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ALTERNATIVE CONTROL MEASURES FOR PESTS OF SHADE TREES AND WOODY ORNAMENTALS IN THE HOME LANDSCAPE

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Feeding by insects and mites can reduce the aesthetic beauty of landscape trees and woody ornamentals. In some cases, plants can be severely weaken or killed, damage by other pests can cause aesthetic injury. When damaging pests are present, the application of appropriate control measures can help to reduce damage while having little impact on beneficial species and posing minimum risk to humans and pets. This factsheet covers alternative control measures that are available. Any pesticide must be used according to label directions, it can cause harm if not used properly.

Many new "reduced risk" insecticides are available. The options have expanded greatly as a result of an emphasis on the development and registration of "safer" pesticides. All pesticides are regulated by the Environmental Protection Agency and have labels that must be followed carefully for safe and effective pest control. They are discussed here by category based on the common name of the active ingredient. Look for this name in the section of the pesticide label that follows the brand name.

Pesticide Labels Have Answers

It is important to be able to read and understand pesticide labels before buying and using them. Be sure that both the plants that you intend to treat and the target pests that you want to control are on the label. Often, the brand name of a product does not tell you much about it. Know how to find the common name of the active ingredient so you can be sure to get what you need. The Directions For Use section of the label also gives valuable information that will allow you to achieve optimum results. Be sure to look for warnings about phytotoxicity. Some plant species or varieties are very sensitive to certain pesticides or are susceptible to leaf or needle discoloration under certain conditions. Also, the label tells you the type of protective clothing to wear and the rates to use when mixing the product.

Microbial Insecticides

Microbial insecticides are living microorganisms or toxins that are produced by them. They can be "grown" on a commercial scale and formulated into products that can be applied most commonly as sprays or dusts. Some are toxic to a specific group of insects or mites and essentially nontoxic to many other arthropods, wildlife or humans.

***Bacillus thuringiensis* insecticides - "the caterpillar killers"**

This common microbial insecticide contains a toxin produced by *Bacillus thuringiensis*, a bacterium found in the soil. *Bt kurstaki* is in most products but *Bt aizawai* is a name that you also might see on the active ingredient label.

Bt insecticides work as stomach poisons to disrupt the gut of caterpillars. Therefore, the insecticide must be sprayed onto leaves on which the caterpillars are actively feeding. Bt insecticides work slowly. Caterpillars that feed on sprayed leaves usually will stop feeding within a few hours but will look healthy and stay on the leaves for several days until they starve. There is no contact activity so a direct spray of the product onto caterpillars will not harm them. *Bt* sprays are most effective against small caterpillars so early detection and treatment is important. These products are broken down by sunlight so there is only short residual effect on treated leaves. Applying them in late afternoon may increase their effectiveness. Additional sprays may be needed to clean up a caterpillar infestation. Examples include Bio-Worm Killer Concentrate, Bt Worm Killer, Dipel, and Thuricide.

Beauveria

These products contain spores of *Beauveria bassiana*, a fungal pathogen of insects. After landing on the insect, *Beauveria* spores germinate, enter and kill the insect. The fungust is effective against some specific pest groups including whiteflies, aphids, thrips, psyllids, mealybugs, and other soft-bodied sucking insects. Since the spores are a stage of a living organism, they have a definite shelf life and must be protected from temperature extremes and long term contact with water. Botanigard ES and Naturalis-O are examples.

Spinosad / Spinosyns
Spinosad insecticides are made by fermenting products from *Saccharopolyspora spinosa*, a soil-inhabiting microorganism. These products have both contact and stomach activity against caterpillars, some beetle larvae, leaf miners, and thrips. They work on the nervous system of the target pests. The insects become paralyzed and stop feeding right away. However, they may be seen on the plant for up to two days before falling off.
Conserve Naturalyte Insect Control is an example.

Insecticidal Soaps

Insecticidal soaps are fatty acid salts that commonly come from plant or animal fats and oils. They must be sprayed directly onto soft-bodied creatures, such as aphids, scale crawlers, or mites. Once on the target, the soap penetrates to damage cell membranes and may interfere with respiration. They are not very effective against hard-bodied insects such as beetles, wasps, and grasshoppers. These soaps are not selective insecticides, they will kill both pest and beneficial species but they leave no residue behind that will kill pests later.

Some insecticidal soaps also contain pyrethrins or other active ingredients to increase their effectiveness. Insecticidal soaps work against a much wider target range than the Bt insecticides and can be applied in sensitive areas because of their very low toxicity. However, some plants can be very sensitive to these sprays under extreme conditions, such as very high temperatures. Common household soaps and detergents are designed to dissolve grease so they also may remove leaf waxes and injure plant tissue. Safers Insecticidal Soap and Concern Insect Killing Soap Concentrate are examples.

Botanical or Plant-derived Insecticides

These insecticides are based on chemicals that come from plants or plant parts and defend those plants from insect attack.

Azadirachtin / Neem
Neem oil, a bitter compound, is extracted from seeds of a tree that grows in tropical and subtropical regions. The common name you will see in the active ingredient part of the label is azadirachtin. When sprayed onto plants, neem oil acts as a feeding repellent that can prevent attack by many types of pests. It also can affect the growth and development of some pests which may suppress problems. Susceptibility to neem varies greatly among different insect species so check the label carefully to be sure that it covers pests that you are trying to manage. Examples include Azatin X and Bioneem Multipurpose Concentrate.

Pyrethrins
Pyrethrins, a mixture of compounds, are extracted from the flower heads of certain *Chrysanthemum* species that are grown primarily in Africa. Pyrethrins are often included in aerosol insecticide cans because they quickly paralyze or "knock down" insects. Pyrethrins are very safe and are registered for many fruits and vegetables, as well as pest control around sensitive areas such as dairy milk rooms and food processing areas. Pyrethrin products often contain piperonly butoxide, a synergist that makes the pyrethrins more effective at a lower use rate.

Pyrethrins are very broad spectrum insecticides. They attack the nervous system of almost all insects and other arthropods, including spiders and mites. Pyrethrins are very effective as contact sprays but are deactivated very quickly by sunlight, moisture, and air so no residue is left behind. Target pests must be hit directly and treatments may need to be repeated. Examples include Concern Multipurpose Insect Killer, Japanese Beetle Killer RTU, and Yard and Garden Insect Killer.

Other plant derivatives
A variety of compounds derived from plants are sold to suppress or control various pests. Examples include Hot Pepper Wax Concentrate (capasicin), Garlic Barrier (garlic juice), rotenone, nicotine, and citrus oil extracts (limonene and linalool). There is not a lot of information effectiveness of some of these products as pest control agents or how they work against target pests.

Oils

Oils have been used to kill insects and mites since the 1700's. An oil covering on the target pests results in suffocation or destroys cell membranes of the organisms. Oils also can kill eggs that present on the plant, a stage of pest development that most insecticides do not affect. They are contact insecticides so they must be sprayed directly in the pest. Thorough coverage is essential, as well as knowing exactly where the pests are on the plant. There is no residual activity following

spray application.

There are two different types of oils- summer or horticultural oil and dormant oil. Summer or horticultural oils are highly refined, lighter weight oils that can be applied when plants are actively growing. The are used to control active pest infestations during the growing season. In contrast, dormant oils are heavier oils that are applied before bud break in the spring or after leaf drop in the fall. This treatment targets inactive stages, such as overwintering mite eggs or scale insects.

Oils can be a very effective means of controlling some pests. However, they must be used carefully and according to label directions. Most labels discuss the sensitivity of plants to oils and also the types of conditions under which they should and should not be applied. For example, beech, redbud, and spruces are among the plants that are very susceptible to injury from oils. Use oils where appropriate but not for general cover sprays. Sunspray Ultrafine Horticultural Oil is an example of a summer or horticultural oil.

Building A Strong Foundation

Most healthy, established trees can tolerate a moderate amount of damage without obvious permanent harm. However, newly transplanted, or otherwise stressed trees, and most shrubs need to be protected from significant leaf loss or attack by sucking insects or borers. Being familiar with the potential damage from pests, or seeking sound advice, can help you make that decision. General management practices are important when developing a plan to manage pests in the home landscape. Following these guidelines will provide basis of a sound, integrated approach to pest management.

1. Healthy plants can protect themselves from pest problems to varying extents. Plants that are located in good sites and fertilized, pruned, and watered, as needed, can ward off or compensate for some damage. However, plants under stress are more susceptible to pest problems, especially borers.

2. Learn to recognize the common pests that are likely to attack your plants and learn to recognize basic injury symptoms. This will allow you to check plants regularly during the season and to take appropriate action, if necessary. For example, it is easier to control pests, such as caterpillars, when they are small and more vulnerable, and before they have reached the size where they do most of their damage. Your county extension office can help with pest identification and give you valuable information on promoting plant health.

3. Accurate problem identification is essential. The insects that you see may not be pests or they may not be the ones responsible for the injury that you find. Also, many control measures are effective against specific pest groups so selecting the proper tactic is important.

Some pest infestations can be picked off, shaken into a pail of soapy water, or pruned out. This can work on small trees or plants where the infestation can be reached but is impractical against others. It is a control technique that should be considered when you encounter some problems.

There are a range of pest control alternatives for the homeowner that have low toxicity to humans and pets, work quickly to control pests without leaving significant residues on the plants, and in general, have a low impact on beneficial species. However, the specificity also requires early detection and correct identification of the pest and thorough spray coverage for optimum results.

Terms-
Active ingredient- these are the components of a pesticide that kill the pest. Inert ingredients, such as solvents or carriers, make up the rest of the product.

Contact insecticide- a product that must land directly onto the target pest in order to kill it. This is accomplished by thorough spray coverage where the pests are active. They are generally effective against chewing and sap-feeding or sucking insects. Since sap-feeding pests are not consuming plant tissue, contact insecticides are the best choice for controlling them.

Residual insecticide- the deposit of the product onto leaves, needles, twigs or branches that remains for a period of time. Pests can pick up a lethal dose by crawling across the treated surface, or most commonly, eating treated foliage. Residual insecticides are effective against pests with chewing mouthparts. These residues are broken down by moisture or sunlight after a few days.