

Field Evaluation of Potential New Fungicides for Control of *Sclerotinia* Leaf Drop of Lettuce in 1994 and 1995

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Abstract

Leaf drop of lettuce is caused by the plant pathogenic fungi Sclerotinia minor and S. sclerotiorum. Cool and moist environmental conditions favor disease development. Potential new fungicides were evaluated in field trials for control of this disease in 1994 and 1995. In the 1994 trial, Fluazinam and Topsin M provided significant decrease of disease and significant increase in marketable yield compared to no treatment in plots infested with Sclerotinia minor or S. sclerotiorum. In 1995, Fluazinam, Topsin M, and two compounds from Ciba significantly reduced disease caused by Sclerotinia minor and increased marketable yield of treated lettuce when compared to nontreated plots.

Introduction

Leaf drop of lettuce, caused by *Sclerotinia minor* and *S. sclerotiorum*, occurs every year in Arizona lettuce fields. As with other fungal diseases of vegetable crops, environmental conditions have a critical effect on the development of disease. Cool moist conditions favor development of leaf drop; therefore, the incidence of this disease is highest during the months of December through early March. To repress leaf drop, fungicides need to be applied to the plant bed when the lettuce seedlings are very small, so that an effective chemical barrier is established between the soil and the developing leaf canopy of the lettuce plant. With this chemical barrier in place, the bottom leaves and stem of each lettuce plant will be protected from colonization by the germinating sclerotia of the pathogens that cause leaf drop. In an attempt to increase the number of fungicides available to growers for control of leaf drop, field trials were initiated in 1994 and 1995 to test the efficacy of potential new fungicides for disease control.

Materials and methods

These trials were conducted at the Yuma Valley Agricultural Center. Sclerotia of *Sclerotinia minor* were produced in 0.25 pt. glass flasks containing 15-20 sterilized 0.5 in. cubes of potato by seeding the potato tissue with mycelia of the fungus. After incubation for 4-6 wk. at 68 F, mature sclerotia were separated from residual potato tissue by washing the contents of each flask in running tap water within a soil sieve. Sclerotia were air-dried at room temperature, then stored at 40 F until needed. Inoculum of *Sclerotinia sclerotiorum* was produced in 2 qt. glass containers by seeding moist sterilized barley grain with sclerotia of this fungus. After 3 months incubation at 75-81 F in the laboratory, abundant sclerotia were formed. The contents of each container were removed, spread on a clean surface and dried. The resultant mixture of sclerotia and infested grain was used as inoculum.

For the 1994 trial, lettuce (Coolguard) was seeded November 2, 1993 in double rows 12 in. apart on beds 40 in. wide. Lettuce was thinned at the 3-4 leaf stage to a 12 in. spacing (December 12, 1993). On December 13, 0.1 oz. of sclerotia of *S. minor* was distributed evenly on each lettuce bed in a band 12 in. wide and 15 ft. long, while

0.5 pt. of the dried inoculum of *S. sclerotiorum* was distributed on each lettuce bed in a band 12 in. wide and 25 ft. long. Fungicides were applied December 15, 1993 and January 6, 1994 to the surface of inoculated beds with a tractor-mounted boom sprayer (D2 31 fine-screen nozzles spaced 12 in. apart) that delivered 100 gal/acre at 100 psi. Treatments were replicated 5 times in a randomized complete block design. Each replicate consisted of 15 or 25 ft. of bed, which contained two rows of lettuce. Treatment beds were separated by single nontreated but inoculated beds. For the 1994 trial, mean soil temperature (F) at the 2-4 inch depth was as follows: December 1993, 54; January 1994, 56; February, 60; March, 67. Total rainfall (in.) was as follows: December, 0.00; January, 0.01; February, 0.31, March 1-8, 0.08. Furrow irrigation was used for the duration of this trial. Leaf drop was monitored by recording the number of collapsed lettuce plants. The percentage of marketable heads was determined at the conclusion of the trial at plant maturity (March 8).

In the 1995 trial, lettuce (Barnburner) was seeded November 2, 1994. Plots were inoculated with *Sclerotinia minor* as described earlier by sprinkling 3.6 grams of sclerotia of *S. minor* on the surface of each 20-ft-long plot between the rows of lettuce. Treatments were applied December 15, 1994 and again January 9, 1995. During the 1995 trial, mean soil temperature (F) at the 2-4 inch depth was as follows: December 1994, 57; January 1995, 56; February, 65; March, 70. Total rainfall (in.) was as follows: December, 1.77; January, 0.58; February, 0.17; March 1-9, 0.02. Plants were rated as in 1994 at the conclusion of the trial at plant maturity (March 9).

Results and Discussion

The results of the 1994 study are presented in Tables 1 and 2 while the results for the 1995 trial are presented in Table 3. Most of the tested materials significantly reduced the incidence of lettuce drop and increased the number of marketable heads compared to plots receiving no chemical treatment. The 1995 trial included one treatment utilizing a potential biological control agent (the bacterium *Pseudomonas cepacia*) which did not demonstrate a significant amount of disease control in this study. No symptoms of phytotoxicity were evident in any of the treatments within this trial. These tests have identified some new materials that might increase the chemical disease control options for leaf drop of lettuce in the future. Further evaluation of potential new fungicides for control of lettuce diseases is planned for next year.

TABLE 1. Results of 1994 field trial to evaluate fungicides for control of leaf drop of lettuce caused by *Sclerotinia minor*. Michael Matheron and Martin Porchas, Yuma Agricultural Center, University of Arizona.

Treatment	Rate (product/A)	Number of diseased heads per plot*	Number of marketable heads per plot*
Fluazinam 500F 2 applic./no incorp.	15.4 fl. oz.	2.6 a**	17.4 cd**
Fluazinam 500F 2 applic./no incorp.	30.7 fl. oz.	2.6 a	18.6 de
Fluazinam 500F 1 applic./incorp.***	30.7 fl. oz.	2.6 a	20.8 fg
Ronilan, then Topsin M 1 applic. of each	1.5 lb.	4.8 b	22.2 g
Fluazinam 500F 1 applic./incorp.***	15.4 fl. oz.	5.6 bc	21.2 fg
Topsin M + Microthiol 2 applications	1.5 + 3.0 lb.	5.6 bc	19.8 ef
Rovral 4F 2 applications	24.0 fl. oz.	6.4 bcd	20.0 ef
Topsin M 2 applications	1.5 lb.	7.2 bcde	19.2 e
Ronilan 50DF 2 applications	1.5 lb.	7.8 cde	20.0 ef
Topsin M, then Ronilan 1 applic. of each	1.5 lb.	9.4 def	16.2 bc
ICIA-5504 25SC 2 applications	10.8 fl. oz.	10.0 efg	15.2 b
Untreated control	-----	13.6 g	12.6 a

* Average number of heads per 15 ft. plot.

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

*** Treatment applied to bed surface, then incorporated into soil before seeding. All other treatments applied after thinning plus 3 weeks later and not incorporated.

TABLE 2. Results of 1994 field trial to evaluate fungicides for control of leaf drop of lettuce caused by *Sclerotinia sclerotiorum*. Michael Matheron and Martin Porchas, Yuma Agricultural Center, University of Arizona.

Treatment	Rate (product/A)	Number of diseased heads per plot*	Number of marketable heads per plot*
Fluazinam 500F 2 applications	30.7 fl. oz.	4.4 a **	30.6 g **
Fluazinam 500F 1 applic./no incorp.	30.7 fl. oz.	4.6 ab	27.2 ef
Fluazinam 500F 2 applications	15.4 fl. oz.	5.2 ab	30.6 g
Ronilan 50DF 2 applications	1.5 lb.	5.6 abc	34.8 h
Fluazinam 500F 1 applic./incorp.***	30.7 fl. oz.	6.8 abc	26.0 de
Fluazinam 500F 1 applic./incorp.***	15.4 fl. oz.	8.0 abc	30.0 g
Ronilan, then Topsin M 1 applic. of each	1.5 lb.	8.4 abc	29.4 fg
Fluazinam 500F 1 applic./no incorp.	15.4 fl. oz.	9.0 bc	29.4 fg
Rovral 4F 2 applications	24.0 fl. oz.	10.0 cd	28.2 efg
Topsin M, then Ronilan 2 applications	1.5 lb.	14.0 de	27.2 ef
Topsin M + Microthiol 2 applications	1.5 + 3.0 lb.	15.0 e	26.0 de
Topsin M 70W 2 applications	1.5 lb.	15.6 e	24.6 d
Untreated control Inoc. not incorp.	-----	20.4 f	14.2 a
ICIA-5504 25SC 2 applications	10.8 fl. oz.	20.4 f	17.8 b
Untreated control Inoc. incorp.	-----	21.2 f	20.4 c

* Average number of heads per 25 ft. plot.

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

*** Treatment applied to bed surface, then incorporated into soil before seeding. Other treatments applied after thinning plus 3 weeks later and not incorporated.

TABLE 3. Results of 1995 field trial to evaluate fungicides for control of leaf drop of lettuce caused by *Sclerotinia minor*. Michael Matheron, Iraj Misaghi, Martin Porchas, and Dominic DeCianne, Yuma Agricultural Center, University of Arizona.

Treatment	Rate (ai/A)	Number of diseased heads per plot*	Number of marketable heads per plot*
Fluazinam 500F	1.0 lb.	4.2 a**	36.0 f**
Fluazinam 500F	0.5 lb.	5.8 a	35.2 ef
Ronilan 50DF	1.0 lb.	7.0 ab	33.2 def
Topsin M 70W	1.05 lb.	8.6 abc	31.6 cdef
Fluazinam 10G***	1.0 lb.	8.8 abc	32.0 cdef
Ciba-BI.		9.0 abc	31.6 cdef
Rovral 4F	1.0 lb.	9.0 abc	31.8 cdef
Ronilan, first time; Topsin M, second time.	1.0 lb. 1.05 lb.	9.2 abc	32.2 cdef
Rovral, first time; Topsin M, second time.	1.0 lb. 1.05 lb.	11.8 bcd	28.4 bcd
Topsin M 70W + Microthiol 80DF	1.05 lb. 2.4 lb.	12.8 cd	27.0 bcd
Ciba-Gr.		12.8 cd	26.6 bc
ICIA-5504 80WG	1.0 lb.	15.4 de	23.6 ab
<i>Pseudomonas cepacia</i>		16.2 de	23.8 ab
Control	-----	19.6 e	19.4 a

* Average number of heads per 20 ft. plot.

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

*** This treatment was only applied on Jan 9, 1995, while all other treatments were applied Dec 15, 1994 as well as Jan 9, 1995.