Title: Evaluation of neonicotinoid insecticide efficacy over time for early-season potato psyllid control, and critical timing of transition to other insecticides

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Amount Requested: $20,000

Introduction and justification for proposed research (SCRI Mini Grant Priority Area #4)

Management of potato psyllids (Bactericera cockerelli) continues to be a major concern to potato growers in areas that are vulnerable to Zebra Chip (ZC) disease. Early season control is critical to prevent adults that have the ZC pathogen (Liberibacter) from feeding and reproducing. Potato growers will typically apply a neonicotinoid (e.g. Admire) (IRAC Group 4) insecticide at planting to protect the young growing plants from attack by potato psyllids that may transmit Liberibacter during feeding. Although the neonicotinoids are effective antifeedants, conceivably preventing adult psyllids from transmitting Liberibacter to plants early in the growing season, growers will often wait until at least 45 days after planting before resuming psyllid control measures using either a Group 6 avermectin (Agri-Mek), a Group 9 flonicamid (Beleaf) or pymetrozine (Fulfill), or a Group 23 tetronic acid derivative (Movento/Oberon). However, it is known that neonicotinoids within treated plants are confined to the xylem (potato psyllids are mainly phloem feeders) and the systemic concentrations decrease over time, with the risk that potato psyllid control efficacy is either not being fully realized and/or is being lost earlier than expected, and growers may not be intervening with their post-neonicotinoid insecticide applications at a critical time. In other words, there may be an open window of opportunity for potato psyllids to feed and infect host plants because they are not being adequately controlled. Furthermore, certain ambimobile systemic insecticides such as Movento may require time for conversion within the plant before efficacy is noted, so proper application timing is critical. Therefore, the proposed research is intended to evaluate the duration of potato psyllid control when a neonicotinoid seed treatment is used, and to develop an effective post-neonicotinoid early/mid-season potato psyllid management scenario.

Objectives

The objectives of this proposed research are to 1) evaluate the long-term adult potato psyllid control efficacy profile of a neonicotinoid insecticide (imidacloprid - Admire) at planting, and establish potato psyllid mortality from plant emergence until 90 days after planting, and 2) establish a transition phase where subsequent insecticide chemistries (e.g. Movento, Agri-Mek and Fulfill) are applied at different times to maintain effective early season potato psyllid management.

Approach

Experimental plots will be established at the Texas AgriLife Research experiment station located at Weslaco. Each plot will consist of four potato plants (cv. ‘Atlantic’) that will be planted
during January or February 2012. Treatment plots will be arranged according to a randomized complete block design, and all four plants within each plot will be covered with a bugdorm soil emergence cage, and also be drip irrigated (see Figure 1 below). Treatments will be an application of a neonicotinoid (Admire) at planting with no further insecticide, neonicotinoid followed by applications of Movento, AgriMek, and Fulfill at 30, 45 and 60 days after planting, and an untreated control (total 11 treatments). Each treatment will be replicated 4 times. Within each plot, one plant will be randomly selected within each cage and approximately ten adult potato psyllids from the laboratory colony will be clip-caged to the plant once per week from emergence through 60 days after planting. Insects will be left on the plants for 72 hours, after which the leaves and clip cages will be removed, insects assayed (alive vs. dead) and number of eggs counted. Treatment effects will be analyzed using ANOVA, followed by a Tukey’s HSD test. Using nonlinear regression techniques, curves will be created for each treatment to relate psyllid survival with time, and differences will be determined using a sum of squares F-test and/or Akaike’s Information Criterion. At the end of the study, tubers will be excavated, weighed and scored for defects.

**Budget ($20,000)**

- Wages $9,000
- Supplies (chemicals, cages, stakes, irrigation equipment, land use costs, fertilizer, seed) $10,000
- Travel $1,000

Figure 1. Proposed experimental design. Numbers reflect the 11 different treatments (not yet assigned) arranged along a row. Each box represents cages inside of which there will be four potato plants.

![Figure 1](image-url)