

Seed treatments, in-furrow and seed plus foliar treatments for control of potato stem canker and black scurf, 2004.

Potatoes infected with *Rhizoctonia solani* (black scurf), 2- 5% tuber surface area infected, were selected for the trials. Potato seed was prepared for planting by cutting and treating with fungicidal seed treatments seven days prior to planting. Seed were planted at the Michigan State University Muck Soils Experimental Station, Bath, MI on 28 Jun into two-row by 20-ft plots (ca. 10-in. between plants to give a target population of 50 plants at 34-in. row spacing) replicated four times in a randomized complete block design. The two-row beds were separated by a 5-ft unplanted row. Dust formulations were measured and added to cut seed pieces in a Gustafson revolving drum seed treater and mixed for 2 min to ensure even spread of the fungicide. Fungicides applied as pre-planting potato seed liquid treatments were applied in water suspension at a rate of 0.02pt/cwt onto the exposed seed tuber surfaces, with the entire seed surface being coated in the Gustafson seed treater. In furrow applications were made over the seed at planting, applied with a single nozzle R&D spray boom delivering 5 gal/A (80 psi) and using one XR11003VS nozzle per row. Fertilizer was drilled into plots before planting, formulated according to results of soil tests. Additional nitrogen (final N 28 lb/A) was applied to the growing crop with irrigation 45 DAP (days after planting). Bravo WS 6SC was applied at 1.5 pt/A on a seven day interval, total of 8 applications, starting after the canopy was about 50% closed. A permanent irrigation system was established prior to the commencement of fungicide sprays and the fields were maintained at soil moisture capacity throughout the season by frequent (minimum 5 day) irrigations. Weeds were controlled by hilling and with Dual 8E at 2 pt/A 10 DAP, Basagran at 2 pt/A 20 and 40 DAP and Poast at 1.5 pt/A 58 DAP. Insects were controlled with Admire 2F at 1.25 pt/A at planting, Sevin 80S at 1.25 lb/A 31 and 55 DAP, Thiodan 3 EC at 2.33 pt/A 65 and 87 DAP and Pounce 3.2EC at 8 oz/A 48 DAP. Emergence was rated as the number of plants breaking the soil surface or fully emerged after planting. The rate of emergence was estimated as the area under the plant emergence curve (max=100) from the day of planting until 23 DAP. The rate of canopy development was measured as the RAUCPC, relative area under the canopy development curve, calculated from day of planting to a key reference point taken as 43 DAP (about 100% canopy closure), (max = 100). Severity of stem canker was estimated as the percentage of stems per plant with greater than 10% girdling caused by *R. solani*, measured 43 days after planting (5 plants per sample were destructively harvested and total stem number and number affected was counted). Vines were killed with Reglone 2EC (1 pt/A on 13 Sep). Plots (25-ft row) were harvested on 5 Oct and individual treatments were weighed and graded. Samples of 50 tubers per plot were harvested 21 days after desiccation (99 DAP). Tubers were washed and assessed for black scurf (*R. solani*) incidence (%) and severity 50 days after harvest on 2 Nov. Severity of black scurf was measured as an index calculated by counting the number of tubers (n = 50) falling in class 0 = 0%; 1 = 1 - 5%; 2 = 6 - 10%; 3 = 11 - 15%; 4 >16% surface area of tuber covered with sclerotia. The number in each class is multiplied by the class number and summed. The sum is multiplied by a constant to express as a percentage. Indices of 0 - 25 represent 0 - 5%; 26 - 50 represent 6 - 10%; 51 - 75 represent 11 - 15% and 75 - 100 >15% surface area covered with sclerotia. Maximum and minimum air temperature (°F) were 88.2 and 67.2 (Jun), 87.5 and 67.7 (Jul), 88.1 and 67.7 (Aug) and 85.3 and 66.0 (Sep). Maximum and minimum soil temperature (°F) were 74.5 and 69.8 (Jun), 77.0 and 71.9 (Jul), 78.0 and 71.4 (Aug) and 75.9 and 70.2 (Sep). Maximum and minimum soil moisture (% of field capacity) was 98.5 and 95.8 (Jun, severe flooding); 98.1 and 63.3 (Jul), 85.4 and 71.4 (Aug) and 76.8 and 79.8 (Sep). Precipitation was 4.04" (Jun), 3.68" (Jul), 1.83" (Aug) and 0.93" (Sep).

No seed treatment (ST) or fungicide applied at planting in-furrow (IF) was significantly different from the untreated control or from the Moncoat MZ 0.5 lb (ST) commercial standard treatment in terms of the final plant stand. No seed treatment (ST) or fungicide applied at planting in-furrow (IF) was significantly different from the untreated control or from the Moncoat MZ 0.5 lb (ST) commercial standard treatment in terms of rate of emergence (RAUEPC). No seed treatment (ST) or fungicide applied at planting in-furrow (IF) was significantly different from the untreated control or from the Moncoat MZ 0.5 lb (ST) commercial standard treatment in terms of the rate of canopy formation (RAUCPC) except treatment 4. All treatments significantly reduced the percentage of stolons with greater than 5% girdling due to *R. solani* in comparison with the untreated control but there was no difference among treatments. All treatments significantly reduced the percent incidence of black scurf on tubers in comparison with the untreated control except treatment 1. There was no significant difference among treatments with 16.3 - 48.8%; 37.5 - 75.0%; and 75.0 - 96.3% incidence of tuber black scurf. All treatments significantly reduced the severity of black scurf on tubers in comparison with the untreated control except treatment 1 measured as an index on the 0 - 100 scale. There was no significant difference in the index of severity of black scurf between treatments with indices between 5.0 and 25.3; 20.0 to 42.2 and from 42.2 to 48.4. Treatments with marketable yield between 246 (non-treated control) and 312 cwt/A; and 273 and 340 cwt/A were not significantly different. There were no significant differences among treatments in total yield.

Treatment and rate/cwt (seed treatment) rate/A (in furrow) ^z			Plant number (%) emerged 23 days after planting		Emergence (RAUEPC) ^y		Canopy development (RAUCPC) ^x	
1	Potato Seed Treater PS 8% 1.0 lb	ST.....	97.0	ab ^w	0.27	ab	0.18	ab
2	Moncut 70DF 0.79 oz/1000 ft	IF.....	98.0	ab	0.26	ab	0.18	ab
3	Moncut 70DF 1.18 oz/1000 ft	IF.....	100.0	a	0.26	ab	0.19	a
4	Maxim 4 FS 0.08 fl oz	ST.....	100.0	a	0.27	ab	0.13	bcd
5	Maxim 4 FS 0.08 fl oz + Amistar 80WDG 0.12 oz/1000 ft	ST IF.....	99.5	a	0.28	a	0.19	a
6	Moncoat MZ 0.75 lb	ST.....	98.0	ab	0.26	ab	0.17	abc
7	Maxim 4 FS 0.08 fl oz + Quadris 2.08SC 0.05 fl oz/1000 ft	ST IF.....	100.0	a	0.29	a	0.18	ab
8	Potato Seed Treater PS 8% 1.0 lb + Amistar 80WDG 0.12 oz/1000 ft	ST IF.....	100.0	a	0.25	ab	0.18	ab
9	Potato Seed Treater PS 8% 1.0 lb + Headline 2.09SC 0.05 fl oz/1000 ft	ST IF.....	97.5	ab	0.26	ab	0.18	abc
10	Tops MZ 0.75 lb	ST.....	96.0	ab	0.27	a	0.18	ab
11	Amistar 80WDG 0.12 oz/1000 ft	IF.....	98.0	ab	0.27	ab	0.18	ab
12	Headsup 3WDG 0.1 lb	ST.....	98.5	ab	0.24	abc	0.16	abcd
13	Headsup 3WDG 0.1 lb + Headsup 3WDG 0.1 lb	ST Foliar...	100.0	a	0.28	a	0.19	a
14	Untreated	NA.....	100.0	a	0.26	ab	0.19	a

Treatment and rate/cwt (seed treatment) rate/A (in furrow) ^z			Percent stolons with greater than 10% girdling due to <i>R. solani</i> ^y		Incidence of black scurf on tubers (%) ^u		Index of severity of black scurf on tubers (%) ^t		Yield cwt/A Marketable (US1) ^s Total ^f			
1	Potato Seed Treater PS 8% 1.0 lb	ST.....	22.3	b ^w	75.0	ab	48.4	a	273.9	ab	283.8	a
2	Moncut 70DF 0.79 oz/1000 ft	IF.....	13.4	b	25.0	c	8.4	c	291.7	ab	304.5	a
3	Moncut 70DF 1.18 oz/1000 ft	IF.....	14.1	b	48.8	bc	20.0	bc	299.7	ab	306.9	a
4	Maxim 4 FS 0.08 fl oz	ST.....	16.2	b	30.0	c	11.3	c	286.0	ab	294.3	a
5	Maxim 4 FS 0.08 fl oz + Amistar 80WDG 0.12 oz/1000 ft	ST IF.....	13.7	b	37.5	bc	16.9	c	339.6	a	348.4	a
6	Moncoat MZ 0.75 lb	ST.....	15.4	b	33.8	c	25.3	bc	301.0	ab	310.2	a
7	Maxim 4 FS 0.08 fl oz + Quadris 2.08SC 0.05 fl oz/1000 ft	ST IF.....	12.1	b	18.8	c	7.8	c	312.2	ab	323.8	a
8	Potato Seed Treater PS 8% 1.0 lb + Amistar 80WDG 0.12 oz/1000 ft	ST IF.....	18.2	b	26.3	c	11.9	c	292.6	ab	337.1	a
9	Potato Seed Treater PS 8% 1.0 lb + Headline 2.09SC 0.05 fl oz/1000 ft	ST IF.....	16.1	b	17.5	c	5.9	c	302.4	ab	313.0	a
10	Tops MZ 0.75 lb	ST.....	18.0	b	32.5	c	14.1	c	324.7	a	333.1	a
11	Amistar 80WDG 0.12 oz/1000 ft	IF.....	14.2	b	16.3	c	5.0	c	292.2	ab	302.5	a
12	Headsup 3WDG 0.1 lb	ST.....	14.0	b	42.5	bc	24.7	bc	294.8	ab	303.9	a
13	Headsup 3WDG 0.1 lb + Headsup 3WDG 0.1 lb	ST Foliar..	19.9	b	33.8	c	15.3	c	309.1	ab	316.4	a
14	Untreated	NA.....	44.9	a	96.3	a	42.2	ab	245.5	b	278.6	a

^z Application type, seed treatment (ST), in-furrow at planting (IF), untreated (NA).

^y RAUEPC (max = 100), relative area under the plant emergence progress curve, day of planting to full emergence 23 days after planting.

^x RAUCPC (max = 100), relative area under the canopy development curve, day of planting to key reference point, 43 days after planting.

^w Values followed by the same letter are not significantly different at P = 0.05 (Tukey Multiple Comparison).

^v Percentage of stems with greater than 10% girdling caused by *R. solani*, average of 5 plants taken 43 days after planting.

^u Percent incidence of tubers with sclerotia of *R. solani* from sample of 50 tubers per replicate.

^t Severity of black scurf (index calculated by counting tuber number (n = 50) falling in class 0 = 0%; 1 = 1 - 5%; 2 = 6 - 10%; 3 = 11 - 15%; 4 > 16% surface area. Indices of 0 - 25 cover the range 0 - 5%; 26 - 50 cover the range 6 - 10%; 51 - 75 cover the range 11 - 15% and 75 - 100 > 15% surface area of tuber with sclerotia.

^s Marketable yield, tubers greater than 2.5" in any plane (US1 grade).

^f Total yield, combined total of US1 grade and tubers less than 2.5" in any plane.