Insect and Mite Control on Woody Ornamentals, and Herbaceous Perennials
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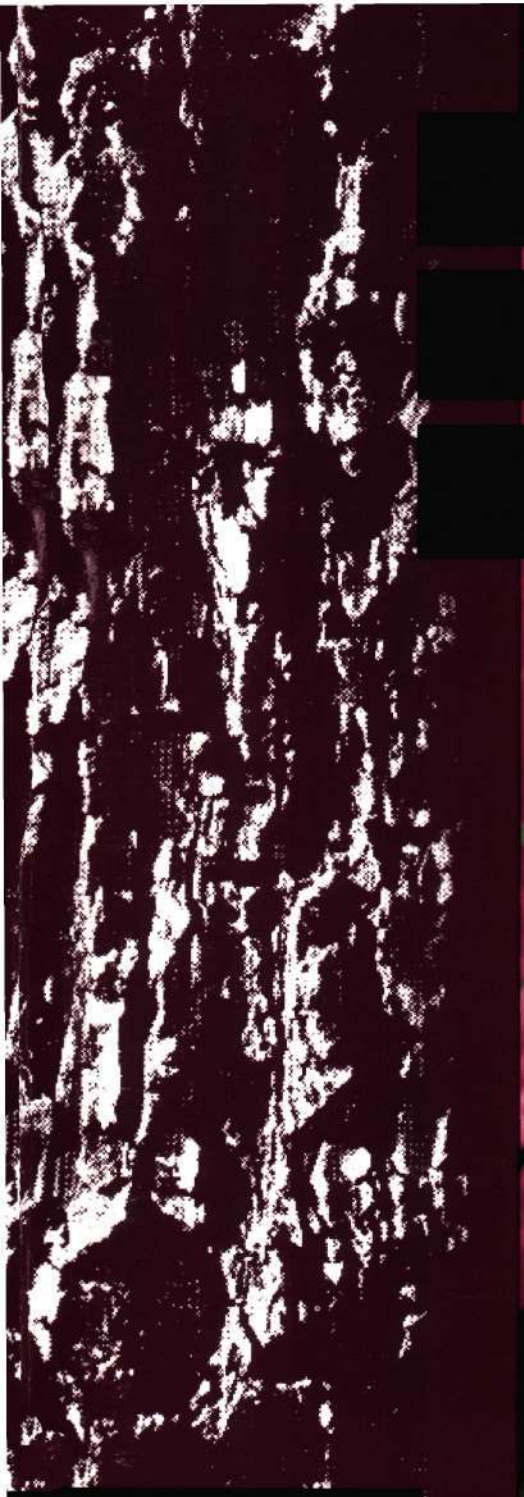

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Insect and Mite Control on Woody Ornamentals and Herbaceous Perennials

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Contents

Cover Photos

Hover Fly Adult on Aster Flower, an Important Aphid Predator.

(insert) Lilac/Ash Borer Adult.

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Introduction

Attractive, vital landscape plants contribute significantly to real estate values. On the other hand, poorly maintained landscapes may become a liability, especially if trees or their parts fail and cause property or bodily injury. This realization, coupled with increased leisure time to enjoy our yards and more discretionary income for landscaping and landscape maintenance have contributed to dramatic increases in the demand for nursery products and competent service personnel. At the same time, concerns for environmental quality and safe use of pesticides require that plant health care activities, including pest control, provide quality plants without creating adverse side effects. This is the challenge for anyone dealing with plant propagation, production, or maintenance.

The nursery industry produces a diverse array of plant materials for landscape use. In many cases, these plants are native to North America and are not seriously damaged by insects or mites on native sites. However, when these same plants are grown under nursery conditions or in a landscape, native arthropods sometimes become pests. Although we do not know precisely why this occurs, it is undoubtedly related to site factors that create instability in plant-insect relationships. Either the effectiveness of natural enemies, including other arthropods and microorganisms, that normally minimize reproductive success is reduced, or the plants become stressed so that they are more attractive or susceptible to opportunistic colonizers. Perhaps both regulating mechanisms commonly breakdown when plants are grown on non-native sites, especially under stressful conditions like those found in the urban forest.

Of course, many pests that damage landscape plants were introduced in the absence of natural enemies that normally limit their exploitation. Japanese beetle, black vine weevil, and gypsy moth are examples of exotic insects that have become extremely common and damaging in North America. Although major efforts have been made to introduce parasites and predators of some introduced pests, they must usually be controlled with pesticidal sprays when their density threatens plant vitality. In any case, potentially damaging arthropods are common on landscape plants.

Since most of us take plants for granted or at least fail to inspect them periodically, insects and mites commonly cause damage before their presence is detected. This chronic lack of vigilance often results in plant damage and causes unnecessary use of large amounts of pesticides. Scheduled plant inspections and use of spot-spraying to control small but building infestations of pest species is a superior way to minimize damage from arthropods.

This bulletin has been prepared to inform users about the insect and mite pests that commonly attack landscape plants, when these pests are most vulnerable to control measures, and currently available control options. The following narrative is included to help plant producers and landscape management practitioners understand the basic principles involved in making responsible and effective pest control decisions.

Making Decisions About Pest Control

Arthropod presence on a valuable plant does not necessarily mean that an effort should be made to eliminate it. If the plants are in nursery production and if the organism is an acknowledged pest species, then it should be controlled as soon as it becomes vulnerable to an efficient control tactic. However, the arthropod might be a beneficial species or a pest species at a low enough density on a landscape plant that control is not necessary. Several factors are considered sequentially to determine the need for indirect or direct action.

Accurate Identification

The first step when an arthropod is detected is to determine its identity. Many insects found on landscape plants are transients or beneficials, part of the natural community that helps keep pest species at low levels. It is extremely important to conserve beneficial arthropods like ladybird beetles, green lacewings, and parasitic wasps, by using pesticides only when they are needed. County agents, Extension specialists located at land grant universities, and landscape maintenance personnel can help identify common arthropods, both pests and non-pests.

Once an insect or mite has been identified as a pest species, its biology and seasonal life history can be obtained to determine how and where it feeds, damage symptoms, number of generations it completes each year, the kinds of plants it infests, stage(s) and time(s) when it is vulnerable to control tactics, and current control options. All of this information is then used to determine the best strategy for dealing with the pest. (see INSECT & MITE MANAGEMENT ALTERNATIVES - The Control Options)

Degree of Infestation

Until a certain number of insects is present on a plant, control measures are not needed. It's not always easy to

know when there are enough insects present to justify control measures. One thousand caterpillars eating leaves might completely defoliate a tree in two weeks, whereas that same number of aphids would hardly be noted. Yet 1,000 aphids today may become 100,000 in a month. This may be more than a plant could tolerate. It is especially difficult to say how many insects should be present on ornamental plants before we should spray. Plants established and growing well in the landscape may be able to tolerate more pests than poorly growing plants. Likewise, some home owners expect no pests while others don't even notice anything until extreme damage has already been done. Of course, nurseries are a different problem. State and federal regulations, as well as purchaser demands, require that plant stock for sale be "pest free." This places rather difficult standards for the final product to be sold. Experience tells us that certain pests must be controlled at the first sign of their presence because they will likely increase in numbers and cause considerable damage. With some pests and on certain plants, we will want to watch the infestation closely and treat only if the injury gets progressively worse.

What Happens if Nothing is Done?

In some cases, doing nothing is the best course of action because predators, parasites, and other factors take over and the pests soon disappear. Most established deciduous trees can be completely defoliated without any apparent permanent harm to them, but defoliation may weaken younger or newly transplanted trees and most shrubs until they die or become susceptible and attractive to other injurious pests.

Doing nothing may result in the beauty of a plant being destroyed or a pest becoming numerous enough to make a general nuisance of itself. In the case of a heavy borer or scale infestation, doing nothing could result in the death of a plant, regardless of its age or size.

Is Spraying Cost Effective?

The cost of having a tree or shrub sprayed one or more times may help a person to make up his/her mind quickly about what to do. It often requires at least two applications of an insecticide/miticide to clean up an infestation. Small trees and shrubs can be sprayed by the homeowner at much less expense. Tall trees may require a sprayer capable of developing as much as 500 pounds of pressure to force the spray to the top of the trees. This undoubtedly must be done by a commercial operator.

From what we have said so far, you probably realize that a person confronted with a pest problem may need some help to know just how serious the problem is and what needs to be done about it.

Where to Get Help

Ohio State University Extension has offices throughout the state. In these offices, personnel are available to help you with your pest problems. Take the specimen to your local county OSU Extension office where they can determine if the sample needs to be submitted to the Plant and Pest Diagnostic Clinic in Columbus, OH. Be sure to provide as much information about the problem as possible. This helps specialists evaluate the problem and prescribe a recommendation.

The Plant and Pest Diagnostic Clinic charges a nominal fee for specimen identification. Your county office has proper forms and fee schedules.

Importance of Early Pest Detection

Because the number and kinds of ornamental pests vary from year to year and even from month to month in any one year, you never know what pest problems you can expect or how severe they will be. So to prevent a pest from slipping in and becoming established on a plant without being noticed, visually inspect plants at least two or three times during the growing season. This may only involve a general inspection of the plants to see that there isn't a loss of color or that the leaves are not being eaten. Turn over a few leaves to see if there are any pests on them. Remember, some insects feed only at night and hide during the daytime. Early detection of a pest provides time to get the problem corrected before the plant suffers permanent injury.

Insect and Mite Management Alternatives Integrated Pest Management

Pest Management versus Pest Eradication

Managing insects and mites that attack our urban ornamental plants has generally relied on the use of pesticides. Whether this is good or bad is beyond the scope of this discussion, but we must ask whether alternative controls are available. Before we can consider the alternatives, we should review our current concept of pest management. Pest management as opposed to "eradication" implies that some pests will always be around. It is the goal of pest management to keep the pest populations down to a level where damage is not overly evident. In field crops, this has generally be termed an economic threshold level. In urban ornamentals, the aesthetic threshold level (the population of a pest which causes noticeable, unacceptable visual damage) is the term to be used.

Integrated Pest Management (IPM)—A Definition

Another common term used is **integrated pest management** (IPM) which is the selection, integration, and implementation of pest control (biological, chemical or cultural) based on predicted economic, ecological, and sociological consequences. In other words, when we use a pest control we must consider the cost both to the ecosystem and human society. Using the IPM approach, three important concepts must be accepted:

1. No **single** pest control method will be successful. All of the control options—biological, chemical and cultural must be used.
2. **Monitoring** (sampling) of the pest is constantly needed in order to evaluate the status (not present, present but not causing aesthetic damage, present and causing aesthetic damage, etc.) of a pest population.
3. Therefore, **mere presence** of a pest is not a reason to justify action for control.

There has been considerable misunderstanding about IPM; IPM control options and the underlying concepts. Perhaps a look at what **IPM is** or **IPM is not** will aid our understanding of these concepts.

What IPM is Not

1. IPM is not a biological control program though biological control is a useful option. However, biological control is only one of the options. We also have to consider chemical and cultural controls.
2. IPM is not an organic program though organic materials can certainly be used if they do not create economic, environmental or sociological problems.
3. IPM is not a pesticide free program because the chemical control tactic may be warranted. Generally, IPM programs have reduced chemical controls (pesticides) but not eliminated them. It is not necessarily the goal of an IPM program to reduce or eliminate pesticides.
4. IPM is not the least or most expensive method of pest management. Usually, the cost of pest control remains close to original costs. Monitoring and sampling costs are traded for scheduled pesticide applications.

What IPM is

1. IPM is a decision making process. Each plant, each year and each habitat is slightly different and programmed controls will not address these differences. Thus, monitoring must be performed and decisions must be made.
2. IPM is a system of pest management decisions based on ecological, economic and sociological values.
3. IPM is a process of pest monitoring and sampling. We must know the status of a pest and whether it really needs a control action or not.
4. IPM is a process that considers **all** of the control options.

Monitoring

Monitoring pest activity and population levels is the key to successful IPM. Unfortunately, most feel that monitoring must be a complicated and time consuming process where someone must constantly watch each and every plant. This is simply not true. Monitoring of pests in nurseries and landscapes can be done in a multitude of ways—from visual inspection to using temperature-dependent (degree-day) developmental models. Another method of solving the seemingly impossible task of monitoring pests in complex settings is the concept of **KEY PLANTS** and **KEY PESTS**:

1. **Key Plants** are trees, shrubs and flowers that are known to have perennial pest problems. As an example, birch trees always get leafminers, aphids and borers while red oaks rarely get significant pests.
2. **Key Pests** are those that cause significant damage or may kill trees, shrubs or perennial flowers. These key pests often have special times (windows of opportunity) that they are susceptible to controls. Aphids or galls in oaks are rarely significant enough to warrant controls while peach tree borers in ornamental plums need special attention.

The Control Options

As mentioned above, IPM uses three general control options—biological, chemical and cultural controls. These are our alternatives and we must understand the benefits and limitations of each option. Since we are dealing with ornamental landscape plants, most of the pest problems are a direct result of poor horticultural maintenance. In other words, plants placed in urban habitats or pushed during nursery production and are not suitably adapted are the ones most likely to be severely attacked by pests. Therefore, let us look at the cultural control option first.

Cultural Controls

The cultural control option should be our first consideration as an alternative in landscape tree and shrub IPM. Cultural controls in field crops have generally included sanitation, crop rotation, tillage, host plant resistance/tolerance, mechanical/physical destruction and quarantine. If we look at these techniques, we may wonder how these relate to ornamentals in nurseries or landscapes. Though we use different terms, these techniques are commonly used and need to be emphasized more.

1. **Sanitation** helps remove inoculum or hiding areas of pests. Pruning, raking of leaves and destruction of heavily infested plant stock are sanitation techniques useful on our urban landscapes and nurserics.
2. **Crop Rotation** is generally used in field crops (i.e., corn rotated with soybean) but should be considered for ornamental tree and shrub production. Many nurserymen rotate growing areas by planting different types of stock after a rotation. This seems to help reduce attacks by borers and root infesting diseases. We also need to realize that most trees and shrubs in urban landscapes are limited by space which reduces their vigor with time. Therefore, if a plant has begun

to reach its limitations, it should be replaced with a smaller, better suited one.

3. **Tillage** in field crops exposes resting pests and breaks up the soil for better air and water movement. In ornamental trees and shrubs, aeration and mulching are analogous.
4. **Host Resistance** uses plants that are less susceptible to pest attack (tolerance) or produce actual toxins (antibiosis) which kill or stop pest growth. Examples of trees and shrubs are well known though poorly utilized. In fact, most insects and diseases which are currently problems can be permanently eliminated with the use of resistant plants. For people concerned with the use of pesticides this is a major option to be considered.
5. **Mechanical/Physical** techniques are as simple as crushing the pest under foot to using large industrial vacuum sweepers to suck up pests. In our landscape plantings, we need to constantly remind ourselves that simple pruning or crushing of pests is preferable to chemical spraying. We are all guilty of spraying an entire juniper hedge for bagworms when only three or four bags were seen which could have been easily picked off and crushed. Likewise, we tend to "Rambo" spray tent caterpillars in the spring when we could just reach in, roll up the nest with the caterpillars inside and dispose of the mess in a bag.
6. **Quarantine** is a legal method of restricting movement of contaminated plant material. Unfortunately, this technique is rarely effective even though we know that most pest problems arrive on infested plant material. Therefore, we should pay special attention to new plantings that may have pests and plant stresses developed from the transplanting process.
7. **Good Horticulture** is one of the simple but commonly ignored methods of pest management. In other words, a "healthy" plant can generally fend for itself against insects, mites and diseases. Therefore, one of the most important control alternatives that we can use is tending to the proper needs of landscape plants. We need to match the correct trees and shrubs to the typical alkaline, hardpan clay soils of our landscapes. To not do so causes plant stress which allows pests to gain the upper hand.

Chemical Controls

Probably our second most useful control option in ornamental plant IPM is chemical control. Unfortunately, we have over used and misused this option so that most citizens are beginning to cast a weary eye to its use. Chemical control to most people means pesticides though other chemicals such as attractants and pheromones are increasing important in our IPM practice. Even if pesticides are our principal weapon, we need to understand that not all pesticides are created equal. In IPM, we want to use the ideal pesticide—a material that only kills the target pest. Unfortunately, we don't have these "silver bullets." Most of the pesticides which are currently used have short residual life spans (this reduces accumulation in the environment), are more selective (this reduces the chance of killing nontarget animals), and are used at lower rates (this reduces the total chemical "load" used). Because of these characteristics, we need to be able to better target our applications in order to achieve satisfactory control.

Another general public misconception about pesticides is that "natural" pesticides are better than "synthetic" pesticides. IPM does not make this distinction. Using pesticides in IPM is evaluated on economic, ecological and sociological impacts together. In other words there are "natural" botanical insecticides (i.e. nicotine sulfate with an LD_{50}=55 and a known carcinogen) which are much more toxic and have more adverse effects than some "synthetic" organic insecticides (i.e., acephate with an LD_{50}=866). In short, chemical controls used in IPM should be selected on their total attributes.

By knowing that we do not have "ideal" pesticides, whether natural or synthetic, we must use great caution to limit their adverse effects. Generally, this means that we should only **target sprays** to those individual plants or blocks which need it—**not cover sprays**. General cover sprays (spraying everything in the landscape or nursery whether needed or not) tend to cause several problems.

Cover sprays often tip the balance of control in favor of the pest. As incredible as this seems, cover sprays usually kill beneficial insects and mites (predators and parasites) better than they kill pests! Since pests usually have good reproductive ability, they "rebound" faster than their natural controls. This causes what we call **pest resurgence** and **secondary pest outbreak**.

Cover sprays tend to cause development of resistance. Pests and potential pests often develop resistance to pesticides when they are under constant pressure from a specific pesticide. In other words, a few insects on a plant may not be causing significant damage, but if we constantly spray these insects we are forcing them to develop resistance. Then, when they reach damaging levels our pesticide is no longer effective.

A more recently identified problem with general cover sprays of pesticides has been identified to be enhanced degradation. Since most of our current pesticides are organic compounds (i.e., containing carbon, hydrogen and oxygen), microbes are able to use the chemicals as foods or nutrients. Generally these microbes are beneficial in aiding in the removal of these pesticides from the environment. However, when constantly "fed" through general cover sprays, these microbes learn to "eat" these pesticides more rapidly than normal. In summary, if we are going to use the chemical control option, we need to **use target sprays only when needed**.

The chemical control option should be considered a **limited resource**. As with all limited or scarce resources, we need to conserve what we have. Many of the chemical companies are no longer developing traditional pesticides. The cost of discovery, development and registration are simply too costly. Therefore, we must conserve what we

have and guard carefully the few new products which become available.

Most people think that chemical control merely means pesticides. The chemical control option also contains repellents, attractants and pheromones, and desiccants. It is easiest to discuss these by their chemistry and activity:

A. **Pesticides** are chemicals which directly kill the pest.

1. **Inorganics** are pesticides without carbon that can be natural earth minerals or man-made compounds. Examples are:

   a. **Boric Acid**—used for cockroach control, not registered for landscapes.
   b. **Diatomaceous Earth**—glass-like remains of single celled organisms, diatoms, which scratch insect cuticle or puncture gut cells. Acts mainly as a desiccant and is rarely useful in landscapes unless combined with an insecticide like pyrethrin.
   c. **Sulfur**—an ancient control for insects and mites.
   d. **Sodium Fluoaluminate** (=Kryocide, Cryolite)—an earth mineral (or man made) which forms sharp glass-like particles which puncture insect gut cells if ingested. Since it is a stomach poison, it does not adversely affect beneficial predators and parasites. Good only against leaf feeding caterpillars, sawflies and beetles.
   e. **Mercury, Lead, Arsinates**—metal compounds used in the past for insect control that are now generally considered too dangerous to use.

2. **Oils** are petroleum or plant based hydrocarbon chains that have insecticidal activity. Toxicity appears to be caused by suffocation and/or membrane disruption. Examples are:

   a. **Summer Oil**—a highly refined mineral oil used on green plants at a 0.5-2.0% rate.
   b. **Dormant Oil**—a slightly less refined mineral oil or summer oil used at a 2.0-4.0% rate when plants are in winter dormancy. When used in winter, has minimal adverse affect on beneficial insects.
   c. **Citrus Oil**—raw oil or separate constituents (i.e., d-Limonene) that have insecticidal properties at low dosages. Usually combined with other insecticides such as soaps.

3. **Fatty Acid Salts** or **Soaps** are man-made hydrocarbons using an ion, usually potassium or sodium, to join together fatty acid chains. Fatty acid chains containing 6 to 10 carbons have insecticidal properties. Insecticidal soaps apparently disrupt cell membranes. Soaps tend to be very good at controlling soft bodied insects such as aphids, mealybugs, soft scales, caterpillars, beetle larvae and spider mites.

4. **Microbial Toxins** are molecules produced by bacteria, fungi, protozoa and other microbes which are toxic. Toxins like Bt endotoxin are relatively low in toxicity to mammals while botulism toxin is one of the most toxic molecules known. These toxins are used by extracting the microbe or using whole organisms. Examples are:

   a. ***Bacillus thuringiensis*** (Bt)—a bacterial product containing both endotoxins and spores which are active on a variety of insects. See Biological Control below.
   b. **Avermectin-B** (=Abamectins, Avid)—a powerful toxin (LD50 = 10mg/kg) derived from *Streptomyces* fermentation.
   c. **Chitin** (=Clandosan)—is the chemical which makes up the exoskeleton of arthropods (insects, crustaceans, etc.) and nematodes. By adding chitin to the soil, microbes produce toxins (ammonia) and/or produce digestive enzymes that destroy the cuticle of insect and nematode pests. Field results in landscapes have not been consistent in efficacy.

5. **Botanicals** are plant extracts, usually alkaloids, that have insecticidal properties. Most people believe that since these are "natural" products, they are "safer" than other pesticides. Many of these chemicals have not been fully tested and many have striking adverse affects on mammals. Many cause severe allergic reactions (i.e., pyrethrin and sabadilla), have high toxicity (nicotine), or are even suspected carcinogens (nicotine). Examples are:

   a. **Pyrethrin** (LD_{50}=200) is derived from a specific species of chrysanthemum originally grown in Iran. The natural product is mainly an irritant to insects and is usually mixed with piperonyl butoxide (PBO) or rotenone to provide better kill of insects. Some people are very allergic to the compounds.

b. **Rotenone** (=Cube, Derris) (LD_{50}=132) is an alkaloid from roots of a tropical plant. Highly toxic to fish, it was used originally by South American indians to collect fish from lakes and rivers. Very toxic to pigs.

c. **Sabadilla** (LD_{50}=2500-4000) is an alkaloid derived from a lily seed from South America. Though having low dermal toxicity, it is a powerful irritant which, if inhaled, can cause severe circulatory and respiratory failure. In spite of some magazine articles, this product is only registered for vegetable pests.

d. **Nicotine** (LD_{50}=55) is an alkaloid derived from tobacco which has high toxicity and is a suspected carcinogen.

e. **Neem** (Azadirachtin, BioNeem, Margosan-O)(LD50 >3000) is an interesting botanical derived from an Asian tree grown in India. Neem is used as a general cleaning chemical and is found in tooth paste. It seems to act as a systemic with repellent and growth regulator effects on insects and mites.

f. **Ryania** (LD_{50}=750) is an alkaloid from a tropical tree with rather high oral toxicity. The oral LD_{50} to dogs is 150 mg/kg. It is only registered for some vegetable crops.

6. **Synthetic Organics** are man-made compounds containing carbon and are usually synthesized from petroleum products. This is the group most people refer to when they mention pesticide. Because of the diversity and number of materials in this group no attempt will be made to cover these compounds.

   a. **Organochlorines** (=Chlorinated hydrocarbons) are organics that usually have long residual life spans in the environment. This quality has caused most to be banned because they end up in the food chain or cause damage to non-target organisms.

   b. **Organophosphates** usually have short residual life spans. They are often stated as being related to nerve gas. Compounds in this group range from category 1 to 3 in toxicity and are generally neurotoxins.

   c. **Carbamates** may have long or short residual life spans and range from category 1 to 3 in toxicity. Most are neurotoxins.

   d. **Pyrethroids** are synthetics that look and act like the botanical, pyrethrins. They range from category 1 to 3 in toxicity though most are in categories 2 and 3.

   e. **Insect Growth Regulators** (IGR) are synthetic chemicals which look and act like insect hormones. They are often metabolism modifying organophosphates and carbamates with very low toxicity to mammals or other non-target animals.

B. **Repellents** are compounds, both natural and synthetic, that cause a pest to stop feeding or move away. Most are used as products applied to skin or clothing to repel mosquitoes and ticks.

C. **Attractants** and **Pheromones** are compounds that attract a pest thinking that the compound is food or another of the species (aggregation and sex pheromones). Most of the compounds in this group have not been used effectively to reduce pests but are used in traps to sample pest activity. Examples are:

   1. **Geraniol/Eugenol** is the attractant "floral scent" used in Japanese beetle traps. These traps do not reduce beetle damage or grub populations. In fact, evidence exists that plants near traps may sustain more damage.
   2. **Disparlure** is the sex pheromone attractant for gypsy moth males. It is a powerful sampling tool but has not been successful in disrupting mating.
   3. **Clearwing Moth Borer Pheromones** is a mix of sex pheromones attractive to several borers such as the dogwood, lilac/ash, rhododendron and peach tree borers. These traps allow for precise timing of larval controls.
   4. **Pine Tip Moth Pheromones** are sex pheromones for various pine tip moths. These traps determine the starting point for degree-day models for predicting larval control windows.

D. **Desiccants** are materials that cause the insect pests to loose water faster than they can replace it. Since insects are very small, this water loss is rapidly lethal. Unfortunately, most desiccants must be kept dry so outside use is limited. Examples are:

   1. **Silica Gel** is the same drying agent used in packing or flower drying and can be ground to a powder to dust onto insects.
   2. **Diatomaceous Earth** acts like a desiccant when dusted on the exterior of insects. The sharp edges of this product abrades away the thin wax waterproofing coat on the exoskeleton of insects.

Biological Controls

Biological control is using **parasites**, **predators** and **pathogens** (diseases) to control pests. We have to realize that in the urban landscape and nursery, there is a multitude of beneficial insects and mites that can prey on pests. In many cases, these naturally occurring beneficials will do a good job of controlling the pests if we do not disturb the system too much. As stated above, we usually disrupt this system

by over using pesticides which kill the beneficials better than the pests. On the other hand there are occasions where we can actually increase these biological controls. The classical way to implement biological controls is through introductions, conservation and augmentation.

A. **Introductions** of exotic parasites, predators or diseases are made when foreign pests become established. This is an attempt to create some of the checks and balances found where these pests are naturally controlled. Occasionally, foreign biological controls are found that may better control native pests.

B. **Conservation** is using other control tactics, usually pesticides, so that they have the least adverse affect on predators and parasites. It can also be the providing of habitat or food needed by biological controls to improve their survival. In the urban landscape or nursery we can use targeted sprays to those specific plants where pests are getting the upper hand. We can also plant flowers which provide nectar and pollen to feed the adults of many of the parasitic insects.

C. **Augmentation** is usually the rearing and release of biological control agents. Unfortunately, this technique is usually expensive and we must use those biological controls that fit into the definition of a "good" biological control.

What is meant by a "good" biological control? Not all predators, parasites and pathogens are useful in their ability to be used in pest management. Useful ones have the following characteristics:

A. **High Reproductive Potential**—they must be able to keep up with the high reproduction of the pests.

B. **Good Mobility**—they must be able to search out the pests or come into contact with the pests.

C. **Host Specific**—they should not be generalists that may adversely affect other, sometimes beneficial, organisms.

D. **Persistent**—they should remain when pest populations become low and carry over from season to season.

E. **Easily Reared or Encouraged**—this will allow them to be inexpensive and competitive with other controls.

F. **Tolerant of Other Controls**—in order to fit into a true IPM system, they need to be tolerant of cultural and chemical controls if used.

In order to illustrate these concepts, let's look at a preying mantis versus a lady beetle. The preying mantis has one generation per year, eats anything in sight (including each other and other beneficials), usually ignores the small insects such a aphids, mites and scales, often doesn't survive the summer to lay another egg case and is very sensitive to any pesticide. Therefore, preying mantids do not qualify as a useful biological control. On the other hand, lady beetles have many generations per year, they only eat a narrow range of pests (usually they are aphid, mite or scale specialists), usually overwinter well and can often withstand some of the softer pesticides, especially soaps and oils. Therefore, lady beetles easily qualify as a useful biological control.

Unfortunately, we often think that we have to actively introduce predators and parasites in our urban landscapes. Since most of these animals already exist, we merely have to be able to recognize them and avoid using cover sprays of pesticides.

Predators which you should learn about are:

A. **Lady Beetles** are commonly sold as adults and are useful control agents if properly handled. The adults need to be fed honey (to resemble aphid honeydew) in a cage (to suppress a strong migration urge) before release in the garden. Larvae are often mistaken for pests because they look like leaf beetle larvae or some other pests (i.e., the "mealybug destroyer" lady beetle larva looks like a mealybug).

B. **Green Lacewings** are not to be confused with the pest, lace bug. The larvae feed on aphids, scales and mites. Eggs are purchased and sprinkled where small pests are noted to be active. The larvae must search for the pests because they do not have wings.

C. **Ground and Rove Beetles** are active predators present in most soil/turf habitats. Both the adults and larvae feed on a wide variety of pests but are highly intolerant of pesticides.

D. **Syrphid Flies** (=Hover Flies) are very common yellow and black flies that have voracious larvae (maggots) which eat aphids.

Parasites are insects (often called parasitoids) with larvae that feed on the inside of their host, usually killing or sterilizing it. Some common parasites which you should learn about are:

A. **Trichogramma Wasps** (=Egg Parasite Wasps) are microscopic (usually less than 0.5-mm long) and lay their eggs in the eggs of other insects. They are usually very host specific and generally limited to butterfly or moth (caterpillar) pests.

B. **Ichneumonid and Brachonid Wasps** are small wasps that commonly attack caterpillars and aphids. The larvae usually emerge from the dying host and spin small white or yellow cocoons.

C. **Tachinid Flies** are generally medium to large flies that lay eggs on caterpillars or various leaf feeding beetles. The eggs hatch into maggots that feed on and eventually kill the host insect.

Pathogens are simply a variety of diseases that kill insects. They are usually bacteria, virus, fungi and protozoa. Insect pathogens are fairly ideal in that they are very host specific. They are also very non-infective to vertebrates. Examples are:

A. **Bacteria** have been the easiest of the pathogens to use because they can often be reared "in vitro" (in artificial culture) and form spores fairly resistant to adverse environments. Examples are:

1. ***Bacillus thuringiensis*** (Bt) has several strains that produce toxins lethal to various insect groups (and are thus technically a chemical control). The most common types are:
   a. Bt 'Kurstaki'—which affects only young caterpillars.
   b. Bt 'Israelensis'—which affects aquatic fly larvae such as mosquitoes and black flies.
   c. Bt 'Tenebrionis'— which affects some leaf feeding beetles.

2. ***Bacillus popilliae*** (= white grub milky disease) has one strain available that kills Japanese beetle grubs. Other strains have been identified that kill other species of grubs but these strains are not commercially available.

B. **Fungi** have been identified but are difficult to use because the spores are easily dried out or need high moisture and/or water to germinate. Examples are:

1. *Beauveria* spp. have been identified infecting a wide variety of insects including bugs and beetles. A commercial strain is available in Europe for Colorado potato beetle control.

2. *Metarhizium* spp. have been identified infecting numerous soil insects including white grubs. No commercial strains are available in the United States.

C. **Viruses** are common pathogens of insects but are one of the most difficult to use because they require living insects to grow. Recent development of insect tissue culture has allowed for rearing of some of the virus strains but the only commercial product is **Nuclearpolyhedrosis Virus** (NPV) for gypsy moth control under the trade name of Gypcheck™.

D. **Entomopathogenic Nematodes** are a group of tiny parasitic roundworms that carry a bacterium lethal to insects. Once the nematode gains entry into an insect it regurgitates the bacterium which paralyzes and kills the insect. The nematode then feeds on the reproducing bacteria. The most commonly mentioned species are:

1. *Steinernema carpocapsae* which has several strains good at attacking insects that live in the upper soil or on the soil surface. Biosafe™, Exhibit™ and Scanmask™ are commercial preparations.

2. *Heterorhabditis* spp. are better at attacking insects which live deeper in the soil. This group can also bore through the insect cuticle.

In summary, there are multiple alternative control methods that can be used in the urban landscape. The concept of integrated pest management provides a framework in which to use all of the alternatives in a systematic fashion. Of most importance is the idea that we must monitor for pest problems and then select the best targeted control available.

Factors Critical to Pesticide Performance

Application Timing

Pest control should be initiated only after the pest has been identified accurately and its presence threatens either the aesthetic quality or the vitality of the plant. If a decision has been made to use a pesticide, timing of the application must coincide with a stage of the pest that is vulnerable to the application.

Many pests, including borers, armored scales and gall formers can be contacted with pesticidal sprays for only a short time during the growing season. For example, armored scales can be controlled best by attacking the newly hatched nymphs (called crawlers). Borer sprays must be applied either before egg laying begins (i.e., bronze birch borer and other flatheaded borers) or before egg hatch (i.e., dogwood borer and other clearwing moth borers). Pesticide applications at any other time during the life cycle of these pests will be ineffective and should not be implemented.

Understanding Pest Life Cycles and Movement

Many insects and mites complete only one life cycle (=generation) each year. A single, well-timed, thoroughly covering spray with an effective pesticide should provide season-long control. Other pests, including aphids, mites and some scales and bark beetles complete two or more generations each year. These pests may require more than one spray during the growing season.

Most adult insects have wings and can fly. After spraying, new insects may fly in and reinfest a plant making it appear that the applied insecticide didn't perform well. For this reason, repeated applications are needed to protect some plants from incoming insects.

Selecting the Correct Insecticide/Miticide

Although many insecticides/miticides are effective against a number of different kinds of pests, it is always important to choose a product that has been proven to provide excellent results against the pest you are trying to control. General purpose sprays and pesticides are not the best approach to pest control. Instead, consult the tables in this bulletin and choose a product that has been rigorously evaluated for its effectiveness against your target pest. Then, use it according to directions on the container label, using only the amount specified. Do not use adjuvants (i.e. spreaders and stickers) unless specified on the label.

Weather-Related Problems

Sprays should always be applied to dry foliage and bark when rain is not expected for several hours. However, as long as sprayed surfaces dry before rainfall occurs, reapplication is usually unnecessary. Sprayed plants should be monitored in five to seven days to determine treatment effects, especially if rain occurs soon after the application. If the treatment was not effective, and if the pest is still in a vulnerable stage, the application should be repeated. It is a good policy to spray when the temperature is between 50 and 90°F (10-32°C). Many pesticides are less effective below this range, and some products may cause plant damage above the upper limit.

Storage Life of Pesticides

Many insecticides/miticides may tend to lose their killing power over a period of time, once they have been opened. This process may be speeded up with improper handling and improper storage. Therefore, it is always best to buy only the amount of insecticide/miticide you expect to use in one season.

Pesticides can be used from one year to the next. Remaining product should be stored in a safe, dry place that does not experience freezing or extremely high temperatures. Refer to the label for specific instructions on long-term storage.

Pest Resistance

Resistance is a general term which, in the broad sense, means pests that were previously killed by a pesticide have produced offspring that are no longer killed by it. To illustrate, let's suppose that an insecticide is applied and that it kills 95% of the insects in a population which contact it, but there are 5% of the insects which received the same dosage but survived the treatment. This 5% is considered resistant to the insecticide. They live to produce another generation, and this generation, having had resistant parents, passes on to its offspring the resistance factor. Most likely there will be a greater number of the new individuals carrying resistance to the insecticide compared to the first treated population. As repeated insecticide applications are made and more generations produced, it is only a matter of time before the majority of the insects in question will survive the insecticidal application. A possible explanation is that the insecticide has acted as a selecting agent, killing those members of a population which are susceptible to the chemical and leaving those which are resistant. Survivors breed and produce subsequent resistant generations. Resistance develops fastest in insects which have high rates of reproduction. This is another reason why pesticides should be used only when and where necessary to prevent damage to valuable landscape plants.

Understand Insecticides/Miticides Before Using Them

Most people know little about pesticides, yet they play a very important role in food production and personal well-being. Even though they are important products, we must not forget that they are poisons and may present serious dangers if not stored and used properly. The best place to learn about a pesticide that you intend to buy and use is the label printed on the container. This is a legal document that contains information developed by scientists, government regulators and suppliers over a period of several years. By following timing recommendations listed in this bulletin and on the pesticide label, you can achieve results equally good as those of the scientists that rigorously tested the product.

How Poisonous are Insecticides/Miticides?

All insecticides and miticides are poisons. However, some are much more toxic than others. The pesticide container issues a precaution statement that indicates just how toxic the product is. For example, a skull and crossbones indicates the most highly toxic materials. In most cases, these products should not be purchased, stored or used by those untrained in pesticide use. Most of these products also will state "RESTRICTED USE PRODUCT," which means that only certified applicators may purchase or apply these products. County OSU Extension offices can supply pesticide certification information.

The toxicity of all pesticides is measured by a term called LD_{50}. LD stands for Lethal Dose, or the amount of material that causes mortality of, in this case 50% of the pest population tested. Most LD_{50} studies are conducted with mice, rats or rabbits under laboratory conditions. Since these animals and humans are warm blooded mammals that share biochemical processes, scientists extrapolate from these tests to predict just how toxic products might be to humans. In any case, LD_{50} is a relative measure of toxicity. We must remember that many individuals in a population will be sensitive to the product at a level well below the LD_{50}.

Pesticide Formulations

Insecticides and miticides may be purchased in forms such as dusts, wettable powders, liquid concentrates, flowables, granules, oil emulsions, aerosol sprays, baits and fumigants. Here are some good and bad points of these formulations.

Dusts are dry mixtures of insecticides with inert powders such as organic flours, minerals, talc, or clay. The dusts are composed of fine particles, about 250 to 350 mesh. They are usually sold in strengths of 0.5 to 10% and are applied in the form purchased. Dusts can be used on almost any surface without harming it, but visible dust will usually create an unsightly appearance. Due to their small particle size, dusts will float in air and are easily blown away during application. They generally leave an effective residue as long as they remain dry, but when they get moist, they may cake and become ineffective. However, a slight amount of moisture on a plant may actually aid in the distribution and adherence of the dust to the treated surface. Dusts are of little use in treating large trees.

Liquid concentrates are high concentrations of the "pure" pesticide dissolved in a solvent. Other materials are added to the concentrate to make the pesticide mix with water. Liquid concentrates are sold in strengths of about 18 to 75%. Because they are concentrates, it takes only a small amount mixed in water to make an effective spray. A disadvantage of liquid concentrates is that they may cause plant injury under certain weather conditions because of the solvents they contain.

Wettable powders are usually made by impregnating an inert powder with an insecticide or by grinding a dry pesticide into a powder and then adding a wetting agent so that the powder particles can be suspended in water. Sprays made with wettable powders must be constantly agitated to prevent the large particles from settling to the bottom of the sprayer. Because the water used as a carrier of the powder during application evaporates, most of the insecticide is left as a residue. However, the powder itself is quite visible and this residue may be undesirable. Wettable powders are sold in strengths from 15 to 80%. As they are not formulated with solvents, they are preferred over liquid concentrates for use on plants which may be injured by solvents. However, during mixing, wettable powders have a tendency to drift or blow about. This problem is often addressed by bagging in water dispersible packets or granulating into dry flowables.

Flowables are finely ground pesticide particles suspended in a liquid, usually water based, carrier. They have the same characteristics as wettable powders but are easier to handle during mixing.

Granules commonly contain from 1 to 20% of the insecticide impregnated onto highly absorptive materials like clays, limestone, corn cob or nut hull pieces or even fertilizer particles ranging in size from 30 to 60 mesh. Granules are heavy. This minimizes drift and prevents undue loss of insecticide and undesirable contamination of areas bordering those being treated. Granules are used mainly for ground treatment and not on foliage.

Oil emulsions contain an insecticide mixed in a highly refined oil and are used primarily for the control of household pests like cockroaches or wood borers. These formulations are sold in strengths from 4 to 5% in low-pressure, atomizer-type applicators. These oil solutions should never be used on plants because the oil will kill living plant tissue.

Aerosol sprays usually contain a mixture of several insecticides in a pressurized can. Most of them contain only a small percentage of insecticide and are designed for small jobs. Until recently, aerosol sprays were used mainly for killing flying pests in the house. Today, many of the aerosols can be applied to rose bushes and other outdoor plants. They are not practical for large scale use on ornamental plants because they are rather expensive for the amount of insecticide contained.

Baits contain a food substance attractive to the insects, along with an effective stomach poison. Formulations are available for use both inside and outside the house. In general, they need to be applied at several intervals to be most effective.

Fumigants may be purchased in solid or aerosol forms and are generally used in closed areas where a lethal concentration of the poison can be built up in the air. Fumigants are of limited value for use on ornamental plants, unless they are grown in enclosed greenhouses or polyhouses.

Systemic Insecticides/Miticides

A systemic insecticide/miticide is one that is absorbed by plant tissue and translocated by the movement of sap from the area treated to additional parts of the plant. Systemics are effective against many different kinds of sucking and chewing insects as well as mites. When absorbed by the plant, they actually become a temporary part of it, and as the plant grows the systemic is distributed to foliage and other growing areas. This built-in poison may continue to be a toxic meal to various pests for several weeks.

One of the advantages of systemics is that when a plant is growing rapidly, even the new growth is being protected by the insecticide. Depending on application method, another good aspect of systemics is that they have little or no direct affect on beneficial insects which prey on the destructive pests feeding on the plant tissue. Also, systemics in a plant are not subject to breakdown by environmental factors such as rain, wind, temperature, and sunlight, at least not as readily as externally applied materials. Systemics cannot be used on all kinds of plants because they may burn foliage.

Systemics are available in granular and liquid concentrate formulations. Granules may be broadcast, used as a side-dressing, or incorporated in the soil at planting time. Liquids may be injected into the soil, watered onto the surface of the ground, painted or sprayed on the bark, sprayed on the foliage, or injected into tree trunks.

How to Protect Yourself when Using Pesticides

Many pest problems cannot be solved without using pesticides. These materials are poisons and must be used accordingly. If we must use pesticides, let's acquaint ourselves with some general precautions which will help us to use them safely.

General Precautions

1. Read the label. This is the first rule of safety in using any pesticide - **read the label and follow the directions and precautions printed on it**.
2. Store pesticides in closed, well-labeled containers where children or pets cannot reach them. Do not store them under the sink, in the pantry, or in the medicine cabinet. Do not store them near food of any kind.
3. Store application equipment as you do pesticides—out of the reach of children or pets.
4. Do not save or reuse empty pesticide containers. Dispose of containers promptly as directed on the label.
5. Do not apply more pesticide than the label recommends. Over dosage is wasteful and may be dangerous.
6. If you use poisoned bait to control rats, mice, or other pests, either indoors or outdoors, place it where children or pets cannot find it.
7. When opening a container of liquid pesticide, keep your face away from, and to one side of the cap or lid.
8. Mix or prepare dusts or sprays outdoors or in a well-ventilated room.
9. In handling **any** pesticide, avoid contact with the skin. Do not get pesticide near your mouth, eyes, or nose.
10. If pesticide gets in your eyes, flush the eyes with water for 5 minutes; get medical attention.
11. Never smoke, eat, or drink while handling a pesticide. After finishing the work, wash exposed skin surfaces with soap and water.
12. If you spill pesticide on your clothing, launder the clothing before wearing it again.
13. If you become ill during or shortly after using a pesticide, call a physician immediately. From the container label, read to him the names of the active chemical ingredients; follow his instructions for first-aid treatment.
14. Poison information centers are located throughout the state and are on call 24 hours a day. In an emergency, you could call the center closest to you, but it is preferable to let your doctor consult the center. Most telephone 911 systems can contact poison information centers directly.

Honey Bee Protection

Honey bees are important pollinators of plants and every effort possible should be made to reduce bee losses from pesticide poisoning. Do not apply pesticides during the bloom period when bees are likely to be most active on the plants.

Precautions for Avoiding Plant Injury

1. Do not apply liquid concentrates when the temperature is above 85°F (30°C). [Do not apply any spray when the temperature is above 90°F (32°C).] Wettable powder formulations are less likely to cause injury.
2. Do not apply dormant oil sprays if the temperature is below 40°F (4°C) or where there is danger of the temperature falling much below this in the 24-hour period.
3. Do not apply horticultural, summer oils when the temperature is 80°F (27°C) or above **and** high humidity reduces the chance of the spray drying within an hour after the application.
4. Use only the amounts of insecticide/miticide indicated on the current pesticide label.
5. Continuous agitation of the spray tank is necessary to prevent spray materials from settling out. Recycle contents of long spray hoses into the spray tank if enough time has elapsed between sprayings for the mix to separate.
6. Clean out sprayer after use.
7. Never use a sprayer that has contained a weed killer (herbicide) to perform other pest control activities.

Insecticide/Miticide Application Equipment

Small Trees and Shrubs

Much of the success or failure of an insecticide/miticide application depends on the kind of equipment used.

Hose-end sprayers are small sprayers that are screwed onto the end of an ordinary garden hose. The spray container varies in size from a half pint to one quart and will deliver from 1 to 15 gallons of spray when the contents are emptied. Insecticide is added to the sprayer on the basis of so many tablespoonfuls per gallon of spray delivered. The sprayers are put in operation by turning on the water and placing a thumb or other device over a small hole in the top of the lid. The insecticide is drawn from the container and mixed with the hose water as the water flows out the nozzle. One of the major disadvantages of this type sprayer is that wettable powder often plugs the nozzles. A big advantage is the constant pressure; you need no pumping to maintain pressure to deliver the spray.

Compressed air sprayers include metal or plastic tanks that vary in size from 1 to 3 gallons. Air is pumped inside the sprayer with a plunger on the tank. The spray is delivered through an attached hose with a hand shut-off valve and a nozzle tip. Disadvantages of this type sprayer

are that it must be pumped frequently to maintain pressure, the tank must be transported, the nozzle tips are of the low-volume type, a relatively long time is required to empty the tank, and tanks rust unless they are made of stainless steel or plastic. In spite of these disadvantages, compressed air sprayers are useful for many smaller pest control jobs in and around the landscape.

Knap-Sac sprayers are compressed air sprayers which vary in size from 3 to 5 gallons and are strapped onto one's back. A handle pump is attached and is pumped continuously at a slow pace. The pumping builds up a pressure in the tank and allows the spray to be delivered through a hose and nozzle tip at an even, steady rate. It, too, is equipped with a hand shut-off valve. This type of sprayer is suited for spraying fairly large areas. Disadvantages are that the sprayers are expensive; loaded with water, they're quite heavy; and they must be pumped-up to maintain pressure. However, a stainless steel knap-sac sprayer should last many years and handle any spray job in the garden and around the landscape, except large tree spraying.

Wheelbarrow sprayers are manually or motor operated hydraulic sprayers mounted on a frame with 1 or 2 wheels. They generally have a capacity of 12 or more gallons. The motorless type sprayer usually requires one person to operate the pump and another to direct the spray stream. Wheelbarrow sprayers are more expensive but are suited for bigger jobs.

Large Trees

The equipment mentioned so far is used primarily for small jobs and would not be practical for large tree spraying. The following equipment is for large tree spraying.

Mist blowers deliver concentrated insecticide to trees by means of a high volume, high velocity air stream. The insecticide is diluted primarily in air rather than in water. Spraying with a mist blower requires an experienced operator. Plant injury or poor distribution of the spray on the tree may result from an improperly operated machine.

Hydraulic sprayers are satisfactory for tree and shrub spraying and have been in use for a long time. Hydraulic machines deliver high gallonage, high pressure sprays. The spray is delivered through a specialized spray gun attached to a pressure hose. This is one of the most common type of sprayer used in controlling pests of shade trees.

Buying Equipment

Before buying a piece of spray equipment, keep in mind the size of the job to be done, kind of performance desired, kinds and amounts of insecticides to be used, amount of water needed per spraying, the size of the plants to be treated, and amount of money to be spent. If you explain these facts to a spray equipment dealer, they will be able to recommend the correct piece of equipment for the job. Remember that a piece of equipment is no better than what it costs or the person who uses it, and all equipment must be serviced and cleaned frequently.

Accessory Equipment—Measuring equipment is necessary to measure accurately the required amounts of insecticides, thus ensuring better pest control results and less plant injury. This equipment includes a 1-quart measuring cup and a set of measuring spoons. They should be kept separate from those used in the home or work place and should be marked in some way to indicate they are for pesticide measurements only.

Alternative Products

Their Selection and Use for Insect and Mite Control on Ornamentals

Introduction

In the previous chapter, we discussed the Integrated Pest Management process and the control options available. Recent interest in alternatives to traditional synthetic pesticides has resulted in numerous products containing botanicals, oils, soaps and microbial materials.

These alternative products often do not act in the same manner as traditional pesticides and the user must understand when these products can be used effectively and what special conditions must be met in order to be successful.

Oils

Oils are petroleum or plant based hydrocarbon chains that have insecticidal/miticidal activity.

The use of oil to kill insects and mites has been known to work since the 1700s. However, the early use of oil usually resulted in killing the plants as well as the insects. Oil came into widespread use to control insects and mites after oil refining techniques were developed which would free the petroleum oils of unsaturated hydrocarbons, acids, and highly volatile elements. Oil is effective against insects and mites because it suffocates or causes cell membrane destruction of the pests that it hits as well as their eggs. Another advantage of oil is that no pest has been known to become resistant to its killing action.

At least three different types of oil are used for pest control: petroleum, summer or horticultural oil; petroleum dormant oil; and citrus oil.

Petroleum, summer or horticultural oil is a lighter weight oil applied during the active growth of a plant, when green plant foliage is present.

Petoleum dormant oil is usually defined as a heavier weight oil applied in spring prior to bud break or in the fall after leaf drop.

Citrus oil is usually added to other pesticide formulations such as soaps and botanical pesticides.

What makes the identification of oils confusing is the fact that summer oils can be used as dormant oils. However, do not use a dormant oil as a summer oil. The simplest method for identifying oils is to **READ THE LABEL**. If the label only mentions use on dormant plants, it is a dormant oil. On the other hand, if the label mentions using the oil on green, leafy plants during the growing season, it is a summer oil.

If you don't want to rely only on the label instructions, there are three oil factors that you need to evaluate: 1. oil volatility, 2. oil viscosity, and 3. the unsulfonated residue rating.

Volatility is measured by the distillation temperature. This is the temperature that the oil comes out of heated crude oil at the refinery. A low distillation temperature produces a light oil. A high distillation temperature produces a heavy oil. The lighter oils evaporate faster and thus have less of a chance to cause plant damage (phytotoxicity). The heavy oils may coat the plant and either smother the leaves or destroy some of the cells. The result is phytotoxicity. The distillation temperature is probably the most important number to look for on the label.

Volatility and Oil Use

Distillation Temperature	Primary Use	Dosage per 100 Gallons
412°F	Summer	1.5-3 gal.
435°F	Summer/Dormant	1.5-2 gal./Summer 3-4 gal./Dormant
438°F	Dormant	2-4 gal.

Viscosity is the flow rate or thickness of an oil. It is measured by the time it takes a volume of the oil to flow through a small funnel opening. The label may say that the oil is a 60 second or 100 second oil. In the past, a lot of emphasis was placed on getting an 80 second oil or better. We feel that the volatility rating is more important.

The **unsulfonated residue** (UR) rating is an index of the quantity of oil free from unsaturated hydrocarbons. Look for oils with a minimum UR of 92%. Some oils are as high as 99% free.

Some of the better oils, especially summer oils, have distillation temperatures of 412°F and UR = 96%.

Even with the best oils, phytotoxicity is always possible. However, this is the same as with standard insecticides! The following guidelines are recommended by most users and manufacturers of dormant and summer oils:

1. Do not apply the oils when the temperature is below 40°F (4.4°C) or above 100°F (37.8°C). If low humidity is accompanying the high temperature, oils have less of a chance of causing damage.
2. Do not apply oils if rain is a possibility or if the plant tissues are wet. The leaves must be dry and the oil must have a chance to evaporate.
3. Avoid spraying or getting drift on oil sensitive plants.
4. Apply the oil according to the label rates. Always go light, not heavy.
5. When using dormant oils or high rates of horticultural oils, do not spray when plant buds are fully open and shoot elongation is occurring.
6. Do not spray plants when the humidity is expected to remain above 90% for 36 to 48 hours.

7. Leaf drop in the fall is not a reliable method for determining plant dormancy. It is better to wait until after several light frosts.
8. Oil sensitive plants are: maples, hickories, black walnut, cryptomera, smoketree and many azaleas.
9. Plants tending towards oil sensitivity are: beech, Japanese holly, redbud, Savin junipers, Photinia, spruces and Douglas-fir.

Most of the oil labels contain a list of plants that are sensitive or tend towards sensitivity. Read them carefully. Most problems occur when oils are simply sprayed on everything in the landscape.

As with all pesticides, use oils only where needed. They do not need to be used as general cover sprays. Plants that have a history aphid, scale and mite problems are the best ones to target.

Soaps—Fatty Acid Salts

Soaps are made from fats reacted with a strong lye to form potassium or sodium salts of the fatty acid components. Fatty acid chains containing 6 to 10 carbon atoms have insecticidal/miticidal activity. These soaps, often called insecticidal soaps, apparently disrupt the respiratory systems and disrupt cell membranes.

Currently available soap products usually contain soaps derived from plant fats and oils. These are often considered "organic" in origin and are considered usable by most organic gardeners.

Mammalian toxicity: Insecticidal soaps have the same general mammalian toxicity traits of any soap or detergent. Contact with mucus membranes, such as eyes or mouth, may cause temporary irritation or a burning sensation. Ingestion may cause vomiting and general gastric upset, but this normally results in no serious consequences. Some insecticidal soap concentrates contain up to 30% ethyl alcohol which can cause intoxication at doses above several ounces; however, vomiting is likely to clear most of the alcohol from the system before it is fully absorbed.

Some insecticidal soap products contain additional insecticidal compounds such as pyrethrins or citrus oils. These alterations change the overall toxicity levels.

Uses: Insecticidal soaps are used as contact pesticides to control a wide variety of insects and mites. Generally, soft bodied insects such as aphids, caterpillars, scale crawlers, leafhopper nymphs, mealybugs, thrips and whiteflies are the best targets. However, some products claim efficacy against Japanese beetle and flea beetle adults.

Soaps are commonly used in more environmentally sensitive areas such as around houses, in interiorscapes and where organic pesticides are requested.

Caution: Common household soaps and detergents have insecticidal properties when applied as 1-2% solutions in water. However, these compounds are **not registered for this purpose and plant injury may occur.**

Botanical Insecticides

These are pesticides derived or extracted from plants or plant parts. For control of ornamental insects and mites, pyrethrins, rotenone and neem (azadiractins) products are currently registered.

Pyrethins

Pyrethrins are six related compounds extracted from dried flowers of the pyrethrum daisy, *Chrysanthemum cinerariaefolium*. When the ground up flower itself is used, the product is called a pyrethrum. Most products use pyrethrins combined with man-made synergists, usually PBO or MGK 264. These synergistic compounds increase the killing power of pyrethrins. Natural pyrethrum and pyrethrins are highly irritating to insect nervous systems and they cause quick "knockdown." However, many insects are able to break down the pyrethrins before death occurs and soon recover. The synergists help stop this break down.

Mammalian Toxicity: Pyrethrins are low in mammalian toxicity, with the oral LD_{50} between 1,200 and 1,500. However, cats are highly susceptible to poisoning from pyrethrins. When ingested, pyrethrins are usually broken down by stomach acids before absorption can occur. Pyrethrins are general irritants and repeated contact may cause skin irritation or allergic reactions.

Uses: Pyrethrins are contact poisons with extremely short residual activity. Exposure to sunlight, air and moisture will degrade them within hours. Pyrethrins are generally mixed with a synergist and rotenone to provide better action against a wider variety of pests.

Rotenone

Rotenone is an alkaloid toxin extracted from the roots of two tropical legumes, *Lonchocarpus* from South America and *Derris* from Asia. Most of the current rotenone comes from Peru where it is often referred to as cube root. "Cube extracts" may appear on the label.

Rotenone is extracted with acetone or ether and the concentrate is used to make products. Some products simply use the powdered root.

Rotenone disrupts cellular respiration and death is relatively slow compared to most nerve toxins. Rotenone is extremely toxic to fish and is used as a fish poison by South American indians or in water management programs. It is also synergized by PBO or MGK 264.

Mammalian Toxicity: Rotenone varies considerably in mammalian LD_{50} values (60-1,500) depending on the carrier used. Most ingested rotenone is detoxified efficiently via liver enzymes. Rotenone is more toxic by inhalation than by ingestion. High exposure may cause nausea, vomiting, muscle tremors and rapid breathing. Contact with rotenone may cause skin irritation and inflammation of mucous membranes.

Uses: Rotenone is a broad-spectrum contact and stomach poison that is most useful against leaf-feeding beetles and caterpillars. Rotenone degrades rapidly when exposed to air and sunlight. Alkaline materials, such as soaps, also speed rotenone degradation. Rotenone is usually mixed with Pyrethrins to provide longer lasting residual and better killing power.

Neem

Neem oil is an extract from the neem tree, *Azadirachta indica*, which is grown in tropical and subtropical climates. The most commonly used compound is azadirachtin, a complex chemical which acts as an insect feeding deterrent and growth regulator.

Azadirachtin can be extracted from much of the neem tree, but most comes from oil pressed from seeds and seed kernels.

When neem is applied to a plant it serves as a repellent, but if it is ingested, the compound affects insect egg laying and growth.

Mammalian Toxicity: Neem is very low in toxicity and has an LD_{50} near 13,000. It rarely causes any irritation to the skin or mucous membranes. It has been used in India and Asia as a cleaner, disinfectant and medicinal.

Uses: Currently registered products for ornamental pest control claim activity against a variety of sucking and chewing insects. Recent field trials have not confirmed significant repellency activity. However, good control of insects can be achieved if the insects are exposed while they are actively growing in their immature stage—nymphs and larvae. Action can be slow because the insect often has to go through a molt or two.

Microbial Insecticides

Microbial insecticides are toxins derived from various bacteria and fungi. The most highly developed group of compounds are derived from the common bacterium, *Bacillus thruingiensis*, or "Bt" for short. The many different strains of this bacterium produce a variety of crystalline protein-like toxins which commonly have toxic activity against certain insect groups.

A second group of compounds have been derived from the soil fungal actinomycete, *Streptomyces avermitilis*. This fungus produces a variety of toxins that are called avermectins. Commercial pesticides derived from this group include ivermectin and abamectin.

BTs

Bacillus thruingiensis is a common bacterium found in soils around the world. Scientists have known for a long time that strains of this bacterium produced crystalline protein toxins which had insecticidal activity. However, it wasn't until the late 1960s that fermentation technology was developed which allowed for the large scale rearing of this bacterium and extraction of the toxin.

Though several strains of the bacterium were known to be toxic to insects, the most widely developed materials were derived from *B.t.* variety *kurstaki*. The toxins derived from this variety are toxic only to the larvae (caterpillars) of butterflies and moths. Products with ornamental labels are: Bactospene™, Biobit™, Caterpillar Attack™, Dipel™, Larvo-Bt™, Thuricide™, Victory™ and others.

In the early 1980s, another strain, *B.t.* var. *israelensis* was developed which has activity against the larvae of certain flies, especially mosquitoes. These products are not effective against the dipterous leafminers of ornamentals.

In the late 1980s, the third strain, *B.t.* var. *tenebrionis* (=*B.t.* var. *san diego*) was developed which has activity against certain beetle larvae. The elm leaf beetle has been the most common ornamental pest target. Products with ornamental labels are: M-One™ and Trident II™.

Apparently, Bt crystalline toxins attack the cell membranes of the gut lining. This causes the insect to stop feeding as soon as it ingests the Bt product and death often occurs several days after gut bacteria have invaded the insect body cavity. In order to get maximum efficacy out of Bt products, it should be targeted towards the younger larvae which have less well developed gut linings.

Mammalian Toxicity: Bt toxins are considered relatively non-toxic to mammals and other animals. Some formulations may have carriers which can cause eye irritation, but this is not caused by the Bt toxin.

Uses: Bt's are useful alternatives to standard pesticides where caterpillars and beetle larvae are a problem. Unfortunately, most of the Bt products are not very effective once the larvae have exceeded half of their growth. Therefore, continuous monitoring of caterpillar or elm leaf beetle populations must be performed in order to target applications correctly. Where reinfestations regularly occur, as in the elm leaf beetle, several applications may be necessary to achieve satisfactory control.

Entomopathogenic Nematodes

Nematodes are commonly called roundworms. They comprise a very large and diverse group which include general scavengers, predators, plant infesting and animal infesting species. A certain group of nematodes attack insects by entering the insect gut or body, regurgitating a lethal bacterium and reproducing in the insect cadaver. These are called entomopathogenic. These nematodes have a mobile, infective juvenile (the J3 stage) which is microscopic and can be sprayed through conventional equipment. These infective juveniles are quite resistant to many chemicals but they can not withstand rapid drying or prolonged contact with sunlight.

There are numerous species which belong to the genera *Steinernema* or *Heterorhabditis*. Both steinernemid and heterorhabditid nematodes have been found in native soils. However, many of the strains currently marketed and under development have come from foreign countries.

Up to the early 1980s, attempts to use these nematodes as biological controls were rarely successful. The nematodes are weakly persistent and rearing sufficient numbers to work was costly.

In the 1980s, several companies developed large scale rearing techniques, often using large scale fermentation technology. This allowed for the production of nematodes in sufficient quantity to be commercially useful.

Because the nematodes are considered animals rather than microbial agents, they do not require pesticide registration by the U.S. EPA.

Mammalian Toxicity: Entomopathogenic nematodes are noninfectious to mammals, birds, fish or other animals except certain insect groups. Some of the residues from nematode production or formulation materials may cause eye irritation, so eye protection during mixing may be in order. Field studies have also indicated that the nematodes rarely come into contact with beneficial insects and mites.

Uses: Since entomopathogenic nematodes are exempt from U.S. EPA registration, caution must be taken when evaluating supplier claims of efficacy. Current research indicates that the nematodes have been useful in reducing black vine weevil larval populations, especially in containerized plants. Other studies have indicated activity against certain borers (when the J3s are applied to borer holes or frass), leafminers and soil inhabiting pests.

The infective juveniles are applied at $1x10^6$ to $2x10^9$ J3s to the acre. Because they are living organisms, they must be applied so as not to expose them to direct sunlight for any length of time and they must be allowed to contact moist surfaces so as not to dry rapidly.

HOST/PEST GUIDE TO INSECTS & MITES ATTACKING ORNAMENTALS

The following is a list of the hosts & their pests that are covered in this bulletin.

AJUGA
Twospotted spider mite

ALDER
European alder leafminer (Hymenopterous)
Woolly alder aphid

ARBORVITAE
Aphids
Arborvitae leafminer (Lepidopterous)
Bagworm
Fletcher Scale
Spruce spider mite
Tip dwarf mite (Eriophyid)
Twospotted spider mite

ASH
Aphid
Ash flowergall mite (Eriophyid)
Ash sawflies
Banded ash clearwing
Elm spanworm
Fall webworm
Flatheaded apple tree borer
Forest tent caterpillar
Leafhoppers
Leafroller
Lilac (Ash) borer
May/June beetles
Oystershell scale
Plant/leaf bugs
Putnam scale
Scurfy scale

AZALEA
Azalea bark scale
Azalea lace bug
Azalea leafminer (Lepidopterous)
Azalea mite (Eriophyid)
Azalea whitefly
Black vine weevil
Rhododendron borer
Southern red mite

BALD CYPRESS
Bagworm
Bald-cypress mite (Eriophyid)

BARBERRY
Barberry aphid
Barberry looper (Barberry caterpillar)
Barberry scale
Barberry webworm

BIRCH
Aphid
Bagworm
Birch beadgall mite (Eriophyid)
Birch leafminer (Hymenopterous)
Bronze birch borer
Fall webworm
Forest tent caterpillar
Gypsy moth
Japanese beetle
Leafhopper
Oystershell scale

BITTERSWEET
Euonymus scale

BOXELDER
Boxelder bug

BOXWOOD
Boxwood leafminer (Dipterous)
Boxwood spider mite
Boxwood psyllid
European fruit lecanium scale

BUCKTHORN (TALLHEDGE)
Bagworm
Japanese beetle

CATALPA
Catalpa sphinx
Japanese beetle

CHESTNUT
Asiatic oak weevil
Japanese beetle
Leafhoppers

CHRYSANTHEMUM
Aphids
Beet armyworm
Cabbage looper
Corn earworm
Leafminer (Dipterous)
Omnivorous leafroller
Twospotted spider mite
Thrips
Whitefly

COLUMBINE
Leafminer (Dipterous)

COTONEASTER
Aphids
Hawthorn lace bug
Leafhoppers
Pear slug (sawfly)
San Jose scale
Twospotted spider mites
Webworm

CRAPEMYRTLE
Aphids

DAY LILY
Aphids
Slugs
Thrips
Twospotted spider mite

DEUTZIA
Aphids
Lilac leafminer (Lepidopterous)

DOGWOOD
Dogwood borer
Dogwood club gall midge
Leafhopper
Oystershell scale
Red-headed flea beetle

DOUGLAS-FIR
Aphids
Bagworm
Cooley spruce gall adelgid

ELM
Bark beetles (native)
Cankerworms
Elm leaf beetle
Elm leafminer (Hymenopterous)
European elm scale
Fall webworm
Japanese beetle
Leafhoppers
Woolly aphid

EUONYMUS
Aphids
Bagworm
Black vine weevil
Euonymus scale
Leafhoppers
Twospotted Spider mites
Winged euonymus scale

FICUS (Cuban Laurel)
Thrips

FIR
Bagworm
Balsam twig aphid
Balsam woolly adelgid
Spruce spider mite
Pales weevil
Pine needle scale

FIRETHORN
Aphids
Black vine weevil
Hawthorn lace bug

FLOWERING FRUIT TREES
Aphids
Bagworm
Borers, flatheaded
Clearwing borers
Eastern tent caterpillar
Fall webworm
Japanese beetle
Leafhoppers
Lesser peach tree borer
Peach tree borer
Pear slug (sawfly)
Pear psylla
Scales
Spider mites
Spring cankerworm
Woolly aphids

FORSYTHIA
Red-headed flea beetle
Spider mites

GOLDEN RAINTREE
Leafhoppers

HACKBERRY
Hackberry nipplegall psyllid
Lace bugs
Putnam scale

HAWTHORN
Aphids
Bagworm
Eastern tent caterpillar
European red mite
Fall cankerworm
Fall webworm
Japanese beetle
Lace bug
Leafhopper
Leafminer (Hymenopterous)
Oystershell scale
Pear slug (sawfly)
Scurfy scale
Terrapin scale

HEMLOCK
Bagworm
Black vine weevil
Hemlock looper
Hemlock scale
Hemlock rust mite (Eriophyid)
Pine needle scale
Spruce spider mite
Strawberry root weevil
Thrips

HICKORY
Caterpillars
Elm spanworm
Hickory petiole gall adelgid
Hickory shuckworm

HOLLY
Black vine weevil
Holly bud moth
Holly leafminer (Dipterous)
Southern red mite

HONEY LOCUST
Bagworm
Cottony maple scale
Honey locust spider mite
Honey locust plant bug
Honey locust pod gall midge
Honey locust scale
Honey locust stunt mite
Leafhoppers
Mimosa webworm
Oystershell scale

HONEYSUCKLE
Aphids
Honeysuckle leafminer (Lepidopterous)
Spider mites
Tatarian aphid

HORNBEAM
Bagworm
Leafhoppers

HOSTA
Slugs
Twospotted spider mite

INKBERRY
Inkberry leafminer (Dipterous)
Southern red mite

IRIS
Iris borer

IVY
Aphids
Japanese beetle
Leafhoppers
Scale

JUNIPER
Bagworm
Juniper midge
Juniper scale
Juniper tip midge
Juniper webworm
Spruce spider mite
Tip dwarf mite (Eriophyid)

LARCH
Bagworm
Larch casebearer
Woolly larch aphid

LILAC
Fall webworm
Lilac (=Ash) borer
Lilac leafminer (Lepidopterous)
Oystershell scale

LINDEN
Aphids
Bagworm
Basswood lace bugs
Cottony maple scale
Fall and spring cankerworms
Fall webworms
Japanese beetle
Linden leaf beetles
Scurfy scale

LOCUST (BLACK)
Locust borer
Locust leafhopper
Locust leafminer (Coleopterous)

HOST/PEST GUIDE TO INSECTS & MITES ATTACKING ORNAMENTALS

The following is a list of the hosts & their pests that are covered in this bulletin.

MAGNOLIA
Leafminer (Coleopterous)
Magnolia scale
Yellow poplar weevil

MAHONIA
Barberry aphid
Barberry looper (Barberry caterpillar)
Barberry webworm

MAPLE
Aphids
Bagworm
Borers (bark beetles & flatheaded)
Cottony maple scale
Eriophyid mites (Eriophyid)
Fall cankerworm
Fall webworm
Forest tent caterpillar
Greenstriped maple worm
Japanese beetle
Leafhoppers
Lecanium scales
Maple bladdergall mite (Eriophyid)
Maple petiole borer
Maple shoot moths
Oystershell scale
Spider mites
Spring cankerworm

MOCK ORANGE
Aphids
Leafminers

MOUNTAIN ASH
European red mite
Fall webworm
Japanese beetle
Lace bugs
Mountain ash sawfly
Woolly aphids

MOUNTAIN LAUREL
Azalea bark scale
Azalea leafminer (Lepidopterous)
Lace bug
Rhododendron borer

OAK
Aphids
Asiatic oak weevil
Bagworm
Borers
Clearwing borer in pin oak
Elm spanworm
Fall webworms
Forest tent caterpillar
Galls (Hymenopterous)
Golden oak scale
Gypsy moth
Japanese beetle
Leafhoppers
Leafminers (Lepidopterous)
Lecanium scale
May/June beetles
Oak kermes scale
Oak lace bug
Obscure oak scale
Orangestriped oak worm
Pin oak sawfly
Skeletonizers (Lepidopterous)
Spider mites
Spring cankerworms
Tent caterpillars
Twig pruner
Twolined chestnut borer

PACHYSANDRA
Euonymus scale
Oystershell scale
Twospotted spider mite

PHLOX
Twospotted spider mite

PIERIS (Japanese Andromeda)
Andromeda lace bug
Southern red mite

PINE
Allegheny mound ant
Aphids
Bagworm
Bark beetles
Black pine leaf scale
Eastern pineshoot borer
Eriophyid mite
European pine shoot moth
Nantucket pine tip moth
Northern pine weevil
Pales weevil
Pine bark adelgid
Pine needle midge
Pine needle scale
Pine root collar weevil
Pine tortoise scale
Pine tube moth
Pine webworm
Sawflies
Spittlebug
Spruce spider mite
White pine weevil
Zimmmerman pine moth

POPLAR
Forest tent caterpillar
Oystershell scale
Poplar tent-maker

PRIMROSE
Twospotted spider mite

PRIVET
Privet rust mite (Eriophyid)
Privet thrips
White peach scale

PYRACANTHA (See Firethorn)

REDBUD
Fall webworm
Leafhoppers
Redbud leaftier
Thornbugs

RHODODENDRON
Azalea bark scale
Black vine weevil
Rhododendron borer
Rhododendron lace bug
Southern red mite

ROSE
Aphids
Japanese beetle
Leafhoppers
Leafminers
Omnivorous leafroller
Rose chafer
Rose midge
Spider mites
Thrips

SERVICEBERRY (Amelanchier)
Aphids
Hawthorn lace bug
Japanese beetle
Pear slug (sawfly)

SPIREA
Aphids
Spirea leaftier

SPRUCE
Aphids
Black vine weevil
Bagworm
Balsam twig aphid
Cooley spruce gall adelgid
Eastern spruce gall adelgid
Pine needle scale
Sawflies
Spruce budworm
Spruce bud scale
Spruce needleminer
Spruce spider mite
White pine weevil

SWEET GUM
Bagworm
Fall webworm
Forest tent caterpillar
Leafminer
Sweet gum pitmaking scale
Sweet gum leaftier
Twospotted spider mite

SYCAMORE
Aphids
Bagworm
Fall webworm
Japanese beetle
Leaffolder
Leafhoppers
Sycamore lace bug
Terrapin scale
Whitemarked tussock moth

TULIP TREE
Leafminer (Coleopterous)
Tulip spot gall midge (Thecodeplosis liriodendri)
Tulip tree aphid
Tulip tree scale
Yellow poplar weevil

VIBURNUM
Aphids
Spider mites

WALNUT
Aphids
European red mite
Fall webworm
Leafhoppers
Twospotted spider mite
Walnut caterpillar
Walnut petiole gall mite

WILLOW
Aphids
Bagworm
Borers (beetle)
Fall webworm
Leaf beetles
Oystershell scale
Poplar tentmaker
Sawflies
Spider mites
Tent caterpillars

WISTERIA
Leafhoppers

YEW (*Taxus*)
Black vine weevil
Fletcher scale
Mealybug
Taxus bud mite

YUCCA
Aphids
Scales

SEASONAL APPEARANCE OF PESTS AND NORMAL TIME FRAME TO APPLY CONTROL MEASURES

The following information serves as a guide to help you know the approximate time when control measures can be implemented. Consult the text for more detailed instructions and information.

Dormant - Before Growth Starts

Host	Pest
Arborvitae	tip dwarf mite, Fletcher scale, spider mites
Ash	ash flower gall mite, scurfy scale, oystershell scale
Bittersweet	euonymus scale
Cotoneaster	San Jose scale
Douglas fir	Cooley spruce gall adelgid
Elm	European elm scale, Putnam scale, scurfy scale, San Jose scale
Euonymus	euonymus scale, winged euonymus scale
Fir	pine needle scale
Flowering fruit trees	mites, San Jose scale, scurfy scale, terrapin scale, aphids
Hackberry	Putnam scale
Hawthorn	terrapin scale, European red mite
Hemlock	Hemlock scale, pine needle scale, Florinia scale
Juniper	Juniper scale, tip dwarf mite, spider mites
Lilac	oystershell scale
Linden	cottony maple scale
Maple	terrapin scale, cottony maple scale, Putnam scale, oystershell scale, scurfy scale, lecanium scale
Oak	golden oak scale, kermes scales, obscure oak scale, lecanium scale
Pine	pine bark adelgid, pine needle scale
Poplar	oystershell scale
Spruce	spruce spider mite, spruce gall adelgid
Sweet gum	sweet gum pit-making scale
Tulip tree	tulip tree scale
Willow	oystershell scale
Yew (Taxus)	Fletcher scale, mealybugs

After Growth Starts

April (early)

Host	Pest
Ash	ash flower gall mite
*Douglas-fir	Cooley spruce gall adelgid
Pine	Pales weevil, Northern pine weevil, Zimmerman pine moth
Spruce (Norway, red, black, white, Colorado	eastern spruce gall adelgid, spruce spider mite, Cooley spruce gal adelgid, spruce needle miner

*Cooley spruce gall adelgid of Douglas-fir can be controlled from spring through fall when temperature is above 60° F.

April (mid)

Host	Pest
Flowering fruit trees	eastern tent caterpillar
Honey locust	honey locust pod gall midge
Juniper	juniper webworm
Pine	white pine weevil, European pine shoot moth, Nantucket pine tip moth
Spruce	northern pine weevil, Pales weevil, white pine weevil, spruce spider mite, spruce needle miner, gall adelgids

April (late)

Host	Pest
Boxwood	boxwood psyllid
Fir	balsam twig aphid
Douglas-fir	Cooley spruce gall adelgid
Flowering fruit trees	eastern tent caterpillar
Inkberry	inkberry leafminer
Maple	maple bladder gall mite
Pine	northern pine weevil, Pales weevil
Spruce (Colorado)	eriophyid mite, spruce spider mite

May (early)

Arborvitae	arborvitae leafminer
Ash	forest tent caterpillar
Birch	forest tent caterpillar
Boxwood	boxwood leafminer, boxwood psyllid
Elm	woolly apple aphid
Fir	balsam twig aphid
Flowering fruit trees	eastern tent caterpillar, lesser peachtree borer
Hackberry	hackberry nipple gall psyllid
Hawthorn	woolly apple aphid, hawthorn leafminer
Hemlock	spruce spider mite, hemlock scale, pine needle scale, florinia scale
Juniper	juniper webworm
Maple	eriophyid mite, maple shoot moths, forest tent caterpillar
Mountain ash	woolly aphid
Oak	forest tent caterpillar gypsy moth
Pine	sawflies, spotted pine aphid, Nantucket pine tip moth, Zimmerman pine moth, pine tube moth, pine needle scale
Poplar	forest tent caterpillar
Spruce	balsam twig aphid, spruce spider mite, woolly larch aphid, pine needle scale
Sweetgum	forest tent caterpillar
Wild cherry	eastern tent caterpillar

May (mid)

Arborvitae	spruce spider mite, arborvitae leafminer
Ash	lilac (=ash) borer, forest tent caterpillar
Azalea	azalea mite, rhododendron borer
Birch	birch leafminer, forest tent caterpillar
Dogwood	dogwood borer
Douglas-fir	Cooley spruce gall adelgid
Elm	cankerworm
Flowering fruit trees	eastern tent caterpillar
Hackberry	lace bugs
Hawthorn	hawthorn leafminer cankerworm
Holly	holly leafminer
Juniper	juniper midge, juniper tip midge, juniper scale
Laurel	rhododendron borer
Maple	forest tent caterpillar, fall cankerworm
Mountain ash	lace bugs
Oak	lace bugs, oak kermes scale, golden oak scale, forest tent caterpillar
Pieris	andromeda lace bug
Pine	pine bark adelgid, spittlebug, eriophyid mite
Poplar	forest tent caterpillar
Rhododendron	rhododendron borer, lace bugs
Serviceberry	hawthorn lace bug
Shade trees	cankerworms
Spruce	spruce spider mite
Sweetgum	forest tent caterpillar
Sycamore	sycamore lace bug
Yew (Taxus)	mealybugs

May (late)

Arborvitae	arborvitae leafminer, spruce spider mite
Ash	Putnam scale, oystershell scale
Birch	bronze birch borer, oystershell scale
Bittersweet	euonymus scale
Elm	flatheaded apple tree borer, white-marked tussock moth
Euonymus	euonymus scale
Flowering fruit trees	flatheaded apple tree borer, Putnam scale
Hackberry	Putnam scale
Hawthorn	hawthorn leafminer, scurfy scale, oystershell scale
Hemlock	Florinia scale
Hickory	hickory petiole gall adelgid
Juniper	juniper scale
Lilac	oystershell scale, lilac borer
Linden	scurfy scale
Maple	oystershell scale, flatheaded apple tree borer, green-striped maple worm
Mountain ash	lace bugs
Oak	flatheaded apple tree borer, oak cleaning borer, golden oak scale, oak kermes scale, May/June beetles, orange-striped oak worm
Pachysandra	euonymus scale, two spotted spider mite
Pieris	andromeda lace bug
Pine	spruce spider mite, eriophyid mite
Rhododendron	azalea leafminer, rhododendron borer
Serviceberry	hawthorn lace bug
Shade trees	white-marked tussock moth, scurfy scale
Sycamore	sycamore lace bug
Willow	scale
Yew (Taxus)	mealybugs

SEASONAL APPEARANCE OF PESTS/ SUGGESTED TIME TO APPLY CONTROL MEASURES-(continued)-

June (early)	
Arborvitae	spruce spider mite,
Ash	oystershell scale, lilac (=ash) borer, fall webworm, elm spanworm
Azalea	lace bugs, rhododendron borer, azalea whitefly,
Birch	bronze birch borer, oystershell scale
Bittersweet	euonymus scale
Boxwood	boxwood leafminer, lecanium scale
Dogwood	dogwood borer
Douglas-fir	bagworms
Euonymus	euonymus scale, winged euonymus scale
Flowering fruit trees	terrapin scale, (peach, plum, apricot)
Hawthorn	oystershell scale
Hemlock	spruce spider mite,
Hickory	elm spanworm
Honeysuckle	honeysuckle leafminer
Juniper	juniper tip dwarf mite, juniper scale, spruce spider mite
Lilac	oystershell scale, lilac borer
Magnolia	yellow poplar weevil
Maple	oystershell scale, green-striped maple worm
Mountain ash	European red mite, lace bugs
Mountain laurel	azalea leafminer, lace bug
Oak	golden oak scale, oak kermes scale, orange-striped oak worm, elm spanworm
Pachysandra	oystershell scale, euonymus scale
Pieris	andromeda lace bug
Pin oak	May beetles
Poplar	oystershell scale, euonymus scale
Rhododendron	azalea whitefly, azalea leafminer, rhododendron borer
Shade trees	terrapin scale, leafhoppers
Spruce	spruce spider mite
Tulip tree	yellow poplar weevil
Yew (Taxus)	mealybugs
Willow	oystershell scale

June (mid)	
Arborvitae	bagworm, black vine weevil
Ash	elm spanworm
Azalea	azalea bark scale, black vine weevil
Birch	bronze birch borer
Flowering fruit trees	flatheaded apple tree borer, wooly apple aphid
Hemlock	strawberry root weevil
Hickory	elm spanworm
Juniper	juniper tip midge, juniper scale
Linden	webworms
Maple	flatheaded apple tree borer, lecanium scale
Oak	oak skeletonizers, May/June beetles, flatheaded apple tree borer, lecanium scale, elm spanworm
Pine	European pine shoot moth, Nantucket pine tip moth
Rhododendron	azalea bark scale, black vine weevil
Spruce	spruce needle miner, spruce spider mite
Sweet gum	sweet gum pit-making scale
Sycamore	sycamore lace bug
Walnut	fall webworm
Yew (Taxus)	black vine weevil

June (late)	
Arborvitae	arborvitae leafminer, bagworms, black vine weevil, Fletcher scale
Azalea	oystershell scale
Bald-cypress	bagworms
Birch	birch leafminer, bronze birch borer
Buckthorn	bagworms
Cedars	bagworms
Cotoneaster	San Jose scale, black vine weevil
Fir	bagworms, black vine weevil
Flowering fruit trees	San Jose scale, bagworms, peach tree borer
Hemlock	spruce spider mite, bagworms, black vine weevil
Hornbean	bagworms
Ivy	Japanese beetle
Juniper	bagworms, juniper scale
Larch	bagworms
Linden	linden leaf beetles, Japanese beetle, bagworms
Maple	bagworms, lecanium scale
Oak	bagworms
Pine	pine tortoise scale, bagworms
Rhododendron	black vine weevil
Shade trees	bagworms, leafhoppers
Shrubs	Japanese beetle
Spruce	spruce spider mite, spruce needle miner
Walnut	walnut caterpillar
Willow	bagworm
Yew (Taxus)	Fletcher scale, black vine weevil

July (early)	
Arborvitae	bagworms
Euonymus	bagworms
Fir	bagworms
Flowering fruit trees	flatheaded borer, San Jose scale, lesser peach tree borer (peach, plum, apricot), bagworms
Hemlock	bagworms
Honey locust	mimosa webworm
Juniper	bagworms
Linden	bagworms
Locust	locust leafminer
Maple	flatheaded borer, cottony maple scale, bagworms
Mimosa	mimosa webworm
Oak	flatheaded apple tree borer, bagworms
Pine	bagworms, pine tortoise scale
Silver maple	cottony maple scale, bagworms
Spruce	spruce bud scale
Yew (Taxus)	black vine weevil

July (mid)	
Arborvitae	Fletcher scale, bagworms
Euonymus	euonymus scale, bagworms
Flowering fruit trees	San Jose scale, bagworms
Hemlock	hemlock scale, pine needle scale, bagworms
Honey locust	mimosa webworm
Linden	cottony maple scale, bagworms
Oak	flatheaded apple tree borer, bagworms
Pine	pine tube moth, pine webworm, bagworms
Silver maple	cottony maple scale, bagworms
Spruce	pine needle scale
Walnut	walnut caterpillar
Yew (Taxus)	black vine weevil, Fletcher scale

July (late)	
Barberry	barberry webworms
Bittersweet	euonymus scale
Euonymus	euonymus scale, winged euonymus scale
Flowering fruit trees	San Jose scale
Honey locust	mimosa webworm
Maple	cottony maple scale
Oak	kermes scale
Pine	pine tortoise scale, Pales, northern pine and white pine weevil adults
Yew (Taxus)	black vine weevil, mealybugs, Fletcher scale

August (early)	
Hemlock	hemlock looper
Honey locust	mimosa webworm
Juniper	juniper tip midge
Oak	oak skeletonizers
Tulip tree	tulip tree scale
Yew (Taxus)	black vine weevil

August (mid)	
Honey locust	mimosa webworm
Mimosa	mimosa webworm
Pine	aphid, pine webworm

August (late)	
Ash	banded ash clearwing
Magnolia	magnolia scale

September (early)	
Arborvitae	Fletcher scale
Locust	locust borer
Magnolia	magnolia scale
Maple	cottony maple scale
Pine	pine root collar weevil
Sweet gum	sweet gum pit-making scale

September (mid)	
Juniper	juniper tip midge
Spruce	spruce gall adelgids

September (late)(through October)	
Juniper	juniper webworm
Pine	Pales weevil (adults), white pine weevil (adults)

MICRO-INJECTION OF SYSTEMIC INSECTICIDES INTO TREES

Systemic insecticides, used as foliar sprays, soil drenches and granular applications to trees for control of a number of important pests, are not new.

Several companies have been developing various methods of injecting these same systemic insecticides directly into the trunk of trees to allow the vascular transport system to distribute the pesticide throughout the plant.

Some of these injection systems use 3/8-inch to 1/2-inch holes for injecting or implanting capsules. Recent evidence indicates that these larger diameter holes may not heal rapidly on some species of trees. Therefore, these techniques should probably be avoided.

Other injection systems use much smaller injection holes, "micro-injection," which seem to heal more rapidly. The following two systems are nationally available:

MAUGET SYSTEM -

The J. J. Mauget Company, P.O. Box 3422, Burbank, CA 91504 provides a micro-injection system which uses prepacked plastic containers which can be compressed to provide internal pressure. An 11/64-inch drill bit is used to make holes in the tree trunk and a microinjector tube is inserted. The compressed conainer is then attached and the pesticide is injected into the tree vasular system. Mauget provides the following two products:

Inject-A-Cide B
(Contains Bidrin)

Host	Pest
Ash	aphids leafhopper
Birch	aphids bronze birch borer gypsy moth birch leafminer
Flowering crabapple (Noncrop)	eastern tent caterpillar
Dogwood	dogwood twig borer
Elms	aphids European elm scale elm leaf beetle
Black gum	gypsy moth
Hackberry	nipple gall psyllid hackberry psyllid
Linden	aphids
Locust	aphids leafhopper
Maples (non-crop)	aphids gypsy moth
Oaks	aphids goudy and oak gall wasps gypsy moth obscure scale pit-making scale (American plum borer)
Pines	European pine sawfly pine spittlebug spider mites
Flowering stone fruits (Non crop)	lesser peachtree borer
Sycamore (Plane tree)	sycamore borer (American plum borer)
Willow	aphids

Inject-A-Cide
(Contains Metasystox-R)

Host	Pest
Cedars	bark beetle
Cottonwoods	aphids
Cypress	bark beetles mites
Douglas-fir	cone moths engraver beetle
Elms	elm leafbeetle
Juniper	bark beetle
Pines (Except pinon)	engraver beetle (5 spined) engraver beetle (Monterey) flathead borer red turpentine beetle black turpentine beetle mites Nantucket pine tip moth pine needle aphid pine needle scale
Redwood	bark beetle mites needle scale
Spruce	adelgids
Walnuts and pecans (Non bearing)	aphids mites

ARBOR$_X$ SYSTEM -

The Tree Technology Systems, Inc., 1014 Rein Road, Cheektowaga, NY 14225 has developed a micro-injection system which uses prepacked plastic containers which can be compressed to provide internal pressure. A 3/16-inch drill bit is used to make holes in the tree trunk and a tip with container is inserted. A tap with a mallot seats the tip and compresses the container.

Dendrex
(Contains Acephate)

Host	Pest
Trees and Shrubs (except flowering crabapple, see below)	aphids bagworms birch leafminer boxelder bugs bronze birch borer budworms cankerworms casebearer coneworms Douglas-fir tussock moth elm leaf beetle larvae gypsy moth larvae Japanese beetle lace bugs leafrollers Nantucket pine tip moth larvae pine needle miner root weevil adults sawflies scale crawlers thrips whiteflies Zimmerman pine moth
Flowering crabapples	aphids tent caterpillars leafrollers

Harpoon
(Contains Metasystox-R)

Host	Pest
Cedars	bark beetle
Cottonwoods	aphids
Cypress	bark beetles mites
Douglas-fir	cone moths engraver beetle
Elms	elm leafbeetle
Juniper	bark beetle
Pines (Except pinon)	engraver beetle (5 spined) engraver beetle (Monterey) flathead borer red turpentine beetle black turpentine beetle mites Nantucket pine tip moth pine needle aphid pine needle scale
Redwood	bark beetles mites needle scale
Spruce	adelgids
Walnuts and Pecans (non-bearing)	aphids mites

IMPORTANT NOTICE

The Listing of Products & Pesticides

There has been no attempt in this bulletin to list the registered pesticides on the basis of most effective to least effective. We do not have effectiveness information for all the pesticides listed and have decided to list them in alphabetical order. **Thus, pesticides in this bulletin are not listed in order of effectiveness.**

Table 1. GENERAL PESTS

Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
APHIDS	Treat when aphids first appear and retreat when needed.	Bioneem	0.3%EC	2.5-5 pt.
		Carbaryl 5D	5% D	N/A (named aphids only)
		Carbaryl 10D	10% D	N/A (named aphids only)
	Note: Do not use Sevin 5 Dust or Sevin Liquid on Boston ivy or Virginia creeper.	Carbaryl 4L	4 lb./gal. F	1 pt. (named aphids only)
		Carbaryl 50WP	50% WP	2 lb. (named aphids only)
		Cythion	5 lb./gal. EC	1.5 pt.
	Note: Do not use Diazinon on ferns, poinsettia, hibiscus or gardenia.	Cythion 8	8 lb./gal. EC	1 pt.
		Decathlon	20% WP	1.3 oz.
		Diazinon 50W	50% WP	1 lb.
	Note: Do not use Thiodan, Endocide or Phaser on birch.	Diazinon 2E (Spectracide)	25% EC	1 qt. (named plants only)
	Note: Do not use soaps on mountain ash, Japanese maple or horsechestnut.	Diazinon 4E & AG500	4lb./gal. EC	1 pt. (named plants only)
		Di-Syston	15% G	Flowers: 3.5-7.25 oz/100 ft. of row OR 7 oz./100 sq.ft.
	Note: Do not use Malathion, Cythion, Malathion Methoxychlor Spray or Shade Tree Insect Spray on ferns or Chinese elms.			Shrubs: 3.75 - 7.5 grams/ft. height
				Trees: 2.5 oz./inch trunk diameter
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Dursban 1E	1 lb./gal. EC	2 pt.
		Dursban	0.5 lb./gal. EC	2 qt.
		Dycarb	76% WP	12-20 oz. (named aphids only)
		Endocide 3EC	3 lb./gal. EC	0.67 qt. (nursery only)
		Ficam W	76% WP	3-6 oz. (named aphids only)
		Grandslam 75WP	75% WP	1-2 lb. (use 50 gal./acre)
		Guthion 2S	2 lb./gal. EC	1.5-2 pt.
		Isotox IV	8.5% EC	3.125 qt.
		Lindane 20%	1.65 lb./gal. EC	1 pt.
		Malathion 50	4.4 lb./gal. EC	1.5-2 pt.
		Malathion 57	5 lb./gal. EC	1.5 pt.
		Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	3.75 pt./acre
		Mavrik Aquaflow	2 lb./gal. F	4-10 oz.
		Mesurol	75% WP	1-2 lb.
		Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
		Oils, dormant (see ALTERNATIVE PRODUCTS)		
		Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
		Orthene	75% SP	0.33 lb.
		Orthene	9.4% EC	3.125 qt.
		Orthenex Spray	Aerosol	N/A (named plants only)
		Oxamyl 10G	10% G	(certain container plants only)(see label)
		Pageant DF	50% DF	0.5 lb.
		Parathion 4EC	4 lb./gal. EC	0.5 pt. (Christmas trees only)
		Parathion 8E	8 lb./gal. EC	0.25 pt. (Christmas trees only)
		Parathion 8 Aqua	8 lb./gal. EC	0.5 pt. (nursery only)
		Pestroy 4EC	4 lb./gal. EC	1 qt. (named aphids only)
		Phaser	3 lb./gal. EC	0.67 qt. (nursery only)
		Pyrethrin (+PBO) (see ALTERNATIVE PRODUCTS)		
		Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
		Rotenone + Pyrethrin (see ALTERNATIVE PRODUCTS)		
		Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Sevimol	4 lb./gal. F	1 qt. (named aphids only)
		Sevin Liquid	2 lb./gal. F	2 qt. (named aphids only)
		Sevin 50W	50% WP	2 lb. (named aphids only)
		Sevin 5 Dust	5% D	1-1.25 lb./1000 sq.ft.
		Soaps (fatty acid salts) (see ALTERNATIVE PRODUCTS)		
		Talstar T&O	7.9% F	8-40 oz.
		Talstar 10WP	10% WP	6.4-32 oz.
		Tempo 2	2 lb./gal. EC	1.5 oz.
		Tempo 20WP	20% WP	1.9 oz.
		Thiodan 50WP	50% WP	1 lb. (nursery only)
		Thiodan 3EC	3 lb./gal. EC	0.67 qt. (nursery only)
		Turcam	76% WP	3-6 oz. (named aphids only)
		Vydate L	2 lb./gal. WSL	(nursery only)(see label)

Table 1. GENERAL PESTS--(Continued)

Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
BAGWORM	Treat when bagworms are small; about mid-June (see CATERPILLARS)	Carbaryl 5D	5% D	N/A
		Carbaryl 10D	10% D	N/A
		Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Cythion	5 lb./gal. EC	2 pt.
		Cythion 8	8 lb./gal. EC	1.25 pt.
		Decathlon	20% WP	1.3 oz.
		Diazinon 50W	50% WP	1 lb.
		Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
		Diazinon 4E & AG500	4lb./gal. EC	1 pt.
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Dursban 1E	1 lb./gal. EC	2 pt.
		Dursban	0.5 lb./gal. EC	2 qt.
		Dycarb	76% WP	12-20 oz.
		Dylox	80% SP	20-30 oz.
		Ficam W	76% WP	11 oz.
		Isotox IV	8.5% EC	4.69 qt.
		Malathion 50	4.4 lb./gal. EC	1.5 qt.
		Malathion 57	5 lb./ga. EC	2 pt.
		Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre
		Mavrik	2 lb./gal. F	5-10 oz.
		Neemitis	0.3% EC	2.5-5 pt.
		Orthene	75% SP	0.33 lb.
		Orthene	9.4% EC	4.69 qt.
		Orthenex Spray	Aerosol	N/A (certain plants only)
		Pageant DF	50% DF	0.5 lb.
		Parathion 8 Aqua	8 lb./gal. EC	0.5 pt. (nursery only)
		Pounce 3.2EC	3.2 lb./gal. EC	4-8 oz./acre (nursery only)
		Pounce 25WP	25% WP	6.4-12.8 oz./acre (nursery only)
		Proxol 80SP	80% SP	20-30 oz.
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Sevimol	4 lb./gal. F	1 qt.
		Sevin 5 Dust	5% D	1-1.25 lb./1000 sq.ft.
		Sevin Liquid	2 lb./gal. F	2 qt.
		Sevin 50W	50% WP	2 lb.
		Talstar T&O	7.9% F	8-40 oz.
		Talstar 10WP	10% WP	6.4-32 oz.
		Tempo 2	2 lb./gal. EC	1 oz.
		Tempo 20WP	20% WP	1.3 oz.
		Turcam	76% WP	11 oz.
BLACK VINE WEEVIL (Adults)	Treat foliage at 3-4 week intervals from early May through August or until no living adults are found. Complete coverage of plants is essential for control.	Dursban Turf	4 lb./gal. EC	1 pt.
		Dursban 50WSP	50% WSP	1 lb.
		Dycarb	76% WP	12-20 oz.
		Ficam W	76% WP	21 oz.
		Guthion 2S	2 lb./gal. EC	1.5-2 pt.
		Isotox IV	8.5% EC	4.69 qt.
		Mavrik Aquaflow	2 lb./gal. F	6.4-10 oz.
		Orthene	75% SP	1.0 lb.
		Orthene	9.4% EC	4.69 qt.
		Oxamyl 10G	10% G	(certain container plants only)(see label)
		Pageant DF	50% DF	1 lb.
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Talstar 10WP	10% WP	6.4-32 oz.
		Turcam	76% WP	5-16 oz.
(Larvae)		Oxamyl 10G	10% G	(certain container plants only)(see label)
		Steinernema carpocapsae (see ALTERNATIVE PRODUCTS)		
		Turcam	76% WP	see label for instructions
CANKERWORMS, FALL AND SPRING	Treat when larvae are small, usually mid-May. (see CATERPILLARS)	"Bt" (kurstaki) (see ALTERNATIVE PRODUCTS)		
		Carbaryl 5D	5% D	N/A
		Carbaryl 10D	10% D	N/A
		Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Decathlon	20% WP	1.3 oz.
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Dycarb	76% WP	12-20 oz.
		Ficam W	76% WP	11 oz.
		Isotox IV	8.5% EC	4.69 qt.
		Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	1-2 qt.
		Mariate 50	50% WP	2-3 lb.
		Methoxychlor 25	2 lb./gal. EC	2-3 qt.
		Methoxychlor 2EC	2 lb./gal. EC	2-3 qt.
		Orthene	9.4% EC	4.69 qt.

Table 1. GENERAL PESTS--(Continued)

Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
CANKERWORMS (cont'd)		Orthene	75% SP	0.33-0.66 lb.
		Pageant DF	50% DF	0.5 lb.
		Pestroy 4EC	4 lb./gal. EC	1 qt. (fall only)
		Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
		Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Sevimol	4 lb./gal. F	1 qt.
		Sevin Liquid	2 lb./gal. F	2 qt.
		Sevin 50W	50% WP	2 lb.
		Talstar T&O	7.9% F	8-40 oz.
		Talstar 10WP	10% WP	6.4-32 oz.
		Tempo 2	2 lb./gal. EC	1 oz.
		Tempo 20WP	20% WP	1.3 oz.
		Turcam	76% WP	11 oz.
CATERPILLARS	Treat when larvae are small	Bioneem	0.3%EC	2.5-5 pt.
		"Bt" (kurstaki) (see ALTERNATIVE PRODUCTS)		
		Decathlon	20% WP	1.3 oz.
		Margosan-O	0.3%EC	2.5-5 pt.
		Mavrik Aquaflow	2 lb./gal. F	4-10 oz.
		Oils, dormant (see ALTERNATIVE PRODUCTS)		
		Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
		Pyrethrin (+PBO) (see ALTERNATIVE PRODUCTS)		
		Rotenone + Pyrethrin (see ALTERNATIVE PRODUCTS)		
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Soaps (fatty acid salts) (see ALTERNATIVE PRODUCTS)		
		Tempo 2	2 lb./gal. EC	1 oz.
		Tempo 20WP	20% WP	1.3 oz.
EASTERN TENT CATERPILLAR	Eggs hatch about the time buds break in the spring. Best time to treat is when the first webs are noticed. Apply treatments to foliage of plant where caterpillars are feeding. (see CATERPILLARS)	"Bt" (kurstaki) (see ALTERNATIVE PRODUCTS)		
		Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Cythion	5 lb./gal. EC	2 pt.
		Cythion 8	8 lb./gal. EC	1.25 pt.
		Diazinon 50WP	50% WP	3 lb.
		Diazinon 2E & 25% (Spectracide)	25% EC	3 qt.
		Diazinon 4E & AG500	4lb./gal. EC	3 pt.
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Dursban 1E	1 lb./gal. EC	2 pt.
		Dursban	0.5 lb./gal. EC	2 qt.
		Dycarb	76% WP	12-20 oz.
		Ficam W	76% WP	3 oz.
		Isotox IV	8.5% EC	4.69 qt.
		Malathion 57	5 lb./gal. EC	2 pt.
		Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	1-2 qt.
		Mariate 50	50% WP	2-3 lb.
		Methoxychlor 2EC	2 lb./gal. EC	2-3 qt.
		Orthene	9.4% EC	4.69 qt.
		Orthene	75% SP	0.33 lb.
		Pageant DF	50% DF	0.5 lb.
		Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt. (named plants only)
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Sevimol	4 lb./gal. F	1 qt.
		Sevin 5 Dust	5% D	1-1.25 lb./1000 sq.ft.
		Sevin Liquid	2 lb./gal. F	2 qt.
		Sevin 50W	50% WP	2 lb.
		Talstar T&O	7.9% F	8-40 oz.
		Talstar 10WP	10% WP	6.4-32 oz.
		Turcam	76% WP	3 oz.
EUROPEAN RED MITE	This 'warm season' mite should be treated like the twospotted spider mite. However, European red mites overwinter as eggs on the host. These eggs can be treated with dormant oils. (see SPIDER MITES)	AND:		
		Diazinon 50W	50% WP	1 lb.
		Diazinon 4E & AG500	4lb./gal. EC	1 pt.
FALL WEBWORM	Treat when webs first appear, which is about June for the first generation and August for the second. (see CATERPILLARS)	Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Cygon 2E	2 lb./gal. EC	2 qt.
		Diazinon 50W	50% WP	3 lb.
		Diazinon 2E (Spectracide)	25% EC	3 qt.
		Diazinon 4E & AG500	4lb./gal. EC	3 pt.
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Dursban 1E	1 lb./gal. EC	2 pt.

Table 1. GENERAL PESTS--(Continued)

Pest	When to Treat	Labelled Pesticides	Formulation You Buy	Amount To Add To 100 Gal. Water
FALL WEBWORM (cont'd)		Dursban	0.5 lb./gal. EC	2 qt.
		Dycarb	76% WP	12-30 oz.
		Dylox 80SP	80% SP	20-30 oz.
		Ficam W	76% WP	6 oz.
		Isotox IV	8.5% EC	4.69 qt.
		Malathion		
		Methoxychlor Spray	2 lb.+2 lb./gal. EC	1-2 qt.
		Margosan-O	0.3% EC	2.5-5 pt.
		Mavrik	2 lb./gal. F	5-10 oz.
		Methoxychlor	50% WP	1-2 lb.
		[illegible]	0.3% EC	2.5-5 pt.
		Orthene	75% SP	0.67 lb.
		Orthene	9.4% EC	4.69 qt.
		Orthene	3% A	N/A
		Pageant DF	50% DF	0.5 lb.
		[illegible] 4EC	4 lb./gal. EC	1 qt.
		Proxol 80SP	80% SP	20-30 oz.
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Sevimol	4 lb./gal. F	1 qt.
		Sevin 50W	50% WP	2 lb.
		Talstar T&O	7.9% F	6-40 oz.
		Talstar 10WP	10% WP	6.4-32 oz.
		Turcam	76% WP	6 oz.
FOREST TENT CATERPILLAR	Treat when larvae are seen in early to mid-May. (see CATERPILLARS)	Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Cythion	5 lb./gal. EC	2 pt.
		Cythion 8	8 lb./gal. EC	1.25 pt.
		Diazinon 50W	50% WP	5 lb.
		Diazinon 2E & 25%		
		(Spectracide)	25% EC	3 qt.
		Diazinon 4E & AG500	4 lb./gal. EC	1 pt.
		Dimilin 4L	4 lb./gal. EC	1-4 oz./acre
		Dimilin 25W	25% WP	2-8 oz.
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Isotox IV	8.5% EC	4.69 qt.
		Malathion 57	5 lb./gal. EC	2 pt.
		Malathion		
		Methoxychlor Spray	2 lb.+2 lb./gal. EC	1-2 qt.
		Marlate 50	50% WP	2-3 lb.
		Methoxychlor 2EC	2 lb./gal. EC	2-3 qt.
		Orthene	9.4% EC	4.69 qt.
		Orthene	75% SP	0.33 lb.
		Pageant DF	50% DF	0.5 lb.
		[illegible] 4EC	4 lb./gal. EC	1 qt.
		Rockland Shade Tree		
		Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt. (named trees only)
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Sevimol	4 lb./gal. F	1 qt.
		Sevin Liquid	2 lb./gal. F	2 qt.
		Sevin 50W	50% WP	2 lb.
		Talstar T&O	7.9% F	6-40 oz.
		Talstar 10WP	10% WP	6.4-32 oz.
GYPSY MOTH	Treat when young larvae are present and all eggs have hatched, usually early May. (see CATERPILLARS)	Aphid-Mite Attack	25% solution	2.0 gal.
		Bioneem	0.3%EC	2.5-5 pt.
		"Bt" (various)	various	various
		Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Decathlon	20% WP	1.5 oz.
		Dimilin 4L	4 lb./gal. EC	0.5-2 oz./acre
		Dimilin 25W	25% WP	1-4 oz.
		Dursban Turf	4 lb./gal. EC	1 pt.
		Dursban 50WSP	50% WSP	1 lb.
		Ficam W	76% WP	4 oz. (egg mass spray)
		Ficam W	76% WP	3 oz. (larval spray)
		Ficam W	76% WP	2.5 lb. (tree trunk spray)
		Isotox IV	8.5% EC	4.69 qt.
		Kryocide	96% WP	15-30 lb./acre
		Malathion		
		Methoxychlor Spray	2 lb.+2 lb./gal. EC	1-2 qt.
		Margosan-O	0.3%EC	2.5-5 pt.
		Methoxychlor 25	2 lb./gal. EC	2-3 qt.
		Orthene	9.4% EC	4.69 qt.
		Orthene	75% SP	0.67 lb.
		Pageant DF	50% DF	1 lb.
		Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
		Rockland Shade Tree		
		Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt. (oak, maple, elm, linden, pine only)
		Scimitar WP	9.52% WP	2.4-4.8 oz.

Table 1. GENERAL PESTS--(Continued)

Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
GYPSY MOTH (cont'd)		Sevimol	4 lb./gal. F	0.75-1 qt.
		Sevin 50W	50% WP	2 lb.
		Talstar T&O	7.9% F	8-40 oz.
		Talstar 10WP	10% WP	6.4-32 oz.
		Tempo 2	2 lb./gal. EC	1 oz.
		Tempo 20WP	20% WP	1.3 oz.
		Turcam	76% WP	4 oz. (egg mass spray)
		Turcam	76% WP	3 oz. (larval spray)
		Turcam	76% WP	2.5 lb. (tree trunk spray)
JAPANESE BEETLE (adult)	Treat when beetles or skeletonized foliage is seen and repeat as needed. Note: Do not use Sevin 5 Dust on Boston ivy or Virginia creeper.	Carbaryl 5D	5% D	N/A
		Carbaryl 10D	10% D	N/A
		Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Cythion	5 lb./gal. EC	1.5 pt.
		Cythion 8	8 lb./gal. EC	1 pt.
		Decathlon	20% WP	1.9 oz.
		Dursban Turf	4 lb./gal. EC	1-2 pt.
		Dursban 50WSP	50% WSP	1-2 lb.
		Dycarb	76% WP	12-20 oz.
		Ficam W	76% WP	11 oz.
		Malathion 50	4.4 lb./ga. EC	1 qt.
		Malathion 57	5 lb./gal. EC	1.5 pt.
		Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	1-2 qt.
		Marlate 50	50% WP	2-3 lb.
		Methoxychlor 2EC	2 lb./gal. EC	2-3 qt.
		Orthene	75% SP	1.33 lb.
		Orthene	9.4% EC	6.25 qt.
		Oxamyl 10G	10% G	(certain container plants only)(see label)
		Pageant DF	50% DF	1-2 lb.
		Pyrethrin (+PBO)	(see ALTERNATIVE PRODUCTS)	
		Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
		Rotenone + Pyrethrin	(see ALTERNATIVE PRODUCTS)	
		Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Sevimol	4 lb./gal. F	1 qt.
		Sevin 5 Dust	5% D	1-1.25 lb./1000 sq.ft.
		Sevin Liquid	2 lb./gal. F	2 qt.
		Sevin 50W	50% WP	2 lb.
		Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
		Talstar T&O	7.9% F	20-40 oz.
		Talstar 10WP	10% WP	16-32 oz.
		Tempo 2	2 lb./gal. EC	1.5 oz.
		Tempo 20WP	20% WP	1.9 oz.
		Turcam	76% WP	11 oz.
		Vydate L	2 lb./gal. WSL	(nursery only)(see label)
LACE BUGS	Treat when lace bug nymphs are first seen. Repeat as needed to protect foliage.	Aphid-Mite Attack	25% solution	3.9 gal.
		Carbaryl 5D	5% D	N/A
		Carbaryl 10D	10% D	N/A
		Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Cythion	5 lb./gal. EC	1 pt.
		Cythion 8	8 lb./gal. EC	1 pt.
		Decathlon	20% WP	1.3 oz.
		Di-Syston	15% G	Flowers: 3.5-7.25 oz/100 ft. of row OR 7 oz./100 sq.ft. Shrubs: 3.75 - 7.5 grams/ft. height Trees: 2.5 oz./inch trunk diameter
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Guthion 2S	2 lb./gal. EC	1.5-2 pt.
		Isotox IV	8.5% EC	4.69 qt.
		Malathion 50	4.4 lb./gal. EC	1.5 qt.
		Malathion 57	5 lb./gal. EC	1 pt.
		Oils, dormant	(see ALTERNATIVE PRODUCTS)	
		Oils, horticultural, summer	(see ALTERNATIVE PRODUCTS)	
		Orthene	9.4% EC	4.69 qt.
		Orthene	75% SP	0.33 lb.
		Orthenex Spray	Aerosol	N/A (certain plants only)
		Pageant DF	50% DF	0.5 lb.
		Parathion 8 Aqua	8 lb./gal. EC	0.5 pt. (nursery only)
		Pounce 3.2EC	3.2 lb./gal. EC	4-8 oz./acre (nursery only)
		Pounce 25WP	25% WP	6.4-12.8 oz./acre (nursery only)
		Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt. (certain plants only)
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Sevimol	4 lb./gal. F	1 qt.
		Sevin 5 Dust	5% D	1-1.25 lb./1000 sq.ft.

Table 1. GENERAL PESTS–(Continued)

Pest	When to Treat	Labeled Pesticide	Formulation You Buy	Amount To Add To 100 Gal. Water
LACE BUGS (cont'd)		Sevin Liquid	2 lb./gal. F	1 qt.
		Sevin 50W	50% WP	2 lb.
		Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
		Talstar T&O	7.9% F	8-40 oz.
		Talstar 10WP	10% WP	6.4-32 oz.
		Tempo 2	2 lb./gal. EC	1 oz.
		Tempo 20WP	20% WP	1.3 oz.
LEAFHOPPERS	Treat when leafhoppers are seen and repeat as needed.	Carbaryl 5D	5% D	N/A
		Carbaryl 10D	10% D	N/A
		Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Cythion	5 lb./gal. EC	1.5 pt. (potato & rose leafhopper only)
		Cythion 8	8 lb./gal. EC	1 pt. (potato & rose leafhopper only)
		Decathlon	20% WP	1.9 oz.
		Diazinon 50W	50% WP	1 lb.
		Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
		Diazinon 4E & AG500	4 lb./gal. EC	1 pt.
		Di-Syston	15% G	Flowers: 3.5-7.25 oz./100 ft. of row OR 7 oz./100 sq.ft. Shrubs: 3.75 - 7.5 grams/ft. height Trees: 2.5 oz./inch trunk diameter
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Dursban 1E	1 lb./gal. EC	2 qt.
		Dursban	0.5 lb./gal. EC	4 qt.
		Guthion 2S	2 lb./gal. EC	1.5-2 pt.
		Isotox IV	8.5% EC	4.69 qt.
		Malathion 57	5 lb./gal. EC	1.5 pt. (potato & rose leafhopper only)
		Malathion Methoxychlor Spray	2 lb. + 2 lb./gal. EC	3.75 pt./acre (potato & rose leafhopper only)
		Marlate 50	50% WP	2-3 lb.
		Mavrik Aquaflow	2 lb./gal. F	4-10 oz.
		Methoxychlor 2EC	2 lb./gal. EC	2-3 qt.
		Orthene	9.4% EC	4.69 qt.
		Orthene	75% SP	1.0 lb.
		Orthenex Spray	Aerosol	N/A (certain plants only)
		Oxamyl 10G	10% G	(various container plants only)(see label)
		Pageant DF	50% DF	0.5 lb.
		Parathion 8 Aqua	8 lb./gal. EC	0.5 pt. (nursery only)
		Pounce 3.2EC	3.2 lb./gal. EC	4-8 oz./acre (nursery only)
		Pounce 25WP	25% WP	6.4-12.8 oz./acre (nursery only)
		Pyrethrin (+PBO)	(see ALTERNATIVE PRODUCTS)	
		Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
		Rotenone + Pyrethrin	(see ALTERNATIVE PRODUCTS)	
		Rockland Shade Tree Insect Spray	2 lb. + 1.1 lb./gal. EC	2-3 qt.
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Sevimol	4 lb./gal. F	1 qt.
		Sevin 5 Dust	5% D	1-1.25 lb./1000 sq.ft.
		Sevin 50W	50% WP	2 lb.
		Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
		Talstar T&O	7.9% F	8-40 oz.
		Talstar 10WP	10% WP	6.4-32 oz.
		Tempo 2	2 lb./gal. EC	1.5 oz.
		Tempo 20WP	20% WP	1.9 oz.
		Vydate L	2 lb./gal. WSL	(nursery only)(see label)
LEAFMINERS	Standard contact insecticides are to be used against adult leafminers at oviposition. Some of the systemic insecticides may have activity on the larvae within the mine.	Avermectin	0.15% EC	2.5-5 pt.
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Dylox	80% SP	20-30 oz. (dipterous only)
		Margosan-O	0.3% EC	2.5-6 pt.
		Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
		Pageant DF	50% DF	0.5 lb.
		Proxol 80SP	80% SP	20-30 oz. (dipterous only)
MEALYBUGS	If the mealybugs have formed ovisacs (cottony masses in which eggs are laid), additional applications may be needed at 7-10 day intervals until no new mealybugs are found.	[illegible]	0.2% EC	2.5-5 pt.
		Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Cythion	5 lb./gal. EC	1.5 pt.
		Cythion 8	8 lb./gal. EC	1 pt.
		Decathlon	20% WP	1.9 oz.
		Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
		Dursban Turf	4 lb./gal. EC	1 pt.
		Dursban 50WSP	50% WSP	1 lb.
		Dursban 1E	1 lb./gal. EC	2 qt.
		Isotox IV	8.5% EC	4.69 qt.
		Malathion 50	4.4 lb./gal. EC	1.5 qt.

Table 1. GENERAL PESTS--(Continued)

Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
MEALYBUGS (cont'd)		Malathion 57	5 lb./gal. EC	1.5 pt.
		Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	3.75 pt./acre
		Margosan-O	0.3% EC	2.5-5 pt.
		Oils, dormant (see ALTERNATIVE PRODUCTS)		
		Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
		Orthene	9.4% EC	4.69 qt.
		Orthenex Spray	Aerosol	N/A (certain plants only)
		Oxamyl 10G	10% G	(certain container plants only)(see label)
		Pageant DF	50% DF	1 lb.
		Parathion 8 Aqua	8 lb./gal. EC	0.75 pt. (nursery only)
		Pyrethrin (+PBO) (see ALTERNATIVE PRODUCTS)		
		Rotenone + Pyrethrin (see ALTERNATIVE PRODUCTS)		
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Sevimol	4 lb./gal. F	1 qt.
		Sevin 50W	50% WP	2 lb.
		Soaps (fatty acid salts) (see ALTERNATIVE PRODUCTS)		
		Talstar T&O	7.9% F	8-40 oz.
		Talstar 10WP	10% WP	6.4-32 oz.
		Vydate L	2 lb./gal. WSL	(nursery only)(see label)
OBSCURE ROOT WEEVIL Adults	Treat plant foliage for adults in early June and again as needed during the summer.	Diazinon 50W	50% WP	1 lb.
		Diazinon 4E & AG500	4lb./gal. EC	1 pt.
		Dursban Turf	4 lb./gal. EC	1 pt.
		Dursban 50WSP	50% WSP	1 lb.
		Dycarb	76% WP	12-20 oz.
		Ficam W	76% WP	1 lb.
		Isotox IV	8.5% EC	4.69 qt.
		Mavrik Aquaflow	2 lb./gal. F	6.4-10 oz.
		Orthene	9.4% EC	4.69 qt.
		Orthene	75% SP	1.0 lb.
		Pageant DF	50% DF	1 lb.
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Turcam	76% WP	1 lb.
PERIODICAL CICADA	Treat plant foliage and tree trunks as adults emerge.	Carbaryl 5D	5% D	N/A
		Carbaryl 10D	10% D	N/A
		Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Pageant DF	50% DF	0.5 lb.
		Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
		Sevimol	4 lb./gal. F	1 qt.
		Sevin 5 Dust	5% D	1-1.25 lb./1000 sq.ft.
		Sevin Liquid	2 lb./gal. F	2 qt.
		Sevin 50W	50% WP	2 lb.
PLANT/LEAF BUGS	Most plant/leaf bugs should be controlled when the new nymphs are active. Once adults are found, they may escape pesticide applications.	Carbaryl 5D	5% D	N/A
		Carbaryl 10D	10% D	N/A
		Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Cythion	5 lb./gal. EC	1.5 pt. (tarnished & 4-lined only)
		Cythion 8	8 lb./gal. EC	1 pt. (tarnished & 4-lined only)
		Decathlon	20% WP	1.9 oz.
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Dylox	80% SP	20-30 oz.
		Malathion 50	4.4 lb./gal. EC	1.5 qt. (tarnished & 4-lined only)
		Malathion 57	5 lb./gal. EC	1.5 pt. (tarnished & 4-lined only)
		Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	3.75 pt./acre (tarnished & 4-lined only)
		Mavrik Aquaflow	2 lb./gal. F	4-10 oz.
		Pageant DF	50% DF	0.5 lb.
		Proxol 80SP	80% SP	20-30 oz.
		Pyrethrin (+PBO) (see ALTERNATIVE PRODUCTS)		
		Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
		Rotenone + Pyrethrin (see ALTERNATIVE PRODUCTS)		
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Sevimol	4 lb./gal. F	1 qt.
		Sevin Liquid	2 lb./gal. F	2 qt.
		Sevin 50W	50% WP	2 lb.
		Soaps (fatty acid salts) (see ALTERNATIVE PRODUCTS)		
		Talstar T&O	7.9% F	8-40 oz.
		Talstar 10WP	10% WP	6.4-32 oz.
		Tempo 2	2 lb./gal. EC	1.5 oz.
		Tempo 20WP	20% WP	1.9 oz.

Table 1. GENERAL PESTS--(Continued)

Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
PSYLLIDS		Bioneem	0.3% EC	2.5-5 pt.
		Carbaryl 5D	5% D	N/A
		Carbaryl 10D	10% D	N/A
		Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Decathlon	20% WP	1.3 oz.
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Isotox IV	8.5% EC	4.69 qt.
		Oils, dormant (see ALTERNATIVE PRODUCTS)		
		Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
		Orthene	9.4% EC	4.69 qt.
		Pageant DF	50% DF	0.5 lb.
		Pyrethrin (+PBO) (see ALTERNATIVE PRODUCTS)		
		Rotenone + Pyrethrin (see ALTERNATIVE PRODUCTS)		
		Sevimol	4 lb./gal.	1 qt.
		Sevin 50W	50% WP	2 lb.
		Soaps (fatty acid salts) (see ALTERNATIVE PRODUCTS)		
		Tempo 2	2 lb./gal. EC	1.5 oz.
		Tempo 20WP	20% WP	1.9 oz.
SCALES (CRAWLERS)	Refer to each species for times that crawlers are emerging and settling. Some crawlers settle on plant foliage and others settle on branches and twigs. Armored scales which overwinter as eggs are not generally susceptable to dormant oil sprays. Most soft scales are susceptable to fall and spring oil applications.	Carbaryl 5D	5% D	N/A
		Carbaryl 10D	10% D	N/A
		Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Diazinon 50W	50% WP	1 lb.
		Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
		Diazinon 4E & AG500	4lb./gal. EC	1 pt.
		Decathlon	20% WP	1.9 oz.
		Dursban Turf	4 lb./gal. EC	1 qt. (named species)
		Dursban 50WSP	50% WSP	2 lb. (named species)
		Dursban 1E	1 lb./gal. EC	4 qt. (named species)
		Dursban	0.5 lb./gal. EC	8 qt. (named species)
		Isotox IV	8.5%EC	4.69 pt.
		Malathion 50	4.4 lb./gal. EC	2-3 qt.
		Oils, dormant (see ALTERNATIVE PRODUCTS)		
		Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
		Orthene	9.4% EC	4.69 qt.
		Orthene	75% SP	0.67 lb.
		Orthenex Spray	Aerosol	N/A (certain plants only)
		Oxamyl 10G	10% G	(certain container plants only)(see label)
		Pagent DF	50% DF	2 lb.
		Parathion 8 Aqua	8 lb./gal. EC	0.75 pt. (nursery only)
		Sevimol	4 lb./gal. F	1 qt.
		Sevin Liquid	2 lb./gal. F	2 qt.
		Sevin 50W	50% WP	2 lb.
		Soaps (fatty acid salts) (see ALTERNATIVE PRODUCTS)		
		Tempo 2	2 lb./gal. EC	1.5 oz.
		Tempo 20WP	20% WP	1.9 oz.
		Vydate L	2 lb./gal. WSL	(nursery only)(see label)
SNAILS AND SLUGS	Apply when leaf damage is first noticed and reapply as needed.	Bug-Geta	3.25 % Bait	1 lb./1000 sq.ft.
		Deadline Bullets	4% Bait	0.5-2 lb./1000 sq.ft.
		Deadline Granules	4% Bait	0.5-2 lb./1000 sq.ft.
		Grandslam 75WP	75% WP	4 lb. (use 50 gal./acre)
		Slug-Geta	2% Bait	1 lb./1000 sq.ft.
SOUTHERN RED MITE	Begin treatment for this 'cool season' mite when mites first appear, usually late April, and apply a second spray 10 days later. This mite usually stops activity by July and starts up again in late September. Fall treatments are effective until regular frosts occur. (see SPIDER MITES)	AND:		
		Ornamite	30% WP	1 lb. (nursery only)
		Pestroy 4EC	4 lb./gal. EC	1 qt.
SPIDER MITES	Many species of spider mites attack ornamentals and perennials. Proper identification is important in determining control timing. 'Cool season' mites are: spruce spider mite on conifers and southern red mite on holly, inkberry, rose and rhododendron. 'Warm season mites are: twospotted spider mite and European red mite on many plants, boxwood spider mite, honeylocust spider mite and oak mite. Spider mite control usually requires a spray program. This requires an application at 7-10 day intervals for 2-3 sprays. Note: Do no use Avid on conifers.	Avid	0.15 lb./gal. EC	4 oz.
		Cythion	5 lb./gal. EC	1.5 pt.
		Cythion 8	8 lb./gal. EC	1 pt.
		Dicotol 4EC	4 lb./gal. EC	1.25 qt.
		Di-Syston	15% G	Flowers: 3.5-7.25 oz/100 ft. of row OR 7 oz./100 sq.ft. Shrubs: 3.75 - 7.5 grams/ft. height Trees: 2.5 oz./inch trunk diameter
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Dursban 1E	1 lb./gal. EC	2 pt.
		Dursban	0.5 lb./gal. EC	2 qt.
		Grandslam 75WP	75% WP	1-2 lb. (use 50 gal./acre)
		Joust	4 lb./gal. F.	4-8 oz. (note phytotoxicity list)
		Kelthane 35	35% WP	1-1.3 lb.
		Kelthane 50	50% WP	0.5-1 lb.

Table 1. GENERAL PESTS--(Continued)

Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
SPIDER MITES (cont'd)		Malathion 57	5 lb./gal. EC	1.5 pt.
		Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	3.75 pt./acre
		Mavrik Aquaflow	2 lb./gal. F	4-10 oz.
		Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
		Morestan 4	4 lb./gal. F	4-8 oz. (note phytotoxicity list)
		Oils, dormant (see ALTERNATIVE PRODUCTS)		
		Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
		Ornamite	30% WP	3-7.5 lb. (Christmas trees/conifers only)
		Oxamyl 10G	10% G	(certain container plants only)(see label)
		Pageant DF	50% DF	0.5 lb.
		Pentac Aquaflow	1 lb./gal. F	8-16 oz.
		Pentac WP	50% WP	12-16 oz.
		Parathion 4EC	4 lb./gal. EC	0.5 pt. (Christmas trees only)
		Parathion 8E	8 lb./gal. EC	0.25 pt. (Christmas trees only)
		Parathion 8 Aqua	8 lb./gal. EC	0.5 pt. (nursery only)
		Pyrethrin (+PBO) (see ALTERNATIVE PRODUCTS)		
		Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
		Rotenone + Pyrethrin (see ALTERNATIVE PRODUCTS)		
		Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Soaps (fatty acid salts) (see ALTERNATIVE PRODUCTS)		
		Talstar T&O	7.9% F	12-40 oz.
		Talstar 10WP	10% WP	9.6-32 oz.
		Vydate L	2 lb./gal. WSL	(nursery only)(see label)
SPRUCE SPIDER MITE	Begin treatment when mites first appear, usually late April, and apply a second spray 10 days later. This mite usually stops activity by July and starts again in September. Fall treatments are effective until late October. (see SPIDER MITES) Note: Oils will remove the blue color from certain conifers.	AND:		
		Isotox IV	8.5% EC	4.69 qt.
		Malathion 50	4.4 lb./gal. EC	1.5 qt.
		Vendex 50WP	50% WP	8-16 oz.
		Vendex 4L	4 lb./gal. EC	8-16 oz. (nursery only)
THRIPS	Treat foliage or flowers as soon as thrips are detected. Repeat applications on a weekly basis are often needed until the populations are under control.	Bioneem	0.3% EC	2.5-5 pt.
		Carbaryl 5D	5% D	N/A
		Carbaryl 10D	10% D	N/A
		Carbaryl 4L	4 lb./gal. F	1 pt.
		Carbaryl 50WP	50% WP	2 lb.
		Cythion	5 lb./gal. EC	1.5 pt.
		Cythion 8	8 lb./gal. EC	1 pt.
		Decathlon	20% WP	1.9 oz.
		Diazinon 50W	50% WP	1 lb.
		Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
		Diazinon 4E & AG500	4lb./gal. EC	1 pt.
		Di-Syston	15% G	Flowers: 3.5-7.25 oz/100 ft. of row OR 7 oz./100 sq.ft. Shrubs: 3.75 - 7.5 grams/ft. height Trees: 2.5 oz./inch trunk diameter
		Dursban Turf	4 lb./gal. EC	1 pt.
		Dursban 50WSP	50% WSP	1 lb.
		Dursban 1E	1 lb./gal. EC	2 qt.
		Dursban	0.5 lb./gal. EC	4 qt.
		Dycarb	76% WP	12-20 oz.
		Ficam W	76% WP	11 oz.
		Guthion 2S	2 lb./gal. EC	1.5-2 pt.
		Lindane 20%	1.65 lb./gal. EC	1 pt.
		Malathion 50	4.4 lb./gal. EC	1.5 qt.
		Malathion 57	5 lb./gal. EC	1.5 pt.
		Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	3.75 pt./acre
		Margosan-O	0.3% EC	2.5-5 pt.
		Marlate 50	50% WP	2-3 lb. (flower thrips only)
		Mavrik Aquaflow	2 lb./gal. F	4-10 oz.
		Methoxychlor 2EC	2 lb./gal. EC	2-3 qt. (flower thrips only)
		Orthene	9.4% EC	4.69 qt.
		Orthenex Spray	Aerosol	N/A (certain plants only)
		Oxamyl 10G	10% G	(certain container plants only)(see label)
		Pageant DF	50% DF	1 lb.
		Parathion 8 Aqua	8 lb./gal. EC	0.5 pt. (nursery only)
		Pyrethrin (+PBO) (see ALTERNATIVE PRODUCTS)		
		Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
		Rotenone + Pyrethrin (see ALTERNATIVE PRODUCTS)		
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Sevimol	4 lb./gal. F	1 qt.
		Sevin 5 Dust	5% D	1-1.25 lb./1000 sq.ft.
		Sevin Liquid	2 lb./gal. F	2 qt.
		Sevin 50W	50% WP	2 lb.

Table 1. GENERAL PESTS--(Continued)

Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
THRIPS (cont'd)		Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
		Talstar T&O	7.9% F	12-40 oz.
		Talstar 10WP	10% WP	9.6-32 oz.
		Tempo 2	2 lb./gal. EC	1.5 oz.
		Tempo 20WP	20% WP	1.9 oz.
		Turcam	76% WP	11 oz.
		Vydate L	2 lb./gal. WSL	(nursery only)(see label)
TWOSPOTTED SPIDER MITE	Treat when mites are present and repeat in 5-10 days, then repeat the procedure as needed. (see SPIDER MITES) Note: Do no use Avid on conifers.	AND:		
		Diazinon 50W	50% WP	1 lb.
		Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
		Diazinon 4E & AG500	4lb./gal. EC	1 pt.
		Isotox IV	8.5% EC	4.69 qt.
		Ornamite	30% WP	1 lb. (nursery only)
		Orthene	9.4% EC	4.69 qt. (suppression only)
		Vendex 50WP	50% WP	8-16 oz.
		Vendex 4L	4 lb./gal. EC	8-16 oz. (nursery only)
WHITEFLIES	Treat when first notices and repeat in 5-10 days, then repeat the procedure as needed.	Bioneem	0.3%EC	2.5-5 pt.
		Cythion	5 lb./gal. EC	1.5 pt.
		Cythion 8	8 lb./gal. EC	1 pt.
		Decathlon	20% WP	1.9 oz.
		Diazinon 50W	50% WP	1 lb.
		Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
		Diazinon 4E & AG500	4lb./gal. EC	1 pt.
		Di-Syston	15% G	Flowers: 3.5-7.25 oz./100 ft. of row OR 7 oz./100 sq.ft. Shrubs: 3.75 - 7.5 grams/ft. height Trees: 2.5 oz./inch trunk diameter
		Dursban Turf	4 lb./gal. EC	8 oz.
		Dursban 50WSP	50% WSP	0.5 lb.
		Dursban 1E	1 lb./gal. EC	2 pt.
		Dursban	0.5 lb./gal. EC	2 qt.
		Isotox IV	8.5% EC	4.69 qt.
		Joust	4 lb./gal. F.	4-8 oz. (note phytotoxicity list)
		Malathion 50	4.4 lb./gal. EC	1.5 qt.
		Malathion 57	5 lb./gal. EC	1.5 pt.
		Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	3.75 pt./acre
		Margosan-O	0.3%EC	2.5-5.0 pt.
		Mavrik Aquaflow	2 lb./gal. F	4-10 oz.
		Morestan 4	4 lb./gal. F	4-8 oz. (note phytotoxicity list)
		Oils, dormant (see ALTERNATIVE PRODUCTS)		
		Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
		Orthene	9.4% EC	4.69 qt.
		Orthenex Spray	Aerosol	N/A (certain plants only)
		Ommyl 10G	10% G	(certain container plants only)(see label)
		Pageant DF	50% DF	0.5 lb.
		Parathion 8 Aqua	8 lb./gal. EC	0.5 pt. (nursery only)
		Pounce 3.2EC	3.2 lb./gal. EC	4-8 oz./acre (nursery only)
		Pounce 25WP	25% WP	6.4-12.8 oz./acre (nursery only)
		Pyrethrin (+PBO)	(see ALTERNATIVE PRODUCTS)	
		Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
		Rotenone + Pyrethrin	(see ALTERNATIVE PRODUCTS)	
		Scimitar WP	9.52% WP	2.4-4.8 oz.
		Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
		Talstar T&O	7.9% F	8-40 oz.
		Talstar 10WP	10% WP	6.4-32 oz.
		Tempo 2	2 lb./gal. EC	1.5 oz.
		Tempo 20WP	20% WP	1.9 oz.
		Turcam	76% WP	5-16 oz. (names species only)
		Vydate L	2 lb./gal. WSL	(nursery only)(see label)
WHITEGRUBS (IN SOIL)	For larvae of Japanese beetle, masked chafers, May/June beetles, green June beetle, Asiatic garden beetle and Oriental beetle, apply a coarse spray to the soil and turf under and around the infested plants. In Ohio, treat grubs in soil in mid-August to early September.	Diecus	5% G	40 lb./acre
		Oftanol 2 Insecticide	2 lb./gal. F	1 gal./acre (apply to soil with coarse spray and irrigate so that no run-off occurs)
(IN CONTAINERS)	Drench infested containers as soon as grubs are detected according to label instructions. Late August to early September is the ideal time.	Diecus	5% G	6.3 oz./cu. yd. (apply during soil mixing)
		Oftanol 2 Insecticide	2 lb./gal.	3.7 oz. (drench at rate of 1 gal./1.6 cu.ft. of growing media, or use 100 gal./6 cu.yd.)
		Steinernema carpocapsae	(see ALTERNATIVE PRODUCTS)	

IMPORTANT NOTICE

The Listing of Products & Pesticides

There has been no attempt in this bulletin to list the registered pesticides on the basis of most effective to least effective. We do not have effectiveness information for all the pesticides listed and have decided to list them in alphabetical order. **Thus, pesticides in this bulletin are not listed in order of effectiveness.**

Table 2. ORNAMENTALS

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
AJUGA	Twospotted spider mite	(see GENERAL PESTS)			
ALDER	European alder leafminer (Hymenopterous)	treat when mines are first seen and repeat as needed.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Bioneem	0.3%EC	2.5-5 pt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Pageant DF	50% DF	1 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Woolly alder aphid	(see GENERAL PESTS: Aphids)			
ARBORVITAE	Aphids	(see GENERAL PESTS)	AND:		
			Diboron 8 Emulsive	8 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	35 oz.
	Arborvitae leafminer (Lepidopterous)	Spray in early May and again 2 weeks later, then again in early August for the new generation.	Bioneem	0.3%EC	2.5-5 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Margosan-O	0.3%EC	2.5-5 pt.
			Pageant DF	50% DF	2 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Bagworm	(see GENERAL PESTS)	AND:		
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	35 oz.
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
	Fletcher scale	Use oil as a dormant treatment in spring. Use any one fo other materials against crawlerrs from late June to early July and repeat in early September. (see GENERAL PESTS: Scales)	AND:		
			Cythion	5 lb./gal. EC	2 pt.
			Cythion 8	8 lb./gal. EC	1.25 pt.
			Malathion 57	5 lb./gal. EC	2 pt.
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
	Spruce spider mite	(see GENERAL PESTS)	AND:		
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	35 oz.
	Tip dwarf mite (Eriophyid)	Treat about mid-May and repeat as needed.	Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dicofol 4EC	4 lb./gal. EC	1.25 qt.
			Kelthane 35	35% WP	1-1.3 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
			Prentac Aquaflow	1 lb./gal. F	8-16 oz.
			Prentac WP	50% WP	12-16 oz.
			Sevimol	4 lb./gal. F	1 qt.
	Twospotted spider mite	(see GENERAL PESTS)	AND:		
			Diboron 8 Emulsive	8 lb./gal. EC	1 pt.
ASH	Aphid	(see GENERAL PESTS)	AND:		
			Diboron 8 Emulsive	8 lb./gal. EC	1 pt.
	Ash flowergall mite (Eriophyid)	Use oil as dormant treatment. Use any one of the others when first blossoms begin to form.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dicofol 4EC	4 lb./gal. EC	1.25 qt.
			Joust	4 lb./gal. F	4-8 oz.
			Kelthane 35	35% WP	1-1.3 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Morestan 4	4 lb./gal. F	4-8 oz.
			Oils, dormant (see ALTERNATIVE PRODUCTS)		
			Prentac Aquaflow	1 lb./gal. F	8-16 oz.
			Prentac WP	50% WP	12-16 oz.
			Sevimol	4 lb./gal. F	1 qt.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
ASH (cont'd)	Ash sawflies	Treat when larvae are present, usually late May.	Sevin 50W	50% WP	2 lb.
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Isotox IV	8.5%EC	4.69 pt.
			Orthene	9.4% EC	4.69 qt.
			Orthene	75% SP	1.0 lb.
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Banded ash clearwing	Treat trunk and large branches in mid-August in southern Ohio and 2 weeks later in northern Ohio.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Dursban 1E	1 lb./gal. EC	4 qt.
			Dursban	0.5 lb./gal. EC	8 qt.
			Pageant DF	50% DF	2 lb.
		SPECIAL INFORMATION			
		Clearwing borer traps can be used to pinpoint adult emergence to aid in proper timing of sprays. Traps should be deployed about 3 weeks before normal treatment time. See timing listed for specific pest and calculate proper time to deploy traps.			
	Elm spanworm	Treat when larvae are seen in early to mid-June. (see GENERAL PESTS: caterpillars)	Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Margosan-O	0.3%EC	2.5-5 pt.
			Pageant DF	50% DF	0.5 lb.
			Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Sevin 50W	50% WP	2 lb.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Fall webworm	(see GENERAL PESTS)	AND:		
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Flatheaded appletree borer	Treat trunk in late May and repeat after 4 weeks.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Lindane Borer Spray	1.65 lb./gal. EC	3 qt.
			Pageant DF	50% DF	2 lb.
	Forest tent caterpillar	(see GENERAL PESTS)	AND:		
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Leafhoppers	(see GENERAL PESTS)			
	Leafroller	Treat when the first leaves are seen folded together. (see GENERAL PESTS: Caterpillars)	Bioneem	0.3%EC	2.5-5 pt.
			"Bt" (kurstaki)	various	various
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Dycarb	76% WP	20-40 oz.
			Margosan-O	0.3%EC	2.5-5 pt.
			Methoxychlor 25	2 lb./gal. EC	2-3 qt.
			Orthene	75% SP	0.33 lb.
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Tempo 2	2 lb./gal. EC	1.5 oz.
			Tempo 20WP	20% WP	1.9 oz.
	May/June beetles	Treat when adults are first seen and repeat as necessary.	Carbaryl 5D	5% D	N/A
			Carbaryl 10D	10% D	N/A
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.9 oz.
			Dursban Turf	4 lb./gal. EC	1-2 pt.
			Dursban 50WSP	50% WSP	1-2 lb.
			Pageant DF	50% DF	2 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To 100 Gal. Water
ASH (cont'd)	May/June beetles (cont'd)		Tempo 2	2 lb./gal. EC	1.5 oz.
			Tempo 20WP	20% WP	1.9 oz.
	Oystershell scale	Apply any one of materials against crawlers about late May and again in 10 days in southern Ohio: 2 weeks later in northern Ohio. (see GENERAL PESTS: scales)	AND:		
			Cythion	5 lb./gal. EC	1 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	1 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre
	Plant/leaf bugs	Treat when young bugs (nymphs) appear in early spring and repeat as needed. (see GENERAL PESTS)			
	Putnam scale	Use oil as dormant treatment in spring. Use one of the other materials against crawlers in late May. (see GENERAL PESTS: Scales)	AND:		
			Guthion 2S	2 lb./gal EC	4.0 pt.
	Scurfy scale	Use oil as dormant treatment . Use any one of the other materials against crawlers early May to June (see GENERAL PESTS: Scales)	AND:		
			Cythion	5 lb./gal. EC	1.5 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	1.5 pt.
AZALEA	Azalea bark scale	Treat when crawlers are present, which is in late June or early July (see GENERAL PESTS: Scales)	AND:		
			Cythion	5 lb./gal. EC	2 pt.
			Cythion 8	8 lb./gal. EC	1.25 pt.
			Malathion 57	5 lb./gal. EC	1.5 pt.
	Azalea lace bug	Treat when first lace bugs are seen and repeat as needed to protect new foliage. (see GENERAL PESTS: Lace Bugs)	AND:		
			Cygon 2E	2 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	25 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
			Dycarb	76% WP	12-20 oz.
			Ficam W	76% WP	11 oz.
			Lindane 20%	1.65 lb./gal. EC	1.5 pt.
			Turcam	76%	11 oz.
	Azalea leafminer (Lepidopterous)	Treat when larvae are present, which is about early-June.	Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Cygon 2E	2 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	25 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Lindane 20%	1.65 lb./gal. EC	1 pt.
			Ficam W	76% WP	42 oz.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Orthenex Spray	Aerosol	N/A
			Pageant DF	50% DF	2 lb.
			Pestroy 4EC	4 lb./gal. EC	1 qt.
			Scimitar WP	9.52% WP	2.4-4.8 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
			Turcam	76% WP	42 oz.
	Azalea mite (Eriophyid)	Begin treatment in May when mites appear and apply a second treatment in 10 days. Repeat this procedure as needed.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Cygon 2E	2 lb./gal. EC	1 pt.
			Dicofol 4EC	4 lb./gal. EC	1.25 qt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	25 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
			Joust	4 lb./gal. F	4-8 oz.
			Kelthane 35	35% WP	1-1.3 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
			Morestan 4	4 lb./gal. F	4-8 oz.
			Pentac Aquaflow	1 lb./gal. F	8-16 oz.
			Pentac WP	50% WP	12-16 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
	Azalea whitefly	Treat when adults are first seen and repeat at 5-day intervals until infestation is checked. Repeat same procedure as needed. (see GENERAL PESTS: Whiteflies)	AND:		
			Cygon 2E	2 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	25 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
AZALEA (cont'd)	Black vine weevil	(see GENERAL PESTS)			
	Rhododendron borer	Treat trunk and larger branches in mid-May for southern Ohio and early June in northern Ohio.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Dursban	0.5 lb./gal. EC	8 qt.
			Lindane 20%	1.65 lb./gal. EC	3 pt.
			Lindane Borer Spray	1.65 lb./gal. EC	3 pt.
			Pageant DF	50% DF	2 lb.
		SPECIAL INFORMATION Clearwing borer traps can be used to pinpoint adult emergence to aid in proper timing of sprays. Traps should be deployed about 3 weeks before normal treatment time. See timing listed for specific pest and calculate proper time to deploy traps.			
	Southern red mite	(see GENERAL PESTS)	AND:		
			Dimethoate 2.67EC	2.67 lb./gal. EC	25 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
BALD-CYPRESS	Bagworm	(see GENERAL PESTS)	AND:		
			Orthenex Spray	Aerosol	N/A
	Bald-cypress mite (Eriophyid)	Treat in early spring when foliage is fully out, then as needed.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dicofol 4EC	4 lb./gal. EC	1.25 qt.
			Joust	4 lb./gal. F	4-8 oz.
			Kelthane 35	35% WP	1-1.3 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
			Morestan 4	4 lb./gal. F	4-8 oz.
			Oils, dormant (see ALTERNATIVE PRODUCTS)		
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
			Pentac Aquaflow	1 lb./gal. F	8-16 oz.
			Pentac WP	50% WP	12-16 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
BARBERRY	Barberry aphid	(see GENERAL PESTS)			
	Barberry looper (Barberry caterpillar)	Treat in late May and then as needed. There are three generations per year.	Bioneem	0.3%EC	2.5-5 pt.
			"Bt" (kurstaki)	various	various
			Decathlon	20% WP	1.3 oz.
			Margosan-O	0.3%EC	2.5-5 pt.
			Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Barberry scale	Spray when crawlers are present. (see GENERAL PESTS: Scales)			
	Barberry webworm	Treat in late July when larvae appear.	Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dylox	80% SP	20-30 oz.
			Margosan-O	0.3%EC	2.5-5 pt.
			Proxol 80SP	80% SP	20-30 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
BIRCH	Aphid	(see GENERAL PESTS)	AND:		
			Cygon 2E	2 lb./gal. EC	0.5 pt.
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	12.5 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
			Orthenex Spray	Aerosol	N/A
	Bagworm	(see GENERAL PESTS)	AND:		
			Orthenex Spray	Aerosol	N/A

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
BIRCH (cont'd)	Birch beadgall mite (Eriophyid)	Treat in early spring when foliage is fully expanded, then as needed.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dicofol 4EC	4 lb./gal. EC	1.25 qt.
			Joust	4 lb./gal. F	4-8 oz. (do not use on river birch)
			Kelthane 35	35% WP	1-1.3 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
			Morestan 4	4 lb./gal. F	4-8 oz.
			Oils, dormant (see ALTERNATIVE PRODUCTS)		
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
			Pentac Aquaflow	1 lb./gal. F	8-16 oz.
			Pentac WP	50% WP	12-16 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
	Birch leafminer (Hymenopterous)	Use any one of the materials listed when adults are present in mid-May and again in late June. Use systemic insecticides after mines are evident.	Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 5D	5% D	N/A
			Carbaryl 10D	10% D	N/A
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Cygon 2E	2 lb./gal. EC	0.5 pt.
			Cythion	5 lb./gal. EC	2 pt.
			Cythion 8	8 lb./gal. EC	1.25 pt.
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	12.5 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
			Di-Syston	15% G	2.5 oz./inch trunk diameter
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Isotox IV	8.5%EC	4.69 pt.
			Lindane 20%	1.65 lb./gal. EC	1 pt.
			Lindane Borer Spray	1.65 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	2 pt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Orthene	75% SP	0.33 lb.
			Orthenex Spray	Aerosol	N/A
			Pageant DF	50% DF	2 lb.
			Pestroy 4EC	4 lb./gal. EC	1 qt.
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
			Sevimol	4 lb./gal. F	1 qt.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Bronze birch borer	Treat entire tree, especially the upper part of the tree in late May. Retreat in early July if season is cooler than normal.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Ficam W	76% WP	21 oz.
			Pageant DF	50% DF	2 lb.
			Turcam	76% WP	21 oz.
	Fall webworm	(see GENERAL PESTS)			
	Forest tent caterpillar	(see GENERAL PESTS)			
	Japanese beetle	(see GENERAL PESTS)			
	Leafhopper	(see GENERAL PESTS)	AND:		
			Orthenex Spray	Aerosol	N/A
	Oystershell scale	Apply any one of the materials against crawlers about late May and again in 10 days in southern Ohio; 2 weeks later in northern Ohio. (see GENERAL PESTS: scales)	AND:		
			Cythion	5 lb./gal. EC	1 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	1 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre
			Orthenex Spray	Aerosol	N/A
BITTERSWEET	Euonymus scale	Use oil as a dormant treatment in spring. Use any one of the other materials in late May and/or late June. Apply treatment when crawlers are present and repeat 10-14 days later. (see GENERAL PESTS: Scales)	AND:		
			Dycarb	76% WP	20-40 oz.
			Guthion 2S	2 lb./gal EC	1.5-2 pt.
			Malathion 57	5 lb./gal. EC	1.5 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
BOXELDER	Boxelder bug	Direct spray against bugs in early summer.	Carbaryl 5D	5% D	N/A
			Carbaryl 10D	10% D	N/A
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.9 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Malathion 50	4.4 lb./gal. EC	1.5 qt.
			Orthene	75% SP	1.0 lb.
			Pageant DF	50% DF	0.5 lb.
			Scimitar WP	9.52% WP	2.4-4.8 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1.5 oz.
			Tempo 20WP	20% WP	1.9 oz.
BOXWOOD	Boxwood leafminer (Dipterous)	Use any one of these materials in early May when adults are active. Use systemics when larvae are present in mines in June.	Ambush	2 lb./gal. EC	6.4-12.8 oz. (nursery only)
			Ambush 25W	25% WP	6.4-12.8 oz. (nursery only)
			Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 5D	5% D	N/A
			Carbaryl 10D	10% D	N/A
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Cygon 2E	2 lb./gal. EC	1 pt.
			Cythion	5 lb./gal. EC	2 pt.
			Cythion 8	8 lb./gal. EC	1.25 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	25 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Dylox	80% SP	20-30 oz.
			Lindane 20%	1.65 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	2 pt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Pageant DF	50% DF	2 lb.
			Proxol 80SP	80% SP	20-30 oz.
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 5 Dust	5% D	1-1.25 lb./1000 sq.ft.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Boxwood spider mite	Treat when mites are present and make a second application 7-10 days later. Repeat same procedure as needed. (see GENERAL PESTS: Spider Mites)	AND:		
			Cygon 2E	2 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	25 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
	Boxwood psyllid	Treat when young psyllids are present, which is in early May, and repeat treatment as needed. (see GENERAL PESTS: Psyllids)	AND:		
			Pestroy 4EC	4 lb./gal. EC	1 qt.
	European fruit lecanium scale	Use oil as a dormant spray in fall or spring. Treat when crawlers are present, which is usually in early June. (see GENERAL PESTS: Scales)	AND:		
			Malathion 57	5 lb./gal. EC	2.5 pt.
BUCKTHORN (Tallhedge)	Bagworm	(see GENERAL PESTS)			
	Japanese beetle	(see GENERAL PESTS)			
CATALPA	Catalpa sphinx	Treat when larvae are small.	Bioneem	0.3%EC	2.5-5 pt.
			"Bt" (kurstaki)	various	various
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Isotox IV	8.5%EC	4.69 pt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
CATALPA (contd)	Japanese beetle	(see GENERAL PESTS)			
CHESTNUT (ornamental)	Asiatic oak weevil	Treat when adults are feeding.	Bioneem	0.3%EC	2.5-5 pt.
			Dursban Turf	4 lb./gal. EC	1 pt.
			Dursban 50WSP	50% WSP	1 lb.
			Pageant DF	50% DF	1 lb.
	Leafhopper	(see GENERAL PESTS)			
CHRYSANTHEMUM (perennial)	Aphid	(see GENERAL PESTS)			
	Beet armyworm		Bioneem	0.3%EC	2.5-5 pt.
			"Bt" (kurstaki)	various	various
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Isotox IV	8.5%EC	4.69 pt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthenex Spray	Aerosol	N/A
			Pageant DF	50% DF	0.5 lb.
			Scimitar WP	9.52% WP	2.4-4.8 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	9.6-40 oz.
			Talstar 10WP	10% WP	12-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Cabbage looper	Treat at first sign of feeding damage or when caterpillars are seen.	Bioneem	0.3%EC	2.5-5 pt.
			"Bt" (kurstaki)	various	various
			Decathlon	20% WP	1.3 oz.
			Isotox IV	8.5%EC	4.69 pt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Corn earworm		Bioneem	0.3%EC	2.5-5 pt.
			Margosan-O	0.3%EC	2.5-5 pt.
	Leafhopper	(see GENERAL PESTS)	AND:		
			Orthenex Spray	Aerosol	N/A
	Leafminer (Dipterous)	Treat when mining of leaves is first detected and repeat as needed.	Ambush	2 lb./gal. EC	6.4-12.8 oz. (nursery only)
			Ambush 25W	25% WP	6.4-12.8 oz. (nursery only)
			Avid	0.15 lb./gal. EC	4 oz.
			Bioneem	0.3%EC	2.5-5 pt.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Dylox	80% SP	20-30 oz.
			Lindane 20%	1.65 lb./gal. EC	1 pt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Orthenex Spray	Aerosol	N/A
			Pageant DF	50% DF	2 lb.
			Proxol 80SP	80% SP	20-30 oz.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Omniverous leafroller	(see GENERAL PESTS: Caterpillars)	Bioneem	0.3%EC	2.5-5 pt.
			"Bt" (kurstaki)	various	various
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.9 oz.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Margosan-O	0.3%EC	2.5-5 pt.
			Methoxychlor 25	2 lb./gal. EC	2-3 qt.
			Pageant DF	50% DF	0.5 lb.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
CHRYSANTHEMUM (cont'd)	Omnivorous leafroller (cont'd)		Scimitar WP	9.52% WP	2.4-4.8 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	9.6-40 oz.
			Talstar 10WP	10% WP	12-32 oz.
			Tempo 2	2 lb./gal. EC	1.5 oz.
			Tempo 20WP	20% WP	1.9 oz.
	Twospotted spider mite	(see GENERAL PESTS)			
	Thrips	(see GENERAL PESTS)			
	Whitefly (Greenhouse)	Treat at first sign of adults on underside of leaves and repeat at 10-14 day intervals as needed. (see GENERAL PESTS: Whiteflies)	AND:		
			Dycarb	76% WP	12-20 oz.
			Endocide 3EC	3 lb./gal. EC	0.67 qt. (nursery only)
			Ficam W	76% WP	21 oz.
			Phaser	3 lb./gal. EC	0.67 qt. (nursery only)
			Thiodan 50WP	50% WP	1 lb. (nursery only)
			Thiodan 3EC	3 lb./gal. EC	0.67 qt. (nursery only)
			Turcam	76% WP	21 oz.
COLUMBINE	Leafminer (Dipterous)	Treat when mining of leaves is first detected and repeat as needed.	Avid	0.15 lb./gal. EC	4 oz.
			Bioneem	0.3%EC	2.5-5 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Dylox	80% SP	20-30 oz.
			Lindane 20%	1.65 lb./gal. EC	1 pt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Pageant DF	50% DF	2 lb.
			Proxol 80SP	80% SP	20-30 oz.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
COTONEASTER	Aphids	(see GENERAL PESTS)			
	Hawthorn lace bug	Treat when young lace bugs are seen and repeat as needed to protect young foliage. (see GENERAL PESTS: Lace Bugs)	AND:		
			Dycarb	76% WP	12-20 oz.
			Ficam W	76% WP	6 oz.
			Fenroy 4EC	4 lb./gal. EC	1 qt.
			Turcam	76% WP	6 oz.
	Leafhoppers	(see GENERAL PESTS)			
	Pear slug (sawfly)	Spray foliage about 2 weeks after the petals fall and again in 2 weeks.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Diazinon 50W	50% WP	3 lb.
			Diazinon 4E & AG500	4lb./gal. EC	3 pt.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Oils, horticultural, summer	(see ALTERNATIVE PRODUCTS)	
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	San Jose scale	Use oil as a dormant treatment in spring. Use any one of the other materials against crawlers in late June and apply at least 2 treatments at 10-day intervals. (see GENERAL PESTS: Scales)			
	Two-spotted spider mites	(see GENERAL PESTS)			
	Webworm	Treat when larvae are present.	Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dylox	80% SP	20-30 oz.
			Margosan-O	0.3%EC	2.5-5 pt.
			Proxol 80SP	80% SP	20-30 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2qt.
			Sevin 50W	50% WP	2 lb.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
COTONEASTER (cont'd)	Webworm (cont'd)		Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
CRAPEMYRTLE	Aphids	(see GENERAL PESTS)			
DAY LILY	Aphids	(see GENERAL PESTS)	AND:		
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	35 oz.
	Slugs	(see GENERAL PESTS)			
DAY LILY (cont'd)	Thrips	(see GENERAL PESTS)	AND:		
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	35 oz.
	Twospotted spider mite	(see GENERAL PESTS)			
DEUTZIA	Aphids	(see GENERAL PESTS)			
	Lilac leafminer (Lepidopterous)	Treat when first mines are seen and repeat as needed.	Bioneem	0.3%EC	2.5-5 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Lindane 20%	1.65 lb./gal. EC	1 pt.
			Isotox IV	8.5%EC	4.69 pt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Pageant DF	50% DF	2 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
DOGWOOD	Dogwood borer	Treat trunk and lower branches in mid-May.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Dursban 1E	1 lb./gal. EC	4 qt.
			Dursban	0.5 lb./gal. EC	8 qt.
			Endocide 3EC	3 lb./gal. EC	0.67-1.5 qt. (nursery only)
			Lindane 20%	1.65 lb./gal. EC	3 pt.
			Lindane Borer Spray	1.65 lb./gal. EC	3 pt.
			Pageant DF	50% DF	2 lb.
			Phaser	3 lb./gal. EC	0.67-1.5 qt. (nursery only)
			Thiodan 50WP	50% WP	1-2 lb. (nursery only)
			Thiodan 3EC	3 lb./gal. EC	0.67-1.5 qt. (nursery only)
	Dogwood club gall (midge)	Treat about the time leaves are expanding in the spring.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
	Leafhopper	(see GENERAL PESTS)			
	Oystershell scale	Treat crawlers about late May and again in 10 days in southern Ohio; 2 weeks later in northern Ohio. (see GENERAL PESTS)	AND:		
			Cythion	5 lb./gal. EC	1 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	1 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre
	Red-headed flea beetle	Treat when feeding damage to leaves is observed. Repeat as needed.	Carbaryl 5D	5% D	N/A
			Carbaryl 10D	10% D	N/A
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.9 oz.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Mavrik Aquaflow	2 lb./gal. F	4-10 oz.
			Pageant DF	50% DF	0.5 lb.
			Scimitar WP	9.52% WP	2.4-4.8 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.
			Sevin 50W	50% WP	2 lb.
			Tempo 2	2 lb./gal. EC	1.5 oz.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
DOUGLAS-FIR	Aphids	(see GENERAL PESTS)	AND:		
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Bagworm	(see GENERAL PESTS)			
	Cooley spruce gall adelgid (aphid)	Apply early in spring , at budbreak, or anytime during the summer when crawlers are active.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dursban Turf	4 lb./gal. EC	1 pt.
			Dursban 50WSP	50% WSP	0.5 lb.
			Oils, dormant (see ALTERNATIVE PRODUCTS)		
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1-2 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
ELM		Bark beetles (native)	Dursban Turf	4 lb./gal. EC	1 gal.
			Dursban 50WSP	50% WSP	8.33 lb.
	Note: Malathion 57% EC may cause slight injury to elm foliage.		Dursban 1E	1 lb./gal F	4 gal.
			Lindane Borer Spray	1.65 lb./gal. EC	3 qt. (do not apply to foliage)
			Methoxychlor 2EC	2 lb./gal. EC	8 gal.
			Methoxychlor 25	2 lb./gal. EC	8 gal.
			Pageant DF	50% DF	16.5 lb.
			Sevimol	4 lb./gal. F	20 qt.
		Control of Dutch elm disease vectors is a highly specialized task. For further information write to Forest Sciences Laboratory, 359 Main Rd., Delaware Ohio 43015. To reduce overwintering survival, treat in early fall. Spray basal 9 feet of trunk until wet but not to runoff. Make application in spring and early summer to tree crown. Spray thoroughly to minimize inoculations.			
	Cankerworms	(see GENERAL PESTS)	AND:		
	Note: Do not use Isotox IV or Orthene on American elm as foliage damage may occur.		Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Elm leaf beetle	Treat when larvae first appear, about when leaves are fully expanded and again in July.	"Bt" (tenebrionis)	(see ALTERNATIVE PRODUCTS)	
			Carbaryl 5D	5% D	N/A
			Carbaryl 10D	10% D	N/A
	Note: Do not use Isotox IV or Orthene on American elm as foliage damage may occur.		Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.9 oz.
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
			Di-Syston	15% G	2.5 oz./inch trunk diameter
			Dursban Turf	4 lb./gal. EC	1-2 pt.
			Dursban 50WSP	50% WSP	1-2 lb.
			Dycarb	76% WP	12-20 oz. (larvae)
			Ficam W	76% WP	11 oz.
			Isotox IV	8.5% EC	4.69 qt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	1-2 qt.
			Mavrik Aquaflow	2 lb./gal. F	4-10 oz.
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS) (larvae)		
			Orthene	9.4% EC	4.69 qt.
			Orthene	75% SP	1.33 lb.
			Pageant DF	50% DF	1-2 lb.
			Pestroy 4EC	4 lb./gal. EC	1 qt.
			Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
			Scimitar WP	9.52% WP	2.4-4.8 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 5 Dust	5% D	1-1.25 lb./1000 sq.ft.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1.5 oz.
			Tempo 20WP	20% WP	1.9 oz.
			Turcam	76% WP	11 oz.
	Elm leafminer (Hymenopterous)	Treat when mines are seen, in early May for the first generation and early June for the second generation.	Bioneem	0.3%EC	2.5-5 pt.
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
	Note: Do not use Orthene on American elm as foliage damage may occur.		Lindane 20%	1.65 lb./gal. EC	1 pt.
			Lindane Borer Spray	1.65 lb./gal. EC	1 pt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Pageant DF	50% DF	2 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water	
ELM (cont'd)	European elm scale	Use oil, or Ethion plus oil as a dormant treatment in the spring. Use one of other materials against crawlers in late June. (see GENERAL PESTS: Scales)	AND:			
			Di-Syston	15% G	2.5 oz./inch trunk diameter	
			Guthion 2S	2 lb./gal EC	3-4 pt.	
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)	
	Note: Do not use Isotox IV or Orthene on American elm as foliage damage may occur.					
	Fall webworm	(see GENERAL PESTS)				
	Note: Do not use Isotox IV or Orthene on American elm as foliage damage may occur.					
	Japanese beetle	(see GENERAL PESTS)				
	Note: Do not use Isotox IV or Orthene on American elm as foliage damage may occur.					
	Leafhoppers	(see GENERAL PESTS)				
	Note: Do not use Isotox IV or Orthene on American elm as foliage damage may occur.					
	Woolly aphid	(see GENERAL PESTS: Aphids) Treat in early May when leaves are expanding.				
	Note: Malathion 57% EC may cause slight injury to elm foliage.					
	Note: Do not apply Isotox IV or Orthene to American elm as injury to foliage may occur.					
EUONYMUS	Aphids	(see GENERAL PESTS)	AND:			
			Cygon 2E	2 lb./gal. EC	2 pt.	
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.	
			Dimethoate 400	4 lb./gal. EC	35 oz.	
			Orthenex Spray	Aerosol	N/A	
	Bagworm	(see GENERAL PESTS)	AND:			
			Orthenex Spray	Aerosol	N/A	
	Black vine weevil	(see GENERAL PESTS)				
	Euonymus scale	Use oil as a dormant spray in late fall or early spring. Use any one of other materials against the crawlers in late May, early June, mid-June. Apply first treatment in May and then apply two more at 10-day intervals. Repeat this procedure as needed.	AND:			
			Cygon 2E	2 lb./gal. EC	2 pt.	
			Cythion	5 lb./gal. EC	1-1.5 pt.	
			Cythion 8	8 lb./gal. EC	1 pt.	
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.	
			Dimethoate 400	4 lb./gal. EC	35 oz.	crawlers in late May, early
			Dycarb	76% WP	20-40 oz.	
			Ficam W	76% WP	6 oz.	
			Guthion 2S	2 lb./gal EC	1.5-2 pt.	
			Malathion 57	5 lb./gal. EC	1.5 pt.	
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre	
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.	
			Turcam	76% WP	6 oz.	
	Leafhoppers	(see GENERAL PESTS)	AND:			
			Orthenex Spray	Aerosol	N/A	
	Twospotted spider mite	(see GENERAL PESTS)				
	Winged euonymus scale	Use oil, or Ethion plus oil as a dormant treatment in the spring. Use any one of other materials against crawlers in early June and again in late July For Vydate use only on commercial planting not for home planting. Apply 200 gals of spray per acre or 5-14 gals. per 1,000 square feet of area. (see GENERAL PESTS: Scales)				
FICUS (Cuban Laurel)	Thrips	Treat when thrips are first seen and repeat as needed. (see GENERAL PESTS: Thrips)	AND:			
			Dimethoate 400	4 lb./gal. EC	17.5 oz.	
FIR	Bagworm	(see GENERAL PESTS)				
	Black vine weevil	(see GENERAL PESTS)				
	Balsam twig aphid	(see GENERAL PESTS: Aphids) Treat when first aphids are seen, about May 1.	AND:			
			Asana XL	0.66 lb./gal. EC	5.8-9.6 oz. (nursery only)	
	Balsam woolly adelgid		Asana XL	0.66 lb./gal. EC	5.8-9.6 oz. (nursery only)	
			Dursban Turf	4 lb./gal. EC	1 pt.	
			Dursban 50WSP	50% WSP	0.5 lb.	
			Pageant DF	50% DF	0.5 lb.	
	Spruce spider mite	(see GENERAL PESTS)				
	Pales weevil	Protect young trees by treating with lindane in mid April-mid May and again in August.				

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
FIR (cont'd)	Pine needle scale	Use oil as a fall dormant treatment. Use one of other materials against crawlers in late April or early May Second generation of crawlers can be treated in mid-July. (see GENERAL PESTS) Note: Oil will injure Douglas-fir flower buds.	AND: Cythion	5 lb./gal. EC	4 pt.
			Cythion 8	8 lb./gal. EC	2 pt.
			Malathion 57	5 lb./gal. EC	1.5 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	5 qt./acre
FIRETHORN (Pyracantha)	Aphids	(see GENERAL PESTS)			
	Black vine weevil	(see GENERAL PESTS)			
	Hawthorn lace bug	Treat when first lace bugs are seen and repeat as needed to protect new foliage.	AND: Dycarb	76% WP	12-20 oz.
			Ficam W	76% WP	6 oz.
			Lindane 20%	1.65 lb./gal. EC	1 pt.
			Pestroy 4EC	4 lb./gal. EC	1 qt.
			Turcam	76% WP	6 oz.
FLOWERING FRUIT TREES (ornamental) (crab apple) (cherry) (quince) (apricot) (peach) (plum) (pear)	Aphids Note: Do not use Isotox IV or Orthene on flowering crabapple as injury to foliage may occur.	(see GENERAL PESTS)	AND: Orthenex Spray	Aerosol	N/A
	Bagworm Note: Do not use Isotox IV or Orthene on flowering crabapple as injury to foliage may occur.	(see GENERAL PESTS)	AND: Orthenex Spray	Aerosol	N/A
	Borers (flatheaded)	Treat trunk in late May and late June.	Lindane 20%	1.65 lb./gal. EC	3 pt.
			Lindane Borer Spray	1.65 lb./gal. EC	3 pt.
	Clearwing borers (dogwood)	Treat trunk, especially at graft junctions, in late May and again a month later.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Dursban 1E	1 lb./gal. EC	4 qt.
			Dursban	0.5 lb./gal. EC	8 qt.
			Lindane 20%	1.65 lb./gal. EC	3 pt.
			Lindane Borer Spray	1.65 lb./gal. EC	3 pt.
			Pageant DF	50% DF	2 lb.
		SPECIAL INFORMATION: Clearwing borer traps can be used to pinpoint adult emergence to aid in proper timing of sprays. Traps should be deployed about 3 weeks before normal treatment time. See timing listed for specific pest and calculate proper time to deploy traps.			
	Eastern tent caterpillar Note: Do not use Isotox IV or Orthene on flowering crabapple as injury to foliage may occur.	(see GENERAL PESTS)			
	Fall webworm Note: Do not use Isotox IV or Orthene on flowering crabapple as injury to foliage may occur.	(see GENERAL PESTS)			
	Japanese beetle Note: Do not use Isotox IV or Orthene on flowering crabapple as injury to foliage may occur.	(see GENERAL PESTS)			
	Leafhoppers Note: Do not use Isotox IV or Orthene on flowering crabapple as injury to foliage may occur.	(see GENERAL PESTS)	AND: Orthenex Spray	Aerosol	N/A
	Lesser peach tree borer	In southern Ohio, apply the first spray early May; in northern Ohio, mid-May. Apply the second spray about the first of July; the third spray in mid-August Direct the spray to thoroughly cover injured bark and scaffold branches.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Pageant DF	50% DF	2 lb.
	Mites Note: Do not use Isotox IV or Orthene on flowering crabapple as injury to foliage may occur.	(see GENERAL PESTS: Spider mites)			
	Peach tree borer	Spray trunk in late June to early July.	Dursban Turf	4 lb./gal. EC	3 qt.
			Dursban 50WSP	50% WSP	6 lb.
			Dursban 1E	1 lb./gal. EC	12 qt.
			Dursban	0.5 lb./gal. EC	25 qt.
			Lindane 20%	1.65 lb./gal. EC	3 pt.
			Lindane Borer Spray	1.65 lb./gal. EC	3 pt.
			Pageant DF	50% DF	6 lb.
	Pear slug (sawfly)	Treat larvae when first detected, usually mid-May, and again in July if needed.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Diazinon 50W	50% WP	3 lb.
			Diazinon 4E & AG500	4lb./gal. EC	3 pt.
			Dursban Turf	4 lb./gal. EC	8 oz.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
FLOWERING PRUIT TREES (cont'd)	Pear slug (cont'd		Dursban 50WSP	50% WSP	0.5 lb.
			Oils, horticultural, summer	(see ALTERNATIVE PRODUCTS)	
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Pear psylla	Apply dormant oil for pear psylla during dormant season. (see GENERAL PESTS) Spray foliage about 2 weeks after the petals fall and again in 2 weeks.	Bioneem	0.3%EC	2.5-5 pt.
	Scales	Use oil as a dormant treatment in spring. Use any one of other materials against crawlers when they are present. (see GENERAL PESTS: Scales)			
	Spring cankerworm	(see GENERAL PESTS)			
	Note: Do not use Isotox IV or Orthene on flowering crabapple as injury to foliage may occur.				
	Woolly aphids	(see GENERAL PESTS: aphids) Apply first spray about June 10 and then repeat as needed. This aphid forms bluish-white threads of cottony material around itself and can be recognized by the threads.			
	Note: Do not use Isotox IV or Orthene on flowering crabapple as injury to foliage may occur.				
FORSYTHIA	Red-headed flea beetle	Treat when feeding damage to leaves is observed. Repeat as needed.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.9 oz.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dursban Turf	4 lb./gal. EC	1-2 pt.
			Dursban 50WSP	50% WSP	1-2 lb.
			Mavrik Aquaflow	2 lb./gal. F	4-10 oz.
			Pageant DF	50% DF	1-2 lb.
			Scimitar WP	9.52% WP	2.4-4.8 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.
			Sevin 50W	50% WP	2 lb.
			Tempo 2	2 lb./gal. EC	1.5 oz.
	Spider mites	(see GENERAL PESTS)			
GOLDEN RAINTREE	Leafhoppers	(see GENERAL PESTS)			
HACKBERRY	Hackberry nipplegall psyllid	Treat in early May. (see GENERAL PESTS: Psyllids)	Bioneem	0.3%EC	2.5-5 pt.
			AND:		
			Dimethoate 400	4 lb./gal. EC	Soil injection: use a 1:3 dilution, inject 1 fl.oz. of dilution for each 0.5 inch of trunk diameter.
			Pestroy 4EC	4 lb./gal. EC	1 qt.
	Lace bugs	Treat when small nymphs appear in mid-May. (see GENERAL PESTS: Lace Bugs)			
	Putnam scale	Use oil as a dormant treatment in spring. Use any one of other materials against crawlers in late May. (see GENERAL PESTS: Scales)	AND: Guthion 2S	2 lb./gal EC	4 pt.
HAWTHORN	Aphids	(see GENERAL PESTS)			
	Bagworm	(see GENERAL PESTS)			
	Eastern tent caterpillars	(see GENERAL PESTS)			
	European red mite	(see GENERAL PESTS)			
	Fall cankerworm	(see GENERAL PESTS)			
	Fall webworm	(see GENERAL PESTS)			
	Japanese beetle	(see GENERAL PESTS)			

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
HAWTHORN (cont'd)	Lace bug	Treat when small nymphs appear, usually in mid-May. (see GENERAL PESTS: Lace Bugs)	AND:		
			Dycarb	76% WP	12-20 oz.
			Ficam W	76% WP	6 oz.
			Pestroy 4EC	4 lb./gal. EC	1 qt.
			Turcam	76% WP	6 oz.
	Leafhopper	(see GENERAL PESTS)			
	Leafminer (Hymenopterous)	Treat when leaves are fully expanded or at first sign of browning about early to mid-May.	Bioneem	0.3%EC	2.5-5 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Pageant DF	50% DF	2 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Oystershell scale	(see GENERAL PESTS)	AND:		
			Cythion	5 lb./gal. EC	1 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	1.5 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre
	Pear slug (sawfly)	Spray foliage about 2 weeks after the pests fall and again in 2 weeks.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Diazinon 50W	50% WP	3 lb.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Scurfy scale	Use oil as a dormant treatment. Use any one of other materials against crawlers in late May. (see GENERAL PESTS: Scales)	AND:		
			Cythion	5 lb./gal. EC	1.5 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	1.5 pt.
	Terrapin scale	Use oil as a dormant treatment in spring. Use any one of other materials when crawlers are on leaves in June. (see GENERAL PESTS: Scales)	AND:		
			Malathion 57	5 lb./gal. EC	2.5 pt.
HEMLOCK	Bagworm	(see GENERAL PESTS)			
	Black vine weevil	(see GENERAL PESTS)			
	Hemlock looper	Treat when worms are first seen, about August 1. (see GENERAL PESTS: Caterpillars)	Bioneem	0.3%EC	2.5-5 pt.
			"Bt" (kurstaki) (see ALTERNATIVE PRODUCTS)		
			Decathlon	20% WP	1.3 oz.
			Margosan-O	0.3%EC	2.5-5 pt.
			Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Hemlock scale	Use oil as a dormant treatment in spring. Use any one of other materials when crawlers are present, about mid-July. (see GENERAL PESTS: Scales)	AND:		
			Cygon 2E	2 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	25 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
	Hemlock rust mite (Eriophyid)	Treat in early spring after leaves are expanded and then as needed.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Cygon 2E	2 lb./gal. EC	1 pt.
			Dicofol 4EC	4 lb./gal. EC	1.25 qt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	25 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
			Joust	4 lb./gal. F	4-8 oz.
			Kelthane 35	35% WP	1-1.3 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
			Morestan 4	4 lb./gal. F	4-8 oz.
			Oils, dormant (see ALTERNATIVE PRODUCTS)		
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
HEMLOCK (cont'd)	Hemlock rust mite (cont'd)		Pentac Aquaflow	1 lb./gal. F	8-16 oz.
			Pentac WP	50% WP	12-16 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
	Pine needle scale	Use oil as a dormant treatment in fall. Use any one of other materials when crawlers are present, usually early May and again in mid-July. (see GENERAL PESTS: Scales)	AND:		
			Cygon 2E	2 lb./gal. EC	4 pt.
			Cythion	5 lb./gal. EC	2 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	25 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
			Malathion 57	5 lb./gal. EC	1.5 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	5 qt./acre
	Spruce spider mite	(see GENERAL PESTS)	AND:		
			Cygon 2E	2 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	25 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
	Strawberry root weevil	Treat foliage and soil around infested plants in the middle of June and twice more at 3-week intervals. (see GENERAL PESTS: Black vine weevil)	Bioneem	0.3%EC	2.5-5 pt.
			Dursban Turf	4 lb./gal. EC	1 pt.
			Dursban 50WSP	50% WSP	1 lb.
			Orthene	75% SP	1.0 lb.
			Mavrik Aquaflow	2 lb./gal. F	6.4-10 oz.
			Pageant DF	50% DF	1 lb.
	Thrips	(see GENERAL PESTS)			
HICKORY	Caterpillars	(see GENERAL PESTS)			
	Elm spanworm	Treat when larvae are seen in early to mid-June.	Bioneem	0.3%EC	2.5-5 pt.
			"Bt" (kurstaki)	various	various
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Margosan-O	0.3%EC	2.5-5 pt.
			Pageant DF	50% DF	0.5 lb.
			Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Hickory petiole gall adelgid (phylloxera)	Use oil in the spring as a dormant treatment against overwintering eggs. Apply any one of the other materials after eggs have hatched, which should be about late May or early June.	Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Oils, dormant	(see ALTERNATIVE PRODUCTS)	
			Pageant DF	50% DF	0.5 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
	Hickory shuckworm	Winter is spent as a larva inside the shucks of fallen nuts. Gathering and destroying infested nuts during the winter is helpful in control.			
HOLLY	Black vine weevil	(see GENERAL PESTS)			
	Holly bud moth		Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dursban Turf	4 lb./gal. EC	1 pt.
			Dursban 50WSP	50% WSP	1 lb.
			Pageant DF	50% DF	1 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
	Holly leafminer (Dipterous)	Use a non-systemic insecticide on the foliage about May 15 to control the adults. Use one of the systemic materials in early June for control of larvae in leaves.	Ambush	2 lb./gal. EC	6.4-12.8 oz. (nursery only)
			Ambush 25W	25% WP	6.4-12.8 oz. (nursery only)
			Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Diazinon 50WP	50% WP	1 lb.
			Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	25 oz. (not Burford Holly)
			Dimethoate 400	4 lb./gal. EC	17.5 oz. (not Burford Holly)

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
HOLLY (cont'd)	Holly leafminer (cont'd)		Di-Syston	15% G	2.5 oz./inch trunk diameter
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Dycarb	76% WP	20-40 oz.
			Dylox	80% SP	20-30 oz.
			Isotox IV	8.5% EC	4.69 qt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 pt.
			Pageant DF	50% DF	2 lb.
			Proxol 80SP	80% SP	20-30 oz.
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Southern red mite	(see GENERAL PESTS)	AND:		
			Dimethoate 2.67EC	2.67 lb./gal. EC	25 oz. (not Burford Holly)
			Dimethoate 400	4 lb./gal. EC	17.5 oz. (not Burford Holly)
HONEYLOCUST	Bagworm	(see GENERAL PESTS)			
	Cottony maple scale	A dormant oil spray may be used before growth starts in the spring. Spray infested trees thoroughly with one of the other materials about July 10 and again in 20 days. Be sure to cover lower leaf surfaces with spray. New information indicates that a spray applied as late as late July and during September should control scale found on the undersides of leaves. (see GENERAL PESTS: Scales)			
	Honeylocust spider mite	(see GENERAL PESTS: Spider mites) Treat when mites are present and again in 10 days and then repeat the same procedure as needed.			
	Honeylocust plant bug	Treat when leaves first appear. (see GENERAL PESTS: Plant bugs)			
	Honeylocust pod gall midge	Treat growing tips as growth starts in the spring and re-treat at 10-day intervals until infestation is cleaned up.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
	Honeylocust scale	Use oil in dormant season. Use any one of the other materials when crawlers are present. (see GENERAL PESTS: Scales)	AND:		
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
	Honeylocust stunt mite (Eriophyid)	Treat when mites are present in early spring and then as needed.	Dicofol 4EC	4 lb./gal. EC	1.25 qt.
			Joust	4 lb./gal. F	4-8 oz.
			Kelthane 35	35% WP	1-1.3 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
			Morestan 4	4 lb./gal. F	4-8 oz.
			Oils, horticultural, summer	(see ALTERNATIVE PRODUCTS)	
			Pentac Aquaflow	1 lb./gal. F	8-16 oz.
			Pentac WP	50% WP	12-16 oz.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
	Leafhoppers	(see GENERAL PESTS)			
	Mimosa webworm	Treat at the first sign of foliage browning, which is during July for the first generation worms and during August for the second generation. (see GENERAL PESTS: Caterpillars)	Bioneem	0.3%EC	2.5-5 pt.
			"Bt" (kurstaki)	(see ALTERNATIVE PRODUCTS)	
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Di-Syston	15% G	2.5 oz./inch trunk diameter
			Dursban Turf	4 lb./gal. EC	1 pt.
			Dursban 50WSP	50% WSP	1 lb.
			Dursban 1E	1 lb./gal. EC	2 qt.
			Dursban	0.5 lb./gal. EC	4 qt.
			Dycarb	76% WP	12-20 oz.
			Dylox	80% SP	20-30 oz.
			Ficam W	76% WP	1 lb.
			Isotox IV	8.5% EC	4.69 pt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
HONEYLOCUST (cont'd)	Mimosa webworm (cont'd)		Orthene	75% SP	0.67 lb.
			Pageant DF	50% DF	1 lb.
			Permit 80SP	80% SP	20-30 oz.
			Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
			Sevimol	4 lb./gal. F	1 qt.
			Turcam	76% WP	1 lb.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Oystershell scale	Treat crawlers about late May and again in 10 days in southern Ohio; 2 weeks later in northern Ohio. (see GENERAL PESTS)	AND:		
			Cythion	5 lb./gal. EC	1 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	1.5 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre
HONEYSUCKLE	Aphids	(see GENERAL PESTS)	AND:		
			Dimethoate 400	4 lb./gal. EC	Soil Injection: use a 1:3 dilution. Inject 1.24 fl. oz. of dilution for each 0.5 inch of trunk diameter.
	Honeysuckle leafminer (Lepidopterous)	Apply to foliage at first sign of mines in leaves or about June 1.	Bioneem	0.3%EC	2.5-5 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Pageant DF	50% DF	1 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Spider Mites	(see GENERAL PESTS)			
	Tatarican aphid	Treat when buds show green in early April and again in about 14 days when leaves are expanded. (see GENERAL PESTS: Aphids)	AND:		
			Dimethoate 400	4 lb./gal. EC	Soil Injection: use a 1:3 dilution. Inject 1.24 fl. oz. of dilution for each 0.5 inch of trunk diameter.
HORNBEAM	Bagworm	(see GENERAL PESTS)			
	Leafhoppers	(see GENERAL PESTS)			
HOSTA	Slugs	(see GENERAL PESTS)			
	Twospotted spider mite	(see GENERAL PESTS)			
INKBERRY	Inkberry leafminer (Dipterous)	Use a non-systemic insecticide on the foliage about May 15 to control the adults. Use one of the systemic materials in early June for control of the larvae in the leaf mines.	Ambush	2 lb./gal. EC	6.4-12.8 oz. (nursery only)
			Ambush 25W	25% WP	6.4-12.8 oz. (nursery only)
			Avid	0.15 lb./gal. EC	4 oz.
			Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Dycarb	76% WP	20-40 oz.
			Dylox	80% SP	20-30 oz.
			Isotox IV	8.5% EC	4.69 qt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Pageant DF	50% DF	2 lb.
			Permit 80SP	80% SP	20-30 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Southern red mite	(see GENERAL PESTS)			
IRIS	Iris borer	Cut and burn leaves in fall after frost. Treat leaves in spring when they are about 5-9 inches tall, then as needed to kill larvae in them.	Cygon 2E	2 lb./gal. EC	1 qt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	35 oz.
			Lindane Borer Spray	1.65 lb./gal. EC	1 pt.
			Pestroy 4EC	4 lb./gal. EC	1 qt.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
IVY	Aphids	(see GENERAL PESTS)	AND:		
			Orthenex Spray	Aerosol	N/A
	Japanese beetle	(see GENERAL PESTS)	AND:		
		(Sevin injures Boston ivy and Virginia creeper.)	Isotox IV	8.5% EC	6.25 qt.
			Orthene	9.4% EC	6.25 qt.
	Leafhoppers	(see GENERAL PESTS)			
	Scale	Treat when crawlers are present, usually May. For Vydate use only on commercial planting not for home planting. Apply 200 gals. of spray per acre or 5-14 gals. per 1,000 square feet of area (see GENERAL PESTS: Scales)			
JUNIPER	Bagworm	(see GENERAL PESTS)	AND:		
			Cygon 2E	2 lb./gal. EC	2 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	25 oz.
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
	Juniper midge	Treat foliage in mid-May when adults are present and/or drench soil under infested plants in late April.	Cygon 2E	2 lb./gal. EC	2 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	25 oz.
	Juniper scale	Use oil as a dormant treatment in the early spring. Use any one of other materials from mid-May to to late June. Two or 3 treatments may be needed be needed at 10-day intervals to clean up an infestation. Repeat same procedure as needed.	AND:		
			Cythion 8	8 lb./gal. EC	1.25 pt.
			Guthion 2S	2 lb./gal EC	1.5-2 pt.
			Malathion 57	5 lb./gal. EC	2 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 qt./acre
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
	Juniper tip midge	Treat foliage about May 15 and again June 20, August 5 and September 15, if needed.	Cygon 2E	2 lb./gal. EC	2 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	25 oz.
	Juniper webworm	Treat in mid-April or early May and again in late September, if needed. (see GENERAL PESTS: Caterpillars)	Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Dylox	80% SP	20-30 oz.
			Margosan-O	0.3%EC	2.5-5 pt.
			Methoxychlor 25	2 lb./gal. EC	2-3 qt.
			Pageant DF	50% DF	0.5 lb.
			Parathion 8 Aqua	8 lb./gal. EC	0.67 pt. (nursery only)
			Proxol 80SP	80% SP	20-30 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Spruce spider mite	(see GENERAL PESTS) Note: Joust & Morestan may damage certain junipers. Test spray prior to overall spray program.	AND:		
			Cygon 2E	2 lb./gal. EC	2 pt.
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	25 oz.
	Tip dwarf mite (Eriophyid)	Apply any one of the materials about June 1 and as needed. Use dormant oil in late November and March or horticultural oil in early spring and late fall.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dicofol 4EC	4 lb./gal. EC	1.25 qt.
			Joust	4 lb./gal. F	4-8 oz.
			Kelthane 35	35% WP	1-1.3 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
			Morestan 4	4 lb./gal. F	4-8 oz.
			Oils, dormant (see ALTERNATIVE PRODUCTS)		
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
			Pentac Aquaflow	1 lb./gal. F	8-16 oz.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labeled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
JUNIPER (cont'd)	Tip dwarf moth (cont'd)		Pounce WP	50% WP	12-16 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
LARCH	Bagworm	(see GENERAL PESTS)	AND:		
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
	Larch casebearer	Treat in early May when larvae are feeding or in late June when new generation is present.	Methoxychlor 25	2 lb./gal. EC	2-3 qt.
	Woolly larch adelgid	Treat in early May when crawlers first appear.	Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
			Oils, dormant (see ALTERNATIVE PRODUCTS)		
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
			Soaps (fatty acid salts) (see ALTERNATIVE PRODUCTS)		
LILAC	Fall webworm	(see GENERAL PESTS)			
	Lilac (=Ash) borer	Treat trunk and large branches in mid-May in southern Ohio and early June in northern Ohio.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Dursban 1E	1 lb./gal. EC	4 qt.
			Dursban	0.5 lb./gal. EC	8 qt.
			Endocide 2EC	2 lb./gal. EC	0.67-1.5 qt. (nursery only)
			Lindane 20%	1.65 lb./gal. EC	3 pt.
			Lindane Borer Spray	1.65 lb./gal. EC	3 pt.
			Pageant DF	50% DF	2 lb.
			Phaser	3 lb./gal. EC	0.67-1.5 qt. (nursery only)
			Thiodan 50WP	50% WP	1-2 lb. (nursery only)
			Thiodan 3EC	3 lb./gal. EC	0.67-1.5 qt. (nursery only)
		SPECIAL INFORMATION: Clearwing borer traps can be used to pinpoint adult emergence to aid in proper timing of sprays. Traps should be deployed about 2 weeks before normal emergence time. See trap label for specific pest and calculate proper time to deploy traps.			
	Lilac leafminer (Lepidoptera)	Treat at first sign of mining in leaves.	[illegible]	9.3% EC	2.5-5 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Isotox IV	8.5% EC	4-8 qt.
			Morgan-O	9.3% EC	2.5-5 pt.
			Orthene	9.4% EC	4-8 qt.
			Pageant DF	50% DF	2 lb.
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	10-32 oz.
	Oystershell scale	(see GENERAL PESTS)	AND:		
			Cythion	5 lb./gal. EC	1 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	1 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
LINDEN	Aphids	(see GENERAL PESTS)			
	Bagworm	(see GENERAL PESTS)			
	Basswood lace bugs	Treat at first sign of feeding damage or when the bugs are present. (see GENERAL PESTS: Lace Bugs)			
	Borers	Treat about early May and again in 4 weeks.			
	Cottony maple scale	A dormant oil spray may be used before growth starts in the spring. Be sure to follow the manufacturer's recommendations. As a foliar treatment, spray infested trees thoroughly with one of these materials about July 1 and again in 10 days. Be sure to cover lower leaf surface with spray. (see GENERAL PESTS: Scales)			
	Fall and spring cankerworms	(see GENERAL PESTS)			
	Fall webworm	(see GENERAL PESTS)			

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
LINDEN (cont'd)	Japanese beetle	(see GENERAL PESTS)	AND:		
			Isotox IV	8.5% EC	6.25 qt.
			Orthene	9.4% EC	6.25 qt.
	Linden leaf beetle	Spray trees at first sign of beetles and feeding injury, which should be in late June or early July.	Mavrik Aquaflow	2 lb./gal. F	4-10 oz.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
	Scurfy scale	Use oil as a dormant treatment. Use any one of other materials against crawlers in late May. (see GENERAL PESTS: Scales)	AND:		
			Cythion	5 lb./gal. EC	1.5 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	1.5 pt.
LOCUST (Black)	Locust borer	Spray tree trunks thoroughly in early September (when goldenrod is blooming).	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Lindane Borer Spray	1.65 lb./gal. EC	3 qt.
			Pageant DF	50% DF	2 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
	Leafhopper	(see GENERAL PESTS)			
	Locust leafminer (Coleopterous)	Treat when foliage is developing and again in early June.	Bioneem	0.3%EC	2.5-5 pt.
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Lindane 20%	1.65 lb./gal. EC	1 pt.
			Lindane Borer Spray	1.65 lb./gal. EC	1 pt.
			Margosan-O	0.3%EC	2.5-5 pt.
			Pageant DF	50% DF	2 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
MAGNOLIA	Leafminer (Coleopterous)	Treat when mines are first seen and repeat as needed.	Bioneem	0.3%EC	2.5-5 pt.
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Pageant DF	50% DF	2 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Magnolia scale	Use dormant oil as fall or spring treatment. Treat with any one of the other materials when crawlers are active in August and September. Repeat treatment as needed. An April spray may also effect some scale mortality. (see GENERAL PESTS: Scales)	AND:		
			Cythion	5 lb./gal. EC	2 pt.
			Cythion 8	8 lb./gal. EC	1.25 pt.
			Malathion 57	5 lb./gal. EC	2 pt.
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
	Yellow poplar weevil	Treat foliage when adults first appear, which should be in late June or early July.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dursban Turf	4 lb./gal. EC	1 pt.
			Dursban 50WSP	50% WSP	1 lb.
			Pageant DF	50% DF	1 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
MAHONIA	Barberry aphid	(see GENERAL PESTS)			
	Barberry looper (Barberry caterpillar)	Treat in late May and then as needed. There are three generations per year. (see GENERAL PESTS: Caterpillars)	Bioneem	0.3%EC	2.5-5 pt.
			Decathlon	20% WP	1.3 oz.
			Margosan-O	0.3%EC	2.5-5 pt.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Barberry webworm	Treat when larvae are present. (see GENERAL PESTS: Caterpillars)	Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dylox	80% SP	20-30 oz.
			Margosan-O	0.3%EC	2.5-5 pt.
			Proxol 80SP	80% SP	20-30 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
MAHONIA (cont'd)	Barberry webworm (cont'd)		Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
MAPLE	Aphids	(see GENERAL PESTS)	AND:		
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Note: Malathion may cause slight injury to maple.				
	Note: Do not apply Isotox IV or Orthene to red or sugar maples.				
	Bagworm	(see GENERAL PESTS)			
	Note: Do not apply Isotox IV or Orthene to red or sugar maples.				
	Borers (bark beetles & (flatheaded)	Treat trunk and lower branches in late May, June and July.	Lindane Borer Spray	1.65 lb./gal. EC	3 qt.
	Cottony maple scale	A dormant oil spray may be used before growth starts in the spring. Be sure to follow the manufacturer's recommendations. Some varieties of maple are susceptible to oil injury. Spray infested trees throughly with one of the standard materials about July 1 and again in 10 days. Be sure to cover lower leaf surfaces with spray. New information indicates that a spray applied as late as late-July and during September should control scale found on the undersides of leaves. (see GENERAL PESTS: Scales)			
	Note: Do not apply Isotox IV or Orthene to red or sugar maples.				
	Erenium mites (Eriophyid)	Treat infested trees in early spring about time buds are starting to open or at first sign of red or yellow patches on under surface of the leaves.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dicofol 4EC	4 lb./gal. EC	1.25 qt.
			Joust	4 lb./gal. F	4-8 oz.
			Kelthane 35	35% WP	1-1.3 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
			Morestan 4	4 lb./gal. F	4-8 oz.
			Oils, dormant (see ALTERNATIVE PRODUCTS)		
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
			Pentac Aquaflow	1 lb./gal. F	8-16 oz.
			Pentac WP	50% WP	12-16 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
	Fall cankerworm	(see GENERAL PESTS)	AND:		
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Note: Do not apply Isotox IV or Orthene to red or sugar maples.				
	Fall webworm	(see GENERAL PESTS)	AND:		
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Note: Do not apply Isotox IV or Orthene to red or sugar maples.				
	Note: Do not use Methoxychlor on red or Japanese maples.				
	Forest tent caterpillar	(see GENERAL PESTS)			
	Note: Do not apply Isotox IV or Orthene to red or sugar maples.				
	Greenstriped mapleworm	Treat in late May or early June. (see GENERAL PESTS: Caterpillars)	Bioneem	0.3%EC	2.5-5 pt.
			Decathlon	20% WP	1.3 oz.
			Margosan-O	0.3%EC	2.5-5 pt.
	Note: Do not apply Orthene to red or sugar maples.		Orthene	9.4% EC	4.69 qt.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Japanese beetle	(see GENERAL PESTS)			
	Note: Do not apply Isotox IV or Orthene to red or sugar maples.				
	Leafhoppers	(see GENERAL PESTS)			
	Note: Do not apply Isotox IV or Orthene to red or sugar maples.				
	Lecanium scales	Treat when crawlers are first seen, which is usually mid to late June (see GENERAL PESTS: Scales)	AND: Malathion 57	5 lb./gal. EC	2.5 pt.
	Note: Do not apply Isotox IV or Orthene to red or sugar maples.				

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
MAPLE (cont'd)	Maple bladdergall mite	Dormant oil may reduce overwintering populations. Use any one of the standard materials when the leaves are bout 1/4 expanded and again in 10 days. Cover lower leaf surface with spray.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dicofol 4EC	4 lb./gal. EC	1.25 qt.
			Joust	4 lb./gal. F	4-8 oz.
			Kelthane 35	35% WP	1-1.3 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
			Morestan 4	4 lb./gal. F	4-8 oz.
			Oils, dormant (see ALTERNATIVE PRODUCTS)		
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
			Pentac Aquaflow	1 lb./gal. F	8-16 oz.
			Pentac WP	50% WP	12-16 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
	Maple petiole borer (Hymenopterous)	Nothing is registered for this pest. Leaf drop will not damage trees. Larva stays in petiole stem on plant, so raking leaves will not help in control.			
	Maple shoot moths	Treat in early May and repeat as needed.			
	Note: Do not apply Isotox IV or Orthene to red or sugar maples.		Isotox IV	8.5% EC	4.69 qt.
			Orthene	9.4% EC	4.69 qt.
			Talstar T&O	7.9% F	12-40 oz.
			Talstar 10WP	10% WP	9.6-32 oz.
	Oystershell scale	Treat crawlers about late May and again in 10 days in southern Ohio; 2 weeks later in northern Ohio. (see GENERAL PESTS: Scales)	AND:		
			Cythion	5 lb./gal. EC	1 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	1 pt.
	Note: Some maples are susceptible to oil injury. See label.		Malathion		
	Note: Do not apply Isotox IV or Orthene to red or sugar maples.		Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre
	Spider mites	(see GENERAL PESTS)			
	Note: Do not apply Isotox IV or Orthene to red or sugar maples.				
	Spring cankerworm	(see GENERAL PESTS)	AND:		
	Note: Do not apply Isotox IV or Orthene to red or sugar maples.		Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
MOCK ORANGE	Aphids	(see GENERAL PESTS)			
	Leafminers		Bioneem	0.3%EC	2.5-5 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Margosan-O	0.3%EC	2.5-5 pt.
			Pageant DF	50% DF	2 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
MOUNTAIN ASH	European red mite	(see GENERAL PESTS)			
	Fall webworm	(see GENERAL PESTS)			
	Japanese beetle	(see GENERAL PESTS)			
	Lace bugs	Treat in mid-May. Make two applications spaced about 10 days apart. (see GENERAL PESTS: Lace Bugs)			
	Mountain ash sawfly	Spray foliage about 2 weeks after the petals fall and again in 2 weeks. (see GENERAL PESTS)	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
			Orthene	9.4% EC	4.69 qt.
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Woolly aphids	Spray in early May. (see GENERAL PESTS)			

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To 100 Gal. Water
MOUNTAIN LAUREL	Azalea bark scale	Treat when crawlers are present, which usually is June. A second spray in 10 days may be needed. (see GENERAL PESTS: Scales)	AND:		
			Cythion	5 lb./gal. EC	2 pt.
			Cythion 8	8 lb./gal. EC	1.25 pt.
			Malathion 57	5 lb./gal. EC	2 pt.
	Azalea leafminer (Lepidopterous)	Treat when mines are first seen and repeat as needed to protect new growth.	Bioneem	0.3%EC	2.5-5 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Pageant DF	50% DF	2 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
(cont'd)			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Lace bug	Treat in early June. (see GENERAL PESTS: Lace Bugs)			
	Rhododendron borer	Treat trunk and large branches in mid-late May.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Dursban 1E	1 lb./gal. EC	4 qt.
			Dursban	0.5 lb./gal. EC	8 qt.
			Pageant DF	50% DF	2 lb.
OAK	Aphids	(see GENERAL PESTS)	AND:		
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Asiatic oak weevil		Bioneem	0.3%EC	2.5-5 pt.
			Dursban Turf	4 lb./gal. EC	1 pt.
			Dursban 50WSP	50% WSP	1 lb.
			Pageant DF	50% DF	1 lb.
	Bagworm	(see GENERAL PESTS)			
	Borers	Spray trunks thoroughly in mid-June and July.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Pageant DF	50% DF	2 lb.
	Clearwing borer in pin oak	Pin oak borer flies during odd numbered years. Flight begins in mid-May in northeastern Ohio. Apply spray in late May.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Pageant DF	50% DF	2 lb.
		SPECIAL INFORMATION			
		Clearwing borer traps can be used to pinpoint adult emergence to aid in proper timing of sprays. Traps should be deployed about 3 weeks before normal treatment time. See timing listed for specific pest and calculate proper time to deploy traps.			
	Elm spanworm	Treat when larvae are seen in early to mid-June. (see GENERAL PESTS: Caterpillars)	Bioneem	0.3%EC	2.5-5 pt.
			"Bt" (kurstaki)	various	various
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Margosan-O	0.3%EC	2.5-5 pt.
			Pageant DF	50% DF	0.5 lb.
			Permethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Fall webworm	(see GENERAL PESTS)	AND:		
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Forest tent caterpillar	(see GENERAL PESTS)			
	Galls (Hymenopterous)	Chemical control recommended only in special cases because galls rarely harm trees. Stem and twig galls should be pruned and destroyed while they are still green to reduce further infestation. Adult gall wasps are usually active when the new leaves and shoots are expanding.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
	Golden oak scale	Use oil as a dormant treatment in the spring. Use any one of other materials against crawlers beginning about mid-May and apply 2 or 3 applications spaced about 10 days apart. (see GENERAL PESTS: Scales)	AND:		
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	35 oz.
			Rockland Shade Tree Insect Spray	2 lb.+12 lb./gal. EC	2-3 qt. (chestnut, English & white only)

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
OAK (cont'd)	Gypsy moth	(see GENERAL PESTS)			
	Japanese beetle	(see GENERAL PESTS)			
	Leafhoppers	(see GENERAL PESTS)			
	Leafminers (Lepidopterous)	Treat when adults are present, which should be when the leaves are about half expanded. Repeat treatment for second generation on white oak only. Cover upper leaf surface with spray.	Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.69 qt.
			Orthenex Spray	Aerosol	N/A
			Pageant DF	50% DF	2 lb.
			Sevin 50W	50% WP	2 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Lecanium scales	Treat when crawlers are present, usually mid to late June. (see GENERAL PESTS: Scales)	AND:		
			Malathion 57	5 lb./gal. EC	2.5 pt.
	May/June beetles	Spray when foliage is being eaten, which should be in June. Beetles feed at night.	Carbaryl 5D	5% D	N/A
			Carbaryl 10D	10% D	N/A
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.9 oz.
			Dursban Turf	4 lb./gal. EC	1-2 pt.
			Dursban 50WSP	50% WSP	1-2 lb.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	1-2 qt.
			Pageant DF	50% DF	2 lb.
			Scimitar WP	9.52% WP	2.4-4.8 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Tempo 2	2 lb./gal. EC	1.5 oz.
			Tempo 20WP	20% WP	1.9 oz.
	Oak kermes scale	Use oil as a dormant treatment in the spring. Use any one of other materials against crawlers in mid-May and apply 2 or 3 applications at 10-day intervals. Repeat treatment in late July. (see GENERAL PESTS: Scales)	AND:		
			Cythion	5 lb./gal. EC	2 pt.
			Cythion 8	8 lb./gal. EC	1.25 pt.
			Malathion 57	5 lb./gal. EC	2 pt.
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt. (white & red only)
	Oak lace bug	Treat when bugs are first seen, usually in early to mid-May, and repeat as needed. (see GENERAL PESTS: Lace Bugs)	AND:		
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	1-2 qt.
	Obscure oak scale	Apply superior oil before growth starts. Use any of the foliar sprays about mid- to late July. (see GENERAL PESTS: Scales)			
	Orangestriped oakworm	Treat in late May or in June.	Bioneem	0.3%EC	2.5-5 pt.
			"Bt" (kurstaki)	various	various
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Isotox IV	8.5% EC	4.69 qt.
			Orthene	9.4% EC	4.69 qt.
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Pin oak sawfly	Treat when larval feeding is seen.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Isotox IV	8.5% EC	4.69 qt.
			Orthene	9.4% EC	4.69 qt.
			Orthene	75% SP	1.0 lb.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
OAK (cont'd)	Pin oak sawfly (cont'd)		Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Skeletoniozers (Lepidopterous)	Treat when damage is first seen; about mid-June and again in August.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathion	20% WP	1.9 oz.
			Scimitar WP	9.52% WP	2.4-4.8 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Tempo 2	2 lb./gal. EC	1.5 oz.
			Tempo 20WP	20% WP	1.9 oz.
	Spider mites	(see GENERAL PESTS)			
	Spring cankerworm	(see GENERAL PESTS)	AND:		
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Tent caterpillars	(see GENERAL PESTS)			
	Twig pruner	Chemical control is not practical. Rake and destroy fallen twigs before late May.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Pageant DF	50% DF	2 lb.
			Talstar T&O	7.9% F	9.6-40 oz.
			Talstar 10WP	10% WP	12-32 oz.
	Twolined chestnut borer	Treat in late May and again late June.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Pageant DF	50% DF	2 lb.
PACHYSANDRA	Euonymus scale	Treat when crawlers are present, late May and early June. Apply at least 3 treatments spaced about 10 days apart and repeat the same procedure as needed. (see GENERAL PESTS: Scales)	AND:		
			Cythion	5 lb./gal. EC	1-1.5 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Guthion 2S	2 lb./gal EC	1.5-2 pt.
			Malathion 57	5 lb./gal. EC	1.5 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
	Oystershell scale	(see GENERAL PESTS)	AND:		
			Cythion	5 lb./gal. EC	1 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	1 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre
	Twospotted spider mite	(see GENERAL PESTS)			
PHLOX	Twospotted spider mite	(see GENERAL PESTS)			
PIERRIS (Japanese andromeda)	Andromeda lace bug	Treat in mid- to late-May. Make two applications (see GENERAL PESTS: Lace Bugs)	AND:		
			Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
	Southern red mite	(see GENERAL PESTS)			
PINE	Allegheny mound ant	Treat in early April by thoroughly spraying the ant mounds.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Pageant DF	50% DF	2 lb.
			Scimitar WP	9.52% WP	2.4-4.8 oz.
	Aphids	(see GENERAL PESTS)	AND:		
			Cygon 2E	2 lb./gal. EC	2 pt.
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
	Bagworm	(see GENERAL PESTS)	AND:		
			Cygon 2E	2 lb./gal. EC	2 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
	Bark beetles	Spray all trunk surfaces when adults are active. Engraver beetles (Ips species) may require several, seasonal sprays. Healthy trees are usually not attacked.	Carbaryl 4L	4 lb./gal. F	4 gal. (named beetles only)
			Carbaryl 50WP	50% WP	40 lb. (named beetles only)
			Lindane 20%	1.65 lb./gal. EC	1 pt./5 gal. (wet trunks)
			Lindane Borer Spray	1.65 lb./gal. EC	6 T/gal. (wet trunks)
			Pageant DF	50% DF	16.5 lb.
			Sevimol	4 lb./gal. F	20 qt. (named beetles only)
			Sevin 50W	50% WP	40 lb. (named beetles only)

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
PINE (cont'd)	Black pine leaf scale	(see GENERAL PESTS: Scales)	AND:		
			Guthion 2S	2 lb./gal EC	3-4 pt.
			Malathion 57	5 lb./gal. EC	2 pt.
	Eastern pineshoot borer (*Eucosma gloriola*) (white pine only)	Moths appear in May and larvae feed inside terminal and lateral shoots. Treat in early May and again in 10 days or prune out brown, wilted or distorted shoots.	Guthion 2S	2 lb./gal EC	1.5-3 pt. (Christmas trees only)
			Talstar T&O	7.9% F	9.6-40 oz.
			Talstar 10WP	10% WP	12-32 oz.
	Eriophyid mites	The mites can be controlled best when new growth is 3-5" long (early June).	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dicofol 4EC	4 lb./gal. EC	1.25 qt.
		Note: Oils will remove glaucus (blue) bloom from tree foliage.	Joust	4 lb./gal. F	4-8 oz.
			Kelthane 35	35% WP	1-1.3 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
			Morestan 4	4 lb./gal. F	4-8 oz.
			Oils, dormant (see ALTERNATIVE PRODUCTS)		
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
			Pentac Aquaflow	1 lb./gal. F	8-16 oz.
			Pentac WP	50% WP	12-16 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
	European pine shoot moth	Treat terminal growth thoroughly in mid-April and again about late June. Pruning off infested terminals before June will help.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Cygon 2E	2 lb./gal. EC	2 pt.
			Cythion	5 lb./gal. EC	1.5 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Decathlon	20% WP	1.3 oz.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dursban Turf	4 lb./gal. EC	1 pt.
			Dursban 50WSP	50% WSP	1 lb.
			Guthion 2S	2 lb./gal EC	1.5-3 pt.
			Malathion 57	5 lb./gal. EC	1.5 pt.
			Methyl Parathion 4E	4 lb./gal. EC	2 pt./acre (Christmas trees only)
			Methyl Parathion 7.5	7.5 lb./gal. EC	1 pt./acre (Christmas trees only)
			Pageant DF	50% DF	2 lb.
			Pestroy 4EC	4 lb./gal. EC	1 qt.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Nantucket pine tip moth	Treat in April through May and again from mid-July to early August as needed.	Ambush	2 lb./gal. EC	6.4-12.8 oz. (Christmas trees only)
			Ambush 25W	25% WP	6.4-12.8 oz. (Christmas trees only)
			Asana XL	0.66 lb./gal. EC	5.8-9.6 oz. (nursery only)
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Cygon 2E	2 lb./gal. EC	2 pt.
			Decathlon	20% WP	1.3 oz.
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	60 oz.
			Dimilin 4L	4 lb./gal. EC	2 oz./acre
			Dimilin 25W	25% WP	4 oz./acre
			Di-Syston	15% G	2.5 oz./inch trunk diameter
			Dursban Turf	4 lb./gal. EC	1 pt.
			Dursban 50WSP	50% WSP	1 lb.
			Dycarb	76% WP	20-40 oz.
			Ficam W	76% WP	2 lb.
			Guthion 2S	2 lb./gal EC	1.5-3 pt. (nursery only)
			Isotox IV	8.5% EC	4.69 qt.
			Methyl Parathion 4E	4 lb./gal. EC	2 pt./acre (Christmas trees only)
			Methyl Parathion 7.5	7.5 lb./gal. EC	1 pt./acre (Christmas trees only)
			Orthene	9.4% EC	4.69 qt.
			Orthene	75% SP	1.0 lb.
			Pageant DF	50% DF	1 lb.
			Pestroy 4EC	4 lb./gal. EC	1 qt.
			Pounce 3.2EC	3.2 lb./gal. EC	4-8 oz./acre (nursery only)
			Pounce 25WP	25% WP	6.4-12.8 oz./acre (nursery only)
			Scimitar WP	9.52% WP	2.4-4.8 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
PINE (cont'd)	Nantucket pine tip moth (cont'd)		Tempo 20WP	20% WP	1.3 oz.
			Torsan	70% WP	2 lb.
	Northern pine weevil	STUMP TREATMENT Fell and destroy stumps before late June or treat stumps before late April or after trees are cut and the temperature is above 50°F. Kerosene or fuel oil is often used as a carrier.	Asana XL	0.66 lb./gal. EC	5.8-9.6 oz. (nursery only)(stump only)
	Pales weevil		Dursban Turf	4 lb./gal. EC	1 pt.
			Dursban 50WSP	50% WSP	1 lb.
			Dyrsan	76% WP	20-40 oz.
			Ficam W	76% WP	42 oz.
			Pageant DF	50% DF	1 lb.
		FOLIAR TREATMENT Seedlings and young twigs can be protected by spraying with lindane in mid-April to early May and again in August.	Pestroy 4EC	4 lb./gal. EC	1 qt.
			Torsan	76% WP	42 oz.
	Pine bark adelgid	Use oil in spring as a dormant treatment. Use any one of other materials when crawlers are active, usually about mid-May. A fast stream of water can be used to wash many adelgids from your trees.	Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Oils, dormant (see ALTERNATIVE PRODUCTS)		
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
			Pageant DF	50% DF	0.5 lb.
			Soaps (fatty acid salts) (see ALTERNATIVE PRODUCTS)		
	Pine needle midge		Asana XL	0.66 lb./gal. EC	5.8-9.6 oz. (nursery only)
	Pine needle scale	Use Ethion and oil as a dormant treatment. Use any one of other materials against crawlers in late April and mid-July. (see GENERAL PESTS: Scales)	AND:		
			Cythion	5 lb./gal. EC	4 pt.
			Cythion 8	8 lb./gal. EC	2 pt.
			Guthion 2S	2 lb./gal EC	1.5-3 pt. (Christmas trees only)
			Malathion 57	5 lb./gal. EC	4 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	5 qt./acre
	Pine root collar weevil	Apply the 1st spray about mid-May, the 2nd spray about mid-August and a 3rd spray in early September.	Dursban Turf	4 lb./gal. EC	1 pt.
			Dursban 50WSP	50% WSP	1 lb.
			Pageant DF	50% DF	1 lb.
	Pine tortoise scale	Use oil as a dormant treatment in spring. Use any one of other materials against crawlers in mid-June through July. (see GENERAL PESTS: Scales)	AND:		
			Guthion 2S	2 lb./gal. EC	1.5-3 pt. (Christmas trees only)
	Pine tube moth	Treat in early May and again in mid-July.	Talstar T&O	7.9% F	6.40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
	Pine webworm	Treat when larvae are seen, usually in mid-July and mid-August.	Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 2E & 25% (Spectracide)	25% EC	1 qt.
			Diazinon 4E & AG500	48% gal. EC	1 pt.
			Dylox	80% SP	20-30 oz.
			Proxol 80SP	80% SP	20-30 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	8.40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Sawflies	Treat when larvae first appear and feeding is seen, in early May for most species of sawflies. (Sawflies may be present from late April through September.)	Asana XL	0.66 lb./gal. EC	5.8-9.6 oz. (named sawflies only)
			Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Guthion 2S	2 lb./gal EC	1.5-3 pt. (Christmas trees only)
			Isotox IV	8.5% EC	4.69 qt.
			Methoxychlor 2S	2 lb./gal. EC	2.5 qt.
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		
			Orthene	9.4% EC	4.69 qt.
			Orthene	75% SP	1.0 lb.
			Pageant DF	50% DF	0.5 lb.
			Pestroy 4EC	4 lb./gal. EC	1 qt. (European only)
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2.3 qt.
			Scimitar WP	9.52% WP	2.4-4.8 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
PINE (cont'd)	Sawflies (cont'd)		Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Spittlebugs	Treat when bugs appear and spittle mass is evident, usually about mid-May to July.	Asana XL	0.66 lb./gal. EC	5.8-9.6 oz. (nursery only)
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.9 oz.
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Ficam W	76% WP	21 oz.
			Isotox IV	8.5% EC	4.69 qt.
			Orthene	9.4% EC	4.69 qt.
			Pestroy 4EC	4 lb./gal. EC	1 qt. (Saratoga only)
			Resmethrin EC26	2 lb./gal. EC	1 pt. (named plants only)
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
			Scimitar WP	9.52% WP	2.4-4.8 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Tempo 2	2 lb./gal. EC	1.5 oz.
			Tempo 20WP	20% WP	1.9 oz.
			Turcam	76% WP	21 oz.
	Spruce spider mite	(see GENERAL PESTS)			
	White pine weevil	Spray leaders in spring when beetles appear, about mid-April.	Lindane Borer Spray	1.65 lb./gal. EC	3 pt.
	Zimmerman pine moth	Spray in mid-April and/or in late August for larval control.	Cygon 2E	2 lb./gal. EC	2 pt.
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	35 oz.
			Dursban Turf	4 lb./gal. EC	1 pt.
			Dursban 50WSP	50% WSP	1 lb.
			Endocide 3EC	3 lb./gal. EC	1 qt. (nursery only)
			Pageant DF	50% DF	1 lb.
			Phaser	3 lb./gal. EC	1 qt. (nursery only)
			Thiodan 50WP	50% WP	1.5 lb. (nursery only)
			Thiodan 3EC	3 lb./gal. EC	1 qt. (nursery only)
POPLAR	Forest tent caterpillar	(see GENERAL PESTS)			
	Oystershell scale	(see GENERAL PESTS)	AND:		
	Note: Do not apply Orthene to lombardy poplar.		Cythion	5 lb./gal. EC	1 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	1 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre
	Poplar tent-maker	Treat when larvae are first seen, usually from May to October, as needed. (see GENERAL PESTS: Caterpillars)	Bioneem	0.3%EC	2.5-5 pt.
			Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Dycarb	76% WP	12-20 oz.
			Ficam W	76% WP	11 oz.
			Isotox IV	8.5% EC	4.69 qt.
			Orthene	9.4% EC	4.69 qt.
			Pageant DF	50% DF	0.5 lb.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
			Turcam	76% WP	11 oz.
PRIMROSE	Twospotted spider mite	(see GENERAL PESTS)			
PRIVET	Privet rust mite (Eriophyid)	Treat when mites are first seen in May and repeat as needed.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 4E & AG500	4lb./gal. EC	1 pt.
			Dicofol 4EC	4 lb./gal. EC	1.25 qt.
			Joust	4 lb./gal. F	4-8 oz.
			Kelthane 35	35% WP	1-1.3 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
			Morestan 4	4 lb./gal. F	4-8 oz.
			Oils, dormant (see ALTERNATIVE PRODUCTS)		
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)		

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To 100 Gal. Water
PRIVET (cont'd)	Privet rust mite (cont'd)		Pentac Aquaflow	1 lb./gal. F	8-16 oz.
			Pentac WP	50% WP	12-16 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
	Privet thrips	Treat at first sign of a thrips infestation. (see GENERAL PESTS: Thrips)			
	White peach scale	Treat when crawlers are present, about June 1. (see GENERAL PESTS: Scales)			
PYRACANTHA (See Firethorn)					
REDBUD	Fall webworm	(see GENERAL PESTS)			
	Leafhoppers	(see GENERAL PESTS)			
	Note: Do not apply Isotox IV or Orthene to redbud as foliar injury may occur.				
	Redbud leafroller	Treat at first sign of leaves being webbed together. (see GENERAL PESTS: Caterpillars)			
	Thornbugs	Treat after foliage has expanded in mid-May.	Carbaryl 4L	4 lb./gal. F	1 qt.
			Carbaryl 50WP	50% WP	2 lb.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
RHODODENDRON	Azalea bark scale	Treat when crawlers are present in June. (see GENERAL PESTS: Scales)	AND:		
			Cythion	5 lb./gal. EC	2 pt.
			Cythion 8	8 lb./gal. EC	1.25 pt.
			Malathion 57	5 lb./gal. EC	2 pt.
	Black vine weevil	(see GENERAL PESTS)			
	Rhododendron borer	Treat trunk and branches in mid-May for southern Ohio and early June in northern Ohio.	Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Dursban	0.5 lb./gal. EC	8 qt.
			Lindane 20%	1.66 lb./gal. EC	3 pt.
			Lindane Borer Spray	1.66 lb./gal. EC	3 pt.
			Pageant DF	50% DF	2 lb.
	Rhododendron lace bug	Treat when lace bugs first appear (about mid-May) and repeat as needed to protect new growth. (see GENERAL PESTS: Lace Bugs)	AND:		
			Lindane 20%	1.65 lb./gal. EC	1.5 pt.
	Southern red mite	(see GENERAL PESTS)			
ROSE	Aphids	(see GENERAL PESTS)	AND:		
			Cygon 2E	2 lb./gal. EC	1 pt.
			Dimethoate 267EC	2.67 lb./gal. EC	1 pt.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
	Japanese beetle	(see GENERAL PESTS)			
	Leafhoppers	(see GENERAL PESTS)	AND:		
			Cygon 2E	2 lb./gal. EC	1 pt.
			Dimethoate 267EC	2.67 lb./gal. EC	1 pt.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
			Malathion 50	4.4 lb./gal. EC	1.5 qt.
	Leafminers		Bioneem	0.09% EC	2.5-5 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Lindane 20%	1.66 lb./gal. EC	3 pt.
			Margosan-O	0.3% EC	2.5-5 pt.
			Pageant DF	50% DF	2 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Omnivorous leaftier	Treat when first leaves are noticed being folded, usually in mid-May. Repeat as needed. (see GENERAL PESTS: Caterpillars)	"Bt" (kurstaki)	various	various
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Diazinon 50W	50% WP	1 lb.
			Diazinon 4E & AG500	4 lb./gal. EC	1 pt.
			Dimilin	25% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
ROSE (cont'd)	Omnivorous leafroller (cont'd)		Dursban 50WSP	50% WSP	0.5 lb.
			Methoxychlor 25	2 lb./gal. EC	2-3 qt.
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	9.6-40 oz.
			Talstar 10WP	10% WP	12-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Rose Chafer	Treat when first adults are noted, usually in late June, and again as needed.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Marlate 50	50% WP	2-3 lb.
			Methoxychlor 2EC	2 lb./gal. EC	2-3 qt.
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.
			Sevin 50W	50% WP	2 lb.
	Rose midge	Cut and destroy infested buds to destroy maggots. Treat as soon as affected buds are noticed, usually in early May, are retreat as needed.	Orthene	9.4% EC	4.69 qt.
			Orthenex Spray	Aerosol	N/A
	Rose slugs (Hymenopterous) (sawflies)	Treat when skeletonized leaves are first noticed in early May. Retreat as needed.	Carbaryl 5D	5% D	N/A
			Carbaryl 10D	10% D	N/A
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz. (bristly)
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Marlate 50	50% WP	2-3 lb.
			Methoxychlor 2EC	2 lb./gal. EC	2-3 qt.
			Oils, horticultural, summer	(see ALTERNATIVE PRODUCTS)	
			Pageant DF	50% DF	0.5 lb.
			Resmethrin EC26	2 lb./gal. EC	1 pt.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.
			Sevin 50W	50% WP	2 lb.
			Tempo 2	2 lb./gal. EC	1 oz. (bristly)
			Tempo 20WP	20% WP	1.3 oz. (bristly)
	Spider mites	(see GENERAL PESTS)	AND:		
			Cygon 2E	2 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	1 pt.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
	Thrips	Treat when thrips are seen and repeat as needed. (see GENERAL PESTS: Thrips)	AND:		
			Cygon 2E	2 lb./gal. EC	1 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	1 pt.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
SERVICEBERRY (Amelanchier)	Aphids	(see GENERAL PESTS)			
	Hawthorn lace bug	Treat when bugs are beginning to build up, usually mid- to late-May. Then treat as needed throughout the summer. (see GENERAL PESTS: Lace Bugs)	AND:		
			Dycarb	76% WP	12-20 oz.
			Ficam W	76% WP	6 oz.
			Turcam	76% WP	6 oz.
	Japanese beetle	(see GENERAL PESTS)			
	Pear slug (sawfly)	Treat when skeletonizing of the leaves is seen.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Diazinon 50W	50% WP	3 lb.
			Diazinon 4E & AG500	4lb./gal. EC	3 pt.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Oils, horticultural, summer	(see ALTERNATIVE PRODUCTS)	
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water	
SPIREA	Aphids	(see GENERAL PESTS)				
	Spirea leaftier	Treat when the first leaves are seen folded together. (see GENERAL PESTS: Caterpillars)				
SPRUCE	Aphids	(see GENERAL PESTS)	AND:			
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.	
	Black vine weevil	(see GENERAL PESTS)				
	Bagworm	(see GENERAL PESTS)	AND:			
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.	
	Balsam twig aphid	Treat when aphids are first present, usually late April or early May. (see GENERAL PESTS)	AND:			
			Asana XL	0.66 lb./gal. EC	5.8-9.6 oz.	(nursery only)
	Cooley spruce gall adelgid (aphid)	Treat before buds start to break in the spring (late March to mid-April), or after the galls open in late July to mid-August.	Carbaryl 4L	4 lb./gal. F	1 pt.	
			Carbaryl 50WP	50% WP	2 lb.	
			Dursban Turf	4 lb./gal. EC	8 oz.	
			Dursban 50WSP	50% WSP	0.5 lb.	
		Note: Oils remove the glaucus (blue) bloom from trees.	Oils, dormant (see ALTERNATIVE PRODUCTS)			
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)			
			Pageant DF	50% DF	0.5 lb.	
			Sevimol	4 lb./gal. F	1-2 qt.	
			Sevin 50W	50% WP	2 lb.	
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)		
	Eastern spruce gall adelgid (aphid)	Treat before buds start to break in the spring (late March to mid-April), or after the galls open in mid-August to September.	Carbaryl 4L	4 lb./gal. F	1 pt.	
			Carbaryl 50WP	50% WP	2 lb.	
			Dursban Turf	4 lb./gal. EC	8 oz.	
			Dursban 50WSP	50% WSP	0.5 lb.	
		Note: Oils remove the glaucus (blue) bloom from trees.	Oils, dormant (see ALTERNATIVE PRODUCTS)			
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)			
			Pageant DF	50% DF	0.5 lb.	
			Sevimol	4 lb./gal. F	1 qt.	
			Sevin 50W	50% WP	2 lb.	
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)		
	Pine needle scale	Use any of the materials against crawlers in late April or early May. (see GENERAL PESTS: Scales)	AND:			
			Cythion	5 lb./gal. EC	4 pt.	
			Cythion 8	8 lb./gal. EC	2 pt.	
			Guthion 2S	2 lb./gal EC	1.5-3 pt.	(Christmas trees only)
	Note: Oil will remove the blue color from Colorado blue spruce.		Malathion 57	5 lb./gal. EC	4 pt.	
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	5 pt./acre	
			Resmethrin EC26	2 lb./gal. EC	1 pt.	
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.	
	Sawflies	Treat when larvae are small; in early spring.	Carbaryl 4L	4 lb./gal. F	1 pt.	
			Carbaryl 50WP	50% WP	2 lb.	
			Decathlon	20% WP	1.3 oz.	
			Dursban Turf	4 lb./gal. EC	8 oz.	
			Dursban 50WSP	50% WSP	0.5 lb.	
			Guthion 2S	2 lb./gal EC	1.5-3 pt.	(Christmas trees only)
			Isotox IV	8.5% EC	4.69 qt.	
			Methoxychlor 2S	2 lb./gal. EC	2-3 qt.	
			Oils, horticultural, summer (see ALTERNATIVE PRODUCTS)			
			Orthene	9.4% EC	4.69 qt.	
			Orthene	75% SP	1.0 lb.	
			Pageant DF	50% DF	0.5 lb.	
			Sevimol	4 lb./gal. F	1 qt.	
			Sevin Liquid	2 lb./gal. F	2 qt.	
			Sevin 50W	50% WP	2 lb.	
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)		
			Tempo 2	2 lb./gal. EC	1 oz.	
			Tempo 20WP	20% WP	1.3 oz.	
	Spruce budworm	Treat in late April to early May when bud sheaths become loose.	Asana XL	0.66 lb./gal. EC	5.8-9.6 oz.	(nursery only)
			Carbaryl 4L	4 lb./gal. F	1 pt.	
			Carbaryl 50WP	50% WP	2 lb.	
			Decathlon	20% WP	1.9 oz.	
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.	
			Dursban Turf	4 lb./gal. EC	8 oz.	
			Dursban 50WSP	50% WSP	0.5 lb.	
			Pageant DF	50% DF	0.5 lb.	
			Resmethrin EC26	2 lb./gal. EC	1 pt.	
			Sevimol	4 lb./gal. F	1 qt.	
			Sevin 50W	50% WP	2 lb.	

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water	
SPRUCE (cont'd)	Spruce budworm (cont'd)		Tempo 2	2 lb./gal. EC	1.5 oz.	
			Tempo 20WP	20% WP	1.9 oz.	
	Spruce bud scale	Treat about July 1 when crawlers are present. (see GENERAL PESTS: Scales)	AND: Guthion 2S	2 lb./gal EC	1.5-3 pt.	(Christmas trees only)
	Spruce needleminer	Apply to foliage in early June and late July. (In northeastern Ohio, late April for overwintering larvae.)	Carbaryl 4L	4 lb./gal. F	1 pt.	
			Carbaryl 50WP	50% WP	2 lb.	
			Dursban Turf	4 lb./gal. EC	1 qt.	
			Dursban 50WSP	50% WSP	2 lb.	
			Pageant DF	50% DF	2 lb.	
			Sevimol	4 lb./gal. F	1 qt.	
			Sevin 50W	50% WP	2 lb.	
	Spruce spider mite Note: Oil will remove the blue color from Colorado blue spruce.	(see GENERAL PESTS)	AND: Resmethrin EC26	2 lb./gal. EC	1 pt.	
	White pine weevil	Spray leaders in spring when beetles appear in April.	Lindane Borer Spray	1.65 lb./gal. EC	3 pt.	
SWEET GUM	Bagworm	(see GENERAL PESTS)				
	Fall webworm	(see GENERAL PESTS)				
	Leafminer	Treat when mines first appear and repeat as needed.	Bioneem	0.3%EC	2.5-5 pt.	
			Dursban Turf	4 lb./gal. EC	1 qt.	
			Dursban 50WSP	50% WSP	2 lb.	
			Margosan-O	0.3%EC	2.5-5 pt.	
			Orthene	9.4% EC	4.69 qt.	
			Pageant DF	50% DF	2 lb.	
			Talstar T&O	7.9% F	20-40 oz.	
			Talstar 10WP	10% WP	16-32 oz.	
	Sweet gum pitmaking scale	Use the oil as a dormant treatment in the spring. Use other materials against crawlers on leaves in mid-June or September when young scales are seen on twigs and buds. (see GENERAL PESTS: Scales)				
	Sweet gum leaftier	Treat when larvae are seen webbing leaves together.	Methoxychlor 25	2 lb./gal. EC	2-3 qt.	
			Talstar T&O	7.9% F	8-40 oz.	
			Talstar 10WP	10% WP	6.4-32 oz.	
	Twospotted spider mite	(see GENERAL PESTS)				
SYCAMORE	Aphids	(see GENERAL PESTS)	AND: Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.	
	Bagworm	(see GENERAL PESTS)				
	Fall webworm	(see GENERAL PESTS)	AND: Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.	
	Japanese beetle	(see GENERAL PESTS)				
	Leaffolder	Treat when leaves are seen folded together. (see GENERAL PESTS: Caterpillars)				
	Leafhopper	(see GENERAL PESTS)				
	Sycamore lace bug	Treat in mid- to late-May. Make two applications spaced about 10 days apart. (see GENERAL PESTS: Lace Bugs)	AND: Ficam W	76% WP	11 oz.	
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre	
			Turcam	76% WP	11 oz.	
	Terrapin scale	Usde any one of the materials when crawlers are present on leaves in June. (see GENERAL PESTS: Scales)	AND: Malathion 57	5 lb./gal. EC	2.5 pt.	
	Whitemarked tussock moth	Treat when caterpillars are first seen and repeat as needed. (see GENERAL PESTS: Caterpillars)	Bioneem	0.3%EC	2.5-5 pt.	
			Decathlon	20% WP	1.9 oz.	
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.	
			Dimilin 4L	4 lb./gal. EC	2-4 oz./acre	
			Dimilin 25W	25% WP	4-8 oz./acre	
			Dursban Turf	4 lb./gal. EC	1 pt.	
			Dursban 50WSP	50% WSP	1 lb.	
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre	
			Margosan-O	0.3%EC	2.5-5 pt.	
			Methoxychlor 25	2 lb./gal. EC	2-3 qt.	
			Orthene	9.4% EC	4.69 qt.	
			Pageant DF	50% DF	1 lb.	

Table 2. ORNAMENTALS–(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation	Amount To Add To 100 Gal. Water
SYCAMORE (cont'd)	Whitemarked tussock moth (cont'd)		Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
			Scimitar WP	9.52% WP	2.4-4.8 oz.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1.5 oz.
			Tempo 20WP	20% WP	1.5 oz.
TULIP TREE	Leafminer (Coleoptera)	Treat when mines first appear.	Bioneem	0.3%EC	2.5-5 pt.
			Dursban Turf	4 lb./gal. EC	1 qt.
			Dursban 50WSP	50% WSP	2 lb.
			Margosan-O	0.3%EC	2.5-5 pt.
			Orthene	9.4% EC	4.5 qt.
			Pageant DF	50% DF	1 lb.
			Talstar T&O	7.9% F	20-40 oz.
			Talstar 10WP	10% WP	16-32 oz.
	Tulip spot gall midge (*Thecodiplosis liriodendri*)	Treat when mining of insect starts, but before galls form, early summer.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
	Tulip tree scale	Use oil as a dormant treatment in fall or spring. Use other materials when crawlers are present, usually in August. (see GENERAL PESTS: Scales)	AND:		
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
	Yellow poplar weevil	Use any one of the materials to control adults in early July.	Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dursban Turf	4 lb./gal. EC	1 pt.
			Dursban 50WSP	50% WSP	1 lb.
			Pageant DF	50% DF	1 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
VIBURNUM	Aphids	(see GENERAL PESTS)			
	Spider mites	(see GENERAL PESTS)			
	Note: Malathion may injure *Viburnum*.				
WALNUT	Aphids	(see GENERAL PESTS) (If walnuts are to be eaten, check insecticide labels for days-waiting-time from last application to harvest.)	AND:		
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Note: Do not apply Dursban after husks open.				
	European red mite	(see GENERAL PESTS)			
	Fall webworm	(see GENERAL PESTS)	AND:		
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Leafhoppers	(see GENERAL PESTS)			
	Twospotted spider mite	(see GENERAL PESTS)			
	Note: Do not apply Diazinon after husks open.				
	Walnut caterpillar	Treat when caterpillars are first seen about late June.	Bioneem	0.3%EC	2.5-5 pt.
			Carbaryl 4L	4 lb./gal. F	1 pt.
	Note: Do not apply Dursban after husks open.		Carbaryl 50WP	50% WP	2 lb.
			[illegible]	25% WP	13 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Margosan-O	0.3%EC	2.5-5 pt.
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.5 oz.
	Walnut petiole gall mite	Treat in early spring about the time the leaves are half open or at first sign of galls on the leaf petioles.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dicofol 4EC	4 lb./gal. EC	1.25 qt.
			Joust	4 lb./gal. F	4-8 oz.
			Kelthane 35	35% WP	1-1.5 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Morestan 4	4 lb./gal. F	4-8 oz.

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
WALNUT (cont'd)	Walnut petiole gall mite (cont'd)		Pentac Aquaflow	1 lb./gal. F	8-16 oz.
			Pentac WP	50% WP	12-16 oz.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin 50W	50% WP	2 lb.
WILLOW	Aphids	(see GENERAL PESTS)	AND:		
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Bagworm	(see GENERAL PESTS)			
	Borers (beetles)	Apply thoroughly to the trunk area at monthly intervals from May to August.	Lindane Borer Spray	1.65 lb./gal. EC	3 qt.
	Fall webworm	(see GENERAL PESTS)	AND:		
			Dibrom 8 Emulsive	8 lb./gal. EC	1 pt.
	Leaf beetles	Treat at first sign of leaf feeding and repeat as needed.	Carbaryl 5D	5% D	N/A
			Carbaryl 10D	10% D	N/A
			Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Dycarb	76% WP	12-20 oz.
			Ficam W	76% WP	11 oz.
			Isotox IV	8.5% EC	4.69 qt.
			Methoxychlor 25	2 lb./gal. EC	2-3 qt.
			Orthene	9.4% EC	4.69 qt.
			Pageant DF	50% DF	0.5 lb.
			Pestroy 4EC	4 lb./gal. EC	1 qt.
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.
			Sevin 50W	50% WP	2 lb.
			Soaps (fatty acid salts)	(see ALTERNATIVE PRODUCTS)	
			Turcam	76% WP	11 oz.
	Oystershell scale	(see GENERAL PESTS)	AND:		
			Cythion	5 lb./gal. EC	1 pt.
			Cythion 8	8 lb./gal. EC	1 pt.
			Malathion 57	5 lb./gal. EC	1 pt.
			Malathion Methoxychlor Spray	2 lb.+2 lb./gal. EC	2.5 pt./acre
			Rockland Shade Tree Insect Spray	2 lb.+1.1 lb./gal. EC	2-3 qt.
	Poplar tentmaker	Treat when larvae are first seen which can be from May to October or as needed. (see GENERAL PESTS: Caterpillars)	Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Isotox IV	8.5% EC	4.69 qt.
			Orthene	9.4% EC	4.69 qt.
			Pageant DF	50% DF	0.5 lb.
			Talstar T&O	7.9% F	8-40 oz.
			Talstar 10WP	10% WP	6.4-32 oz.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Sawflies	Treat when larvae are small but before extensive leaf feeding is noted.	Carbaryl 4L	4 lb./gal. F	1 pt.
			Carbaryl 50WP	50% WP	2 lb.
			Decathlon	20% WP	1.3 oz.
			Dursban Turf	4 lb./gal. EC	8 oz.
			Dursban 50WSP	50% WSP	0.5 lb.
			Orthene	9.4% EC	4.69 qt.
			Orthene	75% SP	1.0 lb.
			Pageant DF	50% DF	0.5 lb.
			Sevimol	4 lb./gal. F	1 qt.
			Sevin Liquid	2 lb./gal. F	2 qt.
			Sevin 50W	50% WP	2 lb.
			Tempo 2	2 lb./gal. EC	1 oz.
			Tempo 20WP	20% WP	1.3 oz.
	Spider mites	(see GENERAL PESTS)			
	Tent caterpillars	(see GENERAL PESTS)			
WISTERIA	Leafhoppers	(see GENERAL PESTS)			

Table 2. ORNAMENTALS--(Continued)

Host	Pest	When to Treat	Labelled Pesticide	Formulation You Buy	Amount To Add To: 100 Gal. Water
YEW (*Taxus*)	Black vine weevil	(see GENERAL PESTS)	AND:		
			Endocide 3EC	3 lb./gal. EC	1.33 qt. (nursery only)
			Lindane Borer Spray	1.65 lb./gal. EC	3 pt.
			Phaser	3 lb./gal. EC	1.33 qt. (nursery only)
			Thiodan 50WP	50% WP	2 lb. (nursery only)
			Thiodan 3EC	3 lb./gal. EC	1.33 qt. (nursery only)
	Fletcher scale	Use oil as a dormant treatment in the spring. Use any one of the other materials against crawlers from late June to late July. (see GENERAL PESTS: Scales)	AND:		
			Cythion	5 lb./gal. EC	2 pt.
			Cythion 8	8 lb./gal. EC	1.25 pt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	35 oz.
	Mealybug	Use oil as a dormant treatment in the spring. Treat with any one of the other materials when overwintering nymphs become active in mid-May and about June 1 and again in late July. Drench plants thoroughly. (see GENERAL PESTS: Mealybugs)	AND:		
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
			Dycarb	76% WP	12-20 oz.
			Ficam W	76% WP	11 oz.
			Turcam	76% WP	11 oz.
	Taxus bud mite	Treat when mites are first seen and repeat in 10 days and then as needed.	Dicofol 4EC	4 lb./gal. EC	1.25 qt.
			Dimethoate 2.67EC	2.67 lb./gal. EC	50 oz.
			Dimethoate 400	4 lb./gal. EC	17.5 oz.
			Endocide 3EC	3 lb./gal. EC	0.67 qt. (nursery only)
			Joust	4 lb./gal. F	4-8 oz.
			Kelthane 35	35% WP	1-1.3 lb.
			Kelthane 50	50% WP	0.5-1 lb.
			Metasystox-R2	2 lb./gal. EC	1-1.5 oz./inch trunk diameter (soil inject only)
			Morestan 4	4 lb./gal. F	4-8 oz.
			Pentac Aquaflow	1 lb./gal. F	8-16 oz.
			Pentac WP	50% WP	12-16 oz.
			Phaser	3 lb./gal. EC	0.67 qt. (nursery only)
			Thiodan 50WP	50% WP	1 lb. (nursery only)
			Thiodan 3EC	3 lb./gal. EC	0.67 qt. (nursery only)
YUCCA	Aphids	(see GENERAL PESTS)			
	Scales	Treat when crawlers are first seen and repeat in 3 weeks. (see GENERAL PESTS: Scales)			

DILUTION TABLES - A GUIDE TO ACCURATE MEASURES

Wettable Powders

Number of ounces of wettable powder to use in small sprayers when amount per 100 gallons is known.

100 Gals.	10 Gals.	5 Gals.	2 Gals.	1 Gal.
0.5 lb.	0.8	0.4	0.2	0.1
1 lb.	1.6	0.8	0.3	0.2
2 lbs.	3.2	1.6	0.6	0.3
3 lbs.	4.8	2.4	1.0	0.5
4 lbs.	6.4	3.2	1.3	0.6
5 lbs.	8.0	4.0	1.6	0.8

Emulsifiable Concentrates

Number of fluid ounces of emulsifiable concentrate to use in small sprayers when amount per 100 gallons is known.

100 Gals.	10 Gals.	5 Gals.	2 Gals.	1 Gal.
1 pt.	1.6	0.8	0.3	0.2
1 qt.	3.2	1.6	0.7	0.3
2 qt.	6.4	3.2	1.3	0.6
1 gal.	12.8	6.4	2.6	1.3

Mist Blower

Quantity of emulsifiable concentrate (EC) needed to make a 25X concentration.

If Amount per 100 Gals. for a High volume Sprays is:	Use This Amount in a Mist Blower for:			
	25 Gals.	10 Gals.	2 Gals.	1 Gal.
1 pt.	6.25 pt.	2.5 pt.	8 fl. oz.	4 fl. oz.
1 qt.	6.25 qt.	5 .0pt.	1 pt.	8 fl. oz.
2 qt.	3.13 gal.	5.0qt.	1 qt.	1 pt.
1 gal.	6.25 gal.	2.5 gal.	2 qt.	1 qt.

Table of Measures

Liquids

1 level tablespoonful = 3 level teaspoonfuls
1 fluid ounce = 2 tablespoonfuls = 29.57 milliliters
1 cupful = 8 fluid ounces
1 pint = 2 cupfuls = 16 fluid ounces
1 quart = 2 pints = 32 ounces
1 gallon = 4 quarts = 128 fluid ounces

Weights

1 ounce = 28.3 grams
1 lb. = 16 ounces = 454 grams
1 ton = 2,000 lbs.

Rates to Use To Treat One Acre

Pounds Actual Pesticide Per Gallon Liquid Concentrate	Pounds Actual of Pesticide Needed						
	1/4	1/2	3/4	1	2	3	4
	Pints of Liquid Concentrate to User Per Acre						
1	2	4	6	8	16	24	32
1 1/2	1.3	2.6	4	5.3	10.6	16	21.3
2	1	2	3	4	8	12	16
4	.5	1	1.5	2	4	6	8

Pounds Actual Pesticide in Wettable Powder	Pounds of Actual Wettable Powder to Use Per Acre						
	1/4	1\2	3\4	1	2	3	4
15%	1.75	3.33	5	6.5	13	20	26.5
25%	1	2	3	4	8	12	16
40%	.6	1.25	1.75	2.5	5	7.5	10
50%	.5	1	1.5	2	4	6	8
75%	.4	.7	1	1.33	2.66	4	5.33

Percent Actual Pesticide in Dust or Granules	Pounds of Actual Wettable Powder to Use Per Acre						
	1/4	1/2	3/4	1	2	3	4
2 1/2%	10	20	30	40	80	120	160
5%	5	10	15	20	40	60	80
10%	2.5	5	7.5	10	20	30	40
20%	1.25	2.5	3.75	5	10	15	20
25%	1	2	3	4	8	12	16

SMALL GALLONAGE RATES

If an insecticide recommendation is given on the basis of 100 gallons of finished spray but only 1 gallon is wanted, the following is a general rule to follow to prepare that 1 gallon of spray:

Dry Formulations -

For each 1 pound of powder that is recommended per 100 gallons of water, use 1 level tablespoonful (T) per 1 gallon of spray.

Liquid Formulations -

For each 1 pint that is recommended per 100 gallons of water, use 1 teaspoonful (t) per gallon of spray.

INFORMATION ABOUT INSECTICIDES/MITICIDES

Pesticide (Common Chemical Name)	Trade Name(s)	Classification	Oral LD_{50}[1] (mg/kg)[2]	Dermal LD_{50}[1] (mg/kg)[2]	Manufacturer
abamectin	Avid	microbial toxins	650	>2000	Merck
acephate	Dendrex, Isotox IV, Orthene, Orthenex	organophosphate	980	10250	Valent
azadiractin (=neem, azatin)	Bioneem, Margosan-O, Neemisis	botanical	>5000	>2000	Grace-Sierra, Safer
azinphos-methyl	Guthion	organophosphate	19	220	Miles
Bacillus thuringiensis var. kurstaki	Biobit, Bactospeine, Caterpillar Attack, Dipel, Javelin, Larvo-BT, Thuricide, Victory and others	spores + crystalline delta-endotoxin, microbial	none	none	Numerous - Abbott DuPont, Upjohn Co Sandoz , etc.
Bacillus thuringiensis var. tenebrio (=san diego)	M-One, Trident II	microbial	none	none	Mycogen, Sandoz
bendiocarb	Dycarb, Ficam, Turcam	carbamate	156	>1000	Nor-Am
bifenthrin	Talstar	pyrethroid	375	>2000	FMC
carbaryl	Carbaryl, Sevimol, Sevin	carbamate	246	>4000	Rhone-Poulenc, Drexel
chlorpyrifos	Dursban, Pageant	organophosphate	270	2000	DowElanco
cryolite	Kryocide	inorganic fluorine	practically nontoxic		Atochem
cyfluthrin	Decathlon, Tempo	pyrethroid	826	>2000	Miles, Olympic
diazinon	Diazinon, Spectracide	organophosphate	400	3600	Ciba, Drexel
dicofol	Docofol, Kelthane	chlorinated hydrocarbon	595	>5000	Rohm & Haas
dicrotophos	Bidrin, Inject-a-cide B	organophosphate	17	224	DuPont, Mauget
dienochlor	Pentac	chlorinated hydrocarbon	3160	>3160	Sandoz
diflubenzuron	Dimilin	insect growth regulator	>4640	>10,000	Uniroyal
dimethoate	Cygon, Dimethoate	organophosphate	235	>400	American Cyanamid, Drexel
disulfoton	Di-Syston	organophosphate	4	10	Miles
endosulfan	Endocide, Phaser,Thiodan	chlorinated hydrocarbon	160	359	FMC, Hoechst
esfenvalerate	Asana XL	pyrethroid	458	>2000	DuPont
fenetrothion	Pestroy	organophosphate	800	1300	PBI-Gordon
fluvalinate	Mavrik Aqua Flow	pyrethroid	282	20000	Sandoz
isofenphos	Discus, Oftanol	organophosphate	20	700	Miles, Olympic
lambda-cyhalothrin	Scimitar	pyrethroid	79	632	Zenica
lindane	Lindane	chlorinated hydrocarbon	125	1000	Drexel, Bonide
malathion	Cythion, Malathion	organophosphate	1000	4100	Setre, Drexel, UAP
metaldehyde	Bug-Geta, Deadline, Slug-Geta	metacetaldehyde	360	—	Valent
methiocarb	Grandslam, Mesurol	carbamate	20	>5000	Olympic, Miles
methoxychlor	Marlate, Methoxychlor	chlorinated hydrocarbon	6000	>6000	Drexel, Prentiss
methyl parathion	Methyl Parathion	organophosphate	20	491	Platte
naled	Dibrom	organophosphate	272	1100	Valent
oxamyl	Oxamyl,Vydate	carbamate	5.4	2960	DuPont
oxydemeton-methyl	Harpoon, Inject-a-cide, Metasystox-R2	organophosphate	48	112	Miles
oxythioquinox	Joust, Morestan	dithiocarbonate	1500	>2000	Miles, Olympic
parathion	Parathion	organophosphate	2	50	Platte

INFORMATION ABOUT INSECTICIDES/MITICIDES (cont'd)

Pesticide (Common Chemical Name)	Trade Name(s)	Classification	Oral LD_{50}[1] (mg/kg)[2]	Dermal LD_{50}[1] (mg/kg)[2]	Manufacturer
permethrin	Ambush, Pounce	pyrethroid	4000	>4000	FMC, Zeneca
petroleum oils	Dormant, Summer, Superior Oils, etc.	hydrocarbon oils	exempt		numerous
propargite	Ornamite	sulfite ester	4029	2940	Uniroyal
pyrethrum	Pyrethrin, Pyrellin, Pyrenone, etc.	botanical	1500	1800	Fairfield, Prentiss, etc.
resmethrin	Resmethrin	pyrethroid	>2500	>3000	Fairfield
rotenone, cubé	Prentox, Rotenone	botanical	1500	---	Fairfield, Prentiss
soaps, pesticidal	Aphid-Mite Attack, Insecticidal Soap, M-Pede, etc.	fatty acid salts	practically nontoxic		Mycogen, Ringer
trichlorfon	Dylox, Proxol	organophosphate	250	> 2100	Miles, Nor-Am

[1]Farm Chemicals Handbook '93 (Meister Publishing Co., Willoughby, OH), and technical data information where available.
[2]Equals milligrams per kilogram of body weight applied orally or dermally. (1 milligram = 1/1,000 of a gram, 454 grams = 1 lb.)

PRODUCTS LISTED IN TABLES AND TYPE OF REGISTRATION*

Ambush 2EC (†)
Ambush 25W (†)
Asana XL (†)
Avid (*)
Bioneem
"Bt" (kurstaki) (see ALTERNATIVE PRODUCTS)
Bug-Geta
Carbaryl 5D
Carbaryl 10D
Carbaryl 4L
Carbaryl 50WP (*)
Cygon 2E
Cythion 5EC
Cythion 8EC
Deadline Bullets
Deadline Granules
Decathlon 20% WP (*)
Dendrex
Diazinon 50W (*)
Diazinon 2E
Diazinon 4E & AG500 (*)
Di-Syston 15% G (†)
Dicofol 4EC
Dibrom 8 Emulsive
Dimethoate 2.67EC
Dimethoate 400
Dimilin 4L (†)
Dimilin 25W (†)
Discus 5% G (*)
Dursban Turf (*)
Dursban 50WSP (*)
Dursban 1EC
Dursban 0.5EC
Dycarb 76% WP
Dylox (*)
Endocide 3EC (*)
Ficam W 76% WP (*)
Grandslam 75WP (†)
Guthion 2S (†)
Harpoon (†)
Inject-A-Cide (†)
Inject-A-Cide B (†)
Isotox IV
Joust
Kelthane 35 (*)
Kelthane 50 (*)
Kryocide 96% WP
Lindane 20%EC (†)
Lindane Borer Spray
Malathion 50
Malathion 57
Malathion + Methoxychlor Spray
Margosan-O
Mavrik Aquaflow
Mesurol 75% WP
Metasystox-R2 (†)
Methyl Parathion 4E (†)
Methyl Parathion 7.5E (†)
Morestan 4
Oftanol 2 Insecticide (*)
Oils (see ALTERNATIVE PRODUCTS)
Ornamite
Orthene 75% SP
Orthene 9.4%EC
Orthenex Spray, Aerosol
Oxamyl 10G (†)
Pageant DF (*)
Parathion 4EC (†)
Parathion 8E (†)
Parathion 8 Aqua (†)
Pentac Aquaflow (*)
Pentac WP (*)
Pestroy 4EC
Phaser (*)
Pounce 3.2EC (†)
Pounce 25WP (†)
Proxol 80SP (*)
Pyrethrin (+PBO) (see ALTERNATIVE PRODUCTS)
Resmethrin EC26
Rotenone + Pyrethrin (see ALTERNATIVE PRODUCTS)
Rockland Shade Tree Insect Spray
Scimitar WP (*)
Sevimol 4F
Sevin Liquid 2F
Sevin 50W
Sevin 5 Dust
Slug-Geta
Soaps (see ALTERNATIVE PRODUCTS)
Spectracide 25% EC
Steinernema carpocapsae (see ALTERNATIVE PRODUCTS)
Talstar T&O (*)
Talstar 10WP (*)
Tempo 2
Tempo 20WP
Thiodan 50WP (*)
Thiodan 3EC (*)
Turcam (†)
Vydate L (†)

* Products without symbols are general use products.
Products with (*) are designated on labels as "Commercial or Agricultural Use Only"
Products with (†) are designated on labels as "Restricted Use Pesticide"