Recent Developments in the Management of Nursery Pests[1]

Whitney S. Cranshaw[2]

Abstract. Insect pest complexes in the intermountain region continue to change rapidly as new pest species are introduced and different plants become favored in landscapes. Among the more serious of the new pest species to become colonized, has been the honeysuckle witches broom aphid which now threatens the future of tartarian types of honeysuckle throughout most of the country. Developments in insect management, however, continue to keep pace with these changing needs. Use of sex pheromone based insect trapping has expanded so that it is now routinely used to monitor flights and associated egg laying periods for several difficult insect control problems. Insecticide technology has also advanced, with greatest current development among synthetic pyrethroids. Also, broader spectrum Bacillus thuringiensis preparations and soap/detergent sprays are offering less hazardous insect control options that are particularly desirable for high population areas. Finally, expanded use of soil applied systemic insecticides has good promise for control of many insect and mite problems. Advantages of these latter treatments are elimination of drift problems, relative ease of application, and generally thorough plant coverage. Limitations include the need for adequate watering, high toxicity, and the potential for direct effects on plant growth.

Several dozen insect and mite species seriously damage woody plants in the intermountain region. Most threatening are the various bark beetles, (Dendroctonus, Ips, Scolytus, etc.), many of which introduce pathogenic fungi into living trees. Borers, primarily clearwing borers, (Sessiidae), are serious pests of certain trees and shrubs and are capable of directly attacking and killing healthy plants. Many other pest species more indirectly affect the overall vigor and health of woody plants. These include insects and mites which suck plant sap (aphids, scale insects, spider mites) and the numerous beetles, caterpillars, and sawflies which are capable of defoliating plants. Among these latter pest species are several which commonly cause serious aesthetic damage to woody plants (e.g. elm leaf beetle, douglas fir tussock moth, pear slug, etc.)

Unfortunately, the status of woody plant pests in the region is not static and many situations have lately changed for the worse. This, in part, is due to changes in plant species used in urban landscaping. For example, honeylocust has been very extensively planted in recent years and this "pest-free" species is developing numerous serious disease, insect, and mite problems.

Also important has been the widespread introduction of new plant pests into the region. This trend has undoubtedly accelerated in recent years with the population influx. Species lists current a decade ago now have to be updated as many "Eastern" species have become established. For example, during 1985 the gypsy moth, viburnum borer (Synanthedon viburni), and a new species of sawfly infesting juniper were first recorded as established along parts of Front Range Colorado.

Also important has been the spread and establishment of "exotic" species. The most important of these recent arrivals to the nursery industry is the honeysuckle witches broom aphid. This aphid seriously threatens the future of tartarian varieties of honeysuckle in the United States. At present, the honeysuckle witches broom aphid heavily damages this commonly planted shrub throughout the mid-West (including Colorado) and its spread into Utah was confirmed in 1985. Management of this insect is discussed in the C.S.U. Service-in-Action Sheet 5.546 (Cranshaw 1985b).

---

[1]Paper presented at the Intermountain Nurseryman's Association Meeting, Fort Collins, Colorado, August 13-15, 1985.

[2]Assistant Professor, Department of Entomology, Colorado State University, Fort Collins, Colorado, 80523.

Improvements in insect management have also progressed in many areas to meet these new challenges.

The use of insect sex pheromone traps in insect pest management has expanded greatly in the past decade. In the past, use of these traps has been greatest in detecting the presence of new pest species in an area. For example, gypsy moth movements continue to be monitored with these traps in many areas of the country.

The most useful application of pheromone technology for plant health care professionals is to follow flights of key insects. This can greatly improve the timing of insecticide applications for plant protection, since flights are correlated with egg laying periods. Among the many pheromone traps available at present, those used for tracking clearwing borers (lilac/ash borer, peach tree borer, viburnum borer), leafrolling caterpillars, and certain pine tip moths are most commonly in use in woody plant protection.

Use of pheromones directly for insect control has also been attempted experimentally. Primary strategies involve either mass trap outs (e.g., certain bark beetles) or mating confusion applications. At present, practical uses of these techniques in nursery production have not been demonstrated.

New developments in insecticides have also occurred, although the pace appears to have slowed in recent years. Primary areas of development involve synthetic pyrethroid insecticides, microbial insecticides, and insect growth regulators.

Development is strongest among the synthetic pyrethroid products. Synthetic pyrethroids are chemically derived from the naturally-occurring pyrethrins which are found as fast-acting insecticides in many household aerosol sprays. The synthetic pyrethroids are marked by having extremely high activity, being effective at rates 1/10 - 1/100 of currently used materials. Mammalian toxicity of the synthetic pyrethroids is generally low, particularly when diluted at use rates, although some individuals report irritation by these materials. Most synthetic pyrethroids have a broad spectrum of activity and a few are also effective miticides. Fluvalinate (Mavrik) is the most recent of these materials to get labelling on woody plants, but many other synthetic pyrethroids should be marketed in the next few years.

Microbial insecticide development primarily concerns improvement of Bacillus thuringiensis products. This area has drawn considerable interest among many biotechnology companies. B. thuringiensis products with effectiveness against leaf-feeding beetles (as well as caterpillars) are being tested successfully. The exceptional safety of B. thuringiensis recommends it for use in high population areas.

Highly promising, but still experimental, is the use of insect parasitic nematodes against soil insects. Several nematode species have demonstrated effectiveness for control of black vine weevil larvae. In 1985, C.S.U. trials also conducted nematode applications which demonstrated control of raspberry crown borer and white grubs.

Rediscovery of an "old" insecticide, soaps, and use of detergents is also becoming more widespread. These materials have often proved very effective for controlling many small insects (aphids, psyllids, etc.) and mites. Safety to the user of soaps and detergents is a major factor in their increased use. Although initial control may be less than with standard insecticides, soap/detergent applications often spare many beneficial insect predators and parasites allowing longer term control. The use of these materials is discussed in C.S.U. Service-in-Action Sheet 5.547, Use of Soaps and Detergents for Insect Control in Colorado (Cranshaw 1985a).

Insecticides with systemic activity (i.e., are translocated within the plant) are also an available tool in insect management on woody plants. These insecticides are often particularly useful for control of "hard-to-reach" insects such as aphids. Greatest use has involved systemic insecticides formulated for use as foliar sprays. These include acephate (Orthene), dimethoate (Cygon), and oxydimetonurethyl (Metasystox-R).

Many of these materials, and others, can be used as soil applications. This treatment method has several major advantages which include: elimination of insecticide drift, generally thorough plant coverage, and ease of application. Soil applied systemic insecticides are routinely used for production of many greenhouse and vegetable crops but are underutilized with woody plants.

Trials conducted at C.S.U. during 1984-85 with soil applied systemic insecticides have targeted 3 difficult-to-control insect problems - honeysuckle witches broom aphid, honeylocust pod gall midge, and the pinyon "pitch mass borer" (Dioryctria sp.). Results have been variable and demonstrate the utility and limitations of these soil applications.

Honeysuckle witches broom aphid control has been outstanding with use of Metasystox-R and Cygon applied as soil drenches. Rates of these materials at 1/16 tsp./3 gallon nursery can have given complete control of this insect for over one month. These results are consistent with those achieved by some Denver area tree care professionals in 1985. Plant injury has been observed with higher rates of Cygon and the phytotoxicity potential of this product is a severe limitation to its use.

Control of honeylocust pod gall midge has been highly variable. Granular formulations of Disyston, Furadan, and Temik have repeatedly failed to provide control. Greatest control (80%+

over 2 generations of the insect) has been achieved with liquid emulsions of Metasystox-R. Furadan 4F applied as a liquid emulsion has been intermediate in performance. Adequate watering to allow insecticide uptake has proved to be critically important.

The pinyon pitch mass borer has resisted control by use of soil applied (or injected) systemic insecticide. This insect causes an extreme disruption of the conducting tissue around the feeding site, preventing adequate uptake of the insecticide. Similarly, other insects which destroy the cambium (bark beetles, borers) are often reported to be poorly controlled unless treatments are initiated early in the infestation.

Therefore, the need for adequate water to allow insecticide uptake and poor translocation to disrupted tissues are key limitations for some uses of soil applied systemic insecticides. These insecticides are also translocated in greatest concentration to newest tissues which can prevent adequate control of species found on older wood. Furthermore, many of the insecticides with systemic ability are highly toxic to mammals and must be used in a very cautious manner.

Another aspect of certain systemic insecticides is their ability to affect the growth of the plant. Phytotoxicity can frequently occur from use of organophosphate types of insecticides, particularly Cygon. Carbamate types of insecticides, (Furadan, Temik), frequently exhibit growth regulator activity. On certain vegetable crops, promotion of flowering has been documented from treatment with these products. In 1984 trials on nursery stock at the Colorado State Forest Service Nursery, transitory increases in growth were noted from treatment of two plant species. Five other species were not observed to have any growth response from treatment with carbamate insecticides. Organophosphate insecticides have not been demonstrated to produce any growth rate increases in these plants when pests were absent.

LITERATURE CITED

Cranshaw, W. S. 1985a. Use of soaps and detergents for insect control in Colorado. Colorado State University Extension Service-in-Action Sheet 5.547, 2p.

Cranshaw, W. S. 1985b. Honeysuckle witches broom aphid. Colorado State University Extension Service-in-Action Sheet 5.546, 2 p.