

**WESTERN INTEGRATED PEST MANAGEMENT CENTER
FINAL REPORT**

TITLE: Screening germplasm for tuber resistance to potato tuberworm

Principal Investigator (PI)

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Cooperators

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Steve James, OSU, Central OR. Agronomist.
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Background Information

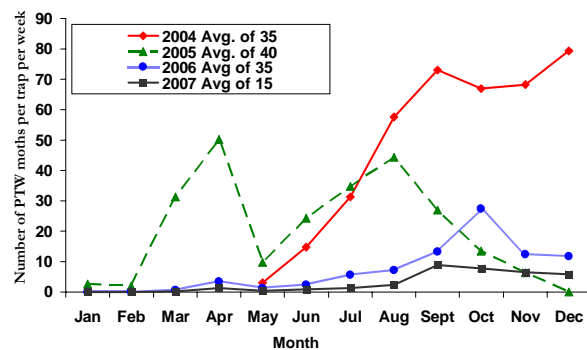
This project addresses a serious and emerging pest in Oregon, Washington, and other major potato states across the northern U.S. The potato tuberworm (PTW) *Phthorimaea operculella* (Zeller) (Lepidoptera: Gelechiidae) is one of the most important pests that infest potato worldwide. It was first detected in Oregon in 2002, with a handful of reports of minor damage. In 2003, several fields were completely lost due to PTW. Economic loss amplified substantially in 2004 and 2005, due to increased PTW densities in areas already infested, range expansion, increased tuber damage, and cost associated with additional



Potato tuberworm larva

control measures. In 2006 and 2007, PTW population was relatively low as compared to previous years; however the pest is well established in the region. The importance of an integrated pest management (IPM) approach for long term control of PTW is substantiated by world-wide research on this pest. Work in other parts of the world has shown that the development of plant resistance is an important component of pest control programs. Our work set the preliminary basis of developing potato accessions with tuber resistance.

**Population dynamics of the PTW,
Oregon, 2004-07**



Objectives

1. Screening potato germplasm directed at PTW resistance for tuber resistance under laboratory conditions
2. Screening potato germplasm directed at PTW resistance for tuber resistance under field conditions

Material and Methods

A total of 30 clones known to be PTW susceptible and resistant were planted at Hermiston in Oregon on April 25 2007. At harvest (September 10), potato tubers were graded to select similar size (6-8 oz) tubers. Tubers were stored at room temperature for 10 days to allow for infested

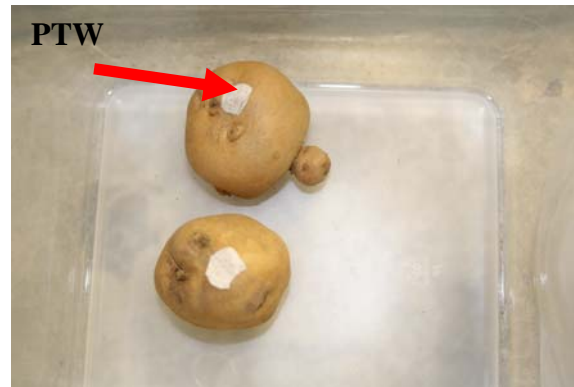


Potato tubers placed on the surface of the soil to be exposed to natural populations of PTW

tubers to become evident. Un-infested tubers were selected and stored in cold storage at 4 °C until evaluations began. **Objective 1.** Field trials (Table 1) consisted of two tubers per clone per rep being placed on the soil surface for exposure to natural populations of PTW. **Objective 2.** In the laboratory (Table 2), two tubers of each clone were placed in plastic containers and artificially infested with 50 tuberworm eggs each. A randomized complete block design with ten replica

tions was used

for both trials. Tuberworm damage was recorded three weeks after inoculation by evaluating larval survival, number of mines, and incidence of damage and average of severity. Resistance of potato clones was measured based on larval survival and damage. Analysis of variance was done using the PROC GLM procedure. Means were separated by Fisher's protected LSD test.



Tubers were placed in plastic containers and artificially infested with 50 PTW eggs

Results

None of the lines screened, with the exception of Spunta G2, a genetically modified clone, showed complete resistance, but quantitative resistance was observed in some lines. The number of larvae recovered and the number of mines generated under field conditions was lower than under laboratory conditions. The incidence of damage was slightly lower under field conditions, but the severity of damage (length of mines) was higher under field conditions.

The host plant resistance observed was quantitative and needs to be combined with other pest management strategies to effectively control potato tuberworm damage.

Table 1. Results of field screening (top ten) of Oregon early generation selections for potato tuberworm resistant, Hermiston OR 2007.

Clone	Tuber Weight Average (g)	Ave. # Eyes	Ave. # PTW Larvae	Ave. # PTW Mines	Ave. Incidence Rating (%)	Ave. Severity¹
Spunta G2	217	9	0	0	0	0.0
Prince Hairy	181	5	1	1	70	1.7
OR05071-1	183	5	1	2	70	2.0
OR05075-1	159	8	1	2	75	2.1
OR05076-2	181	6	1	2	70	2.2
OR05081-1	248	5	1	2	75	2.3
A93157-6LS	204	11	1	3	80	2.3
T88-4	154	5	2	2	80	2.3
Q174-2	102	5	1	2	75	2.4
OR05070-1	172	6	1	3	75	2.4
Mean	186	7	2	3	83	2.7
LSD (0.05)	39	2	1	1.4	20	0.9

¹Severity is the length of mine
severity 1= mine length 1-2 mm
severity 2= mine length 3-10 mm
severity 3= mine length >1-2 cm
severity 4= mine length >2-3 cm
severity 5= mine length > 3 cm

Table 2. Results of laboratory screening (top ten) of Oregon early generation selections for potato tuberworm resistant, Hermiston, OR 2007.

Clone	Tuber Weight Average (g)	Ave. # Eyes	Ave. # PTW Larvae	Ave. # PTW Mines	Ave. Incidence Rating (%)	Ave. Severity¹
Spunta G2	233	11	2	2	13	0.4
OR05081-1	180	5	1	2	75	0.8
OR05080-2	161	4	3	4	100	1.0
Prince Hairy	140	7	3	4	88	1.0
T88-4	111	4	4	6	100	1.0
OR05080-1	143	5	3	5	100	1.1
OR05082-1	144	5	3	5	100	1.1
Q174-2	108	7	8	7	100	1.1
OR05012-1	180	11	7	8	100	1.3
OR05081-2	114	6	4	6	100	1.3
Mean	157	8	7	8	95	1.6
LSD (0.05)	55	3	5	5	19	0.6

¹Severity is the length of mine
severity 1= mine length 1-2 mm
severity 2= mine length 3-10 mm
severity 3= mine length >1-2 cm
severity 4= mine length >2-3 cm
severity 5= mine length > 3 cm