2016 Research Progress Report to Maine Potato Board

Determining the Factors that Impact Soft Rot and Blackleg of Potato

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1. Responses of potato varieties to soft rot pathogens

The experiments were conducted under laboratory conditions at the University of Maine, Orono, ME in 2016. Bacterial culture *Dickeya dianthicola* ME30 and *Pectobacterium wasabiae* WPP163 were grown on tryptic soy agar (TSA) plates and incubated at 22 ± 2 °C for 24 hours to get the pure culture. Potato tubers of each variety were washed using tap water. Sterile hole puncher was used to make 5-mm deep wound on the tuber slice. 40 µl bacterial suspension was added to each hole on the tuber slice. Sterile distilled water was used as control. The treated tubers were incubated in a moist chamber for 3 days at 22 ± 2°C. After incubation, the size of extended rot lesion was measured using a ruler.

Table 1. Responses of potato varieties to soft rot pathogens

Variety	ME30 - Lesion (cm)	WPP163 - Lesion (cm)
Atlantic	4.6	2.9
Norcheif	2.7	3.9
Nordak	3.7	5.4
Nordonna	5.1	3.1
Norglean	3.2	1.3
Norland	3.2	4.9
Norvalley	3.1	3.7
Pantonac	1.8	2.0
Pioneer	6.2	5.3
Ranger Russet	0.8	1.4
Reba	8.2	2.5
Red Burt	3.3	1.6
Red Warba	2.2	2.7
Rideau	4.5	5.4
Rosegold	3.9	3.8
Rural New Yorker	3.0	2.7
Sangre	2.0	1.1
Satapa	1.6	2.3
Sebago	2.4	2.8
Stately	2.9	4.6
Super Red Norland	2.8	3.2
Warba	3.2	3.1
Wasca	1.2	2.3
White Cloud	3.3	2.6

2. Effect of antibacterial activities of essential oils (EOs), streptomycin, copper sulfate, and isothiocyanade(AITC).

Test bacteria included *Dickeya dianthicola* (ME30), *Pectobacterium wasabiae* (WPP163), *Pectobacterium carotovorum* (WPP14), *Dickeya dadantii* (3937). One milliliter of bacterial liquid culture (10^8 cfu/ml) was transferred onto tryptic soy agar (TSA) in a Petri plate and evenly spread. A sterile paper disc (6 mm in diameter) was placed on the center of TSA plate, followed by adding 10 µl of each 100% EOs onto the disc. The plates were incubated at 28°C for 48 h. Antibacterial activity was evaluated by measuring the diameter of the inhibition zones (mm) against tested pathogens. Results showed that oregano and clove had significant antibacterial effect.

Table 2. Effect of essential oils on bacterial growth measure by inhibition zones (mm).

Bacterial isolate	Clove	Citronella	Cinnamon bark	Bay leaf	Thyme	Lemon grass	Palmarosa	Cinnamon Leaf	Oregano	EC50 (mg/L)
PA24	17.3	5.1	14.5	7.4	7.8	11.4	5.0	16.0	40.4	n/a
ME30	25.3	5.5	17.4	7.9	7.9	11.6	6.4	17.6	56.3	40027
3937	15.8	22.3	18.1	7.9	4.0	30.8	13.0	14.4	49.1	31536
WPP163	26.3	2.8	34.8	0.0	7.3	12.9	8.5	25.1	58.5	38878
WPP14	24.5	6.3	19.4	12.0	9.0	14.3	8.8	17.4	47.6	60859

Table 3. Effect of select compounds on bacterial growth− effective concentration with diameter = 10 mm (mg/ml).

Isolate	Streptomycin	Oregano	Clove	Copper sulfate
Dickeya dianthicola (ME30)	0.62	0.47	1.26	3.25
Pectobacterium wasabiae (WPP163)	1.07	0.38	0.76	2.90
Pectobacterium carotovorum (WPP14)	1.12	0.48	0.83	2.82
Dickeya dadantii (3937)	1.74	0.32	1.90	3.39

3. Distribution of *Dickeya* and *Pectobacterium* spp. in Maine

Table 4. Pathogen detection in blackleg samples in Maine

Source	*Dickeya* spp.	*Dickeya dianthicola*	*Pectobacterium* spp.	*P. carotovorum*	*P. wasabiae*
weeds	23	0	12	9	3
water	35	0	17	6	0
soil	0	0	3	3	0
potato tuber	13	5	58	-	1
potato stem	36	33	13	-	-