

## Activity of Fungicides and Biological Control Agents against Garlic White Rot, Fresno Co., 2008

Thomas Turini, Larry Schwankl, Michael Davis, James Gerik, Kurt Hembree, Richard Molinar

In the San Joaquin Valley of California over 13,000 acres are infested with *Sclerotium cepivorum*. Growers typically avoid planting allium crops in infested fields, and some growers have very few fields that are not infested. To examine potential components of a control program, two trials were conducted in a Fresno County, CA commercial field infested with *Sclerotium. cepivorum* (114 sclerotia/kg soil sampled 27 Sep 2007). Efficacy of chemical/biological control agents applied in the planting trench were evaluated: In a separate trial, the effect of control programs including an application at planting in combination with multiple fungicide applications through buried drip were assessed. The experimental design of the efficacy trial was a five replication randomized complete block design. Materials compared were Endura 6.8 oz, Folicur 20.5 fl oz with and without WatermaxxII 2 qts, Cannonball 50WP 8.0 oz with and without WatermaxxII 2 qts, Cannonball 50WP 4.0 oz, Moncut 2.86 lbs, *Glomes intrardices* 30.0 lbs, Contans 2, 4 and 8 lbs and an untreated control. The experimental design of the control programs trial was a 5 replication split block; drip application programs were the main plot treatments and the at-planting applications were the sub plot treatments. The main plot treatments included a) Cannonball 8.0 oz on 15 Feb and Folicur 20.5 on 7 Mar, b) Cannonball 8.0 oz on 15 Feb, Folicur 20.5 on 7 Mar and Endura 6.8 oz on 27 Mar, c) Folicur 20.5 on 15 Feb, Cannonball 8.0 oz on 7 Mar and Endura 6.8 oz on 27 Mar, and d) untreated control. In both studies, California Late garlic was planted in two seed lines per 40" bed at a rate of 6.3 lbs of seed per 30 ft plot on 20 Nov 2007. On 21 Nov, the field was sprinkler irrigated. All at-planting treatments were applied with a CO<sup>2</sup>-pressurized back pack sprayer in the equivalent of 25 gallons of water per acre. The spray was applied in a 4 to 5 inch band directly into the 2-3 inch-deep trench 5 to 30 minutes before the garlic cloves were placed in the trench. After establishment, the field was irrigated with drip tape (510-12-220) placed at the center of each bed. All drip applied materials were pump injected over a 45 to 60 minute period. On 7 and 15 Feb, 50 cloves were collected from untreated buffers, surface sterilized in 0.25% sodium hypochlorite for 1 to 2 minutes and placed on a wire mesh over water in plastic containers and incubated at 72°F. After three weeks of incubation, *S. cepivorum* was present on 2 cloves sampled on 7 Feb and 1 clove sampled on 15 Feb. On 23 Apr and 14 May, each plot was rated for typical above-ground white rot symptoms including plant death and leaf dieback. Twenty-five ft of each single-bed plot was mechanically harvested on 22 Aug, for the control programs trial and on 23 Aug for the efficacy trial. Garlic remained in bags in the field and were re-weighed on 3 Sep.

In the efficacy trial, only Folicur with or without WatermaxxII, Endura, and Cannonball at 8.0 oz with or without the WatermaxxII consistently had lower disease ratings and higher yields than the untreated control. In the control programs trial, all at-planting applications reduced disease as compared to the untreated control except for Contans. However, none of the drip applied programs reduced disease severity, which may be attributable to infection that occurred prior to the first application through the drip.

**Table 1. Influence of fungicide programs incorporating at planting and drip applications on white rot severity**

<b>Treatment</b>			<b>Severity (0-10)</b>		<b>Weights (tons/acre)</b>	
<b>Material applied at planting</b>			<b>23 Apr</b>	<b>14 May</b>	<b>Fresh wt<sup>z</sup></b>	<b>Dry wt<sup>y</sup></b>
Cannonball 8.0 oz + Botran 5F 102 oz			1.25 c <sup>x</sup>	1.70 b	5.51 a	5.21 a
Folicur 20.5 oz			2.20 b	2.15 b	5.23 a	4.90 a
Cannonball 8.0 oz			1.70 bc	2.30 b	5.29 a	4.14 a
Untreated control			3.10 a	4.15 a	3.01 b	2.53 b
Contans 4 lbs			3.70 a	4.90 a	2.54 b	2.44 b
<b>Date of application and materials applied</b>			<b>Severity (0-10)</b>		<b>Weights (tons/acre)</b>	
<b>15 Feb</b>	<b>7 Mar</b>	<b>27 Mar</b>	<b>23 Apr</b>	<b>14 May</b>	<b>Fresh wt</b>	<b>Dry wt</b>
Cannonball 8.0oz	Folicur 20.5 oz		2.52	3.00	4.63	3.82
Cannonball 8.0oz	Folicur 20.5 oz	Endura 6.8 oz	2.40	3.28	4.26	3.82
Folicur 20.5 oz	Cannonball 8.0oz	Endura 6.8 oz	2.24	3.00	4.43	3.91
Untreated control			2.40	3.28	4.07	3.83
			NS <sup>w</sup>	NS	NS	NS

<sup>z</sup> Fresh weight was taken on date harvested, 22 Aug.

<sup>y</sup> Dry weight was taken 12 days after harvest, on 3 Sep

<sup>x</sup> Means followed by the same letter within a column are not significantly different (P=0.05)

<sup>w</sup> Means in column above NS are not significantly different (P=0.05)

**Table 2. Efficacy of materials applied at planting on white rot symptom severity.**

<b>Treatment (rate of formulated product per acre, applied in planting furrow)</b>	<b>Severity (0-10)</b>		<b>Weights (tons/acre)</b>	
	<b>23 Apr</b>	<b>14 May</b>	<b>Fresh wt<sup>z</sup></b>	<b>Dry wt<sup>y</sup></b>
Endura 6.8 oz	1.60 f	4.20 ab	4.58 a	4.30 a
Folicur 20.5 fl oz fp/a	2.40 cdef	4.60 ab	3.92 ab	3.70 a
Cannonball 50WP 8.0 oz + WatermaxxII 2 qts	2.00 def	4.20 ab	3.54 abc	3.50 ab
Folicur 20.5 fl oz + WatermaxxII 2 qts	1.60 f	3.00 b	3.43 abcd	3.24 abc
Cannonball 50WP 8.0 oz	1.80 ef	5.00 a	3.32 bcde	3.13 abc
Cannonball 50WP 4.0 oz	3.20 abcd	4.40 ab	2.82 bcdef	2.42 bcd
Moncut 2.86 lbs	3.00 bcde	5.20 a	2.56 cdef	2.38 cd
<i>Glomes intrardices</i> 30.0 lbs	3.60 abc	5.00 a	2.34 def	2.20 cd
Contans 4 lbs	3.40 abc	5.80 a	2.15 ef	2.09 cd
Contans 2 lbs	3.80 ab	5.40 a	2.04 f	1.89 d
Contans 8 lbs	3.80 ab	5.20 a	1.91 f	1.89 d
Untreated control	4.40 a	5.40 a	1.76 f	1.73 d

<sup>z</sup> Fresh weight was taken on date harvested, 22 Aug.

<sup>y</sup> Dry weight was taken 11 days after harvest, on 3 Sep

<sup>x</sup> Means followed by the same letter within a column are not significantly different (P=0.05)