Title and Primary Focus Area (PFA): Potato Variety Screening Trial for Zebra Chip Resistance Under Controlled Field Cage Conditions (PFA: 4)

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Research Location: Yakima, WA

Need: Development and identification of potato varieties with resistance to or tolerance of zebra chip (ZC) are crucial to development of effective and sustainable management strategies for the disease. Since ZC infection and incidence depend on liberibacter infection rate in psyllids, it is difficult to rely on naturally occurring psyllid populations during screening under open field conditions. We conducted a preliminary screening trial in the summer of 2010 at the USDA-ARS Research Farm at Moxee in WA, to quickly assess susceptibility of 102 potato varieties and advanced breeding lines to ZC under controlled field cage conditions. Results showed that 29 entries had ZC symptoms in raw tubers ranging from light to almost none. All the remaining 73 entries had severe ZC symptoms in fresh tubers. Tuber samples of these 29 entries with no to light ZC symptoms were processed into fried chips: 4 did not show typical ZC symptoms in fried chips, 2 produced chips with light ZC symptoms, and the rest had typical ZC symptoms. However, several of these entries with ZC symptoms in fried chips did not show any ZC symptoms in tubers when baked. Results of this study suggest that some of these potato lines may be tolerant to ZC and warrant further investigation. We propose to conduct a more thorough screening of these potential promising potato lines under controlled field cage conditions, with replications, different psyllid pressure/density, liberibacter testing, and processing.

Objective: Conduct further liberibacter/psyllid exposure studies under controlled field cage conditions to quickly and accurately assess susceptibility of potato cultivars and advanced breeding lines to ZC.

Approach: Twenty to 30 advanced potato breeding lines will be selected from the promising lines identified during the 2010 trial. Seed pieces of each entry will first be planted in the greenhouse. At around tuber initiation, plants of each selection will individually be exposed to 2 densities of liberibacter-infective psyllids: low or high density (3 and 10 psyllids/plant, respectively) for about 1 week. After psyllid exposure in the greenhouse, psyllids will be eliminated from the plants with insecticides (fumigation) before being transplanted into small cages in the field. Each cage will contain 10 plants: 3 entry plants exposed to low psyllid density, 3 plants exposed to high psyllid density, 2 Atlantic plants exposed to each of the psyllid densities, and 2 entry plants to serve as negative controls. There will be 2 cages/replications per entry. The plants in the cages will be observed for ZC symptoms. At the end of the experiment, tubers from each plant will be hand-harvested and checked for ZC symptoms. Plant and tuber samples will also be tested by PCR to confirm liberibacter infection. Tuberc samples from each entry and treatment will be processed into fried chips. In addition, tubers will be assessed for ZC symptoms after baking/boiling. Depending on the results of the trial, the most promising lines could be evaluated for potato psyllid feeding using EPG technique to assess potential source of resistance.

Expected Outcome: This research will provide information on whether screened varieties/lines are differentially resistant to or tolerant of ZC under different psyllid/liberibacter pressure. This information will help affected potato growers and processors to quickly minimize losses due to ZC by identifying and selecting (or developing) cultivars that are less vulnerable to ZC. (Requested Funding: $36,663)