

Evaluation of Fungicide Performance for Control of Powdery Mildew on Lettuce in 2000

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Abstract

*Powdery mildew on lettuce is caused by the fungus *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 2000. Powdery mildew appeared in our plots by Feb 9 and reached high levels by plant maturity on Mar 2. Nontreated lettuce plants were heavily infected with powdery mildew at plant maturity, whereas the disease ranged from low to virtually nonexistent levels in plots treated with BAS 500, Quadris+Actigard, Flint, Flint+Actigard, Flint alternated (alt.) with Trilogy, Rally, Microthiol, EksPunge alt. with Microthiol, KHHUBF-99-001, Quinoxifen, Flint alt.with Serenade, Rally alt. with Serenade, and Serenade alt. with Microthiol. These compounds have various modes of action, and some could be available for "organic" production. The future 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 products of importance for this crop.*

Introduction

Powdery mildew, caused by the fungus *Erysiphe cichoracearum*, has normally appeared on spring lettuce during March and April in western Arizona, when moderate to warm temperatures and dry environmental conditions prevail. However, during the 1998-99 production season, some powdery mildew was detected as early as December and January, then became prevalent and increasingly severe from February through April. In the 1999-2000 production season, powdery mildew on lettuce again was detected in December; however, final disease severity was high but not as severe and widespread as in 1998-99.

Successful control of powdery mildew requires the presence of an effective fungicide on plants before onset of the disease. 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 95°F. 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 November 2, 1999 in double rows 12 inches apart on beds with 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 December 15 to a 12 inch spacing. Treatment beds were separated by single nontreated beds. Fungicide treatments were applied with a tractor-mounted boom sprayer (flat-fan nozzles spaced 12 inches apart) that delivered 50 gallons/acre at 100 psi. Foliar applications of materials were made January 18 and February 2, 9, and 16, 2000, depending on the treatment. Maximum and minimum ranges (°F) of air temperature were as follows: December 1999, 64-78, 33-53; January 2000, 64-83, 33-54; February, 64-82, 38-57; March 1-2, 73-76, 44-52. Maximum and minimum ranges (%) for relative humidity were as follows: December 1999, 38-91, 12-27; January 2000, 52-98, 13-38; February, 65-100, 15-51; March 1-2, 74-92, 19-28. Total rainfall of 0.05 inches fell on one day, February 21. Furrow irrigation was used for the duration of this trial. The severity of powdery mildew caused by *Erysiphe cichoracearum* was determined at plant maturity (from Feb. 29 to Mar. 2) by rating 10 plants randomly selected from each of the five replicate plots per treatment using the following rating system: 0 = no powdery mildew colonies present on plant; 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 lettuce head. Yield loss due to rejected lettuce heads normally would begin to occur on plants with a rating above 2.0.

Results and Discussion

Nontreated lettuce plants were heavily infected with powdery mildew at plant maturity, whereas the disease ranged from low to virtually nonexistent levels in plots treated with BAS 500, Quadris+Actigard, Flint, Flint+Actigard, Flint alternated (alt.)with Trilogy, Rally, Microthiol, EksPunge alt. with Microthiol, KHHUBF-99-001, Quinoxifen, Flint alt.with Serenade, Rally alt. with Serenade, and Serenade alt. with Microthiol. No phytotoxicity was evident in any plots treated with fungicides.

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.

These compounds have various modes of action, and some could be available for "organic" production. If continued efficacy is demonstrated and registration is granted for use on lettuce, then the destructive effects of powdery mildew on lettuce may be managed by application of these materials in an effective disease management program, both for conventional and organic production.

Table 1. 2000 Powdery mildew of lettuce fungicide trial.

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Treatment	Rate (lb a.i./A)	Treatment dates *	Disease rating
Kaligreen 82WP + Latron B-1956 alternated with Kaligreen + Latron + Rally 40W	2.5 + 0.24 pt or 2.5 + 0.24 pt +0.12	1,3 2,4	0.1
Microthiol 80DF	8.0 lb	1,2,4	0.1
Rally 40W	0.063	1,2,4	0.1
Rally 40W	0.125	1,2,4	0.1
Rally 40W alt. with Serenade WP	0.12 or 2.0	1,2,4	0.1
Rally 40W alt. with Serenade WP	0.12 or 4.0	1,2,4	0.1
Serenade WP + Microthiol 80DF	2.0 + 4.0	1,2,3,4	0.1
Serenade WP + Microthiol 80DF	4.0 + 4.0	1,2,3,4	0.1
Serenade WP alt. with Microthiol 80DF	2.0 or 8.0	1,2,3,4	0.1
EKsPunge 100WP alt. with Microthiol 80DF	4.0 or 8.0	1,2,3,4	0.2
Serenade WP alt. with Microthiol 80DF	4.0 or 8.0	1,2,3,4	0.2
Quinoxifen (250 g/l)	0.167	1,2,4	0.2
Flint 50WG	0.047	1,2,4	0.4
Actigard 50WG + Flint 50WG	0.016 + 0.047	1,2,4	0.4
KHHUBF-99-001	0.5 gal	1,2,4	0.4
KHHUBF-99-001	0.25 gal	1,2,4	0.5
BAS 500 20WG	0.25	1,2,4	0.7
Flint 50WG	0.062	1,2,4	0.7
Actigard 50WG + Quadris 25SC	0.016 + 0.25	1,2,4	0.7
BAS 500 20WG	0.15	1,2,4	0.9

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Table 1 (continued). 2000 Powdery mildew of lettuce fungicide trial.

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Treatment	Rate (lb a.i./A)	Treatment dates *	Disease rating
TABLE CONTINUED FROM PRECEDING PAGE			
Flint 50WG alt. with Serenade WP	0.06 or 2.0	1,2,4	0.9
Flint 50WG alt. with Serenade WP	0.06 or 4.0	1,2,4	0.9
Flint 50WG alt. with Trilogy 70EC	0.062 or 0.35 gal	1,2,4	0.9
EksPunge 100WP + Latron B-1956	4.0 + 0.24 pt	1,2,3,4	1.1
Kaligreen 82WP + Latron B-1956	2.5 + 0.24 pt	1,2,3,4	1.1
Actigard 50WG	0.03	1,2,4	1.2
Actigard 50 WG alt. with Trilogy 70EC	0.03 or 0.35 gal	1,2,4	1.3
EKsPunge 100WP	4.0	1,2,3,4	1.3
Quadris 25SC	0.25	1,2,4	1.4
Serenade WP	2.0	1,2,3,4	1.4
Serenade WP	4.0	1,2,3,4	1.7
Trilogy 70EC	0.35 gal	1,2,4	2.2
Nontreated	-----		3.7
LSD (Least Significant Difference, $P=0.05$)			0.2

* Treatment dates: 1 = Jan. 18; 2 = Feb. 2; 3 = Feb. 9; 4 = Feb. 16. Small powdery mildew colonies (1-2 mm in diameter) were first observed on plants Feb. 9, 2000.