

POTATO (*Solanum tuberosum* 'Russet Burbank')
Seedpiece/Foliar Treatment Evaluation

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Evaluation of the effect of AuxiGro (seedpiece and foliar application) on *Rhizoctonia* stem canker, silver scurf and black scurf (in storage), and on yield and quality, 2001

Cut seedpieces of Russet Burbank potatoes were planted April 30, at the Hancock Agricultural Research Station to evaluate the effect of chemical treatments 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, 48lb samples of seedpieces were placed in plastic bags with the chemical and shaken until seedpieces were uniformly coated with chemical. Seedpieces were planted with an assist-feed planter with the covering shoes removed 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 two 28-foot-long rows with seedpieces planted 12 inches apart in the row and 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). AuxiGro was applied to foliage at tuber initiation and 30-40 days prior to vine kill. To simulate application of AuxiGro as a tank mix with a standard fungicide, AuxiGro was applied to selected plots with a backpack sprayer using a hand-held boom with four XR11003VS nozzles at a rate equivalent to 33 gpa at 30 psi, prior to application of fungicide to the entire trial with the standard field spraying equipment. 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. On June 25, a 5-foot long section was dug from each of the two rows of each plot and seedpiece decay, disease development and general plant vigor, were evaluated. 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 that 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 that emerged; height per hill is the sum of heights measured, divided by 56, 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. To determine average tuber set per plant, four hills from each plot were hand-dug on August 27 and the tubers were counted. Tubers were covered and left in the hill to be included in the harvest. A 46-foot-long 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.

Table 1. Effect of treatment on field emergence and stand of Russet Burbank potatoes.

Chemical treatment (Foliar application dates: tuber initiation - Jun 29; 30-40 days before vinekill - Jul 26)	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 Potato Seed Treater (mancozeb 6%), 0.75 lb/cwt, seedpiece treatment.....	45.1	55.8	74.1	75.4	76.3	75.4	75.4	75.4	75.9	75.9	26.7
2 Potato Seed Treater (manc. 6%) + Auxigro (premix), 0.75 lb/cwt, seedpiece treatment.....	36.6	52.2	73.7	75.0	77.7	76.8	77.2	78.1	77.7	77.7	26.3
Potato Seed Treater (manc. 6%) + Auxigro (premix), 0.75 lb/cwt, seedpiece treatment											
3 Auxigro WP, 5 oz/A (foliar - tuber initiation).....	44.6	61.2	79.9	81.7	79.5	81.3	80.8	79.9	80.8	81.3	27.5
Potato Seed Treater (manc. 6%) + Auxigro (premix), 0.75 lb/cwt, seedpiece treatment											
4 Auxigro WP, 5 oz (foliar - 30-40 days before vinekill)	47.8	58.9	80.8	83.9	83.5	84.4	81.3	81.3	82.1	82.1	27.8
Potato Seed Treater (manc. 6%) + Auxigro (premix), 0.75 lb/cwt, seedpiece treatment											
5 Auxigro WP, 5 oz/A (foliar - tuber initiation and 30-40 days before vinekill)	54.0	66.1	87.9	88.4	87.9	87.5	86.6	86.6	86.6	87.5	24.9
Potato Seed Treater (manc. 6%), 0.75 lb/cwt, seedpiece treatment											
6 Auxigro WP, 5 oz/A (foliar - tuber initiation and 30-40 days before vinekill)	33.9	49.6	73.7	76.3	76.3	76.3	75.0	75.4	75.4	75.4	26.0
Pr > F ³	0.10	0.21	0.09	0.10	0.27	0.10	0.19	0.31	0.21	0.15	0.14
LSD ³	14.8*	NS	11.2	10.9	NS	9.8	NS	NS	NS	NS	NS

¹ Based on 56 seedpieces planted/56 feet of row.

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

Table 2. Effect of treatment on height, decay, black leg and Rhizoctonia symptoms and plant development on Russet Burbank potatoes. (Treatment numbers correspond to those listed in Table 1).

Treatment no.	Avg. height (cm) ¹						June 25 evaluation							
	Per plant			Per hill			% decay ²	% of plants with blackleg	% of total stems with blackleg	Rhizoctonia severity (%) ³	No. of stems per plant	Avg. fresh weight (g)		Avg. no. daughter tubers / plant
	6/8	6/15	6/22	6/8	6/15	6/22						Leaves + stems / plant	Daughter tubers / plant	
1	11.8	31.0	44.9	9.0	23.3	34.0	70.5	7.5	2.1	11.2	3.7	488.2	106.3	8.7
2	11.5	29.2	42.7	8.9	23.0	33.3	68.1	2.5	0.5	8.6	4.8	598.8	104.5	10.7
3	11.0	30.6	43.5	9.0	24.5	35.3	71.3	5.0	1.7	8.5	4.4	522.2	100.8	8.6
4	12.2	31.8	45.5	10.3	25.8	37.4	86.7	0.0	0.0	8.7	4.1	572.1	125.0	11.2
5	13.6	35.6	49.6	11.9	30.8	43.3	78.4	2.5	0.5	6.0	5.1	606.1	158.6	14.7
6	11.7	31.6	45.1	8.9	24.0	34.1	59.5	2.5	1.0	13.1	4.8	535.8	81.3	8.1
Pr > F ⁴	0.22	0.26	0.03	0.05	0.18	0.02	0.09	0.30	0.40	0.73	0.01	0.38	0.24	0.02
LSD ⁴	NS	NS	3.9	2.1	NS	5.6	18.1*	NS	NS	NS	0.7	NS	NS	3.8

¹ Avg. height per plant includes only those plants which grew. To calculate avg. height per hill, a height of 0 is included 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 $P = 0.10$. * indicates differences between treatments were significant at $P = 0.10$, but not at $P = 0.05$.

Table 3. Effect of seedpiece treatment on yield, proportion of US#1, undersize and culls and size grades of Russet Burbank potatoes. (Treatment numbers correspond to those listed in Table 1)

Treatment no.	Avg. no. tubers/hill ¹	Total yield cwt/A	US#1		Undersize ²		Culls		Specific gravity	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.
1	63.8	246.7	68.3	26.3	147.5	61.6	31.0	12.1	1.065	34.8	44.3	18.4	2.4	20.8	0.0	0.0
2	50.5	220.2	56.0	23.4	139.1	65.5	25.1	11.1	1.062	40.2	43.5	14.4	1.9	16.3	0.0	0.0
3	64.3	263.7	96.6	31.0	140.0	58.7	27.1	10.3	1.064	36.4	40.7	21.1	1.7	22.9	0.0	0.0
4	49.8	243.9	58.3	20.9	161.8	69.9	23.8	9.1	1.064	44.9	37.5	16.9	0.7	17.6	0.0	0.0
5	64.8	283.1	94.4	29.4	164.6	62.3	24.2	8.3	1.065	41.8	37.7	18.7	1.4	20.2	0.4	0.0
6	63.3	204.0	40.9	19.3	143.8	71.2	19.3	9.5	1.064	36.7	44.5	16.9	0.0	16.9	1.8	0.0
Pr > F³	0.06	0.43	0.21	0.28	0.67	0.16	0.37	0.13	0.34	0.41	0.77	0.89	0.22	0.83	0.22	--
LSD³	13.0*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	--

1 Four hills from each plot were hand-dug on August 27 and the tubers were counted. Tubers were covered and left in the hill to be included in the harvest.

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

3 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 experimental treatment on value per acre of Russet Burbank tubers. (Treatment numbers correspond to those listed in Table 1)

Treatment no.	Gross value of yield ¹		Effect of treatment on value ²	
	Fresh market ³	Processing ⁴	Fresh market ³	Processing ⁴
1	335.21	1142.15	0.00	0.00
2	273.09	923.90	-62.11	-218.25
3	458.10	1489.98	122.90	347.83
4	276.68	1007.12	-58.52	-135.03
5	436.83	1437.30	101.62	295.15
6	198.72	795.33	-136.48	-346.82
Pr > F⁵	0.20	0.19	0.20	0.19
LSD⁵	NS	NS	NS	NS

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

2 Gross value of treatment 1 (Potato Seed Treater, 0.75 lb/cwt, seedpiece treatment) 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 processing contract pricing: Base price is \$4.77/cwt for 69% US#1 (4 oz. minimum) with specific gravity of 1.078. A premium is paid for > 18% 10 oz. or greater. For each 1% > 18% (max. = 32%) > 10 oz. the price increases \$0.03/cwt. The price decreases \$0.03/cwt for each 1% below 19% to 10%. A decrease of \$0.05 for each 1% of potatoes below 10% 10 oz. There is an increase or decrease in price per hundred weight depending on specific gravity: >1.085 + \$.17; 1.084 + \$.14; 1.083 + \$.11; 1.082 + \$.08; 1.081 + \$.06; 1.080 + \$.04; 1.079 + \$.02; 1.078 .00; 1.077 -\$0.02; 1.076 -\$0.04; 1.075 -\$0.06; 1.074 -.08; 1.073 -\$0.10; 1.072 -\$0.12; ≤ 1.071 -.50. There is a payment of \$2.00/cwt for processing culls (up to a maximum of 15% of the total by weight).

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

