

POTATO (*Solanum tuberosum*)
Common Scab; *Streptomyces scabies*

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Evaluation of potato cultivars and breeding selections to identify resistance to common scab - Antigo

A trial was established May 14 at the Langlade County Research Area, Antigo, WI to evaluate the reaction of potato cultivars and breeding selections to common scab. The trial was located in a field where common scab has been a persistent problem. To increase pressure for scab development, hydrated lime has been added to the area each year before planting to raise the pH. Lime was applied this year at the rate of 3 ton/A (70-79 grade) May 11. Tubers were cut by hand into approximately 2 oz seedpieces and were mechanically planted in a randomized complete block design with four replications. Each plot consisted of two 8-foot-long rows with spacing three feet between rows and 12 inches within the row. The soil type was Antigo silt loam, pH 5.8 (fall, 1999). Plots were fertilized with 600 lb/A of 13-34-8 in the row at planting, and sidedress applications of 250 lb/A of NH_3SO_4 on June 26 and 250 lb/A of NH_3NO_4 on July 2. Insects were controlled with Admire 2F incorporated in fertilizer used at planting (16 fl oz./500 lb) and Asana XL, 8.0 fl oz./A applied as a foliar spray July 20. Weeds were controlled by application of Dual 8E, 1.6 pt/A + Linex 50DF, 1.6 lb/A on June 5. A standard foliar fungicide program for early and late blight control included: Bravo Ultrex (1.4 lb/A, June 26 and July 3; 1.2 lb/A, July 20, August 11, 26, 31 and September 7), Quadris (12 fl oz./A, 9 Jul; 10 fl oz./A July 28) and Curzate 60DF 3.3oz/A + Bravo Ultrex 1.2 lb/A, August 17. Vines were killed with Diquat, 1.0 pt/A on August 31 and September 7. Plots were mechanically harvested September 14 and graded. After tubers were washed, 40 tubers from each treatment plot were chosen at random and assessed for scab severity (area covered by lesions and lesion type). Lesion type was rated on a 5-point scale with: 0 = no lesions; 1 = superficial less than 10 mm; 2 = superficial, greater than 10 mm; 3 = raised, less than 10 mm; 4 = raised, greater than 10 mm; 5 = pitted scab. Total yield from each plot was graded into US#1, undersize, and cull categories. Cull potatoes included misshapen, green and rotten potatoes along with tubers exhibiting pit scab. Rainfall (in.) measured during the growing season was May 17-31 (2.65); June (3.17), July (2.94); August (4.36) and September 1-14 (1.6). Plots were not irrigated.

Soil moisture during the early part of the growing season was adequate and it was not until mid to late July that the plants were stressed from moisture shortage. Consequently the incidence and severity of scab were lower than expected. Emergence was excellent for all lines tested. The surface area of tubers exhibiting scab lesions was highest for Snowden, W1201 and ARS W95-6553-1. The scab lesion type index was also highest for these three entries plus W1355-1, W1386 and AF1921-4. Six promising breeding lines had a lesion type index of 5.1 or less. These include W1348 rus, W1836-3 rus, W1876-1 rus, AF1758-7, AF1764-3 and Liberator. Total yields ranged from 215.1 cwt/A (Dark Red Norland) to 421.1 cwt/A (AF1921-4).

Table 1. Emergence, yield and evaluation of scab symptoms on potato cultivars and breeding lines.

Cultivar or Breeding Line	% of Plants Emerged ¹			Lesion Area Index ²	Lesion Type Index ³	Yield						
	6/12	6/20	6/28			Total Yield cwt/A	US#1		Undersize ⁴		Culls	
							cwt/A	%	cwt/A	%	cwt/A	%
AF 1758-7 ⁵	34.4	96.9	100.0	3.8	4.1	371.2	283.6	75.9	8.6	2.3	79.0	21.7
AF 1764-3 ⁵	1.6	81.3	95.3	2.9	3.1	301.3	250.2	82.6	9.5	3.3	41.5	14.1
AF 1856-1 ⁵	17.2	92.2	95.3	5.5	6.9	375.5	325.8	86.0	4.8	1.4	44.9	12.6
AF 1866-8 ⁵	34.4	95.3	95.3	4.9	7.6	224.8	155.6	67.3	11.8	5.6	57.4	27.1
AF 1921-4 ⁵	25.0	96.9	98.4	8.4	13.6	421.1	288.8	68.5	18.6	4.4	113.7	27.0
ARS W95-6553-1 ⁵	46.9	96.9	100.0	10.0	14.3	366.2	313.8	85.4	14.5	3.9	37.9	10.7
Dark Red Norland ⁶	46.9	79.7	89.1	5.0	6.0	215.1	184.0	85.3	13.2	6.0	17.9	8.8
Liberator (MSA091-1) ⁷	48.4	98.4	100.0	4.6	5.1	336.2	272.7	81.0	14.5	4.4	49.0	14.6
Russet Burbank ⁶	76.6	96.9	100.0	3.5	3.4	303.1	121.2	35.6	35.6	11.7	146.3	52.6
SC 8801-2 ⁵	1.6	75.0	90.6	4.4	5.5	303.6	236.6	78.0	3.6	1.1	63.3	20.9
Snowden ⁶	62.5	95.3	96.9	10.5	15.1	361.6	307.9	85.1	20.2	5.6	33.6	9.3
W 1201 ⁶	45.3	93.8	98.4	13.6	14.3	324.2	251.2	77.1	12.0	3.6	61.0	19.3
W 1348 rus ⁶	56.3	100.0	100.0	3.4	5.1	350.5	236.0	66.5	42.7	12.6	71.9	20.9
W 1355-1 ⁶	56.3	98.4	100.0	9.0	17.5	310.1	225.3	71.6	37.2	12.1	47.6	16.2
W 1386 ⁶	62.5	96.9	96.9	9.3	17.3	406.8	309.2	76.3	15.2	3.7	82.4	19.9
W 1431 ⁶	20.3	95.3	98.4	4.0	6.1	365.3	293.3	79.4	9.8	2.7	62.2	17.9
W 1836-3 rus ⁶	59.4	95.3	98.4	2.5	3.9	380.0	293.1	76.5	20.9	5.6	66.0	17.9
W 1876-1 rus ⁶	53.1	89.1	95.3	4.5	5.0	282.0	192.8	68.5	18.6	6.8	70.6	24.8
W 2275-3 R ⁶	12.5	87.5	95.3	6.0	9.1	330.3	254.8	76.8	42.4	12.8	33.1	10.4
Pr > F ⁸	< 0.01	< 0.01	0.02	0.14	0.03	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
LSD ⁸	19.1	7.9	6.2	NS	10.2	66.6	64.6	10.9	8.9	2.8	32.9	10.2

1 Emergence based on 16 seedpieces planted in 16 ft of row.

2 Lesion area index. Lesions were rated on a 5-point scale with: 0 = no lesions; 1 = 1-10% of the surface area of the tuber affected; 2 = 10-25% affected; 3 = 25-50% affected; 4 = 50-75% affected; 5 = > 75% affected. The lesion area index = the sum for all classes of [(the number of tubers in that class x the class number) x 100]/(5 x total number of tubers rated). The maximum value for this index (if all tubers were rated 5) is 100.

3 Lesion type index. Lesions were rated on a 5-point scale as described in the text. The type lesion index was calculated by summing the number in each class x the class number x 100/(5 x the total number of tubers rated). The maximum value for this index (if all tubers were rated 5) is 100.

4 Undersize indicates potatoes < 1 7/8 inch diam.

5 Tubers obtained from Alvin Reeves, University of Maine

6 Tubers obtained from H. Grozia, University of Wisconsin Horticulture Department Breeding Program

7 Tubers obtained from David Douches, Plant and Soil Science Dept., Michigan State University.

8 Analysis of variance was performed on data and Fisher's protected least significant difference (LSD) was calculated. NS = not significant at $P = 0.05$.