Mapping resistance to the Potato Cyst Nematode, *Globodera pallida*, in a tetraploid, russet-skinned potato population

INTRODUCTION

- *Globodera pallida* is a major quarantined pest of potato in the world. Since the first detection in 2006 has had a significant economic impact on the Idaho potato industry.
- Long tuber shape and russet skin potato are US market preference. There is no resistance in russet-skinned breeding germplasm for *G. pallida*.
- *G. pallida* is classified into three pathotypes (Pa1-Pa3) based in their virulence reactions on different potato genotypes and the Idaho population has been classified as Pa2/3.
- In this study, PCN resistance was analyzed in a tetraploid population derived from PCN resistant cv. Eden and susceptible cv. Western Russet.

MATERIAL AND METHODS

1 A10915 Population Dataset:

- Tetraploid mapping population 'Eden' x 'Western Russet' consisting of 245 individuals.
- Desiree, Western Russet and Russet Burbank used as susceptible control and 4 potato differential lines

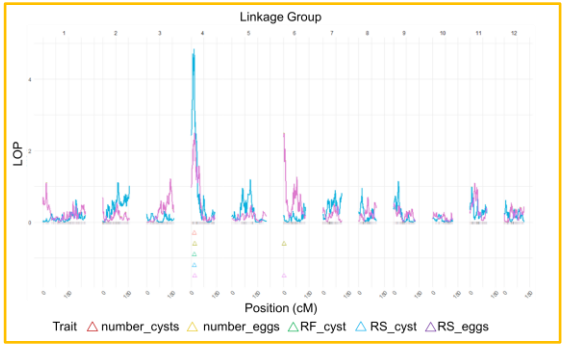
2 Evaluations:

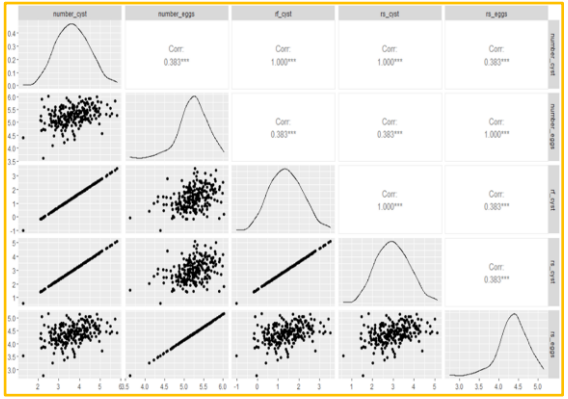
- Clay pot tests in greenhouse with 6-10 pots per individual/controls
- Results standardized by calculating relative susceptibility (RS) to cv. Russet Burbank
- Traits: number of cysts, number of eggs/cyst, RS cysts, RS eggs and reproductive factor (RF) cysts.

3 Data Analysis:

- Genotyped on 21K SNP markers
- QTL analysis was performed using R package QTLpoly

RESULTS





Summary statistics of a QTL for *G. pallida* detected within A10915 population

Trait	QTL	LG	cM	H^2
number_cysts	1	4	18.14	0.193
RS cysts	1	4	18.14	0.194
RF cysts	1	4	18.14	0.193
number_eggs/cyst	1	4	21.30	0.111
	2	6	2.07	0.085
RS eggs	1	4	21.30	0.111
	2	6	2.07	0.085

Reproductive factor (RF) within the population

RF	Total mean cysts	Number of progeny	% of population
RF < 1	< 10	9	3.67
RF < 2	< 20	37	15.10
RF > 3	> 290	199	81.22

Total mean eggs/cyst within the population

Total mean eggs/cyst	Number of progeny	% of population
< 50	37	15.10
< 100	41	16.74
< 150	62	25.31
> 200	105	42.86

DISCUSSION & CONCLUSIONS

- Nine clones were considered as resistant (RS value ≥ 7)
- Mean eggs/cyst and RS eggs/cyst poorly correlated with mean cysts per genotype. For example, a genotype with low mean cysts could have high eggs/cyst.
- Both the number of cysts and the number eggs/cyst are important variables in determining resistance.
- Mean cysts and RF cysts were strongly correlated within this population.
- QTL analysis indicated while cyst phenotypes mapped to a single locus on chromosome 4, egg-related phenotypes were located on chromosomes 4 and 6.
- Markers linked to the detected QTL on chromosome 4 and 6 would likely prove useful for applied breeding to develop PCN resistant varieties.
- These results will help to further characterize PCN resistance from Eden and identify genetic regions valuable for PCN resistance in oblong, russet-skinned processing potatoes for the US industry.

Rocio Silvestre[1], Louise-Marie Dandurand[2], Richard Novy[3], Jonathan Whitworth[3] and Joseph C. Kuhl[1]

[1] *Department of Plant Sciences, University of Idaho, Moscow, ID, USA*

[2] *Department of Entomology, Plant Pathology and Nematology, University of Idaho, Moscow, ID, USA*

[3] *United States Department of Agriculture, Agricultural Research Service (USDA-ARS), Aberdeen, ID, USA*

Country: USA
State: Idaho
Local time: Pacific Time Zone

USDA

Northwest Potato Research Consortium

University of Idaho