III. Fruits and Vegetables

Tree Fruits

Selected Highlights from Tree Fruit IPM

D. G. Pfeiffer

Apple has traditionally been a heavily sprayed crop. Two to three prebloom sprays, followed by a petal fall and up to eight cover sprays are normally applied, each containing a mix of insecticide and fungicide. However, there is great potential for reduction of this heavy pesticide load through the use of IPM.

Integrated Pest Management has been approached in tree fruits at several levels. A scouting program for arthropod management, using cooperatively hired scouts, was implemented from 1985-1987. This successful program monitored about 15 pest species, as well as predators for European red mite and the aphid complex. Scouts made twenty weekly visits to orchards, approximately the period between bloom and harvest. The orchard scouts delivered counts directly to the participating growers, but made no control recommendations. The grower, armed with current pest and beneficial species population counts, was then better equipped to make control decisions. These decisions are made in consultation with existing extension literature on effects of specific pesticides on individual pests, as well as on major orchard predators. Growers tended to participate in the program each year it was offered. This implementation program ended temporarily because of changes in extension personnel, but is planned to resume in the near future. Disease and weed control aspects were addressed to growers in extension presentations independent of this IPM program, but are expected to be incorporated in a new, expanded Integrated Orchard Management program. This program will also address concerns such as monitoring and management of pesticide resistance, an area of increasing concern to growers.

As part of the basis for an IPM program, valid economic injury levels and action thresholds are needed. This has been part of the fruit IPM program at Virginia Tech. Many secondary pests (induced by sprays for primary pests) are foliar feeders. Such pests are often tolerable in low to moderate densities. Based on research on the interactions between foliar feeders and apple trees in our program, action thresholds for the green aphid complex (apple aphid and spirea aphid) have recently been raised (i.e. a higher population may be tolerated than previously recognized). Such research has led to similar changes in action thresholds for white apple leafhopper. These changes have impacts beyond the simple immediate reductions in sprays required, important as such reductions are. White apple leafhoppers have increasingly become resistant to orchard pesticides. Reduction in chemical control efforts will slow the development of this resistance. Likewise, apple aphid, formerly an abundant species, has apparently been displaced by spirea aphid, indistinguishable in the field; however, the “new” species is more tolerant of orchard spray programs. Since aphid predators are still impeded by sprays, there is greater potential for aphid outbreaks under conventional spray programs. Obviously reductions in spray applications have immediate economic and ecological benefits, but both types of benefits may become compounded by the lessened disruption of the complex ecological system within the orchard from insecticide applications.

A new approach in orchard IPM is the use of mating disruption. By release of pheromones (the sexual attractant of a species), mating is disrupted, resulting in lower populations in the orchard. This approach offers dramatically expanded potential for reduction of pesticide use. The range of fruit pests for which mating disruption is the subject of IPM research is greater in Virginia than in any other state. This approach has been used successfully against codling moth, variegated leafroller, tufted apple bud moth and redbanded leafroller in...
apple, and oriental fruit moth and lesser peachtree borer in peach. In order to demonstrate the cost efficacy of this approach, effects of low spray programs using mating disruption on beneficial species and secondary pest populations are now the subject of research. There is evidence of decreased pest pressure from aphids and white apple leafhopper in orchard blocks under mating disruption for codling moth and leafrollers. The disruption system for lesser peachtree borer will be a major advance for applicator safety, convenience to the grower, and degree of control provided.

**Small Fruits**

**Selected Highlights from Small Fruit IPM**

*D. G. Pfeiffer*

Most IPM activity in small fruits has been involved with grapes. The target for most insecticide sprays in Virginia vineyards has been Japanese beetle. Although the foliar feeding injury by this species is conspicuous, the vines can tolerate substantial injury without an impact on the crop. Our research program showed that a totally unrestrained natural population did not affect sugars or acids in the berries, or yield per vine. Very high populations caged onto vines did influence these parameters. This research showed that most insecticide sprays targeted toward Japanese beetle are probably unnecessary.

A further advance toward pesticide reduction in Virginia vineyards has resulted from the use of mating disruption for a key pest, grape berry moth. We have shown that this approach can be effective for this pest, even in some high-risk situations. But we have also made progress on learning how best to integrate this non-insecticidal approach with limited use of sprays. The cost efficacy of this approach, effects of low spray programs using mating disruption on beneficial species and secondary pest populations are now the subject of research. There is evidence of decreased pest pressure.
The Colorado potato beetle (CPB), *Leptinotarsa decemlineata*, is the major limiting factor in Virginia potato production. Many fields in Virginia have been planted year after year in potatoes, resulting in the development of CPB populations resistant to many classes of labeled insecticides. This problem is especially severe in potato fields in northern Accomack County. Since the adult CPB overwinter in the soil, crop rotation is a recommended cultural practice for CPB control. Due to the expense of irrigating multiple fields and the relatively low value of alternate crops, many Virginia growers are limited in their ability to practice rotation.

As a result of the problems mentioned above, it is necessary to investigate alternate means of CPB control involving an IPM program. There are several native insect predators and parasitoids of CPB; however, it is rare that they occur in great enough numbers to provide adequate control. This study will investigate the efficacy of releases of lab-reared biocontrol agents to supplement the natural populations for CPB control. The native predators *Coleomegilla maculata* and *Perillus bioculatus*, which are predators of CPB egg masses and larvae will be released.

Two separate fields in a commercial potato operation will be used in this study. The biocontrol agents will be released on one field and the other field will be used as a control. The grower who farms these fields currently practices an IPM program involving crop rotation and the use of Bts, which should minimize adverse effects on the biocontrol agents. USDA APHIS will fund this study with a grant of $5,000.

Sampling will take place twice weekly both to determine the efficacy of the biocontrol agents and the optimum time for their release. The crop phenology and CPB population dynamics data taken in this grower’s field in 1992 will also aid in determining the optimum time for the releases of the biocontrol agents. Numbers of any beneficial insects other than the ones under study will also be recorded, if present. Counts of all CPB life stages and beneficial insects present on 50 random plants will be taken on each sampling date in both the release and control fields. A third field, from a different grower who uses conventional CPB practices, will be sampled in a similar manner.

We hope that releases of the biocontrol agents will enable growers to apply fewer sprays and that the efficacy of such pesticides as Bts, which only control a specific CPB life stage, will be improved. Economic and yield data will be obtained from both growers.