REDUCING PESTICIDE INPUTS IN PUBLIC AREAS

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A growing awareness of problems associated with overusing pesticides has prompted many landscape managers to seek efficient, economical and environmentally sound alternatives for managing landscape pests. Integrated pest management (IPM) is a system or strategy which utilizes all suitable methods and techniques in a compatible manner to maintain pest densities below levels causing unacceptable injury. Inherent in the IPM philosophy is the recognition that for most pests, population levels exist that can be tolerated without significant plant injury. The landscape manager does not attempt to eradicate a pest because moderate pest levels help maintain natural enemies, and chemical overuse can lead to pesticide resistance. The overall objective of IPM is to optimize rather than maximize pest control.

An important aspect of an IPM approach involves planning ahead to avoid or reduce pest problems as much as possible. Decisions made during the establishment and maintenance of the landscape can influence pest development. Among these key decisions are selection of appropriate plant species and cultivars, site selection, weed and disease control, irrigation and fertility programs. Stressed plants are often more easily damaged by pests. Maintaining healthy, vigorous landscape plants and turf is perhaps the best preventive insect management strategy.

Despite appropriate measures to avoid or reduce insect problems, pest populations can increase under certain conditions. When using an IPM approach, control measures including conventional pesticides are employed only when pest numbers reach or threaten to reach predetermined levels, or "treatment thresholds". These thresholds are flexible guidelines that are usually defined as the level of insect abundance or damage that can be tolerated before taking action. They are typically based on a number of variables including pest species, abundance, and life stage; variety, vigor and value of the plant; relative effectiveness and cost of control measures; and time of year. Treatment thresholds are not hard rules that apply to every situation, but when used conscientiously, they should help landscape managers make effective pest management decisions.

IMPLEMENTING A LANDSCAPE IPM PROGRAM

Establishing a pest management program requires a sound understanding of the growth habits and cultural requirements of the landscape plant; knowledge of the biology, behavior, life history and type of damage caused by potential pests; and information regarding the time of year, growth stage of the plant and environmental conditions under which pest damage is most likely to occur. Accurate pest identification is also important. In addition, landscape and ground managers must integrate their insect control with disease, weed and cultural management strategies.

Pest Identification

All urban landscapes are inhabited by a diverse array of organisms including insects, spiders, mites and small animals. Most of these cause little or no damage and are generally considered nonpests. Others are beneficial and aid in the breakdown of organic matter, pollination of crops, or serve as natural enemies of pests. Only a few of the insects and mites present are actually plantfeeding pests. Because of the wide diversity of species present and the many similarities between pests and nonpests, it is important to be able to distinguish incidental and beneficial species from target pests.

Early Detection

Successful management of most landscape insect pests depends upon early detection before they reach damaging levels. This can best be accomplished through frequent inspections to detect early signs of insects and their damage. When examining plants, look for natural enemies of pests, such as lady beetles, lacewings, spiders, or parasitic wasps that may be reducing pest populations. Insect monitoring aids include magnifiers, drop cloths, sweep nets, sticky traps, as well as light and pheromone traps.

Insect Monitoring Techniques

All landscape plants should be regularly inspected for pest problems throughout the growing season. Monitoring allows the landscape manager to confirm the presence or absence of an insect or mite pest, determine the pest species present, assess the need for taking corrective measures, evaluate the efficacy of insecticide treatments, and develop site history information. Depending on the size of the planting, inspect all plants or a subsample of plants of each species. Plants of different species or at different growth stages may have different pest levels and should be inspected separately. Depending on the particular plant and pest involved, certain parts of a plant should be checked first. For example, spider mites are usually found on the underside of leaves.

Record-keeping

Accurate recordkeeping is essential to make maximum use of information obtained during plant inspections. When you inspect landscape plants or turf, record the information in a quantitative fashion. For example, record the number of insects found per plant or leaf, rather than recording "many" or "few". After the growing season, review this information and plan to improve your pest management next year. You may detect patterns, such as more damage or pests on certain cultivars. Use this information next year to minimize pest problems. Effective record-keeping also allows you to know when to anticipate certain pest problems and plan ahead to deal with them. Also, information from regular inspections will permit you to evaluate which control practices are effective and which need to be modified in the future.

PEST MANAGEMENT ALTERNATIVES

As previously indicated, IPM uses a combination of complementary strategies to effectively manage pest populations. The following paragraphs describe some of the pest management alternatives available to the landscape manager.

Cultural Methods

Cultural methods involve manipulating the environment to make it less suitable for pest survival. These measures are usually preventive in nature and must be implemented before the insect reaches pest status.

Selection of Plant Materials. When selecting landscape plants, choose plant materials that are welladapted to local soil and environmental conditions. Planting insect resistant varieties is another valuable IPM tool. Plant resistance to insect pests has been found in many plants, although the degree of resistance may vary considerably from one cultivar to another. Most universities, nurseries, garden centers and cooperative extension offices can provide information on resistant plant cultivars and those best adapted to local environments.

Plant Diversity. Planting patterns and the diversity of plant species in the landscape can influence the natural enemies of various insect pests. A diversity of plants increases the likelihood that some of them will harbor low levels of pest insects. This allows predatory and parasitic insects to survive periods of low pest populations on other plants. Many predatory and parasitic insects feed on either pollen, nectar or plant sap either as an essential part of their nutrition or as an alternate food source in the absence of prey insects. Having a diversity of flowering plants with different blooming periods can increase survival of many beneficial insects. Some cultivated plants that provide food resources include Phacelia, sweet alyssum, and many composite plants, such as tansy. Umbelliferous plants, such as caraway, dill, fennel and yarrow are also very attractive nectar sources to several groups of natural enemies.

Sanitation. Many insect and mite pests seek shelter or attempt to overwinter in plant residues. Overwintering forms include eggs on dead leaves, adults in plant stems and larvae or pupae in plant stems or in the soil. Removing dead branches or canes from trees and shrubs and raking and composting leaves, grasses and other plant debris helps eliminate many overwintering sites.

Mulches. Exercise caution in the use of heavy mulches during the growing season. Thick mulches of plant material will encourage the development of potentially damaging pests such as white grubs, millipedes, sowbugs and cutworms. However, a light mulch of straw or shredded plant material will moderate soil temperatures and conserve moisture. Apply plant residues and compost in the fall and deeply till into the soil. Increasing the organic content of soils helps retain moisture and improve fertility.

Water and Fertilizer Management. Adequate fertilization and watering encourages healthy, vigorous plant growth. For example, deep watering of landscape plants as needed is better than more frequent shallow watering. Although these practices do not prevent insect infestations, they tend to promote healthier growth and a more vigorous plant that is better able to tolerate pest damage.

Mechanical/Physical Methods

Mechanical/physical pest control methods include hand removal; use of screens, barriers, or trapping devices; freezing; crushing; and grinding. They are the oldest, and in some cases, the simplest of all insect control methods. These tactics differ from cultural control measures because they are directed against the pest itself rather than the pest's environment. Mechanical methods are not widely used in commercial settings because they are often expensive and labor intensive.

Hand Removal. Remove large or readily visible insects by hand and destroy, or dislodge pests into a can containing a small amount of water and detergent. The egg masses of many insects can be scraped off or smashed. During winter, removing bagworm cases from juniper and witches' brooms from honeysuckle will help reduce infestations the following spring. Handremoval requires considerable time, however, and may not be feasible for heavy infestations or when larger landscapes are involved.

Exclusion Using Screens and Barriers. Metal screens or cold frames covering highvalue plants also can be used to exclude larger insects, birds and rabbits. Sticky bands placed around tree trunks will help reduce infestations of spring cankerworm and elm leaf beetles.

Trapping. Various kinds of traps can be used to monitor insect abundance, and in some cases, help reduce pest numbers. Yellow sticky traps are highly attractive to whiteflies, aphids, thrips, leafhoppers and other small flying insects, and are used by some commercial greenhouses for insect control. In outdoor settings, traps placed near susceptible plants may capture some invading insects before they can damage the plant. Other trapping devices, used largely against fruit flies and caterpillar pests, use pheromones or attractive scents to lure flying adult stages to their sticky surfaces. They are better used as monitoring tools than control measures.

Syringing. A vigorous stream of cold water from a hose can be used to dislodge aphids, other small insects and spider mites from landscape plants. Syringing must be carried out frequently, however, as it has little effect on eggs, and will not prevent some insects and mites from crawling back onto plants.

Biological Control

This important IPM strategy utilizes beneficial organisms including predators, parasites or insect pathogens to reduce pest populations. It can be implemented by releasing beneficial organisms into the landscape, or by modifying cultural, chemical and other control practices to conserve existing natural enemy populations. In general, effective use of this approach requires a detailed knowledge of predator/prey or parasite/host biology, accurate timing and careful application procedures.

Beneficial Insects and Mites. Natural populations of predators (e.g., lady beetles, lacewings, syrphid flies, praying mantids, wasps, and predaceous mites) and parasites (e.g., parasitoid wasps and tachinid flies) are valuable in reducing infestations of insect and mite pests. If these or other beneficial organisms are observed in the turf, care should be taken to ensure their survival. If pest control becomes necessary, corrective measures which minimize injury to beneficial organisms should be selected. Remember that a low level of pest infestation may need to be tolerated to attract and maintain natural enemy populations.

DiseaseCausing Microorganisms. Certain disease-causing organisms or their products can also be used to reduce insect populations. Among the microorganisms known to attack turfgrass insects are bacteria, fungi, viruses, protozoans and nematodes. Products containing certain pathogens or their derivatives (e.g., Conserve, Condor T&O, DiPel, Crymax, Mattch, MVP II, Naturalis T&O and others) are available through pest management supply companies, and some pesticide manufacturers.

Wildlife. Insecteating birds and small mammals can be attracted to turf areas by planting trees and shrubs that provide cover and furnish berries for food. Birds can also be encouraged by providing water or nesting sites. It should be recognized, however, that some bird and animal species can be highly destructive to turfgrass and some landscape plants, and may do more harm than good.

Insecticides/Acaricides

Insecticides and acaricides are the most powerful tools available for insect and mite control in urban landscapes. In many cases, they afford the only practical method of reducing pest populations that have already reached damaging levels. Insecticides have rapid corrective action in preventing further pest damage, and offer a wide range of properties and methods of application. They are relatively low in cost, and their use often results in a substantial economic or aesthetic benefit. Some potential problems associated with insecticide use include the development of pest resistance, outbreaks of secondary pests, adverse effects on nontarget organisms including humans, pets, wildlife and beneficial insects, hazardous residues in our food supply and ground water contamination.

When insecticides are used in an IPM program, they should be carefully selected and their application timed with respect to the developmental stages of the target pest. Insect monitoring information can help pinpoint the optimal time for treatment. Proper selection and timing of pesticide applications are extremely important in obtaining the best possible control with the least adverse effect on the environment. Observe damage threshold levels (i.e., treat only when necessary) and limit treatments to infested areas of the turf whenever possible. When using any pesticide, ensure proper calibration of the application equipment. Remember, some biological control agents and new-chemistry insecticides require special handling and application techniques. Always read the product label and discuss application procedures with your supplier before use.

Establishing an integrated pest management program for your landscape will require time, effort and careful planning. The potential rewards, however, are substantial in terms of improved pest control, reduced costs and less reliance on pesticides for insect and mite control.