

GARLIC (*Allium sativum* 'California Late')
White rot; *Sclerotium cepivorum*

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Comparison of fungicides and biological control agents for control of white rot, 2007-08.

Two experiments were conducted in a Fresno County, CA commercial field infested with *Sclerotium cepivorum* (114 sclerotia/kg soil sampled 27 Sep 07). In an at-planting efficacy comparison, the activity of chemical/biological control agents applied in the planting trench was evaluated. The experimental design was a randomized complete block design with five replications. Materials compared were Endura 70WG 6.8 oz, Folicur 3.6F 20.5 fl oz with and without Watermaxx II 2 qt, Cannonball 50WP 8 oz with and without Watermaxx II 2 qt, Cannonball 50WP 4 oz, Moncut 70DF 2.86 lb, *Glomes intrardices* 30 lb, Contans 5.3WG 2, 4 and 8 lb and an untreated control. In a drip applied/at-planting efficacy comparison, the application of a fungicide or biological control agent in the planting trench and/or multiple fungicide applications through buried drip were evaluated. The experimental design of this trial was a five 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 50WP 8 oz applied 15 Feb and Folicur 3.6F 20.5 fl oz applied 7 Mar; b) Cannonball 50WP 8 oz applied 15 Feb, Folicur 3.6F 20.5 fl oz applied 7 Mar, and Endura 70WG 6.8 oz applied 27 Mar; c) Folicur 3.6F 20.5 fl oz applied 15 Feb, Cannonball 50WP 8.0 oz applied 7 Mar and Endura 70WG 6.8 oz applied 27 Mar; and d) untreated control. The sub plot treatments were the at-planting applications, which included Cannonball 50WP 8.0 oz, Cannonball 50WP 8.0 oz + Botran 5F 3.2 qt, Contans WG 4 lb, Folicur 3.6F 20.5 fl oz, lbs and an untreated control. In both studies, garlic was planted in two seed lines per 40 in. bed at a rate of 6.3 lb of seed per 30 ft plot on 20 Nov 07. All at-planting treatments were applied with a CO²-pressurized back pack sprayer in the equivalent of 25 gal/A in water except for *G. intrardices*, which was applied as a granular material into the planting furrow. The spray was applied in a 4 to in. band directly into the 2-3 in.-deep trench 5 to 30 min before the garlic cloves were placed in the trench. On 21 Nov 07, the field was sprinkler irrigated. After establishment, the field was irrigated with drip tape (510-12-220) placed at the center of each bed at a depth of 2 in. All drip applied materials were pump injected over a 45 to 60 min period. On 7 and 15 Feb, 50 cloves were collected from untreated buffers, surface sterilized in 0.25% sodium hypochlorite for 1 to 2 min and placed on a wire mesh over water in plastic containers and incubated at 72°F. After 3 wk of incubation, *S. cepivorum* was present on two cloves sampled on 7 Feb and one clove sampled on 15 Feb. On 23 Apr and 14 May, each plot was rated for typical above-ground white rot symptoms including leaf dieback and plant death on a 0-10 scale: In plots that received a 0 rating, there were no symptomatic plants observed and all plants were dead in plots rated 10. Twenty-five ft of each single-bed plot was mechanically harvested on 22 Aug. Garlic remained in bags in the field and was re-weighed on 3 Sep. Data was subjected to analysis of variance for experiment with the randomized complete block design and a factorial analysis of variance for the split plot design. Least significant difference (P=0.05) was used for mean separation in both experiments.

In the experiment for evaluation of the at-planting/drip applications, all at-planting applications reduced disease as compared to the untreated control except for Contans WG. However, none of the drip application programs reduced disease severity, which may be attributable to infection that occurred prior to the first application through the drip. In the experiment for evaluation of at-planting applications, only Folicur 3.6F with or without Watermaxx II, Endura 70WG, and Cannonball 50WP 8 oz with or without the Watermaxx II had lower disease ratings and higher yields than the untreated control. No evidence of phytotoxicity was observed in any treatments in either experiment.

Efficacy of materials applied at planting on white rot symptom severity and yield.

Treatment (rate of formulated product per acre, applied in planting furrow)	Severity (0-10) ^z		Weights (tons/acre)					
					Fresh wt ^y		Dry wt ^x	
	23 Apr	14 May						
Endura 70WG 6.8 oz.....	1.60	f ^w	4.20	ab	4.58	a	4.30	a
Folicur 3.6F 20.5 fl oz.....	2.40	cdef	4.60	ab	3.92	ab	3.70	a
Cannonball 50WP 8.0 oz + WatermaxxII 2 qt.....	2.00	def	4.20	ab	3.54	abc	3.50	ab
Folicur 3.6F 20.5 fl oz + WatermaxxII 2 qt.....	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 70DF 2.86 lb.....	3.00	bcde	5.20	a	2.56	cdef	2.38	cd
<i>Glomes intrardices</i> 30 lb.....	3.60	abc	5.00	a	2.34	def	2.20	cd
Contans WG 4 lb.....	3.40	abc	5.80	a	2.15	ef	2.09	cd
Contans WG 2 lb.....	3.80	ab	5.40	a	2.04	f	1.89	d
Contans WG 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

^z Each plot was rated for typical above-ground white rot symptoms including leaf dieback and plant death on a 0-10 scale with a plot receiving a 0 rating having no symptomatic plants and a plot of all dead plants would be rated 10.

^y Fresh weight was taken on date harvested, 22 Aug.

^x Dry weight was taken 11 days after harvest, on 3 Sep.

^w Means followed by the same letter within a column are not significantly different as determined by LSD (P=0.05).

Influence of fungicide programs, which consisted of at-planting and/or drip applications, on white rot severity and yield.

Treatment	Severity (0-10) ^z		Weights (tons/acre)					
	23 Apr	14 May	Fresh wt ^y	Dry wt ^x				
Material applied at planting								
Cannonball 50WP 8.0 oz + Botran 5F 3.2 qt.....	1.3	c ^w	1.70	b	5.51	a	5.21	a
Folicur 3.6F 20.5 fl oz.....	2.2	b	2.15	b	5.23	a	4.90	a
Cannonball 50WP 8.0 oz.....	1.7	bc	2.30	b	5.29	a	4.14	a
Untreated control.....	3.1	a	4.15	a	3.01	b	2.53	b
Contans WG 4 lbs.....	3.7	a	4.90	a	2.54	b	2.44	b

Date of drip application and materials applied			Severity (0-10)		Weights (tons/acre)	
15 Feb	7 Mar	27 Mar	23 Apr	14 May	Fresh wt	Dry wt
Cannonball 50WP 8.0 oz	Folicur 3.6F 20.5 fl oz		2.52	3.00	4.63	3.82
Cannonball 50WP 8.0 oz	Folicur 3.6F 20.5 fl oz	Endura 70WG 6.8 oz	2.40	3.28	4.26	3.82
Folicur 3.6F 20.5 fl oz	Cannonball 50WP 8.0 oz	Endura 70WG 6.8 oz	2.24	3.00	4.43	3.91
Untreated control			2.40	3.28	4.07	3.83
Drip application, probability			NS ^v	NS	NS	NS
At planting/drip treatment interaction, probability			NS	NS	NS	NS

^z Each plot was rated for typical above-ground white rot symptoms including leaf dieback and plant death on a 0-10 scale with a plot receiving a 0 rating having no symptomatic plants and a plot of all dead plants would be rated 10.

^y Fresh weight was taken on date harvested, 22 Aug.

^x Dry weight was taken 12 days after harvest, on 3 Sep

^w Means followed by the same letter within a column are not significantly different as determined by LSD (P=0.05)

^v Means in column above NS are not significantly different (P=0.05)