

POTATO (*Solanum tuberosum* L. 'Pike')  
Black scurf and stem canker; *Rhizoctonia solani*

W. W. Kirk, R. L. Schafer and D. Berry  
Department of Plant Pathology  
Michigan State University  
East Lansing, MI 48824

### Seed treatments, in-furrow and seed plus foliar treatments for control of potato stem canker and black scurf, 2002.

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 29 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 five-foot unplanted row. Dust formulations were measured and added to cut seed pieces in a Gustafson revolving drum seed treater and mixed for two minutes 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 p.s.i.) 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 29 days after planting. 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 49 DAP (about 100% canopy closure), (max = 100). Severity of stem canker was estimated as the percentage of stems per plant with greater than 5% girdling caused by *R. solani*, measured 70 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 20 Sep). Plots (25-ft row) were harvested on 29 Oct and individual treatments were weighed and graded. Samples of 50 tubers per plot were harvested 14 days after desiccation (approximately 135 DAP). Tubers were washed and assessed for black scurf (*R. solani*) incidence (%) and severity 40 days after harvest. 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.

No seed treatment (ST) or fungicide applied at planting in-furrow (IF) was significantly different from the untreated control or from the Maxim MZ 0.5 lb (ST) commercial standard treatment in terms of the final plant stand (91 - 100%). Maxim MZ 0.75 lb (ST) emerged at a significantly lower rate [relative rate of emergence (RAUEPC)] than the untreated control. No other treatments emerged at a rate significantly different from the untreated control or from the Maxim MZ 0.5 lb (ST) commercial standard treatment. Messenger 1.4 oz/1000 ft (IF) had a significantly lower rate of canopy formation (RAUCPC) than the untreated control but no other treatments were significantly different from the untreated control or from the Maxim MZ 0.5 lb (ST) commercial standard. Seed treatments and in-furrow applications of fungicides were not phytotoxic. All treatments significantly reduced the percentage of stolons with greater than 5% girdling due to *R. solani* in comparison with the untreated control. Headsup 0.002 lb (ST) had significantly more stolon girdling (29.2%) in comparison to the commercial standard. No treatments significantly reduced the percent incidence of black scurf on tubers in comparison with the untreated control or the commercial seed treatment standard. All treatments significantly reduced incidence of black scurf on tubers in comparison with the untreated control. There was no significant difference in incidence of black scurf between treatments with 7.5% [Moncoat MZ 0.75 lb (ST)] to 16.3% [Maxim MZ 0.75 lb (ST)] and included the commercial standard [Maxim MZ 0.5 lb (ST), 11.3%]. Messenger 1.4 oz/1000 ft (IF) and Headsup 0.002 lb (ST) had significantly greater incidence (%) of black scurf on tubers than the commercial standard. All treatments significantly reduced the severity of tuber black scurf in comparison with the untreated control. There was no significant difference in the index of severity of black scurf between treatments with indices between 1.9 [Moncoat MZ 0.75 lb (ST)] to 4.7 the commercial standard [Maxim MZ 0.5 lb (ST), 4.7]. Messenger 1.4 oz/1000 ft (IF) and Headsup 0.002 lb (ST) had significantly more severe tuber black scurf than the commercial standard but all other treatments were not significantly different in terms of severity of tuber black scurf from the commercial standard. No treatments were significantly different from the untreated control or the commercial seed treatment standard in terms of marketable or total yield.

## Funding Industry

Treatment and rate/cwt (seed treatment) rate/A (in furrow)	Application timing <sup>z</sup>	Plant number (%) emerged 29 days after planting	Emergence (RAUEPC) <sup>y</sup>	Canopy development (RAUCPC) <sup>x</sup>
1 Tops MZ 0.75 lb	ST.....	99.5 a <sup>w</sup>	0.26 ab	0.56 ab
2 Quadris 2.08SC 0.05 fl.oz/1000 ft	IF.....	97.0 a	0.27 ab	0.53 ab
3 Moncoat MZ 0.75 lb	ST.....	100.0 a	0.28 ab	0.55 ab
4 Moncut 70DF 0.79 oz/1000 ft	IF.....	96.0 a	0.25 bc	0.56 ab
5 Moncut 70DF 1.18 oz/1000 ft	IF.....	95.0 a	0.25 bc	0.50 cd
6 6% Mancozeb 1lb	ST.....	100.0 a	0.28 ab	0.55 ab
7 Maxim MZ 0.5 lb	ST.....	94.5 a	0.25 bc	0.53 ab
8 Maxim MZ 0.75 lb	ST.....	91.0 a	0.24 c	0.48 cd
9 Messenger 1.4 oz/1000 ft	IF.....	92.5 a	0.25 bc	0.46 d
10 Headsup 0.002 lb	ST.....	99.0 a	0.26 ab	0.53 abc
11 Untreated	NA.....	99.5 a	0.27 ab	0.53 abc

Treatment and rate/cwt (seed treatment) rate/A (in furrow)	Application timing <sup>z</sup>	Percent stolons with greater than 5% girdling due to <i>R. solani</i> <sup>v</sup>	Incidence of black scurf on tubers (%) <sup>u</sup>	Index of severity of black scurf on tubers (%) <sup>t</sup>	Yield cwt/A	
					Marketable (US1) <sup>s</sup>	Total <sup>r</sup>
1 Tops MZ 0.75 lb	ST.....	21.6 cdefg <sup>w</sup>	12.5 de	3.4 ef	357 a	387 a
2 Quadris 2.08SC 0.05 fl.oz/1000 ft	IF.....	18.7 defg	10.0 de	3.1 ef	347 a	372 a
3 Moncoat MZ 0.75 lb	ST.....	15.6 fg	7.5 e	1.9 f	349 a	374 a
4 Moncut 70DF 0.79 oz/1000 ft	IF.....	24.9 bcd	12.5 de	3.4 ef	356 a	384 a
5 Moncut 70DF 1.18 oz/1000 ft	IF.....	14.8 g	13.8 de	4.1 ef	346 a	377 a
6 6% Mancozeb 1lb	ST.....	28.4 bc	21.3 d	6.9 e	336 a	364 a
7 Maxim MZ 0.5 lb	ST.....	22.5 cdef	11.3 de	4.7 ef	351 a	384 a
8 Maxim MZ 0.75 lb	ST.....	18.3 defg	16.3 de	4.7 ef	358 a	385 a
9 Messenger 1.4 oz/1000 ft	IF.....	22.7 bcde	50.0 bc	18.4 b	345 a	368 a
10 Headsup 0.002 lb	ST.....	29.2 b	41.3 c	14.1 cd	354 a	382 a
11 Untreated	NA.....	40.5 a	70.0 a	22.8 a	336 a	366 a

<sup>z</sup> Application type, seed treatment (ST), in-furrow at planting (IF), untreated (NA).

<sup>y</sup> RAUEPC (max = 100), relative area under the plant emergence progress curve calculated from the day of planting to full emergence at 29 days after planting.

<sup>x</sup> RAUCPC (max = 100), relative area under the canopy development curve calculated from day of planting to key reference point, 50 days after planting (about 100% canopy closure).

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

<sup>v</sup> Percentage of stems with greater than 5% girdling caused by *R. solani*, average of 5 plants taken 70 days after planting.

<sup>u</sup> Percent incidence of tubers with sclerotia of *R. solani* from sample of 50 tubers per replicate.

<sup>t</sup> 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.

<sup>s</sup> Marketable yield, tubers greater than 2.5" in any plane (US1 grade).

<sup>r</sup> Total yield, combined total of US1 grade and tubers less than 2.5" in any plane.