

**POTATO (*Solanum tuberosum* 'Snowden')
Seedpiece Treatment Evaluation**

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Evaluation of the effect of potato seedpiece treatment and plant spacing on emergence, disease control and yield - Hancock, 2001

Cut seedpieces of Snowden potatoes were planted April 30, at the Hancock Agricultural Research Station to evaluate the effect of chemical treatments and plant spacing on seedpiece decay, *Rhizoctonia* canker development, emergence, stand, and yield. All seedpieces were mechanically cut, treated and allowed to heal three days before planting. To apply chemical seedpiece treatments, 44-lb samples of seedpieces were placed in plastic bags with the chemical and shaken until seedpieces were uniformly coated with chemical. Seedpieces were placed in the furrow with an assist-feed planter with the covering shoes removed. Seedpieces were moved by hand to result in 14-inch or 12-inch spacing within the row and then all seedpieces were mechanically covered using hilling disks. Seedpieces were not inoculated, relying on presence of *Erwinia* and *Rhizoctonia* on seed tubers and in the field. Conditions at planting were air temperature 82°F, soil temperature 68°F at the depth of seedpiece placement, seedpiece temperature 69°F and relative humidity 30%. The sky was clear and the soil was slightly moist. A randomized complete block design with four replications was used for the experiment, with each plot consisting of a single 50 foot row with treatment rows spaced three feet apart. The soil type was Plainfield loamy sand, pH 5.5. Fertilizer applied was: 0-0-60, 300 lb/A, broadcast April 16, before planting, 6-24-24, 600 lb/A, banded in the row at planting, sidedress applications on May 18 (21-0-0, 350 lb/A) and May 30 (34-0-0, 375 lb/A) and broadcast application May 30 of calcium sulfate, 500 lb/A. Lime, 2 ton/A, was applied April 16. Insects were controlled with Admire 2F incorporated in the fertilizer at planting (16 fl oz./500 lb) and foliar application of Thiodan 3 EC (1.0 qt/A) + Spintor 2 SC (4.0 oz/A) on August 9. Roundup Ultra (1.0 qt/A, April 27), Lorox DF (1.0 lb/A, May 9) and Poast (1.0 qt/A) + Crop Oil (1.0 qt/A), August 21, were applied for weed control. Fungicide was applied on a standard schedule for early and late blight control (Bravo Zn, 1.5 pt/A + Curzate 60 DF 3.3 oz - June 13, 26; Bravo Zn, 1.5 pt/A + Quadris 2.08F, 6.2 fl oz./A - June 21, July 12; Bravo Zn, 1.5 pt/A + Quadris 2.08F, 10 fl oz./A - June 29; Bravo Zn, 1.5 pt/A - July 5, 2.13 pt/A - July 19, 26, August 2, 9, 16, 23, 30, September 6). Vines were killed with an application of Diquat, 1.0 qt/A, plus Peptoil, 1.0 qt/A on August 31. Rainfall measured during the growing season (inches) was May (7.2); June (4.1); July (2.73); August (4.57) and September (through the 20th) (4.3). An additional 11.9 inches of water was applied as overhead sprinkler irrigation in 23 applications (June 11 - August 20).

Emergence was counted for each plot ten times (May 21 - June 22). Height measurements were taken for all plants in the trial on June 8, 15 and 22. To evaluate seedpiece decay, disease development and general plant vigor, a 10-foot long section of row from each plot was evaluated on June 25. The hills from each plot were dug by hand and the number of stems per plant, *Rhizoctonia* canker severity, incidence of black leg symptoms and extent of seedpiece decay were recorded. Seedpieces from plants which were dug and evaluated were removed and discarded. Total fresh weight of all leaves and stems, and weight and number of daughter tubers was recorded for the sample of plants dug from each plot. These values were expressed as grams (fresh weight) per hill. Plant height was expressed in two different ways: height per plant is the sum of all plant heights, divided by the actual number of plants which emerged; height per hill is the sum of heights measured, divided by the number of hills planted. Height per hill thus represents a measure of general vigor of all plants in a plot, since this value would be very low if few plants emerged. A forty-foot section of row in each plot was mechanically harvested September 20 and graded into US#1, undersize, and cull categories. Specific gravity was measured on a sample of tubers from each plot. US#1 tubers from all plots were sorted using an optical size grader into six categories: <4 oz., 4-6 oz., 6-10 oz., 10-13 oz., 13-16 oz., and >16 oz.

Wet and cool conditions during mid-May to early-June slowed emergence and contributed to seedpiece decay of freshly cut seedpieces. Treatment of Snowden seedpieces with Maxim-MZ did not affect emergence, plant height or incidence of blackleg when compared with the untreated control at the June 25 evaluation. Maxim-MZ reduced the incidence of *Rhizoctonia* stem canker and reduced the fresh weight of leaves and stems at the June 25 evaluation. Yields were lower than expected due to early dying and weed pressure in mid to late August. Overall, total yields were highest in untreated plots and treatment of seedpieces with Maxim-MZ did not increase yield above the untreated control.

Figure 1. Soil Temperature and Rainfall/Irrigation - Hancock Agricultural Research Station, 2001

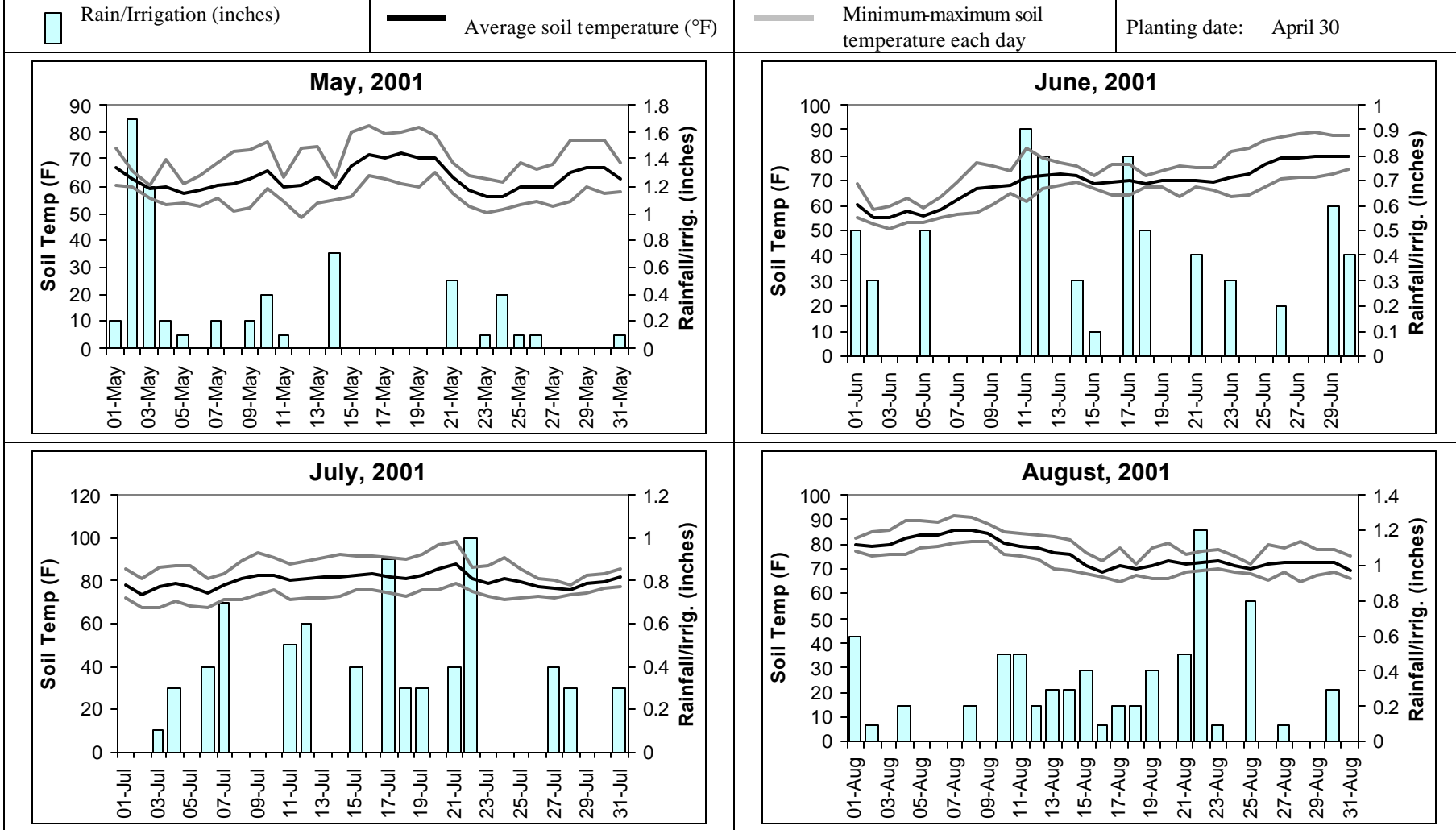


Table 1. Effect of plant spacing and seedpiece treatment on field emergence and stand of Snowden potatoes.

	Chemical treatment	Spacing	Percentage of plants emerged on: ¹									Avg. days to emergence ²	
			5/21	5/24	5/29	6/1	6/5	6/8	6/12	6/15	6/19		6/22
1.	Untreated	12"	26.5	38.5	66.5	69.5	69.0	72.0	67.5	67.5	68.0	68.5	28.6
2.		14"	31.4	47.1	66.3	70.9	69.8	72.1	69.8	69.8	70.3	69.8	27.1
3.	Maxim-MZ 10.1 DP, 8 oz/cwt (0.5 lb/cwt)	12"	31.0	42.0	64.0	64.0	63.0	66.0	64.5	65.0	65.5	65.5	28.6
4.		14"	33.7	47.1	66.3	65.7	64.0	66.3	66.9	66.9	69.8	69.2	28.4
5.	Maxim-MZ 10.1 DP, 6 oz/cwt (0.375 lb/cwt)	12"	35.0	41.5	55.5	57.0	56.0	58.5	58.0	58.5	58.0	58.5	25.5
6.		14"	40.1	50.6	65.1	65.1	64.5	65.1	64.5	64.5	65.7	65.1	26.0
Pr > F ³			0.41	0.44	0.38	0.25	0.31	0.26	0.37	0.41	0.28	0.38	0.16
LSD ³			NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Analysis of the effect of seed treatment and plant spacing												
Effect of seed treatment (data pooled for other factors)												
	Untreated.....	28.9	42.8	66.4	70.2	69.4	72.0	68.6	68.6	69.2	69.1	27.9
	Maxim-MZ 10.1 DP, 8 oz/cwt.....	32.4	44.5	65.1	64.8	63.5	66.1	65.7	65.9	67.6	67.3	28.5
	Maxim-MZ 10.1 DP, 6 oz/cwt.....	37.6	46.0	60.3	61.1	60.3	61.8	61.3	61.5	61.8	61.8	25.7
	Pr > F ³	0.18	0.77	0.30	0.10	0.14	0.08	0.18	0.19	0.16	0.18	0.04
	LSD ³	NS	NS	NS	8.6*	NS	8.9*	NS	NS	NS	NS	2.2
Effect of plant spacing (data pooled for other factors)												
	12"	30.8	40.7	62.0	63.5	62.7	65.5	63.3	63.7	63.8	64.2	27.6
	14"	35.1	48.3	65.9	67.2	66.1	67.8	67.1	67.1	68.6	68.0	27.2
	Pr > F ³	0.25	0.06	0.25	0.27	0.35	0.50	0.24	0.28	0.15	0.25	0.64
	LSD ³	NS	7.8*	NS	NS	NS	NS	NS	NS	NS	NS	NS
Interaction-seed treatment x plant spacing												
	Pr > F ³	0.96	0.89	0.45	0.65	0.60	.068	0.81	0.83	0.78	0.79	0.63

1 Based on 50 seedpieces planted/50 feet of row (12" spacing) or 43 seedpieces (14" spacing). A sample from each plot in the trial was dug and rated for disease on June 21.

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

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 difference between treatments were significant at $P = 0.10$, but not at $P = 0.05$).

Table 2. Effect of plant spacing and seedpiece treatment on height, decay, black leg and Rhizoctonia symptoms and plant development on Snowden potatoes.

Chemical treatment	Spacing	Avg. height (cm) ¹						June 25 evaluation								
		Per plant			Per hill			% decay ²	% of plants with black leg	% of total stems with black leg	Rhizoctonia severity (%) ³	No. of stems per plant	Avg. fresh weight (g)		Avg. number daughter tubers / plant	
		6/8	6/15	6/22	6/8	6/15	6/22						Leaves + stems / plant	Daughter tubers / plant		
1. Untreated	12"	9.0	17.1	32.1	6.4	11.5	22.2	94.8	12.5	9.2	11.7	4.1	428.9	73.4	4.7	
2.	14"	8.9	18.4	31.3	6.4	12.9	21.9	90.0	10.0	3.6	9.2	3.8	465.6	76.5	4.6	
3.	12"	8.0	15.9	28.3	5.3	10.3	18.5	99.9	10.0	4.3	4.5	3.4	324.7	67.0	4.6	
4.	14"	9.1	16.5	30.0	6.1	11.1	20.9	99.9	7.5	7.1	2.6	2.5	348.0	57.5	4.1	
5.	12"	9.4	17.1	29.9	5.5	10.0	17.5	100.0	5.0	3.3	6.2	2.7	264.9	79.6	4.3	
6.	14"	9.4	15.6	29.6	6.1	10.2	19.3	100.0	5.0	2.2	5.1	3.9	348.1	76.8	4.9	
Pr > F ⁴		0.59	0.45	0.16	0.65	0.35	0.31	0.02	0.81	0.56	0.23	0.39	0.26	0.89	0.98	
LSD ⁴		NS	NS	NS	NS	NS	NS	6.4	NS	NS	NS	NS	NS	NS	NS	

Analysis of the effect of seed treatment and plant spacing

Effect of seed treatment (data pooled for other factors)

Untreated	8.9	17.8	31.7	6.4	12.2	22.0	92.4	11.3	6.4	10.5	4.0	447.3	75.0	4.7
Maxim-MZ 10.1 DP, 8 oz/cwt	8.6	16.2	29.1	5.7	10.7	19.7	99.9	8.8	5.7	3.6	2.9	336.4	62.3	4.4
Maxim-MZ 10.1 DP, 6 oz/cwt	9.4	16.4	29.7	5.8	10.1	18.4	100.0	5.0	2.8	5.7	3.3	306.5	78.2	4.6
Pr > F ⁴	0.40	0.26	0.05	0.43	0.13	0.12	< 0.01	0.40	0.44	0.06	0.28	0.08	0.51	0.91
LSD ⁴	NS	NS	2.1	NS	NS	NS	4.5	NS	NS	5.7*	NS	128.0*	NS	NS

Effect of plant spacing (data pooled for other factors)

12"	8.8	16.7	30.1	5.7	10.6	19.4	98.2	9.2	5.6	7.5	3.4	339.5	73.3	4.5
14"	9.1	16.9	30.3	6.2	11.4	20.7	96.7	7.5	4.3	5.7	3.4	387.3	70.3	4.5
Pr > F ⁴	0.50	0.85	0.81	0.32	0.34	0.36	0.37	0.66	0.59	0.42	0.96	0.35	0.80	0.98
LSD ⁴	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Interaction-seed treatment x plant spacing

Pr > F ⁴	0.51	0.38	0.40	0.78	0.82	0.69	0.45	0.95	0.39	0.96	0.27	0.87	0.91	0.75
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1 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.

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

3 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.

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 3. Effect of plant spacing and seedpiece treatment on yield, proportion of US#1, undersize and culls and size grades of Snowden potatoes.

Chemical treatment	Spa- cing	Total yield cwt/A	US#1		Undersize ¹		Culls		Specific gravity	No. of tubers/5 hills	Size grades of US#1 potatoes						
			cwt/A	%	cwt/A	%	cwt/A	%			% < 4 oz.	% 4-6 oz.	% 6-10 oz.	% 10-13 oz.	% 6-13 oz.	% 13-16 oz.	% > 16 oz.
Untreated	12"	289.3	219.3	76.2	27.7	9.4	42.2	14.4	1.072	63.3	32.8	27.3	30.4	4.9	35.4	2.0	2.5
	14"	305.1	243.2	79.0	25.6	8.8	36.3	12.2	1.074	47.0	28.8	23.8	36.2	5.7	41.8	5.3	0.3
Maxim-MZ 10.1 DP, 8 oz/cwt	12"	246.4	185.5	75.1	26.5	11.2	34.3	13.7	1.072	57.0	28.4	21.2	35.9	9.6	45.5	2.7	2.1
	14"	295.7	228.4	76.7	27.0	9.5	40.3	13.8	1.077	43.0	31.3	29.3	29.0	5.5	34.5	2.3	2.6
Maxim-MZ 10.1 DP, 6 oz/cwt	12"	239.6	187.9	78.2	18.8	8.1	32.9	13.7	1.073	60.0	25.6	27.0	32.2	9.7	41.9	3.8	1.8
	14"	247.7	196.0	79.1	23.1	9.4	28.6	11.5	1.074	59.3	25.1	22.8	38.6	8.1	46.7	4.3	1.1
Pr > F²		0.45	0.48	0.54	0.33	0.62	0.64	0.74	0.30	0.22	0.65	0.14	0.28	0.41	0.28	0.55	0.83
LSD²		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Analysis of the effect of seed treatment and plant spacing

Effect of seed treatment (data pooled for other factors)																	
Untreated.....	297.2	231.3	77.6	26.7	9.1	39.3	13.3	1.073	55.1	30.8	25.6	33.3	5.3	38.6	3.7	1.4	
Maxim-MZ, 8 oz/cwt	271.1	207.0	75.9	26.8	10.3	37.3	13.8	1.074	50.0	29.8	25.2	32.5	7.5	40.0	2.5	2.4	
Maxim-MZ, 6 oz/cwt	243.7	192.0	78.7	21.0	8.7	30.7	12.6	1.073	59.6	25.3	24.9	35.4	8.9	44.3	4.0	1.4	
Pr > F³	0.22	0.29	0.32	0.12	0.42	0.36	0.73	0.75	0.34	0.32	0.96	0.64	0.25	0.41	0.54	0.75	
LSD	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Effect of plant spacing (data pooled for other factors)																	
12"	258.4	197.6	76.5	24.4	9.6	36.5	13.9	1.072	60.1	28.9	25.2	32.8	8.1	40.9	2.9	2.2	
14"	282.8	222.5	78.3	25.2	9.2	35.1	12.5	1.075	49.8	28.4	25.3	34.6	6.4	41.0	4.0	1.3	
Pr > F²	0.32	0.23	0.25	0.72	0.74	0.78	0.27	0.05	0.06	0.86	0.94	0.50	0.34	0.97	0.33	0.47	
LSD²	NS	NS	NS	NS	NS	NS	NS	0.003	11.0*	NS	NS	NS	NS	NS	NS	NS	NS
Interaction-seed treatment x plant spacing Pr > F²	0.76	0.78	0.86	0.57	0.47	0.57	0.69	0.43	0.44	0.66	0.02	0.09	0.51	0.11	0.41	0.63	

1. Undersize is defined as potatoes less than 1 7/8 inches in diameter.

2. Analysis of variance was performed on data, and Fisher's protected least significant difference (LSD) 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 4. Effect of plant spacing and seedpiece treatment on value per acre of Snowden tubers.

Chemical treatment	Spacing	Gross value of yield ¹		Effect of treatment on value ²	
		Fresh market ³	Chipping ⁴	Fresh market ³	Chipping ⁴
Untreated	12"	2191.73	1068.15	0.00	0.00
	14"	2584.38	1216.05	392.66	147.91
Maxim-MZ 10.1 DP, 8 oz/cwt	12"	2035.30	943.64	-156.43	-124.51
	14"	2319.50	1120.42	127.77	52.27
Maxim-MZ 10.1 DP, 6 oz/cwt	12"	2083.26	959.02	-108.47	-109.13
	14"	2180.86	1003.45	-10.87	-64.71
Pr > F ⁵		0.78	0.62	0.78	0.62
LSD ⁵		NS	NS	NS	NS
Analysis of the effect of seed treatment, seed size and plant spacing					
Effect of seed treatment (data pooled for other factors)					
Untreated		2388.10	1142.10	196.30	73.95
Maxim-MZ, 8 oz/cwt		2177.40	1032.00	-14.30	-36.12
Maxim-MZ, 6 oz/cwt		2132.10	981.20	-59.70	-86.92
Pr > F ⁵		0.63	0.43	0.63	0.43
LSD ⁵		NS	NS	NS	NS
Effect of plant spacing (data pooled for other factors)					
12"		2103.40	990.30	-88.3	-77.88
14"		2361.60	1113.30	169.9	45.16
Pr > F ⁵		0.28	0.24	0.28	0.24
LSD ⁵		NS	NS	NS	NS
Pr > F for interaction:					
Seed trt x plant spacing ⁵		0.87	0.85	0.87	0.85

1 Cost of seedpiece treatment chemicals were not included in calculations for this trial.

2 Gross value of untreated control (fresh cut, no chemical applied) minus gross value for the treatment.

3 Typical 2001 fresh market pricing: 4-6 oz. \$11.50/cwt, 6-10 oz. \$14/cwt, 10-13 oz. \$15.5, >13 oz. \$15, < 4 oz. and culls \$2/cwt.

4 Typical 2001 chipping price of \$5.50/cwt for a size range of 1 7/8 to 4" (estimated to be all US#1 potatoes from our size grading except those > 16 oz.) Process grade for chip stock (undersize + culls + >16 oz.) = \$2.00/cwt.

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 $P = 0.05$).

