Title: Incorporating plant resistance for the potato psyllid into an IPM program

Program Focus Area: Pest Management and Breeding

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Research Location: University of California South Coast Res. and Extension Center, Orange Co. CA

Need: There are two key reasons to determine if the resistance found to date in potatoes is sufficient to reduce control costs for zebra chip. First, our current reliance on pesticides is expensive and will likely fail if pesticide resistance develops to any of the key compounds. Second, considerable effort and funding has been expended to develop resistant potato lines that have not been tested in an IPM program. From the data presented at the recent Zebra Chip Meeting in Dallas, it appears that some plant lines can reduce transmission of ZC under moderate pressure from the psyllid (very high pressures of 20 adults per plant for two weeks resulted in substantial yield loss). Thus, if the resistant lines are to be useful, some insecticidal control of the psyllids will be necessary. Our primary objective is to test the most resistant potato lines in a typical IPM program used in Texas and California. The ultimate goal is to determine if these lines can either reduce the need for pesticide application or reduce the occurrence of ZC in the tubers.

Objectives:
1. Test the lines P2-4 and A05379-211 from Idaho and NY138 and TX05249-11 from Texas in an IPM program. The line A05379-211 represents a BC4 progeny with better adaptation than breeding clone 463-4, the putative source of its psyllid resistance. Resistance of A05379-211 is exhibited as a lower average feeding duration and higher average duration off the potato leaflet. These lines will be tested within an IPM program to determine if they can either reduce the need for pesticide application or reduce the occurrence of ZC in the tubers. Either outcome will improve the economics of potato production.
2. Determine if the resistance reported at the last ZC meeting is based on simple non-preference or if there is true antibiosis. These data will provide critical information to the breeders regarding the potential impacts and directions for their programs.

Approach:

Objective 1. The four test lines and a control line ('Norkotah' or 'Atlantic') will be planted in a randomized complete block design in the field. One set of four replicates of each plant line will be left untreated, while another set will be treated with a typical IPM program based on occurrence of the psyllid. The key compounds include imidacloprid, avermectin, movento (or oberon), etc. in a rotational program that is designed to eliminate or greatly reduce repetition of similar modes of action. The psyllid populations will be assessed using the procedures of Butler and Trumble that maximize the efficiency of the sampling effort (edges of the field, middle of the plant, bottom of the leaves). This will allow direct comparisons between plant lines and control programs to specifically allow determination of the usefulness of the plant resistance. Objective 2. Tests of psyllid development, survival and plant preference will be conducted using replicated clip cage studies on the plants as well as standard olfactometer experiments.

Expected Outcome: If successful, the employment of the resistant lines will reduce production costs, minimize the need for pesticide use, and reduce the potential for resistance development to pesticides.

Requested Funding: I am requesting $31,500 for this research ($25,000 plus the required 26% overhead). This will cover the planting costs, field costs (station rent, irrigation, fertilizer, weed control, etc.), nearly two months of my post doc (who will handle the field trial and antibiosis/antixenosis studies), pesticide applications, etc.