

## White Rot Control Trial in Onions

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A field trial was conducted on the Intermountain Research and Extension Center in Tullake, California to evaluate methods of fungicide application for the control of white rot disease in onions. The experiment was established in a field known to have a history of white rot fungus (*Sclerotium cepivorum*). Laboratory analysis of replicated soil samples indicated an average count of 77 white rot sclerotia per 500 grams of soil, prior to planting.

### Procedures

Folicur 3.6F (tebuconazole), the principal fungicide evaluated, was applied to the soil pre-plant and early pre-emergence to onions using the varied application techniques described below. The fungicide treatments are also listed on Table 1 and application techniques are illustrated in Figure 1.

In Treatments 1 and 2, Folicur was injected preplant using four straight fertilizer knives per bed. Spacing between shanks was 3.5 inches, centered on a 36 inch bed. In treatment 1, the shanks were set to inject fungicide 2 inches below the top of the seedbed. In treatment 2, injection depth was set 6 inches below the top of the seedbed. Folicur was applied at the rate of 1.7 pints per acre product in 37 gallons per acre of water carrier.

Treatment 3 was applied using two spray sweeps per bed. The 11.25 inch wide spray sweeps were fitted with a flat fan spray nozzle designed to apply a thin horizontal fungicide application the full width of the sweep. Using two sweeps per bed, a uniform horizontal layer of fungicide was applied 2 inches below the seedbed surface. The application rate was 1.7 pints per acre of Folicur in 94 gallons per acre of water carrier.

Treatments 4 and 5 were applied pre-plant using a custom built spray rake. The spray rake consisted of flat fan nozzles fitted to each of four slanted vertical knives which were attached to a 15 inch wide horizontal blade. Three spray nozzles were fitted to each vertical shank for a total of 12 nozzles. The nozzles were arranged in such a manner that four nozzles sprayed 1 inch below the bed surface; 4 nozzles sprayed 3.5 inches below the surface; and 4 nozzles sprayed 6 inches below the surface. Horizontal spacing between nozzles was 5 inches. At normal tractor ground speeds, the soil swirled between the knives creating a fairly uniform mixing of fungicide in a treated zone approximately 6 inches deep and 20 inches wide in the center of the bed. The Folicur application rates in treatment 4 and 5 were 1.7 and 3.4 pints of product per acre, respectfully. Both treatments were applied with 215 gallons per acre water carrier.

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In treatments 6 through 9, fungicides were applied broadcast pre-emergence to the soil surface with a conventional spray boom two days after planting. Treatments 6 through 8 used rates of 0.84, 1.13 and 1.7 pints per acre of Folicur respectfully. Treatment 9 used the fungicide Endura (boscalid), 70% EC, at a rate of 10 ounces per acre of product. All pre-emergence spray applications were applied broadcast in 40 gallons of water carrier and were incorporated into the soil immediately after application with 0.6 inches of sprinkler irrigation.

In treatments 10 and 11, no fungicide applications were made (untreated controls).

The pre-plant treatments were applied and onions planted on June 3, 2003. Each treatment was applied to eight replicate plots arranged in a replicated complete block design. Individual plot size was 6 x 25 feet (two 36 inch wide planting beds, 25 feet long). Five seed lines spaced 3.5 inches apart were sown on raised 36 inch wide beds (see Figure 1). The onions were a Southport White Globe (a dehydrator variety). Soil type was Tulebasin mucky loam with 12% organic matter. Pre-emergence treatments were applied on June 5. Onions were grown to maturity under solid-set sprinklers using standard fertilizer, weed control and irrigation practices.

White rot symptoms were first observed in the plots mid August. Symptoms spread rapidly through the field. By October 17, onion tops were largely collapsed due to the combination of white rot symptoms and field frost. On October 23 and 24, onions were hand lifted to facilitate examination of the bulbs for white rot symptoms. Diseased and non-diseased bulbs were segregated and bulb weights were recorded for each plot.

## **Results**

The onion yield and disease results are shown on Table 1. Overall bulb yields were low due to the very late planting date and were not significantly different across fungicide treatments. White rot disease was heavy and uniformly spread throughout the trial area. On average, nearly 60% of all onion bulbs were infected. Treatments 3, 4 and 5 significantly reduced the degree of white rot decay. The remaining treatments appeared to have no effect on disease expression. The effective treatments were the Folicur applied 2 inches deep with the spray sweeps (treatment 3) and the two spray rake applications (treatments 4 and 5). The high rate of Folicur applied through the rake produced the best control in the trial.

Under these high disease pressures, even the most successful treatments resulted in unacceptable rot (36-48%). Still, it is encouraging that Folicur appeared to have activity against the disease. It is also evident that the method of application may play a very important role in Folicur efficacy. The uniform soil incorporation provided by the spray rake seemed to improve efficacy. Perhaps more intriguing was the shallow spray blade application. The shallow layered treatment may have created a protective barrier under the seed, impeding white rot migration up the roots to the bulb. This observation encourages additional study with Folicur placement — perhaps banded in the seed row directly under the seed. This approach has previously been shown to improve the efficacy of other fungicides against white rot disease.

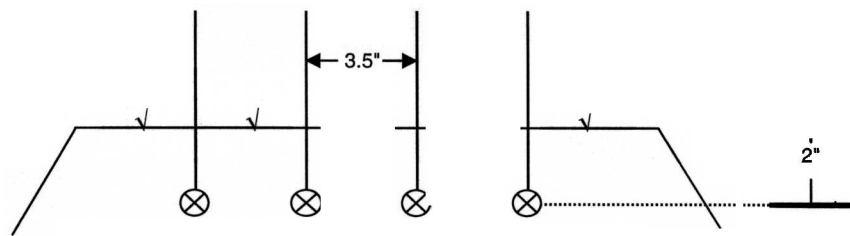
Table 1. 2003 White Rot Control Trial in Onions

Treatment	Rate	Total Yield (cwt/a)	%rot
1 Folicur Shank Injected 2" deep Preplant <sup>1</sup>	1.7 pt/a	252	62.3
2 Folicur Shank Injected 6" deep Preplant	1.7 pt/a	251	66.7
3 Folicur Sweep Injected 2" deep Preplant	1.7 pt/a	274	39.2
4 Folicur Spray Blade (rake) Preplant	1.7 pt/a	267	48.6
5 Folicur Spray Blade (rake) Preplant	3.4 pt/a	270	36.7
6 Folicur Broadcast Preemergence	0.84 pt/a	236	64.9
7 Folicur Broadcast Preemergence	1.13 pt/a	253	69.6
8 Folicur Broadcast Preemergence	1.7 pt/a	245	62.5
9 Endura Broadcast Preemergence <sup>2</sup>	10 oz/a	269	64.1
10 Untreated Control		247	69.6
11 Untreated Control		246	63.2
Mean		255	59.1
CV%		11.20	21.20
LSD(0.05)		NS	12.50

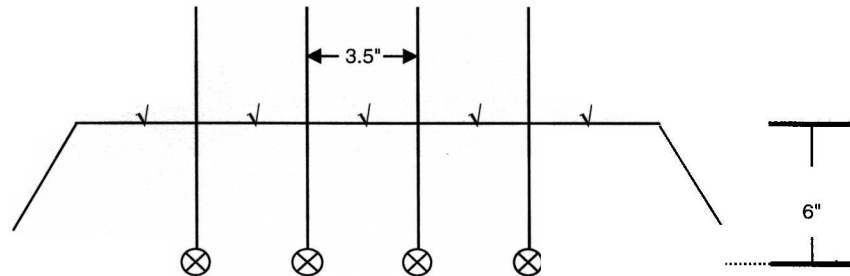
<sup>1</sup> Folicur 3.6F (tebuconazole)

<sup>2</sup> Endura 70% EC (boscalid)

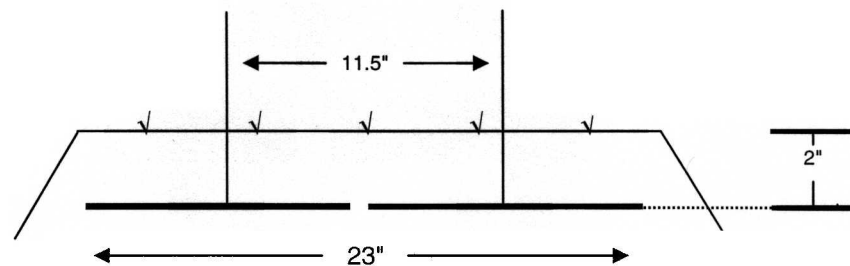
Treatment 1



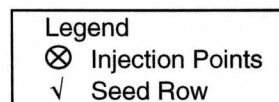
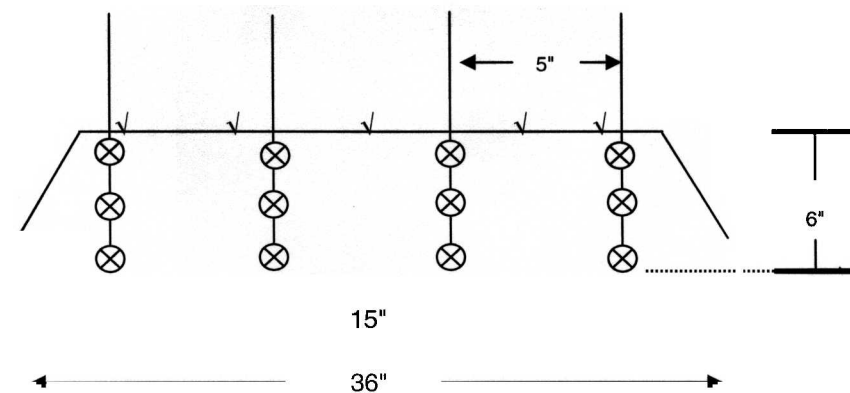
Treatment 2



Treatment 3



Treatment 4 and 5



**Figure 1.**

Illustration of pre-plant fungicide application techniques in 36 inch wide raised onion planting beds.