Research on Plum Curculio & Apple Maggot: Latest Developments

Ronald J. Prokopy, Department of Entomology
University of Massachusetts, Fernald Hall, Amherst, MA 01003
(413) 545-1057 prokopy@ent.umass.edu

This presentation will cover findings from our experiments in commercial apple orchards in 2003 on use of odor-baited "trap trees" for monitoring plum curculios and use of odor-baited pesticide-treated spheres for directly controlling apple maggot flies.

Plum curculio (PC).

PC adults overwinter in border areas adjacent to orchards. They immigrate into orchards during April, May, and June. Over the past decade, we have developed and evaluated several kinds of odor-baited traps aimed at capturing immigrating PC adults and correlating rises and falls in adult captures with rises and falls in injury to fruit. None of the traps has proved useful for this purpose. Therefore, in 2003 we bypassed use of traps and instead decided to bait perimeter-row apple trees themselves with attractive odor. Such odor-baited "trap trees" could aggregate incoming PC adults and thereby aggregate injury to fruit. To assess the occurrence of fresh injury in an orchard as a trigger for insecticide application, a grower or consultant could restrict fruit sampling solely to trap trees, saving time and enhancing accuracy.

In 2003, we conducted trap tree experiments in more than 80 blocks of apple trees in Massachusetts, Vermont and New Hampshire. Trap trees were baited with our most powerful odor combination: the synthetic fruit volatile benzaldehyde (BEN) and the synthetic pheromone grandisoic acid (GA). We found the following:

GA released at 1mg per day plus BEN released at 40 mg per day performed as well as or better than trap trees baited with greater or lesser amounts of these attractants in combination. The distance over which a trap tree baited with such odor was effective in aggregating damage to fruit extended to at least 31-33 meters (maximum evaluated) along a perimeter row. Trap trees at corners of orchard blocks were as effective as perimeter-row trap trees midway between corner trees. Within the canopy of a trap tree, damage to fruit did not tend to be localized in the vicinity of the odor source but tended to be rather evenly distributed among various sectors of the canopy. Finally, among three candidate thresholds evaluated as a trigger for insecticide application, a threshold of 1 freshly-injured fruit proved better than thresholds of 2 or 4 freshly-injured fruit out of 50 fruit sampled on a trap tree in assuring that orchard-wide damage would remain below a pre-set economic injury level of 1%. Our findings lead us to suggest that after a whole-orchard application of insecticide to apple trees shortly after petal fall, subsequent applications of insecticide against PC can be confined to peripheral-row trees and be driven by a provisional threshold of 1 freshly injured fruit out of 50 fruit sampled on a perimeter-row trap tree baited with above odor.

Apple Maggot Flies (AMF)

AMF build into large numbers on abandoned apple trees outside of commercial orchards. They immigrate into orchards during July and August. Very few originate within commercial orchards.

AMF can be controlled very effectively using organophosphate insecticides, whose long-term future use under FQPA remains uncertain. For over a decade we have been evaluating an alternative that we have developed as a substitute for whole-orchard spraying of insecticide to control AMF. It involves placement of odor-baited red spheres on perimeter-row apple trees to intercept immigrating AMF before they lay eggs in apples. In 2003, we conducted 2 experiments in 18 commercial apple orchard blocks in Massachusetts aimed at improving the effectiveness and simplicity of using traps for AMF control.

In our first experiment, we surrounded 1-acre blocks of apple trees with sticky-coated red spheres baited with a 5-component blend of attractive odor. The spheres were placed different distances apart on perimeter-row apple trees. Distances between traps were pre-programmed to vary from 5 to 15 meters apart according to the architecture of the orchard. Orchard blocks having small trees (M.9 rootstock), well pruned trees, AMF-tolerant front-row cultivars (e.g., McIntosh) and open terrain or sprayed apple trees as bordering area received traps 15 m apart (equivalent to 55 traps per 10-acre block). Orchard blocks having large trees (e.g., M.7 rootstock), trees in need of pruning, AMF-susceptible front-row cultivars (e.g., Gala) and hedgerow or woods as bordering area received traps 5 m apart (equivalent to 160 traps per 10-acre block). Orchard blocks having intermediate characteristics received traps 10 m apart. Results showed that adjusting distance between traps according to orchard architecture gave excellent AMF control (equivalent to 3 organophosphate sprays) in 8 of the 12 experimental blocks. Control using traps was less effective in 4 of the blocks, all characterized by large trees and less than ideal pruning.

In our second experiment, we compared sticky (tangletrap) on the sphere surface as AMF killing agent with 2 kinds of plastic spheres that received pesticide as killing agent plus feeding stimulant to induce AMF to ingest pesticide. In each of 6 commercial orchards, we surrounded _-acre blocks of apple trees with above-type spheres. Results showed that plastic spheres capped with a 200-gram rodent-proof disc containing sugar (feeding stimulant), paraffin wax (to meter out the sugar) and Entrust (= Spinosad) as toxicant gave AMF control equal to that of plastic spheres coated with latex paint containing Provado (= Imidacloprid) as toxicant and capped by sugar-paraffin discs. Control by each type of sphere was equal to that provided by sticky spheres or 3 organophosphate sprays. AMF that alight on pesticide-treated spheres feed on the sugar that drips down from the sugar-paraffin disc atop the sphere and in so doing ingest pesticide.

Together, results from these 2 experiments suggest that effective AMF control can be obtained by placement of pesticide-treated odor-baited spheres on perimeter-row apple trees at distances prescribed by orchard architecture. Pesticide-treated spheres should be available for sale by a West Virginia company along with EPA-approved use for commercial orchards by the 2005 growing season.