Resources for Establishing an IPM Program for Ornamental Plants

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INTRODUCTION

Integrated pest management (IPM) is an ecological pest management strategy that focuses on longterm prevention or suppression of pest problems with minimum impact on human health, the environment, and nontarget organisms. Principal components include pest identification; methods for detecting, monitoring, and predicting pest outbreaks; a knowledge of the biology of the pest and its ecological interactions with hosts, natural enemies, and competitors; and compatible methods of preventing and managing pest populations. Preferred techniques include encouraging naturally occurring biological control, using alternate plant species or cultivars that resist pests or stock that is certified pest-free, selecting pesticides with lower toxicity to humans and nontarget organisms; adoption of cultivation, pruning, fertilizing, or irrigation practices that reduce pest problems; or changing the habitat to make it incompatible with pest development. Broad spectrum pesticides are used as a last resort when careful monitoring indicates they are needed according to preestablished guidelines. When treatments are necessary, the least toxic and most target-specific pesticides are chosen. IPM is a knowledge-based decision-making system, and an essential element is a well-trained and informed decisionmaker. Resources for establishing an IPM program are discussed below.

PEST IDENTIFICATION

Improper identification of pests or damage leads to many pest management mistakes. Similar-looking organisms may require quite different management actions; a pesticide, cultural practice, or resistant cultivar that controls one may not control the other. Even more importantly, organisms that closely resemble pests may actually not be damaging or may even be beneficial. When pesticides are applied to control a nonpest, not only is the problem not alleviated but the toxic materials may cause further injury to the system by inhibiting biological control or causing phytotoxicity. Sometimes insects, mites, or other organisms are incorrectly identified as pests because they occur on plants suffering damage from an unrelated cause such as overwatering, phytotoxicity, or disease. It is important to confirm that damage symptoms are the result of the organism targeted for control.

Anyone carrying out an IPM program should have a basic library to assist in identification of both pests and hosts. Managers working with woody ornamentals will find the Cornell publications by Sinclair et al. (1987) and Johnson and Lyon (1988) essential pest idenfication guides. The University of California Division of Agriculture and Natural Resources (UCANR) has two publications with color pictures of pests on ornamentals including Koehler (1987) for insects and Keim and Humphrey (1988) for pathogens. An IPM manual for woody ornamentals featuring over 250 color pictures of pests and damage is being produced in my office and will

be released before the end of 1993. Several general references with color pictures are available from UCANR including the Grower's Weed Identification Book, Pests of the Garden and Small Farm (Flint, 1990a), and the various-crop specific IPM manuals produced by the UC Statewide IPM Project. Another good source of assistance in identifying plant disease problems are the series of compendia produced by the American Phytopathological Society; currently they have publications on greenhouse crops (Jarvis, 1992), ornamental palms (Chase and Brochat, 1991), ornamental foliage (Chase, 1987), elm (Stipes and Campana, 1981), rhododendron and azalea (Coyier and Roane, 1986), rose (Horst, 1983) as well as compendia for many agricultural crops. Vertebrate pests are addressed in Salmon and Lickliter (1984). Insect and mite pests of interior plantscapes and glasshouses are discussed in Hussey and Scopes (1985) and Steiner and Elliot (1987); insects attacking many trees are described in Furniss and Carolin (1977). There are numerous general reference books for insects; one good one is Swan and Papp (1972). California propagators should be aware of the color keys for whiteflies, mealybugs, soft scales, and armoured scales (Gill 1982a, 1982b, 1982c, 1982d) produced by the California Department of Food and Agriculture as well as keys to aphids, thrips, mites, snails, and slugs (Kono and Papp, 1977). A key to ants is provided in Haney et al. (1987).

Some pest organisms can only be reliably identified by trained professionals. Do not hesitate to ask for help. Pathogens and nematodes can be particularly difficult to identify but insects and mites will also need to be sent to experts on some occasions. Try to identify local sources of expertise before problems crop up so you can be sure of getting the most rapid service. County departments of agriculture and university Cooperative Extension offices will help in identification or refer you to appropriate experts. Some private laboratories identify nematodes and pathogens for a fee. Obtaining the services of a well-trained and experienced pest management consultant may be the best way to assure ready access to reliable ID resources.

BIOLOGICAL/ECOLOGICAL INFORMATION

A goal of integrated pest management is to take advantage of the ecological relationships between host, pest, natural enemies, or the environment to sustain long-term suppression of pest problems with minimum hazard to the environment. Many of the publications listed in the section above on pest identification can give you some background for understanding the biologies of your crop plants and pests. General references on integrated pest management (e.g. Flint and van den Bosch, 1981) or crop management (e.g. Harris, 1983) can give you some basic ecological concepts. However, some of the most valuable information will be that you obtain yourself through regular monitoring of your plants and their pest problems. Always keep written records and monitor in a uniform manner so you can compare month-to-month or year-to-year patterns. Two computer programs available from the UC IPM Program, DDU, and TRAP, can help you predict pest growth based on temperature or keep and analyze monitoring data from traps.

MONITORING GUIDELINES/TREATMENT THRESHOLDS

A common denominator of all IPM programs is having a trained pest manager regularly (e.g. weekly or biweekly) check plants in a systematic manner for evidence of pests or other potential problems. A few specialized monitoring devices

are available such as pheromone traps for some moth pests and yellow sticky traps for whiteflies and leafminers, but generally monitoring involves visual inspection of leaves, bark, buds, or other plant parts. For some agricultural crops and a few ornamentals, University experts have developed guidelines based on these sampling results as to when pesticide treatment or other control actions are necessary. A few guidelines are outlined in publications reviewed under pest identification as well as in the UCIPM Pest Management Guidelines listed in the references (guidelines for ornamental crops will begin to be released in 1993). However, in many cases, pest managers in ornamental nurseries will have to develop their own guidelines based on experience and their knowledge of their clientele. What distinguishes IPM programs from conventional programs that require spraying at the first detection of a pest is the concept that minimum levels of some pests can be tolerated without economic loss. Our research in the University of California Davis Arboretum (Flint et al., in press) indicates that customers do not discriminate between plants with certain types of damage, and that establishing a monitoring program by a trained pest management scout can significantly reduce pesticide use with no loss of plant quality.

ECOLOGICALLY SOUND PEST MANAGEMENT METHODS

Preferred management methods in an IPM program are those that have minimum impact on natural sources of biological control, are least likely to induce pesticide resistance, are least likely to have negative human health or environmental impacts, yet provide effective long-term control. One very important but underutilized strategy in ornamental horticulture is the use of pest-tolerant cultivars. Too often cultivars are chosen without regard to pest resistance or are planted under conditions inappropriate for their vigorous growth, thus increasing their susceptibility to pests. Information about pest resistance and growing requirements should be available from your seed or propagation sources; keep records of your own experiences to supplement this information under your own growing conditions. Good introductions to the types of methods used in IPM programs are given in Flint (1990a), Olkowski et al. (1991), Henn and Weinzierl (1989, 1990), Weinzierl and Henn (1989), and Weinzierl et al. (1990). Many of the other publications listed in the references give specific recommendations for ecologically sound pest management techniques for specific pests. The California Environmental Protection Agency puts out a free list of sources of biological control agents (Hunter 1992). Twenty of the most common natural enemies are pictured in a poster (Flint, 1990b) from UC ANR publications. The Bio Integral Resource Center (P.O. Box 7414, Berkeley, CA 94707) puts out an annual list of IPM products and services; they also publish two publications, The IPM Practitioner and The Common Sense Pest Control Quarterly, that can keep you informed about new innovations in IPM. University Cooperative Extension offices offer expertise, publications, demonstrations, and workshops to help you identify IPM methods suitable for your operation; get on their mailing lists! Choosing pesticides that have the least impact on natural control and the environment should be an important element of your program. For insect and mite control, soaps, oils, and microbial pesticides are good selective choices where they are effective. Manufacturers can provide you with labels and MSDS sheets; a recent publication (Davidson et al., 1991) details the use of oils for controlling insect and mite pests. Croft (1990) reviews the research literature on impact of pesticides on natural enemies. Steiner and Elliot (1987)

summarize impact of pesticides on natural enemies commonly released in glasshouses. Marer (1988) discusses how to use conventional pesticides selectively and safely.

THE PEST CONTROL CONSULTANT

Initiating an IPM program on a commercial scale is a formidable task, especially for someone with little formal training in pest management. Flint et al. (1991) gives some idea of what is involved. At least at first, I strongly recommend contracting the services of an experienced IPM consultant, who is not involved in the sale or application of pesticides, or hiring a staff member with the appropriate expertise. The Plant Protection and Pest Management Masters Degree program at the University of California at Davis provides an excellent educational background, especially when supplemented with field experience. Several other universities in the U.S. offer similar programs.

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