ADVANCES TOWARD DEVELOPMENT OF HOST PLANT VOLATILE-BASED MONITORING AND ATTRACTICIDE CONTROL TECHNIQUES FOR CODLING MOTHS

Douglas Light, Katherine Reynolds, Alan Knight, Dayananda Rajapaska, Clive Henrick, Ronald Buttery, Glory Merrill, James Roitman, Bruce Campbell, Carolyn Pickel, Nicole Darby, Janine Hasey, Rick Buckner, and Bill Olson

ABSTRACT - SUMMARY

The codling moth (CM) is the key pest of walnuts, damaging the husk, shell, seed coat and kernal of walnuts, thereby allowing for the invasion and colonization by Aspergillus species and the production of aflatoxin. Last year, we reported the discovery of a new, host-plant volatile (HPV) - derived, bisexual attractant for the codling moth. This kairomonal attractant is the first Lepidopteran bisexual lure, specific for both females and males, that is a single compound and has potency and attractancy properties comparable to sex pheromone’s attraction of exclusively males. This year we have made progress in defining and developing this lure/attractant for its practical monitoring and control uses through strides in team organization and technology transfer, behavioral analysis, practical use assessment, and application of evolving control technologies.

First, our ARS Unit’s potential and capabilities to achieve implementation success have greatly been enhanced by the formation of a cooperative research endeavor (CRADA) with Trécé, Inc., the world’s leader in insect semiochemical traps and monitoring systems. Our CRADA team has filed a patent application on the discovery of this novel and powerful attractant and its applied uses in monitoring and controlling this world-wide pest. Due to patent infringment and propriety concerns, we will not divulge the chemical structure of the attractant and its related compounds. Second, we have had success in rigorously determining the “active ingredient” for this CM-HPV attractant through selectivity and structural specificity tests on the attractancy of synthesized and highly pure chemical analogs. Further, we have determined that both sexes of CM are highly sensitive to this kairomonal attractant, which was supported also by the strong potency and longevity evidence for this lure. Third, we have demonstrated, in both conventional orchards and mating disruption orchards, the practical use of this CM-HPV attractant as a tool that is as accurate as pheromone for detecting moth emergence and delineating flight patterns but defines not just the males’ but also the females’ population trends. It is the presence and egg-laying of female moths that determines the damage potential of the next larval feeding generation, and thus the need for and appropriate timing of control measures. Fourth, we have initiated the design and testing of attracticide (attract & kill) formulations that slowly and effectively release this kairomonal attractant and effectively poison on short contact the attracted moths.

These advances all point to the promise of the future implementation of this developing novel population monitoring and control technology for the effective protection of walnuts from CM damage and Aspergillus infection.