Soil borne Pathogens and Potato Production

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Soil borne diseases can be a major concern to potato producers due to the fact that many of the pathogens can survive in soil and on debris for very long periods. In our region the diseases and pests most commonly experienced include, pink rot (*Phytophthora erythroseptica*), black dot (*Colletotrichum coccodes*), common scab (*Streptomyces scabies*), powdery scab (*Spongospora subterranea*) rhizoctonia (*Rhizoctonia solani*) and a number of nematodes. If possible, control is usually most effective if potato cultivars with resistance are used along with rotations to include crops not conducive to pathogen multiplication along with the use of appropriate chemicals. Some research has been performed to identify cultivars with resistance to pink rot and black dot, but this has focused mainly on cultivars useful to producers in the Mid-West and West. Studies in the Pacific Northwest, Maine, and Europe have shown that using brassicas (Caliente and Nemat) in potato rotations has been beneficial in controlling many soil borne pathogens.

The goals of this work were to:

1. Identify cultivars and breeding lines useful to NY and PA potato producers with good resistance to (a) pink rot (b) black dot.

2. Evaluate the role of brassicas (Caliente and Nemat) as bio-fumigants in rotations for potato production in our region.

1. a) Responses of cultivars to infection by the pink rot organism were determined under greenhouse, laboratory and field conditions (2 seasons of evaluation). In this presentation we will report on the results from the field (artificially inoculated soil) studies.

Yukon Gem and **NY140** consistently showed good resistance (Table 1).

Yukon Gem along with good pink rot resistance and high yield potential is reported to have good late blight foliar resistance. One of our producers, a small scale grower and home gardeners in our region grew **Yukon Gem.** In general, the yields without irrigation were good (av. 280 cwt/acre), except in one very dry location and about 450 cwt/acre with irrigation. All consumers were impressed with the cooking attributes, and flavor. Seed is not currently available from NY State, but Windy Mountain Farms, harvested from mini tubers last season and therefore **Yukon Gem** seed could be available locally in the future.

NY140, although showing excellent pink rot resistance and outstanding yields has a less clear future as the specific gravity appears unsuitable for fresh processing or chipping.

Table 1. The percentage (by weight) of tubers with pink rot at harvest for 2009 and 2010 seasons from artificially inoculated trials at Freeville NY .

Cultivar/clone	Year 1 (2009)	Year 2 (2010)
	mean % disease at harvest	mean % disease at harvest
NY138	1.84 bc	5.49 bc
NY139	5.11 bc	18.88 ab
NY140	0.49 c	0.99 c
Yukon Gem	1.99 bc	2.31 bc
Red La Soda	7.08 ab	10.75 abc
Satina	7.65 ab	26.96 a
Red Cloud	19.65 a	17.58 ab
Classic Russet	4.14 bc	8.5 abc
Standard Error	2.6	3.9

Within column, cultivars with the same letter are not significantly different

1.b) From greenhouse soil inoculation studies, cultivar tuber responses to the black dot organism were determined (Table 2). Clones of NY144 and F52-1 from this one study have significantly higher resistance compared to the other clones and cultivars evaluated.

Table 2. Response of tubers to black dot infection inoculated under greenhouse conditions for cultivars and clones from Cornell breeding program.

Cultivar and Clone	Av. % tuber infected	SE
NY138	71.8	5.7
NY 139	60.5	5.7
NY 140	51	10.3
NY 141	54.5	5.7
NY 144	20.5	5.7
NY 146 (D40-50)	79.5	5.7
NY 147 (D40-263)	66.8	5.7
F11-1	53.8	5.7
F52-1	4.4	5.9
Keuka Gold	87.8	5.7
Red Maria (NY129)	56.3	6.3
Superior	83.1	5.7
Snowden	91.9	5.7

Work is ongoing to determine more about the sunken lesion response associated with the disease (http://www.plantmanagementnetwork.org/sub/php/brief/2010/potato/).

The importance of foliar infections for epidemics in our region was investigated. Our initial findings indicate that when cvs. Reba, Yukon Gold, Norwis, Marcy and Salem were examined; cv. **Marcy** may be the most resistance to leaf infections. These findings could be important for potato production under conditions such as those experienced on LI.

2. The mustards **Caliente 61**, **Caliente 199** and **Nemat** were grown as a single or double crop on several potato farms throughout the region where soil borne issues were a problem (Table 3). The value of the mustard as a bio-fumigant was determined by the amount of disease and yield of potatoes in the following season. Nemat did not overwinter at either of the locations. Where **Caliente 61** was sown, chopped, incorporated and followed with **Nemat** (which did not survive the winter) there was a significant reduction in powdery scab infected tubers, with 14lb healthy tubers in a 10ft row compared with less than 3lb healthy tubers from a row previously sown to oats. In none of the other plots was there a reduction in the percent of diseased tubers, or an increase in total yield. In one location, the producer commented that the soil was easy to prepare for potato after the mustard.

From this one season trial with the Calientes and Nemat it appears that more studies are needed if these are to be of value for controlling soil borne pests in potato production systems in our region.

Table 3. Brassica variety, time of seeding, harvest and incorporation and diseases being addressed on fields of five potato farms in New York State.

Farm	Disease to be addressed	Brassica variety	Seeding time 2009 season	Harvesting & incorporation	Growth period
Farm 1	Powdery scab	Caliente 199	June 5	July 27	7 wks
Farm 1	Powdery scab	Caliente 199/ Nemat	Nemat Sept 1	July 27	7 wks Overwinter (Nemat)
Farm 1	Powdery scab	Caliente 61	June 5	July 27	7 wks
Farm 1	Powdery scab	Caliente 61/ Nemat	Nemat Sept 1	July 27	7 wks Overwinter (Nemat)
Farm 2	Pink rot	Caliente 61	July 1	Aug 28	9 wks
Farm 3	Common scab & Rhizoctonia	Caliente 61	Aug 7	Sept 26	7 wks
Farm 3	Common scab & Rhizoctonia	Nemat	Aug 7	Sept 26	7 wks
Farm 4	nematodes	Nemat	July 20 & Aug 3	Oct 5	11 wks
Farm 5	Rhizoctonia	Nemat	Sept 19		overwinter

Acknowledgements.

We thank Guterman and Freeville staff and the New Visions high school students who provided valuable assistance. We are grateful to PVMI, Northwest potato variety development program and growers for donation of potato seed. Funding was from USDA-potato grant, NYFVI, Empire State Potato Growers, Friend's of Long Island and Hatch funds (T. Zitter).