

Evaluation of the efficacy of seedpiece or in-furrow fungicide treatment for potato disease control - Spooner, 2001

A field trial was established May 11 at the Spooner Agricultural Research Station, in northwestern WI to evaluate the effect of selected treatments applied to seed or in the furrow at planting on *Rhizoctonia* stem canker and on plant stand, vigor and yield. US#1 Russet Burbank tubers were mechanically cut at the Hancock Agricultural Research Station, Hancock, WI, into approximately 2 oz. seedpieces and treated as described. All potatoes were cut and treated May 10 and were then transported to Spooner and planted the next morning. The experiment was designed as a randomized complete block with four replications, each plot consisting of two 25-foot-long rows spaced 36 inches apart with tubers 12 inches apart in the row. All seedpiece treatments were applied to 40 lb samples of freshly cut potatoes in large plastic bags. The bags were then rolled to shake seedpieces and uniformly distribute the chemicals. Seedpieces were planted by hand. In-furrow treatments were applied in an 8-inch-wide band over the seedpieces at a rate equivalent to 29 gal water/A at 40 psi, using a hand-held boom with a single HC-2 70° hollow disc cone nozzle. After treatment, all seedpieces were mechanically covered using hilling disks. Seedpieces were not inoculated. This study relied on inoculum present on seed tubers and/or in field soil. The soil type was Cress sandy loam, pH 6.5. At planting, air temperature was 60 F with cloudy skies, the soil was at moisture capacity with a temperature of 57 F, and the seedpiece temperature was 55 F. Fertilizer included: 6-24-24, 600 lb/A banded in the row at planting, and sidedress applications on June 5 (21-0-0-24S, 250 lb/A) and June 20 (33-0-0, 300 lb/A). Insects were controlled with Admire 2F incorporated with the fertilizer at planting (16 fl oz./500 lb). Sencor 4F, 1.5 pt/A + Prowl 3.3 EC, 1.8 pt/A was applied May 30 for weed control. All treatments received the same foliar fungicide program to control foliar blight: Penncozeb 75DF (1.5 lb/A, June 21); Quadris (0.76 pt/A, June 28, July 12 and 25); Echo 720 (1.5 pt/A, July 3 and 18, August 2, 9, 15 and 24); Bravo Zn (1.0 pt/A, August 28). The number of plants that emerged was counted for each plot on June 6, 14, 20 and 25. On July 9 the height of each plant in one row of each plot in the trial was recorded and then 5 feet from each row (10 feet/plot) was dug by hand and plants were rated for *Rhizoctonia* canker, black leg and seedpiece decay. The number of stems per plant, fresh weight of leaves and stems, and weight of daughter tubers were recorded. The remaining portion of each plot (a total of 40 feet of row) was left to mature and provide yield data. Vines were killed with Diquat, 1.0 pt/A, applied on August 28 and September 4. Plots were machine harvested on September 10. Tubers were graded into US#1, undersize, and cull categories. Samples from all plots were placed in storage at the Hancock Agricultural Research Station and will be evaluated for tuber decay, silver scurf and black scurf and general quality after several months in storage. Rainfall measured during the growing season (inches) was May 11-31 (2.56), June (7.33), July (3.57), August (4.48), and September 1-9 (1.49). An additional 6.29 inches of irrigation was applied for a total of 25.72 inches of rainfall and irrigation during the growing season.

Weather conditions early in the growing season favored rapid plant emergence and by June 25, emergence was complete. Lowest emergence was observed in plots where seedpieces were treated with Tops MZ. Plants in plots treated with Tops MZ, with or without Gaucho insecticide, were among the shortest plants in the trial and had the fewest stems. The incidence of blackleg was highest in plots where seedpieces were treated with L1036-A2. The incidence of *Rhizoctonia* canker symptoms was variable, but tended to be somewhat less in plots where Moncut was applied in-furrow at planting. Total yields ranged from 292.9 cwt/A (Tops MZ) to 439.9 cwt/A (Evolve). No treatment resulted in final emergence, % decay, black leg severity or total yield that was significantly better than the untreated control. Treatment with Evolve or TOPS MZ Gaucho resulted in yield of US#1 tubers that was significantly greater than the untreated control.

Footnotes for Table 1.

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- 1 Based on 50 seedpieces planted/50 feet of row.
 - 2 The average number of days to emergence was calculated for all plants which grew.
 - 3 Avg. height per plant includes only those plants which grew. To calculate avg. height per hill, a height of 0 is included in the average for hills where no plant grew.
 - 4 Analysis of variance was performed on data, and Fisher's protected least significant difference (LSD) was calculated. NS = not significant at $P = 0.10$ (* indicates differences between treatments were significant at $P = 0.10$, but not at $P = 0.05$).

Table 1. Effect of treatment at planting (seedpiece or in-furrow) on field emergence, stand and height of Russet Burbank potatoes.

Trt No.	Treatment Chemicals	Rate Formulated product	Application schedule	Percentage of plants emerged on: ¹				Avg. days to emergence ²	Height 7/9 ³	
				6/6	6/14	6/20	6/25		Per plant	Per hill
1.	Untreated Seed			91.0	94.5	91.0	94.0	27.6	54.1	43.2
2.	Plant Helper	0.5 gal/1000 lb seed	Seedpiece trt	80.0	89.5	84.5	88.5	29.1	52.9	43.2
3.	Plant Helper Plant Helper	0.5 gal/1000 lb seed 2 gal/A	Seedpiece trt Appl. In-furrow	77.5	85.5	85.5	87.5	27.1	52.4	40.6
4.	Moncut 50 WP	1.10 oz/1000 row ft	Appl. In-furrow	87.0	92.5	90.0	94.5	27.7	51.6	41.2
5.	Moncut 50 WP	1.65 oz/1000 row ft	Appl. In-furrow	95.0	97.5	92.5	97.5	28.3	53.2	45.6
6.	Maxim MZ	0.5 lb/cwt	Seedpiece trt	77.0	86.0	84.5	90.0	28.1	51.0	38.9
7.	Quadris SC	0.6 fl oz/1000 rft	Appl. In-furrow	93.0	97.5	97.5	97.0	27.0	52.4	44.2
8.	TOPS MZ 8.5D	0.75 lb / cwt	Seedpiece trt	59.0	66.0	63.0	79.5	30.8	48.2	33.9
9.	Evolve	0.75 lb / cwt	Seedpiece trt	83.5	90.0	87.5	89.0	28.3	53.4	41.4
10.	L1036-A2	0.75 lb / cwt	Seedpiece trt	76.5	86.0	83.5	89.0	28.5	51.8	36.2
11.	TOPS MZ Gaucho	0.75 lb / cwt	Seedpiece trt	69.0	83.5	80.0	88.5	29.8	52.4	37.3
Pr > F ⁴				< 0.01	< 0.01	< 0.01	< 0.01	0.06	0.05	< 0.01
LSD ⁴				8.4	7.9	7.6	6.2	2.3*	3.1	5.4

Table 2. Effect of treatment at planting (seedpiece or in-furrow) on decay, black leg and Rhizoctonia symptoms, growth and yield (Treatment numbers as listed in Table 1).

Trt No.	July 9 Evaluation of 10 hills per replication								Total yield cwt/A	US#1		Undersize ³		Culls											
	% decay ¹	% of Plants with black leg	% of Total stems with black leg	Rhizoctonia severity (%) ²	No. of stems per plant	Avg. fresh weight (g)		Avg. No. Daughter tubers per hill		cwt/A	%	cwt/A	%	cwt/A	%										
						Leaves + stems per hill	Daughter tubers per hill																		
1.	94.3	20.0	8.1	11.0	5.1	856.2	265.4	13.7	410.3	191.7	46.8	183.3	44.7	35.4	8.6										
2.	96.9	17.5	6.9	8.4	4.5	729.7	216.3	11.2	399.4	203.5	50.9	158.5	39.7	37.4	9.4										
3.	96.8	27.5	12.2	12.3	5.1	754.7	212.0	11.3	412.7	213.0	51.7	164.5	39.8	35.3	8.5										
4.	97.2	10.0	4.1	4.4	5.3	892.5	268.0	14.4	412.1	189.2	45.5	196.6	48.1	26.4	6.4										
5.	96.2	15.0	5.3	5.5	5.7	976.4	328.8	18.8	411.5	194.6	47.3	192.0	46.6	24.9	6.1										
6.	100.0	30.0	13.0	14.9	5.0	819.9	244.2	13.5	388.9	200.3	51.5	153.7	39.5	34.9	9.0										
7.	93.1	12.5	4.0	8.9	4.6	887.4	261.6	14.1	432.2	188.6	43.3	219.0	51.2	24.6	5.5										
8.	93.9	20.0	8.0	15.3	3.8	688.9	157.5	8.8	292.9	157.0	53.3	88.8	30.4	47.1	16.4										
9.	100.0	22.5	10.6	18.5	4.2	794.4	238.6	11.9	439.9	246.1	55.7	155.9	35.7	37.9	8.6										
10.	100.0	40.0	24.9	14.5	4.2	691.2	215.8	11.7	407.3	224.0	55.0	145.7	35.8	37.6	9.2										
11.	85.7	10.0	3.6	7.8	3.6	813.6	235.5	12.0	430.9	231.7	53.8	162.8	37.6	36.4	8.6										
Pr > F ⁴											0.02	0.14	0.03	0.35	0.02	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.21	< 0.01	
LSD ⁴											7.4	NS	11.3	NS	1.2	144.9	76.5	3.8	45.2	38.7	6.8	25.4	5.7	NS	4.2

1. Severity of seedpiece decay rated on a Horsfall-Barratt scale of 0 (no decay) to 11 (100% decay). Ratings were converted to percentages.

2. Severity rated on a Horsfall-Barratt scale of 0 (no infection) to 11 (death of all stems due to Rhizoctonia infection). Ratings were converted to percentages.

3. Undersize is defined as potatoes less than 2 inches in diameter.

4. Analysis of variance was performed on data, and Fisher's protected least significant difference (LSD) was calculated. NS = not significant at $P = 0.10$ (* indicates differences between treatments were significant at $P = 0.10$, but not at $P = 0.05$).