

POTATO (*Solanum tuberosum* 'Russet Burbank')
Blackleg and bacterial soft rot; *Erwinia carotovora* subsp.
atroseptica, *E. carotovora* subsp. *carotovora*
Rhizoctonia canker (black scurf); *Rhizoctonia solani*
Silver scurf; *Helminthosporium solani*

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Evaluation of the efficacy of seedpiece or in-furrow fungicide treatment for potato disease control - Spooner, 2003

A field trial was conducted 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. Potatoes were cut and treated 5 May and were then transported to Spooner and planted 7 May. The experiment was designed as a randomized complete block with four replications, each plot consisting of two 25-ft-long rows spaced 36 in. apart with tubers 12 in. apart in the row. Seedpiece treatments were applied to 40 lb samples of freshly cut potatoes in large plastic bags. The bags were rolled to shake seedpieces and uniformly distribute the chemicals. Furrows were opened and then seedpieces were planted by hand. In-furrow treatments were applied in an 8-in.-wide band over the seedpieces in the open furrow at a rate equivalent to 2.0 gal/1000 row ft 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 6.6. At planting, air temperature was 65 F with relative humidity of 75% and partly cloudy skies, the soil was moderately moist with a temperature of 52 F, and the seedpiece temperature was 60 F. Fertilizer included: 6-24-24, 550 lb/A banded in the row at planting, and sidedress applications on 2 Jun (34-0-0, 400 lb/A) and 20 Jun (21-0-0-24S, 200 lb/A). Insects were controlled with Admire 2F incorporated with the fertilizer at planting (16 fl oz/500 lb) and foliar application of Baythroid (2.5 oz/A, 16 Jul) and Raven (*Bacillus thuringiensis*) (3 qt/A, 23 Jul). Prowl 3.3EC (2.4 pt/A) + Sencor 4 (0.5 pt/A) was applied 27 May for weed control. All treatments received the same foliar fungicide program to control foliar blight: Bravo WeatherStick Zn (1 pt/A) + Quadris (0.38 pt/A) 7 and 23 Jul, 7 Aug; Bravo WeatherStick Zn (1.5 pt/A), 16 and 30 Jul, and 22 Aug; and Dithane M22 special (1.8 lb/A) 14 and 29 Aug. The number of plants emerged was counted for each plot 30 May, 5, 13 and 19 Jun. On 15 Jul the height of each plant in one row of each plot was recorded, and 5 ft from each row (10 ft/plot) was dug by hand. Plants were rated for Rhizoctonia canker on stems, black leg, and seedpiece decay. The number of stems and stolons 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 ft of row) was left to mature and provide yield data. Vines were killed with applications of Reglone (1.0 pt/A) + Preference NIS (1 pt/100 gal), 29 Aug and 5 Sep, and plots were machine harvested on 18 Sep. 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 (in.) was 7-31 May (3.42), Jun (5.36), Jul (2.92) Aug (1.58), and 1-18 Sep (0.42). An additional 7.31 in. of irrigation was applied to the field.

Environmental conditions favored crop emergence and by 19 Jun, close to 100% of the planted seedpieces had emerged. Seedpiece decay was lowest in plots with no furrow treatment and planted with untreated seed, plots with a Moncut (low rate) furrow treatment and plots with a Quadris furrow treatment. Treatment did not affect the severity of Rhizoctonia stem canker, stem numbers, leaf and stem fresh weight or weight of daughter tubers on 15 Jul. In addition, treatment did not affect total yield or yield of US#1, undersize or cull tubers.

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	Percentage of plants emerged on: ¹				Avg. days to emergence ²	Height 15 Jul (cm) ³	
				30 May	5 Jun	13 Jun	19 Jun		Per plant	Per hill
1	Untreated			57.0	86.0	99.0	100.0	26.8	75.6	68.0
2	Moncut 70 DF	0.79 oz prod/1000 rft	Appl. In-furrow	61.5	89.5	100.0	100.0	26.2	72.3	66.0
3	Moncut 70 DF	1.18 oz prod/1000 rft	Appl. In-furrow	56.5	84.0	99.5	100.0	26.9	71.7	69.3
4	Maxim MZ	0.25 lb/cwt (1/2 rate)	Seedpiece treatment							
	Quadris	0.6 fl oz/ 1000 rft	Appl. In-furrow	42.5	63.0	96.0	97.5	29.3	70.4	68.5
5	Maxim MZ	0.5 lb/cwt	Seedpiece treatment	50.0	83.0	97.0	97.5	27.2	71.3	66.9
6	Quadris	0.6 fl oz/ 1000 rft	Appl. In-furrow	43.0	82.0	99.5	100.0	28.0	76.7	67.8
Pr > F ⁴				0.19	0.02	0.04	0.02	0.04	0.38	0.99
LSD ⁴				NS	14.8	2.8	2.0	1.9	NS	NS

1. Based on 50 seedpieces planted/50 ft of row.

2. The average number of days to emergence was calculated for all plants that grew.

3. Avg. height per plant includes only those plants that 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 (alpha=0.05). NS = not significant at $P = 0.10$.

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

Trt no.	15 Jul evaluation of 10 hills per replication									Yield						
	% decay ¹	% of plants with black leg	% of total stems with black leg	Rhizoctonia severity (%) ²	Avg. no. of stems/plant	Avg. fresh weight (g) ³		Avg. no. daughter tubers/ hill	Total cwt/A	US#1		Undersize ⁴		Culls		
						Leaves + stems per hill	Daughter tubers/ hill			cwt/A	%	cwt/A	%	cwt/A	%	
1	65.3	0.0	0.0	13.0	4.1	779.6	370.5	9.6	416.6	289.3	69.1	68.7	16.9	58.5	13.9	
2	68.4	0.0	0.0	18.5	4.4	839.2	363.4	10.2	430.5	308.0	70.9	73.6	17.7	48.9	11.4	
3	81.7	0.0	0.0	14.0	3.7	727.5	351.5	9.0	396.6	278.7	69.3	89.6	23.4	28.4	7.2	
4	95.4	0.0	0.0	13.7	4.2	775.1	398.6	10.4	373.6	256.2	68.7	94.3	25.2	23.2	6.1	
5	94.9	0.0	0.0	13.4	4.5	750.1	340.8	10.3	430.7	288.1	66.6	100.5	23.8	42.2	9.7	
6	55.7	0.0	0.0	14.4	3.9	797.1	400.3	9.2	397.3	273.7	68.7	86.3	21.9	37.3	9.4	
Pr>F ⁵		< 0.01	---	---	0.65	0.29	0.84	0.84	0.41	0.40	0.55	0.80	0.23	0.21	0.15	0.22
LSD ⁵		20.2	---	---	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

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. All daughter tubers > 0.75-in.-diam were removed and weighed. Remains of seedpieces were also removed. Fresh weight was taken of all remaining plant tissue. Calculations are based on 10 hills per plot. If no plant emerged for a hill, a value of 0 for that plant was included in the calculation.

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

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