

POTATO (*Solanum tuberosum* L. 'FL1879')  
Black scurf and stem canker; *Rhizoctonia solani*

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### Seed, in-furrow and emergence treatments for control of seed- and soil-borne *Rhizoctonia*, 2007.

Potatoes 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 two days prior to planting. Seed were planted at the Michigan State University Muck Soils Experimental Station, Bath, MI on 10 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 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 0.2 pt/cwt onto the exposed seed tuber surfaces, with the entire seed surface being coated in the Gustafson seed treater. Foliar applications were applied with a R&D spray boom delivering 25 gal/A (80 p.s.i.) and using three XR11003VS nozzles 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). Previcur Flex was applied at 0.7 pt/A on a seven day interval, total of four applications, starting 1 day after inoculation of adjacent plots with *Phytophthora infestans*. 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. Vines were killed with Reglone 2EC (1 pt/A on 20 Sep). 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 (RAUEPC, max=100) from the day of planting until 31 days after planting. Four plants per plot were harvested 10-days after the final treatment application (13 Jul) and the percentage of stems and stolons with greater than 5% of the total surface area were counted. Plots (20-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 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 >15% 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, minimum and average daily air temperature (°F) were 91.3, 36.1 and 66.6 and 2-d with maximum temperature >90°F (Jun); 95.2, 37.7 and 67.0 and 4-d with maximum temperature >90°F (Jul); 93.4, 36.3 and 68.7 and 4-d with maximum temperature >90°F (Aug); 90.0, 34.1 and 63.4 and 1-d with maximum temperature >90°F (Sep). Maximum, minimum and average daily soil temperature (°F) were 75.1, 53.1 and 65.8 (May); 82.1, 53.2 and 68.2 (Jun); 83.1, 53.7 and 65.3 (Jul); 80.5, 54.5 and 67.1 (Aug); 77.1, 51.3 and 66.4 (Sep). Maximum, minimum and average soil moisture (% of field capacity) 79.0, 75.2 and 77.3 (May); 91.7, 77.2 and 81.3 (Jun); 82.1, 74.1 and 77.9 (Jul); 98.1, 75.4 and 80.7 (Aug); 76.2, 66.6 and 69.8 (Sep). Precipitation was 0.99 in. (May), 3.91 in. (Jun), 0.80 in. (Jul), 6.18 in. (Aug) and 1.09 in. (Sep). Plots were irrigated to supplement precipitation to about 0.1 in./A/4 day period with overhead sprinkle irrigation.

No treatment affected final plant stand or RAUEPC and none were significantly different from the untreated control. Marketable yields ranged from 189 to 287 cwt/A (not-treated check = 195 cwt/A) and treatments with greater than 247 cwt/A were significantly different from the untreated check and Maxim FS (ST). Total yield ranged from 229 to 325 cwt/A (untreated check = 239 cwt/A) and treatment with greater than 289 cwt/A had significantly greater total yield than the untreated check and Maxim FS (ST). No treatment affected the total number of stolons or stem number per plant. Treatments with less than 8.7% incidence of stolon canker were significantly different from the untreated control. Treatments with less than 5.5% incidence of stems with canker were significantly different from the untreated control. No treatment affected the incidence or severity of black scurf on tubers evaluated 40 days after harvest. Seed treatments and seed treatment plus fungicide applications of fungicides were not phytotoxic.

Treatment and rate/1000 row ft; rate/cwt potato seed; rate/A <sup>z</sup>	Final plant stand (%)	RAUEPC <sup>y</sup>	Yield (cwt/A)			
			US1		Total	
LEM 17 200EC 0.67 fl oz (B <sup>x</sup> )....	96.3	31.3	235	b-e <sup>w</sup>	268	b-e
LEM 17 200EC 1.63 fl oz (B)....	87.5	35.9	275	abc	314	ab
LEM 17 200EC 3.26 fl oz (B)....	86.3	35.5	249	a-d	289	abc
LEM 200SC 0.67 fl oz (B).....	82.5	29.8	279	ab	318	a
LEM 200SC 1.63 fl oz (B).....	85.6	37.6	272	a-d	317	a
LEM 200SC 3.26 fl oz (B).....	88.8	30.9	228	def	265	cde
Quadris 2.08SC 0.4 fl oz (B).....	87.5	32.8	287	a	325	a
Evito 4FL 0.26 fl oz (B).....	87.5	31.1	230	c-f	267	cde
Evito 4FL 0.26 fl oz (C).....	85.0	31.2	228	def	268	b-e
Maxim 4FS 0.16 fl oz/cwt (A)....	72.5	24.5	189	f	229	e
Weco 0406 4FS 0.5 fl oz/cwt (A).	84.4	32.4	247	a-d	282	a-d
Weco 143 4FS 0.5 fl oz/cwt (A)...	88.1	35.1	277	ab	317	a
Untreated Check.....	85.6	35.3	195	ef	239	de
HSD <sub>0.05</sub>	12.81	8.03	45.5		46.2	

<sup>z</sup> Application type; rate per 1000 row ft for in-furrow applications; rate per cwt of potato seed-piece application prior to planting; liquid formulations for seed piece application at 0.2 pt/cwt; .

<sup>y</sup> RAUEPC = Relative area under the emergence progress curve measured from planting to 31 days after planting.

<sup>x</sup> Application dates: A= 13 Jun (liquid formulations for seed piece application at 0.2 pt/cwt; B= 13 Jun (in-furrow); C= 29 Jun (banded over row).

<sup>w</sup> Values followed by the same letter are not significantly different at  $p = 0.05$  (Honest Significant Difference; Tukey Multiple Comparison).

Treatment and rate/1000 row ft; rate/cwt potato seed; rate/A <sup>z</sup>	Rhizoctonia symptoms						
	Stems (55 DAP)		Stolons (55 DAP)		Tuber black scurf		
	Number/ plant	Girdling > 5% <sup>y</sup>	Number	Percent infected <sup>x</sup>	Incidence (%)	Severity scale (0 - 100)	
LEM 17 200EC 0.67 fl oz (B <sup>w</sup> )....	3.5	17.4	23.5	22.7	96.3	bcd <sup>v</sup> 37.5	
LEM 17 200EC 1.63 fl oz (B)....	3.6	13.2	21.2	15.1	88.8	cde c-f 39.7	
LEM 17 200EC 3.26 fl oz (B)....	3.3	8.9	25.3	10.0	90.0	de def 38.8	
LEM 200SC 0.67 fl oz (B).....	3.3	12.9	23.0	14.0	91.3	cde c-f 37.8	
LEM 200SC 1.63 fl oz (B).....	3.0	14.2	21.0	16.7	100.0	cde c-f 42.5	
LEM 200SC 3.26 fl oz (B).....	4.0	5.5	24.4	8.7	92.5	de ef 35.6	
Quadris 2.08SC 0.4 fl oz (B).....	3.4	18.4	23.4	21.2	100.0	b-e b-e 44.7	
Evito 4FL 0.26 fl oz (B).....	3.2	16.6	20.4	32.9	83.8	ab ab 35.9	
Evito 4FL 0.26 fl oz (C).....	3.1	33.4	20.8	43.3	100.0	a a 49.7	
Maxim 4FS 0.16 fl oz/cwt (A)....	3.6	3.7	23.7	6.7	81.3	e f 33.1	
Weco 0406 4FS 0.5 fl oz/cwt (A).	3.9	6.4	25.6	11.7	100.0	cde c-f 42.8	
Weco 143 4FS 0.5 fl oz/cwt (A)...	3.4	7.1	21.8	17.5	95.0	cde b-f 41.9	
Untreated Check.....	3.3	22.0	22.4	26.0	97.5	bc abc 50.6	
HSD <sub>0.05</sub>	1.10	2.93	2.45	4.30	14.82	25.47	

<sup>z</sup> Application type; rate per 1000 row ft for in-furrow applications; rate per cwt of potato seed-piece application prior to planting; liquid formulations for seed piece application at 0.2 pt/cwt.

<sup>y</sup> Stems with greater than 5% of area with stem canker due to *Rhizoctonia solani*.

<sup>x</sup> Stolons with greater than 5% of area with stolon canker due to *Rhizoctonia solani*.

<sup>w</sup> Application dates: A= 13 Jun (liquid formulations for seed piece application at 0.2 pt/cwt; B= 13 Jun (in-furrow); C= 29 Jun (banded over row).

<sup>v</sup> Values followed by the same letter are not significantly different at  $p = 0.05$  (Honest Significant Difference; Tukey Multiple Comparison).