

Effect of Fungicides and Lettuce Cultivar on Severity of Botrytis Gray Mold: 2007 Study

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Abstract

Gray mold, caused by the fungus *Botrytis cinerea*, usually has been considered a minor disease in field-grown lettuce. However, for the past two lettuce production seasons, the incidence of this disease has increased significantly in Southwestern Arizona lettuce fields. Most of the infected fields were planted to romaine lettuce; however, some iceberg lettuce plantings were involved as well. The occurrence of gray mold was most prevalent during February and March. The primary symptoms of the disease include plant wilting accompanied by a fuzzy gray growth at the plant base, which contains masses of airborne spores. Sclerotia may also be present on infected tissue. Infected plants that show these symptoms usually wilt and die. *Botrytis cinerea* can survive on crop debris, as a pathogen on numerous crops and weed hosts, and as sclerotia in soil. Airborne spores that land on senescent or damaged lettuce stems and leaves germinate and rapidly colonize this tissue. Once established, the pathogen grows into adjacent healthy stems and leaves. A field trial was established to 1) evaluate the effectiveness of some fungicides to reduce the incidence of *Botrytis* gray mold and 2) compare the susceptibility of some lettuce cultivars to this disease. *Botrytis* gray mold did not develop in plots of the crisphead cultivar 'Winterhaven'; however, the disease was present in all plots planted with cultivars of romaine lettuce. Among the tested romaine cultivars, *Botrytis* gray mold incidence was lowest in 'A 35585-1', 'Fresh Heart' and 'Rome 59' in untreated plots as well as in plots treated four times with the fungicides Rovral, Endura, or Switch. On the other hand, disease incidence was highest on the cultivar 'Green Towers' in untreated plots as well as those treated with one of the three tested fungicides. To compare the ability of tested fungicides to control *Botrytis* gray mold, the disease incidence values for each of the five romaine cultivars treated with each specific fungicide were pooled together and compared to disease levels recorded on untreated plants. Foliar applications of treatments were made Jan 24, Feb 1, Feb 16 and Feb 28, 2007. A 31% reduction in disease was recorded on romaine lettuce plants treated with Switch, whereas a 17% reduction in *Botrytis* gray mold was observed on plants treated with Endura. Rovral did not significantly reduce *Botrytis* gray mold in this trial. Additional field trials are planned to verify these initial findings.

Introduction

Gray mold, caused by the fungus *Botrytis cinerea*, usually has been considered a minor disease in field-grown lettuce. However, for the past two lettuce production seasons, the incidence of this disease has increased significantly in Southwestern Arizona lettuce fields. Most of the infected fields were planted to romaine lettuce; however, some iceberg

lettuce plantings were involved as well. The occurrence of gray mold was most prevalent during February and March. The primary symptoms of the disease include plant wilting accompanied by a fuzzy gray growth at the plant base, which contains masses of airborne spores. Sclerotia may also be present on infected tissue. Infected plants that show these symptoms usually wilt and die. *Botrytis cinerea* can survive on crop debris, as a pathogen on numerous crops and weed hosts, and as sclerotia in soil. Airborne spores that land on senescent or damaged lettuce stems and leaves germinate and rapidly colonize this tissue. Once established, the pathogen grows into adjacent healthy stems and leaves.

Since gray mold in the past has normally been considered a minor disease on lettuce, specific management tools, including the use of fungicides, have not been tested recently. *Botrytis cinerea*, the cause of gray mold, and *Sclerotinia minor* and *S. sclerotiorum*, the causal agents of lettuce drop, are closely related; therefore, fungicides active against *Sclerotinia* usually are active against *Botrytis* as well. However, it is not known which particular fungicides and timing of applications would be most effective in managing gray mold. Secondly, there may be useful differences among lettuce cultivars with respect to susceptibility to gray mold. The increasing acreage devoted to production of romaine lettuce, use of wide-bed plantings and sprinkler-irrigation are creating environmental conditions extremely favorable for development of *Botrytis* gray mold. The tremendous amount of spores produced on these infected plants can be easily moved in the air from these sites to nearby healthy lettuce plants, facilitating rapid disease development. The objectives of this study were to 1) evaluate the effectiveness of some fungicides to reduce the incidence of *Botrytis* gray mold and 2) compare the susceptibility of some lettuce cultivars to this disease.

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%). The crisphead lettuce cultivar 'Winterhaven' as well as the romaine cultivars 'Green Towers', 'Rubicon', 'Rome 59', 'Fresh Heart' and 'A 35585-1' were 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 at the 3-4 leaf stage to a 12 in. spacing. Treatment beds were separated by single nontreated beds. Treatments were applied with a tractor-mounted boom sprayer that delivered 50 gal/acre at 100 psi to hollow-cone nozzles spaced 12 in. apart. Foliar applications of treatments were made Jan 24, Feb 1, Feb 16 and Feb 28, 2007. Maximum and minimum ranges (°F) of air temperature were as follows: Dec, 2006, 58-77, 29-50; Jan, 2007, 49-77, 22-50; Feb, 63-83, 36-53; Mar 1 to 15, 66-94, 33-56. Maximum and minimum ranges (%) for relative humidity were as follows: Dec 2006, 20-94, 4-38; Jan 2007, 36-96, 8-34; Feb, 58-90, 7-31; Mar 1 to 15, 44-85, 5-12. No rainfall occurred during this trial. The incidence of disease was determined at plant maturity (Mar 14) by recording the number of dead and dying plants in each plot that had symptoms of *Botrytis* gray mold. As a point of reference, the original stand of lettuce was thinned to 50 plants per plot.

Results and Discussion

Botrytis gray mold did not develop in plots of the crisphead cultivar 'Winterhaven'; however, the disease was present in all plots planted with cultivars of romaine lettuce. Among the tested romaine cultivars, *Botrytis* gray mold incidence was lowest in 'A 35585-1', 'Fresh Heart' and 'Rome 59', in untreated plots as well as in plots treated four times with the fungicides Rovral, Endura, or Switch. On the other hand, disease incidence was highest on the cultivar 'Green Towers' in untreated plots as well as those treated with one of the three fungicides. To compare the ability of tested fungicides to control *Botrytis* gray mold, the disease incidence values for each of the five romaine cultivars treated with each specific fungicide were pooled together and compared to disease levels recorded on untreated plants. A 31% reduction in disease was recorded on romaine lettuce plants treated with Switch, whereas a 17% reduction in *Botrytis* gray mold was observed on plants treated with Endura. Rovral did not significantly reduce *Botrytis* gray mold in this trial. Additional field trials are planned to verify these initial findings.

2006-2007 Botrytis Gray Mold Fungicide and Lettuce Cultivar Evaluation Trial

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Lettuce cultivar	Mean number of plants per 25 ft plot with Botrytis gray mold ¹			
	Untreated plants	Rovral 4F @ 1.0 qt of product/acre	Endura 70WG @ 0.69 lb product/acre	Switch 62.5WG @ 0.875 lb product/acre
Winterhaven	0 ²	0	0	0
A 35585-1	5.8 b ³	5.2 b	4.6 c	3.8 c
Fresh Heart	6.2 b	6.0 b	5.0 bc	4.2 bc
Rome 59	6.8 b	6.2 b	5.4 bc	4.8 bc
Rubicon	7.2 ab	6.6 b	6.4 ab	5.2 ab
Green Towers	8.8 a	9.2 a	7.8 a	6.2 a
All cultivars combined	7.0 A ⁴	6.6 A	5.8 B	4.8 C

1 Treatment dates: 1 = Jan 24; 2 = Feb 1; 3 = Feb 16; 4 = Feb 28, 2007. Disease incidence data collected Mar 14.

2 No Botrytis gray mold developed on the crisphead cultivar ‘Winterhaven’ in this trial. This cultivar was not included in the statistical analysis of data.

3 Values in each column followed by a different lower case letter are significantly different (LSD test, $P = 0.05$).

4 Values in this row followed by a different upper case letter are significantly different (LSD test, $P = 0.05$).