V. Ornamentals

IPM for Orangestriped Oakworm

Mark A. Coffelt
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Program History

The orangestriped oakworm, *Anisota senatoria* (J. E. Smith) (Lepidoptera: Saturniidae), became a serious problem in Norfolk, Virginia urban forests in 1981. Widespread defoliation occurred from 1981 to 1987 and limited control was obtained with pesticide applications based on citizen demand. This policy is not cost effective and adds significant pesticide load to the urban environment. Beginning in 1987, research was conducted on developing IPM strategies to more effectively manage *A. senatoria* populations.

Program Description

An aesthetic threshold and injury level was established and implemented in 1988. The aesthetic threshold was defined as the *A. senatoria* egg mass density that caused a given level of defoliation (Coffelt 1992). Bright yellow egg masses are oviposited on leaf undersides, primarily in the lower canopy or bottom one-third of the tree. Daily scouting was conducted by walking underneath the tree canopy and counting the number of egg masses per 30 cm branch segment. Research estimated the amount of defoliation that would occur, based on the egg mass density. The aesthetic injury level was defined as the lowest amount of defoliation that was tolerated by citizens and the lowest defoliation (%) that would not significantly reduce tree health (Coffelt & Schultz 1990). A citizen survey revealed tolerance levels (Coffelt & Schultz 1991), and starch analysis determined the effect of defoliation on tree health (Coffelt 1992). Citizen tolerance levels indicated that most citizens would accept some defoliation, and 25% defoliation was the upper tolerance limit.

Data indicated that trees should not receive pesticide applications if defoliation was less than 25%. If scouting indicated populations approaching the threshold, pesticide application with *Bacillus thuringiensis* was recommended for susceptible early instars.

Another component of the IPM program was identification of natural enemies. Egg and larval parasites were collected from *A. senatoria* life stages from 1988-1991, and biological control by releasing *Trichogramma minutum* (Hymenoptera: Trichogrammatidae) was conducted in 1989 and 1990 (Coffelt & Schultz 1992, Coffelt 1992).

The cost of the IPM program during the first year (1988) was $1,566. Program support was supplied by the City of Norfolk Bureau of Parks and Forestry, pest management funds from the Virginia Nurserymen’s Association, and IPM Extension funds through VPI & SU. Four VPI & SU researchers and approximately six Norfolk forestry employees were involved with the program in 1988. Norfolk managed the program in 1989 and continues to implement these IPM strategies.

Program Locations

City of Norfolk and Virginia Beach, VA. There were approximately 1400 trees that received different levels of defoliation during the IPM program. Approximately 130 Norfolk citizens were surveyed and 75 acres were involved in the IPM program.

Program Results

Pesticide volume in 1988 decreased by 80% with a cost savings of 55% (Coffelt & Schultz 1990). The program was evaluated to be very successful, despite a slight increase (1.0%) in the number of 90-100% defoliated trees (from 34 to 47 trees). The direct benefit to Norfolk was a cost savings and a more environmental sound method to control a key insect pest. The tree care industry can implement these thresholds and injury levels into their IPM program for *A. senatoria* control.

Additional benefits included conservation of natural enemies, because less pesticides were applied and biorational materials were used. Numerous parasites were identified attacking *A. senatoria* (Coffelt & Schultz 1992), primarily...
Hymenoptera and Diptera species. Inundative release of *T. minutum* was not effective, probably because *A. senatoria* was not a preferred host. Identification of parasites will complement biological control programs for shade tree pests in urban environments.

Other Information

Host plant preference studies have indicated that *A. senatoria* prefers certain oak species over others. White oak, *Quercus alba*, was a least preferred species, and pin oak (*Q. palustris*) and willow oak (*Q. phellos*) were the most preferred.

Future Plans

The *A. senatoria* IPM program has been completed. Future research will develop IPM strategies for key insect pests in the urban landscape, such as azalea lace bug and euonymus scale. Thresholds and injury levels for these pests will be a primary objective.

Research Cited


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**IPM for Euonymous Scale**

**Peter B. Schultz**

Program History

Euonymous scale is a foreign introduced pests of euonymous. This pest is an armored scale which is very difficult to control with conventional pesticides. Preliminary surveys indicated that over 2/3 of euonymous plantings nationwide had severe problems with this pest. As a result, landscapers who would prefer to use plants in this genus have switched to alternatives. The USDA/ARS was initially involved with the collection and importation of natural enemies of euonymus scale. Colonies of *Chilocorus kuwanae* were introduced into Virginia in 1988.

Program Description

The program involves cooperators with USDA/APHIS, VDACS, and is directed by P.B. Schultz, who serves as state project coordinator. A total of 8 cooperators and 3 VPI & SU personnel are involved in the program. Sampling and scouting techniques have been developed by USDA/APHIS, and involve site visits to euonymous plantings in residential and commercial properties. Infested twigs are collected and mailed to Niles, MI, for identification of potential native natural enemies. Pest density surveys are also a part of the study. The program is supported in part by USDA/APHIS funds. Labor costs are absorbed by the cooperating agencies.
Program Location
Study areas are in the four major urban areas of Virginia, Richmond, Fredricksburg, Fairfax (northern Virginia), and Norfolk (Hampton Roads). One year of data has been collected in each of the above areas.

Results
In Hampton Roads study sites, both species of predatory beetles (*Chilocorus kuwanae* and *Cybocephalus nipponicus*) released in 1988 have been recovered. Releases of *C. kuwanae* were made in Richmond, Fredricksburg, Fairfax, and Boyce, Virginia. In addition, an as yet unidentified hymenopterous parasite has been recovered. The benefits of pesticide reduction, while inherent, have not been documented.

Potential Benefits
Aside from pesticide reduction, there is considerable benefit in having euonymus again be utilized by landscapers. Nurserymen find the genus profitable to produce, and easy to market if the key pest can be managed through non-chemical means.

Future Plans
The project will continue for the next year, with additional surveys for pest density and natural enemies. Site monitoring of release sites will determine natural enemy release criteria.

IPM of Weeds in the Landscape

Jeffrey F. Derr

Background
The nursery industry in Virginia is multifaceted, including wholesale plant production, retail sales, and landscape design, installation, and maintenance. It is estimated that 10 to 15% of a property’s value comes from its landscape.

Weed management is an integral part of an effective landscape maintenance program. Weeds compete with desired plants for water, light, nutrients, and space. Weeds detract visually from a landscape planting. Certain weeds, such as poison ivy, pose a hazard to people. Weeds block visibility along roadsides. For these reasons, homeowners, commercial landscape maintenance firms, parks and recreation personnel, among others, must control weeds in tree, shrub, groundcover, and flower plantings.

A variety of methods have been used in the past for landscape weed control, including hand-weeding, organic and inorganic mulches, herbicides, and black plastic. A new method to suppress weed in landscape plantings has been the introduction and use of landscape fabrics, a form of geotextile. Landscape fabrics overcome a major limitation with black plastic, which is its lack of porosity to water or gasses.

Research project
We have been evaluating the utilization of organic and inorganic mulches in combination with landscape fabrics for weed control and nursery crop growth. This research, which is being conducted at the Hampton Roads Agricultural Experiment Station, has been a joint project between Dr. Jeffrey F. Derr, Weed Scientist, and Dr. Bonnie L. Appleton, Nursery Specialist, with assistance from technicians Robert T. Taylor and Audrey Salzman and part-time employees. The project has been supported by geotextile manufacturers, mulch suppliers, nurserymen, and landscape maintenance organizations.

Control of important landscape weeds, such
as large crabgrass, yellow nutsedge, and bermudagrass, by fabric/mulch combinations has been compared to mulches applied alone, preemergence herbicides, and black plastic. The use of various lava rocks and white marble chips have been compared to shredded pine bark mulch. The effect of mulch type (organic versus inorganic) on weed control with landscape fabrics has been investigated. This research has been conducted both in the field and in the greenhouse. Costs were determined for the various treatments, allowing for an economic comparison of weed control strategies. Weed shoot growth, weed density, and nursery crop growth has been recorded, along with monitoring of soil moisture and temperature under mulches and landscape fabrics.

Results
Landscape fabric plus mulch combinations have controlled weeds better than mulches, either organic or inorganic, applied alone. Landscape fabrics, however, have differed in their ability to suppress weed growth and in general have been more effective on annual than perennial weeds. Black plastic has provided greater weed control than landscape fabrics. Efforts are continuing on ways to improve the weed control potential with landscape fabrics.

Total weed control costs were lowest in the treatments lacking a mulch as the landscape fabrics gave greater weed control when not covered by an organic layer. Uncovered fabrics would not be aesthetically acceptable in landscape plantings, although potential exists for such use in nursery production. Weed control costs were greater in mulch/fabric combinations than in treatments utilizing herbicides and mulches, although landscape fabrics would be expected to give longer term control than herbicides. Further research is needed on the effect of mulch depth on effectiveness of landscape fabrics. Lower treatment costs could be obtained if shallower mulch layers could be used above a fabric.

Mulch type above the landscape fabric has affected weed control. Use of a lava rock plus landscape fabric improved control of annual grassy weeds over that observed with landscape fabric plus shredded pine bark mulch combinations. Mulch particle size may also be an important factor with mulch/fabric combinations. Weed growth in moist organic mulches above a landscape fabric is a concern with use of these materials. We observed weed root penetration through landscape fabrics. The geotextiles investigated differed in their ability to withstand weed root penetration. Resistance to weed root penetration may be related to the percent open versus closed space in the fabrics. Program goals are to continue evaluating landscape weed control measures to find the optimum combination of methods.

Impacts
Landscape weed control is an important concern for property owners, landscape maintenance companies, parks personnel, and others across all counties of Virginia. Landscape maintenance is especially important in urban parts of the state. Potential benefits of this research to these individuals and companies include improved weed control, lower weed control costs through lower hand weeding costs, and reduction in herbicide use.
Dogwood Anthracnose

R. Jay Stipes

This problem was first documented in the western U.S. and along the eastern seaboard in the late 1970s, and was first reported in Virginia in 1987. It is catastrophic to the state tree and flower, the flowering dogwood, *Cornus florida*, and the high-hazard sites are the highlands where lower temperatures combined with higher rainfall (including higher acidic depositions) prevail. The eastern piedmont and coastal (tidewater) areas currently appear to be low-hazard sites, we think primarily because of relatively elevated temperatures intolerable to the causal pathogen, *Discula destructiva*. Dogwood Anthracnose (DA) was first designated “lower branch dieback,” since that accurately describes a major component of the syndrome. DA must not be confused with “spot anthracnose,” a relatively harmless, “common cold” disease of the dogwood. Spot anthracnose lesions remain contained, while DA lesions continue to coalesce and “metastasize” into the petioles, branches and finally to the trunk where complete girdling and death of the entire tree occur. An integrated disease management program has been launched to manage the disease in VA. Components include (1) disease surveys to document both incidence and severity, (2) sanitation (destruction/inactivation of diseased tissues to reduce inoculum levels), (3) search for and use of resistant individuals/cultivars/species, (4) avoidance (culture/use of trees away from high-hazard sites), and (5) fungicidal contact sprays/injections where other management procedures cannot or will not be implemented. Costs of integrated program development will be borne primarily by donated talent and labor, with minimal input from industry/state/private resources. Cooperation with extension personnel, graduate/undergraduate students, arborists and colleagues are being and will be generated on this project. Most work will, of necessity because of limited travel support, be done locally (Montgomery County). Each year, as research/survey results are obtained and analyzed, evaluations will then be made on epidemiology (disease spread) and treatment efficiencies.

Dutch Elm Disease

R. Jay Stipes

Dutch Elm Disease (DED) was discovered in Virginia in 1935, and even though the disease has ravaged much of the wild and landscape elm population, many fine specimens are extant, largely because disease dissemination is not as effective, as say in chestnut blight, and also because many of the elms that once existed in a monoculture situation are now gone. Of all tree or other plant diseases, IPM is the supreme way to manage DED! If all components of the system are in place or can afford to be implemented (sanitation, avoidance, insect vector control, resistance, fungicide injection, et al.), DED could become only a “textbook disease.” However, because of inadequate management funds, most prominently the inability to effect rigorous sanitation programs by cities, and because of the high price of tree injection also by cities, the disease continues to remain a menace and threat to large, beautiful, high-value, individual landscape specimens. DED is another introduced tree disease, and was first reported in Ohio in 1930; it was introduced on diseased elm wood from Europe. The disease can move from diseased to healthy trees within root-grafting distance of each other, but it is transmitted most effectively by the smaller European bark beetle, *Scolytus multistriatus*, when it emerges in the spring from diseased trees and commences feeding in twig crotches of healthy elms. Once the disease develops a significant “beach head,” it is only a matter of time until death ensues; many vain attempts at therapy (cure) result when radical surgery and/or fungicide injection are elected too late in the infection. Most exciting developments have occurred in recent years in fungicide injection technology. We now know where, how and when to inject trees for preventive management of DED. New exciting chemistries are now available, the most recent of which was tested at
Virginia Tech from which a full federal label was just issued, that for propiconazole or Alamo fungicide. The other effective fungicide is thiabendazole (Arbotect 20S).

**Future Plans for Dogwood Anthracnose and Dutch Elm Disease Work.** In DA efforts, we plan to continue as much survey work as possible, to look at integrated management procedures to maintain the disease as low levels, to encourage preventive approaches to consumers state-wide, to study biological bases for disease development and prevention, and to continue evaluating fungicide administration techniques for disease prevention and cure. In DED work, we plan to continue our long-term program in the evaluation of fungicide injection and how disease can be prevented or cured in trees. New compounds will be evaluated, and always new methods will be tried. Support of any kind is sorely needed to keep these programs afloat.