzate M-8 72WP + Manzate 200DF + Buffer PS	0.9 lb. + 0.56 lb. + 1.0 pt.	1.8 bc	2.3 fgh
BAS 490 50WP	0.15 lb.	2.0 c	2.3 fgh
Nontreated control	------	4.6 d	2.3 fgh

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