

# Assessment of Fungicides to Manage Sclerotinia Drop of Lettuce in 2007

Michael E. Matheron and Martin Porchas

## Abstract

*Sclerotinia drop on lettuce is caused by two soil-borne fungi, Sclerotinia minor and S. sclerotiorum. This disease is favored by moist soil and moderate temperatures. Some registered products as well as new chemistries in development were compared for their ability to suppress Sclerotinia drop on lettuce during the winter vegetable growing season in 2006-2007. Sclerotia of each pathogen were incorporated into plots after lettuce thinning and just before the first application of test compounds. In plots infested with S. minor, Sclerotinia drop was reduced most effectively by some of the treatments containing boscalid, (Endura), fluazinam (Omega), Coniothyrium minitans (Contans), potassium silicate (Silmatrix), and polyoxin D (Endorse), where disease reduction compared to untreated plants ranged from 34 to 53%. In plots infested with S. sclerotiorum, disease was reduced most effectively by application of iprodione (Rovral) and Omega followed by cyprodinil+fludioxonil (Switch), where Sclerotinia drop reduction compared to untreated plants ranged from 40 to 52%. Several other treatments provided significant but lessor degrees of disease control in the presence of S. minor and S. sclerotiorum. Two applications of the biopesticide Contans significantly reduced disease in plots infested with either S. minor or S. sclerotiorum. There was no statistical difference in disease control for either pathogen between application of Endura at 50 or 100 gal/acre. Two applications of Endura resulted in significantly higher disease control compared to one application of this product for plots infested with S. sclerotiorum; however, there was no difference in plots containing S. minor. For a valid comparison of products for control of Sclerotinia drop of lettuce, it is important to compare the results obtained from more than one field study. The reader is urged to review previous studies in addition to this report to get an accurate picture of the relative efficacy of tested compounds for control of Sclerotinia drop. Fungicides are not the only tools available to growers to manage Sclerotinia drop. Cultural methods, such as soil solarization or soil flooding in the summer, as well as crop rotation, can greatly reduce the number of viable sclerotia in an infested field. Use of these cultural methods alone or in combination with fungicide treatments can result in dramatic reductions in the incidence of Sclerotinia drop of lettuce.*

## Introduction

Sclerotinia drop of lettuce is caused by two fungal pathogens, *Sclerotinia minor* and *S. sclerotiorum*. As with other fungal diseases of vegetable crops, environmental conditions govern disease development. Mild to moderate temperatures and moist soil conditions favor Sclerotinia drop; therefore, the incidence of the disease normally is highest from December through March in western Arizona lettuce fields. Application of certain fungicides to lettuce beds, usually after thinning and again about 2-3 weeks later, can significantly reduce the severity of this disease.

Conventional fungicides form a chemical barrier 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 soil-borne sclerotia of the pathogens.

Timely application of an effective fungicide can be a critical component of an overall management strategy for Sclerotinia drop. Some new products are in development that have activity on the group of plant pathogens that includes *Sclerotinia*. Two existing products, *Coniothyrium minitans* (Contans) and *Bacillus subtilis* (Serenade), are biological disease control materials consisting of a fungus and a bacterium, respectively. These biopesticides reduce disease severity by either destroying sclerotia or inhibiting their germination. A field trial was initiated during the 2006-2007 vegetable season to test and compare the efficacy of available and potentially new products on Sclerotinia drop of lettuce.

## 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%). Sclerotia of *Sclerotinia minor* were produced in 0.25 pint 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 75°F until needed. Inoculum of *Sclerotinia sclerotiorum* was produced in 2 qt glass containers by seeding moist sterilized barley seeds with mycelia of the pathogen. After 2 mo incubation at 68°F, abundant sclerotia were formed. The contents of each container were then removed, spread onto a clean surface and air-dried. The resultant mixture of sclerotia and infested barley seed was used as inoculum. 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 Dec 12 at the 3-4 leaf stage to a 12 in. spacing. Sclerotia were applied to plots after thinning on Dec 19, 2006. For plots infested with *Sclerotinia minor*, 0.13 oz (3.6 grams) of sclerotia were distributed evenly on the surface of each 25-ft-long plot between the rows of lettuce and incorporated into the top 1-inch of soil. For plots infested with *Sclerotinia sclerotiorum*, 0.5 pint of a dried mixture of sclerotia and infested barley grain was broadcast evenly over the surface of each 25-ft-long lettuce plot, again between the rows of lettuce on each bed, and incorporated into the top 1-inch of soil. Treatment beds were separated by single nontreated beds. Unless noted otherwise in the data table, treatments were applied with a tractor-mounted boom sprayer (hollow-cone nozzles spaced 12 in. apart) that delivered 50 gal/acre at 100 psi. Test materials were applied to the surface of the bed and plants on Dec 21, 2006, Jan 3, 2007, and for some treatments, Jan 12. Mean soil temperature (°F) at the 4 in. depth was as follows: Nov, 69; Dec, 56; Jan, 54; Feb, 63; Mar, 72. No rainfall was recorded for the duration of the trial. The severity of disease was determined at plant maturity (Mar 14) by recording the number of dead and dying plants in each plot. As a point of reference, the original stand of lettuce was thinned to 50 plants per plot.

## Results and Discussion

In plots infested with *S. minor*, Sclerotinia drop was reduced most effectively by some of the treatments containing boscalid (Endura), fluazinam (Omega), Contans, potassium silicate (Silmatrix), and polyoxin D (Endorse), where disease reduction compared to untreated plants ranged from 34 to 53%. In plots infested with *S. sclerotiorum*, disease was reduced most effectively by application of iprodione (Rovral) and Omega followed by cyprodinil+ fludioxonil (Switch), where Sclerotinia drop reduction compared to untreated plants ranged from 40 to 52%. Several other treatments provided significant but lesser degrees of disease control in the presence of *S. minor* and *S. sclerotiorum*, as shown in the following data table. Two applications of the biopesticide Contans significantly reduced disease in plots infested with either *S. minor* or *S. sclerotiorum*. There was no statistical difference in disease control for either pathogen between application of Endura at 50 or 100 gal/acre. Two applications of Endura resulted in significantly higher disease control compared to one application of this product for plots infested with *S. sclerotiorum*; however,

there was no difference in plots containing *S. minor*.

For a valid comparison of products, number of applications, etc, for control of Sclerotinia drop of lettuce, it is important to compare the results obtained from more than one field study. The reader is urged to review previous studies in addition to this report to get a true picture of the relative efficacy of compounds for control of Sclerotinia drop.

Fungicides are not the only tools available to growers to manage Sclerotinia drop. Cultural methods, such as soil solarization or soil flooding in the summer, as well as crop rotation, can greatly reduce the number of viable sclerotia in an infested field. Use of these cultural methods alone or in combination with fungicide treatments can result in dramatic reductions in the incidence of Sclerotinia drop of lettuce.

**2006-2007 Sclerotinia Drop of Lettuce Fungicide Trial**

Mike Matheron and Martin Porchas, The University of Arizona, Yuma Agricultural Center, Yuma, AZ

Treatment	Method of application <sup>1</sup>	Rate of product per acre	Treatment dates <sup>2</sup>	Number of diseased plants per 25 ft plot <sup>3</sup>	
				<i>Sclerotinia minor</i>	<i>Sclerotinia sclerotiorum</i>
Endura 70WG	Soil spray @ 100 gpa	0.69 lb	1,2	10.4	24.0
Endura 70WG	Soil spray @ 50 gpa	0.69 lb	1,2	11.4	28.2
Endura 70WG	Soil spray @ 50 gpa	0.69 lb	2	12.2	41.4
Omega 500F	Soil spray @ 50 gpa	1.5 pt	1	13.2	24.0
Contans WG	Soil drench	4.0 lb	1,2	13.4	32.0
Silmatrix	Soil spray @ 50 gpa	1.0 gal	1,2,3	13.8	37.8
Silmatrix	Soil drench	0.5 gal	1,2,3	13.8	35.2
Endorse	Soil spray @ 50 gpa	6.2 oz	1,2	14.4	25.6
Contans WG	Soil drench	4.0 lb	1	14.6	30.8
Silmatrix	Soil drench	1.0 gal + 1.0 qt	1,2,3	15.6	37.2
+ Yucca extract					
Omega 500F	Soil spray @ 50 gpa	1.5 pt	1		
Switch 62.5WG	Soil spray @ 50 gpa	0.88 lb	2	15.8	18.4
Contans WG	Soil drench	4.0 lb + 4.0 qt	1	15.8	32.2
+ Serenade MAX					
Contans WG	Soil drench	4.0 lb	1		
Serenade MAX	Soil drench	2.0 lb	2	16.0	35.6
Serenade MAX	Soil drench	2.0 lb	1		
Endura 70WG	Soil spray @ 50 gpa	0.69 lb	2	16.0	37.2
Endorse	Soil spray @ 50 gpa	12.5 oz	1,2	16.2	40.8
Silmatrix	Soil drench	1.5 gal	1,2,3	16.6	40.6
Silmatrix	Soil drench	1.0 gal	1,2,3	16.6	34.6
Contans WG	Soil drench	4.0 lb + 2.0 lb	1		
+ Serenade MAX		0.69 lb		16.8	27.0
Endura 70WG	Soil spray @ 50 gpa		2		
Serenade MAX	Soil drench	2.0 lb	1	16.8	40.6
Serenade MAX	Soil drench	2.0 lb	1,2	18.6	37.4
Contans WG	Soil drench	4.0 lb	1		
Endura 70WG	Soil spray @ 50 gpa	0.69 lb	2	19.2	30.2
Omega 500F	Soil spray @ 50 gpa	1.0 pt	1		
Switch 62.5WG	Soil spray @ 50 gpa	0.88 lb	2	19.6	32.2
Rovral 4F	Soil spray @ 50 gpa	1.0 qt	1,2	19.8	22.8
<b>Untreated control</b>	-----	-----	-----	<b>22.0</b>	<b>38.0</b>
<b>LSD (Least Significant Difference, P = 0.05)</b>				<b>4.1</b> <sup>4</sup>	<b>5.1</b> <sup>4</sup>

1. Soil drenches were applied to the bed surface between lettuce rows in 1.0 gal of water per plot. An additional 1.0 gal of water was applied to further incorporate the product into the soil. This application method was intended to simulate incorporation of the product into the bed by sprinkler irrigation. The soil spray applications were made to the bed surface without further application of water.
2. Test materials were applied to the surface of the bed and plants on 1) Dec 21, 2006; 2) Jan 3, 2007; 3) Jan 12.
3. Disease assessment was performed at crop maturity on Mar 14, 2007. Each 25 ft. plot contained 50 plants. All diseased plants were dead or dying.
4. Least Significant Statistical Difference (LSD) at  $P = 0.05$ . Values in each column differing by more than the LSD are significantly different.