

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

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Evaluation of the efficacy of seedpiece or in-furrow fungicide treatment for potato disease control - Spooner, 2002

A field trial was established 6 May 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 6 May and were then transported to Spooner and planted. 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. 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 52 F with cloudy skies, the soil was wet with a temperature of 47 F, and the seedpiece temperature was 55 F. Fertilizer included: 6-24-24, 550 lb/A banded in the row at planting, and sidedress applications on 7 Jun (33-0-0, 350 lb/A) and 20 Jun (24-0-0-26S, 200 lb/A + 46-0-0, 200lb/A). Insects were controlled with Admire 2F incorporated with the fertilizer at planting (16 fl oz./500 lb) and foliar application of Baythroid (2 oz/A, 16 Jul; 10 oz/A, 29 Jul). Turbo, 2.0 pt/A, was applied 7 Jun for weed control. All treatments received the same foliar fungicide program to control foliar blight: Quadris (0.76 pt/A, 8 and 22 Jul, 5 Aug) and Bravo (1.0 pt/A, 16 and 29 Jul, 13 and 19 Aug). The number of plants emerged was counted for each plot ten times between 5 Jun and 1 Jul. 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 and plants were rated for Rhizoctonia canker (stems and stolons), 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 Reglone, 1.0 pt/A, 19 Aug, and plots were machine harvested on 17 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 May (3.84), Jun (4.08), Jul (7.0) and Aug (4.26). An additional 3.19 in. of irrigation was applied to the field.

Unusually cool and wet soil conditions from planting to emergence delayed emergence and extended the emergence period to over 5 wk. Compared with the untreated control plots, several treatments including A12534 (seed treatment), A12534 on the seed plus Quadris in-furrow, and Maxim MZ 0.5 lb/A (seed treatment) appeared to reduce final emergence. Treatments did not affect the percent seedpiece decay, incidence of blackleg, and incidence or severity of Rhizoctonia stem/stolon cankers. The number of daughter tubers on 15 Jul varied greatly between treatments and did not seem to be related to the final yield at harvest. The treatments evaluated in this trial did not affect total yield or yield of US#1, undersize or cull tubers.

Footnotes for Table 1

- 1 Based on 50 seedpieces planted/50 feet 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. 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 7/15 ³	
				6/5	6/7	6/10	6/12	6/14	6/17	6/20	6/25	6/28	7/1		Per plant	Per hill
1	Untreated			9.0	43.0	74.5	86.5	89.0	93.0	91.5	93.0	89.5	93.0	38.6	45.7	41.1
2	A12534 6.5 DS	0.25 lb/cwt	Seedpiece treatment	4.0	25.0	52.5	67.5	74.0	83.0	84.0	85.0	85.0	85.5	37.7	46.1	40.7
3	A12534 6.5 DS	0.5 lb cwt	Seedpiece treatment	2.5	26.5	59.0	70.5	75.0	82.5	84.5	82.5	84.5	82.5	39.0	44.0	36.3
4	A12534 6.5 DS	0.25 lb cwt	Seedpiece treatment													
	Quadris	0.6 fl oz/1000 rft	Appl. In-furrow	2.0	18.5	53.0	65.5	68.5	75.0	76.5	78.5	77.5	77.5	39.7	44.8	38.8
5	Quadris	0.6 fl oz/1000 rft	Appl. In-furrow	7.0	38.0	74.0	87.5	91.0	96.5	95.5	96.0	95.0	96.0	36.6	45.8	43.7
6	TOPS MZ 8.5D	0.75 lb/cwt	Seedpiece treatment	4.0	38.0	75.5	85.0	89.0	93.0	94.0	93.5	94.5	94.0	35.9	48.6	43.3
7	Moncoat MZ 7.5 DP	0.75 lb/cwt	Seedpiece treatment	5.5	32.0	70.5	88.0	91.5	94.0	94.5	93.5	95.0	93.5	35.9	48.4	46.4
8	Moncut 70 DF	0.79 oz /1000 rft	Appl. In-furrow	19.0	57.0	87.5	95.5	95.5	97.0	96.0	94.5	94.5	96.5	37.4	48.3	46.4
9	Moncut 70 DF	1.18 oz /1000 rft	Appl. In-furrow	13.5	49.5	79.0	92.5	93.5	95.5	94.5	92.5	91.0	94.5	36.5	46.6	44.4
10	Maxim MZ	0.25 lb/cwt (1/2 rate)	Seedpiece treatment													
	Quadris	0.6 fl oz/1000 rft	Appl. In-furrow	6.0	34.0	67.5	78.5	83.0	83.5	86.0	85.5	86.0	86.0	37.2	49.3	47.0
11	Maxim MZ	0.5 lb/cwt	Seedpiece treatment	3.5	26.0	61.0	74.0	81.5	81.0	82.5	82.5	82.0	83.0	36.4	44.6	35.3
12	Evolve	0.75 lb/cwt	Seedpiece treatment	5.5	33.5	70.0	82.5	84.5	89.5	89.5	88.5	88.0	88.5	37.6	49.3	46.8
Pr > F ⁴				< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.04	0.10	0.01
LSD ⁴				7.1	13.7	14.5	12.8	11.2	9.3	9.2	7.7	7.5	7.9	2.4	4.1*	7.1

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

Trt no.	July 15 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. no. of stolons/plant	Avg. fresh weight (g) ⁴		Avg. no. daughter tubers per hill	Total cwt/A	US#1		Undersize ³		Culls		
				Stems	Stolons			Leaves + stems per hill	Daughter tubers per hill			cwt/A	%	cwt/A	%	cwt/A	%	
1	75.8	2.5	0.7	17.5	7.4	3.6	10.9	790.4	119.7	6.5	262.9	93.1	33.7	75.2	30.4	94.7	35.9	
2	87.8	0.0	0.0	21.2	6.5	3.0	8.2	508.6	44.0	2.5	301.1	127.5	41.2	84.7	28.8	88.9	30.0	
3	76.1	0.0	0.0	17.0	9.8	4.0	10.4	688.9	101.1	5.6	275.5	103.3	37.2	80.3	29.5	91.8	33.2	
4	90.0	0.0	0.0	18.4	3.2	2.9	9.1	428.7	23.1	1.4	257.7	97.9	37.2	74.6	28.9	85.3	33.8	
5	75.8	2.5	0.8	16.8	7.2	3.4	11.6	738.8	106.8	5.3	276.2	108.2	36.9	85.1	31.8	82.9	31.3	
6	99.2	2.5	0.6	23.5	8.4	3.7	13.1	696.3	83.9	5.1	271.2	106.4	38.9	81.9	30.9	82.9	30.2	
7	86.8	2.5	0.6	16.6	3.7	3.6	13.0	615.8	58.3	4.1	283.5	119.6	41.0	92.0	33.7	71.9	25.3	
8	88.0	0.0	0.0	19.8	5.9	3.8	12.9	771.7	97.3	5.5	263.9	112.4	41.6	84.8	32.6	66.7	25.8	
9	89.4	7.5	3.8	17.7	9.4	4.0	13.6	767.7	102.2	6.0	293.3	132.3	43.0	78.5	27.3	82.4	29.7	
10	92.3	2.5	1.0	15.5	3.4	3.8	12.7	680.4	77.8	4.8	288.3	135.2	46.3	79.7	27.5	73.4	26.2	
11	91.8	0.0	0.0	15.5	4.2	3.8	13.6	694.0	72.3	4.6	295.8	127.7	41.4	87.7	30.7	80.4	27.9	
12	82.0	0.0	0.0	16.1	4.8	4.1	12.9	687.8	83.3	5.0	259.4	106.0	40.0	73.7	29.6	79.6	30.4	
Pr>F ⁵		0.12	0.18	0.12	0.88	0.23	0.04	0.22	< 0.01	0.10	0.02	0.59	0.63	0.67	0.42	0.85	0.83	0.60
LSD ⁵		NS	NS	NS	NS	NS	0.72	NS	156.4	60.2*	2.6	NS	NS	NS	NS	NS	NS	NS

- Severity of seedpiece decay rated on a Horsfall-Barratt scale of 0 (no decay) to 11 (100% decay). Ratings were converted to percentages.
- 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.
- Undersize is defined as potatoes less than 2 inches in diameter.
- 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.
- 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).