

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

W. R. Stevenson and R. V. James
Dept. of Plant Pathology
University of Wisconsin-Madison
1630 Linden Dr., Madison, WI 53706
K. R. Williams, Langlade County Cooperative
Extension, P.O. Box 460, 837 Clermont St.
Antigo, WI 54409

Evaluation of the effect of treatment on seedpiece decay, Rhizoctonia canker, plant vigor and yield - Antigo, 2002

A trial was established 20 May at the Langlade County Research Area, Antigo, WI, to evaluate the effect of selected seedpiece treatments on seedpiece decay, Rhizoctonia stem canker, plant stand, vigor and yield. US#1 Snowden tubers were mechanically cut into approximately 2 oz seedpieces at the Hancock Agricultural Research Station, Hancock, WI, and treated as described. 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 transported to Antigo and were mechanically planted in a randomized complete block design with four replications. Each plot consisted of two 25-ft-long rows spaced 3 ft apart with seedpieces planted 12 in. apart in the row. The soil type was Antigo silt loam, pH 5.3. At planting, air temperature was 57 F with partly cloudy skies, the soil was slightly moist with a temperature of 59 F, and the seedpiece temperature was 55 F. Seedpieces were not inoculated, relying on inoculum present on seed tubers and/or in field soil. Plots were fertilized with 580 lb/A of 12-30-10 in the row at planting, and a sidedress application of 150 lb/A of NH₃SO₄ on 27 Jun. Insects were controlled with Admire 2F incorporated in the fertilizer used at planting (16 fl oz/500 lb). Dual 8E, 1.6 pt/A + Lincx DF, 1.6 lb/A was applied on 29 May to control weeds. A standard foliar fungicide program for early and late blight control consisted of: Bravo Ultrex (1 lb/A - 28 Jun, 20 Aug ; 1.1 lb/A - 7 Jul ; 1.2 lb/A 19 Jul, 2, 15, 25 and 30 Aug, 6 Sep) and Quadris (7.5 fl oz/A - 11 and 27 Jul, 8 Aug). The number of plants that emerged was counted for each plot on 10, 17 and 24 Jun and 1 Jul. On 24 Jul the height of each plant in one row of each plot in the trial was recorded and 5 ft was dug by hand from each row (10 ft/plot). 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 applications of Reglone, 1.5 pt/A, on 30 Aug and 6 Sep. Plots were mechanically harvested 19 Sep and graded into US#1, undersize, and cull categories. Cull potatoes included misshapen, green and rotten potatoes. 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 (in.) measured during the growing season included 20-31 May (1.03); Jun (3.38); Jul (2.67); Aug (5.22) and 1-15 Sep (1.92). An additional 1.7 in. irrigation was applied for a total of 15.92 in. of rainfall and irrigation during the growing season.

Cool temperatures and moist soil conditions during emergence contributed to an average emergence time of about 4 wk. No significant differences were observed between treatments in the percentage of emerged plants or in the average days to emergence. However, values of average height per plant were lower for plots where the seedpieces were treated with Maxim MZ at 0.5 lb/cwt when compared with other treatments. Although seedpiece treatment did not affect severity of seedpiece decay, treatments with Moncoat, Tops MZ or Mancozeb exhibited significantly fewer stems with symptoms of blackleg. All treatments significantly reduced the severity of Rhizoctonia stem canker, but did not affect Rhizoctonia severity on stolons or daughter tubers. Treatment did not affect the number of plant stems, stolons, or daughter tubers per hill. Yields were influenced by seedpiece treatment, with the lowest yield from plots where seedpieces were treated with Maxim MZ at 0.5 lb/cwt. Yields of undersize and culls were not affected by seedpiece treatment. Increased crop values for chipping were noted in plots treated with Maxim MZ 0.25 lb/cwt, Moncoat MZ and Tops MZ.

Table 1. Effect of seedpiece treatment on field emergence, stand and height of Snowden potatoes.

Trt No.	Treatment (Rate formulated product)	Percentage of plants emerged on: ¹				Avg. days to emergence ²	Height 24 Jul (in.) ³	
		10 Jun	17 Jun	24 Jun	1 Jul		Per plant	Per hill
1	Untreated	28.5	78.5	84.5	81.5	27.7	18.5	7.3
2	Maxim MZ, 0.25 lb/cwt (1/2 rate)	30.0	83.5	83.5	82.5	27.1	19.2	7.5
3	Maxim MZ, 0.5 lb/cwt	32.5	76.0	77.5	71.0	29.6	16.9	6.6
4	Moncoat MZ 7.5 DP, 0.75 lb/cwt	28.5	79.5	87.0	82.5	28.1	19.6	7.7
5	TOPS MZ 8.5D, 0.75 lb/cwt	29.5	82.0	82.0	79.5	26.5	19.1	7.5
6	Mancozeb seed treater 6%, 0.75 lb/cwt	30.5	79.5	83.0	79.5	27.6	19.5	7.7
Pr > F ⁴		0.96	0.62	0.44	0.28	0.50	0.02	< 0.01
LSD ⁴		NS	NS	NS	NS	NS	1.6	0.6

- 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. NS = not significant at $P = 0.10$.

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

Trt No.	24 Jul evaluation of 10 hills per replication												
	% 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 (lb) ⁴		Daughter tubers		
				Stems	Stolons	Daughter tubers ³			Leaves + stems per hill	Daughter tubers per hill	Avg. no. per hill	% with Rhizoctonia symptoms	
1	94.6	7.5	4.8	23.3	6.9	0.9	3.4	8.6	1.2	0.4	5.4	15.9	
2	100.0	5.0	2.8	12.5	3.7	0.5	2.8	6.2	0.9	0.3	4.2	14.3	
3	99.9	2.5	1.1	8.1	3.2	1.1	2.9	7.1	1.1	0.4	5.1	11.4	
4	99.7	0.0	0.0	11.7	7.6	0.8	2.7	6.8	1.2	0.4	4.9	12.7	
5	97.9	2.5	0.6	13.7	6.3	1.2	3.3	8.7	1.4	0.6	6.2	9.7	
6	96.5	0.0	0.0	9.1	5.4	0.6	3.4	8.4	1.2	0.5	6.4	11.1	
Pr > F ⁵		0.37	0.21	0.07	0.05	0.24	0.90	0.30	0.25	0.01	0.04	0.29	0.83
LSD ⁵		NS	NS	3.6*	9.7	NS	NS	NS	NS	0.3	0.2	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 Area of daughter tuber with symptoms of Rhizoctonia rated on a Horsfall-Barratt scale of 0 (no symptoms) to 11 (entire surface of with symptoms). Ratings were converted to percentages.
- 4 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.
- 5 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 2. Effect of seedpiece treatment on yield (Treatment numbers as listed in Table 1).

Trt No.	Yield								Chipping value ²
	Total cwt/A	US#1		Undersize ¹		Culls			
		cwt/A	%	cwt/A	%	cwt/A	%		
1	310.6	275.7	88.7	10.0	3.2	25.0	8.1	1690.08	
2	319.9	279.0	87.7	10.3	3.2	30.6	9.1	1726.84	
3	274.2	235.9	85.9	9.3	3.4	28.9	10.7	1471.08	
4	317.3	275.2	86.8	6.2	2.0	35.8	11.3	1708.71	
5	317.6	285.0	89.7	6.6	2.1	26.0	8.2	1736.75	
6	301.7	253.4	84.8	11.0	3.6	37.3	11.6	1601.74	
Pr > F ³		0.04	0.06	0.85	0.14	0.06	0.92	0.91	0.02
LSD ³		29.7	34.6*	NS	NS	1.3*	NS	NS	163.01

- 1 Undersize is defined as potatoes less than 1 7/8 inches in diameter.
- 2 Typical 2002 chipping price of \$5.75/cwt for a size range of 1 7/8 to 4" (estimated to be all US#1 potatoes from our trial) Process grade for chip stock (undersize + culls) = \$3.00/cwt.
- 3 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 $P = 0.05$).