

2016 Research Progress Report to Maine Potato Board

Screening Potato Varieties for Pink Rot, Bacterial Soft Rot, and Dry Rot Resistance

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1. Pink rot trial

A field trial was conducted in Aroostook Research Farm, Presque Isle, ME in 2016, in studying pink rot resistance of 32 varieties of potato. Randomized complete block design was applied in the trial with three blocks. Plots size was one 3-ft-wide row with 10 feet in length and one foot of plant space. Inoculum of *Phytophthora erythroseptica* were prepared before planting. Three isolates of *P. erythroseptica* were incubated in mushroom spawn bags containing 6 L of vermiculite, and 3 L V8 broth (200 ml low sodium V8, 800 ml of distilled water, 2 g CaCO₃, and 30 µg β-sitosterol per liter) for four weeks at 22°C. During planting, six liters of vermiculite inocula of *P. erythroseptica* were evenly hand-distributed in-furrow in each row. Fertilizer (N:P:K = 14:14:14) was applied at 1,100 lb/A. All plots were treated with insecticides and herbicides as standard practice to the area. Bravo WeatherStik (1260 ga/ha) was applied to the foliage during the season to prevent the spread of late blight. The emergence of potato was evaluated on 25 July. Potato vines were killed on 30 August and 6 September. Potato tubers in each plot were harvested on 14 September. The harvested tubers were examined for disease and yield. Pink rot was evaluated by calculating the disease index. Data were analyzed using JMP (version 9.0).

Variety	Emergence (%)	Yield (lb/plot)	Disease index (%)	Variety	Emergence (%)	Yield (lb/plot)	Disease index (%)
AF0338-17	33.3	12.7	0.0	AF5245-1	30.0	7.5	27.4
AF3001-6	26.7	10.9	0.0	AF5280-5	20.0	8.8	0.0
AF3362-1	76.7	23.3	5.8	AF5215-2	93.3	25.0	30.6
AF4124-7	50.0	7.8	23.9	AF5225-1	20.0	5.0	36.0
AF4138-8	10.0	2.8	31.7	AF5406-7	33.3	11.5	0.0
AF4157-6	83.3	19.1	22.5	AF5469-2	53.3	17.9	0.0
AF4172-2	66.7	19.6	29.9	AAF07521-1	16.7	7.1	0.0
AF4296-3	40.0	10.3	15.4	WAF10073-3RUS	50.0	17.1	28.0
AF4552-5	33.3	9.5	0.7	NDAF092412-3	100	26.0	50.8
AF4648-2	50.0	11.6	0.0	AF5468-5	70.0	14.0	44.4
AF4953-6	33.3	10.8	1.0	Atlantic	80.0	23.7	1.2
AF4985-1	40.0	12.1	5.8	Snowden	46.7	12.0	0.0
AF3317-15	16.7	4.1	0.0	Pike	80.0	25.7	1.7
AF5040-8	100.0	18.4	19.1	Russet Nortkotah	96.7	19.9	11.7
AF5091-8	20.0	7.3	0.9	Dark Red Norland	86.7	17.8	8.9
AF5179-4	13.3	3.8	19.6	Red Gold	86.7	13.7	55.1

2. Fusarium dry rot trial

The experiments were conducted under laboratory conditions at the University of Maine, Orono, ME in 2016. 34 potato varieties were tested for Fusarium dry rot resistance in the lab. One Fusarium isolate obtained from diseased potato tuber on Aroostook farm, Presque Isle, ME was used as inoculum for this project. *Fusarium* spp. isolate was grown on potato dextrose agar (PDA) plate and incubated at $22 \pm 2^\circ\text{C}$ for six days. 2 ml sterile distilled water was poured on the plate to wash and harvest conidia. The final concentration of spore suspension was adjusted to 10^6 conidia/ml. Six disease-free potato tubers of each variety were used in this experiment (3 as control, 3 as treatment). The tubers were surface-disinfected with 0.6% sodium hypochlorite and rinsed three times with sterile distilled water. Each tuber was inoculated at three points between the stem and the bud end, with 0.1 ml of spore suspension. Sterile hole puncher was used to make three 5 mm deep wound on the tuber. Then the tuber tissue inside the wound was removed to make a 5x5 mm hole on the tuber. 100 μl spore suspension was added to each hole on the tuber. Sterile distilled water was used as control. Then the holes were covered with the removed tuber tissue. Vaseline was used to completely close the holes after inoculation. The treated tubers were incubated for 6 weeks at 10°C . After incubation, the tubers were cut through the inoculation points and the size of extended rot lesion was measured using a ruler. Data were analyzed using SAS.

Potato Variety	Lesion w/ inoculum (mm)	Lesion w/o inoculum (mm)	Potato Variety	Lesion w/ inoculum (mm)	Lesion w/o inoculum (mm)
A3001-6	2.6	1.0	NDAF092412-3	4.1	3.0
AF4172-2	2.3	3.0	AF5406-7	4.0	3.8
AF4648-2	3.1	1.8	AF4950-2	3.7	4.8
AF4124-7	3.0	2.3	Yokon Gold	4.5	3.2
AF4296-3	2.6	3.7	AAF08065-2	4.2	4.2
AF5312-1	3.0	2.7	Russet Burbank	4.6	3.8
AF5464-4	2.8	3.3	Sebago	4.7	3.3
A3362-1	3.2	2.3	Shepody	4.4	4.7
AAF07521-1	2.6	4.3	AF4659-12	6.2	4.3
AF4872-2	3.1	2.7	AF5468-5	8.9	2.8
AF5245-1	3.1	2.8	AF4953-6	9.0	3.0
WA10073-3 Rus	3.2	3.0	AF5071-2	9.7	3.3
AF5280-5	3.3	2.7	AF5164-19	10.7	3.7
Katahdin	3.4	2.5	Atlantic	14.4	3.3
AF5179-4	3.4	2.8	Dark Red	21.4	1.0
Green Mountain	3.2	3.7	Norland		
AF5091-8	3.1	4.0	AF4985-1	22.9	3.7
AF4138-8	3.4	4.0	AF0338-17	26.2	2.8
AF5469-2	3.6	4.0	AF5432-5	50.0	1.0
Snowden	3.8	3.5	AF5040-8	53.7	2.8

3. Soft rot trial

The experiments were conducted under laboratory conditions at the University of Maine, Orono, ME in 2016. 34 potato varieties were tested for dry rot/blackleg resistance in the lab. *Dickeya dadantii* strain 3937 was used as inoculum for this project. 3937 was grown on tryptic soy agar (TSA) plate and incubated at $28 \pm 2^\circ\text{C}$ for 24 hours to get the pure culture. A single colony was transferred to autoclaved 15 ml tube containing 10 ml tryptic soy broth (TSB), and multiplied in TSB at $28 \pm 2^\circ\text{C}$ overnight. Disease-free potato tubers of each variety were washed using tap water and cut vertically into 5-mm thick discs. The discs were surface-disinfected with 0.6% sodium hypochlorite and rinsed three times with sterile distilled water. Sterile hole puncher was used to make 2-mm deep wound on the tuber slices. 40 μl bacterial suspension was added to each hole on the tuber slice. Sterile water was used as control. The treated tubers were incubated in a moist chamber for 3 days at $27 \pm 2^\circ\text{C}$, and $30 \pm 2^\circ\text{C}$. After incubation, the size of extended rot lesion was measured using a ruler. Data were analyzed using SAS (version 9.2). Results showed that AF4615-5 was the most tolerant to soft rot, followed by AF4552-5, AF4198-2, AF4609-1, and 'Norland'.

Potato Variety	Average lesion measurement (cm)			
	WPP14 @27°C	WPP163 @27°C	3937 @30°C	3937 @27°C
WAF 10073-3 Rus	13.30	7.79	4.50	-
AF 4138-9	13.12	10.17	5.00	-
AF 4872-2	12.74	8.08	3.37	-
AAF 08065 - 2	11.14	7.09	0.55	-
AF 5169 - 19	11.09	7.96	4.25	-
AF 5091-8	14.16	2.14	5.30	-
AF 5464-4	12.09	5.62	3.65	-
AF 4124-7	15.66	7.54	8.75	-
AF 4172-2	15.66	7.54	4.15	-
Shepody	15.24	9.82	2.62	-
AAF 07521 - 1	11.75	7.44	10.00	-
AF 5406 - 7	10.66	3.30	11.25	-
AF 3362- 1	10.65	6.92	4.55	-
AF 5245 - 1	10.62	6.36	10.00	-
AF 3001 - 6	10.19	9.69	13.50	-
AF 4950 - 2	10.06	7.90	13.50	-
AF 4648 - 2	9.77	7.30	6.10	-
AF 0338-17	9.61	9.42	8.75	-
AF 5040 - 8	8.44	8.96	13.50	-
Yukon Gold	8.30	8.16	4.30	-
Sebago	5.91	6.45	-	14.00
AF 4953-6	15.87	9.82	-	14.00
Red Norland	15.12	9.52	-	12.25
AF 4985-1	14.69	8.12	-	8.12
AF 5468-5	14.00	10.06	-	20.00

AF 5071- 2	13.94	9.82	-	4.50
AF 4296-3	12.62	11.37	-	15.75
NDA F092	12.56	8.91	-	13.50
AF 5432-5	12.46	8.70	-	12.00
Kathadin	12.06	5.20	-	5.25
Russet Burbank	11.81	3.46	-	14.10
AF 5179 - 4	11.80	3.30	-	6.00
AF 5312 - 1	11.62	1.99	-	9.00
AF 5280-5	10.69	8.70	-	17.50
AF 5469 - 2	10.45	6.69	-	17.50
Snowden	10.37	5.77	-	7.25
Green Mountain	10.00	8.67	-	7.50
Atlantic	9.50	7.25	-	5.97
AF 4659-12	9.02	7.11	-	14.00
