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Insect Control Recommendations

EXTENSION DIVISION
Virginia Polytechnic Institute and State University

INSECT PESTS OF ORNAMENTALS AND LAWNS AROUND THE HOME

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These recommendations are intended for the non-professional gardener interested in controlling insects and mites on lawns and ornamental plants around the home. With these recommendations, the more common pest species can be controlled safely and simply with a minimum number of pesticides. For complex or persistent problems and for large shade trees or expansive areas, it is wise and economical to engage the services of an experienced commercial arborist or custom spray applicator.

Identification and significance of pest problems.

There are two frustrating problems in controlling insects and mites on ornamentals. One is knowing if, what, and when pesticides should be used on more than 100 different plant genera. The other, and probably most frustrating, is determining the identity and importance of any given pest found feeding on valuable and long-established trees and shrubs. More than 2,000 species of insects and mites may be encountered on woody plants. A great majority of these are uncommon, occasional, and pose little threat of serious damage to the plants, while about 15 per cent are common, injurious, and potentially destructive. One of the best reference books on the subject is "Gardener's Bug Book" by Cynthia Westcott.

The aesthetic nature of prized ornamentals creates high values for individual plants. Therefore, even a minor or uncommon pest can be an important and costly problem for the owner if it is severe on only one or a few plants. The average home gardener is familiar with very few of even the more important pests, thus each unfamiliar insect found feeding on valuable ornamentals creates uncertainty as to possible damage or loss of plants.

To help identify pest problems, an index is provided listing the insects and mites reported from more than 100 different kinds of woody ornamentals. It is not feasible to list all of the specific pests. For example, 20-30 species of scale are known from camellia, 18-20 species from elm, and 20-24 species from oak. There are 22-25 species of borers known to attack oak, and 8-10 species of mites known to attack elm. In the index the pests are listed by type as groups or individuals. Those of major importance which are common, injurious, and usually require control treatments are underscored. Those which are occasional, minor, have no known control, or for which control is unnecessary in usual situations are not underscored. For each important pest or pest group, control recommendations are suggested in the section following the index.

Most pests can be identified tentatively with a minimum knowledge of entomology. To use these recommendations for a given problem, look in the index under the host plant involved. By scanning the list, the appropriate group

or pest usually can be found by knowing the difference between aphids, borers, leafhoppers, scale insects, lacebugs, leafminers, defoliators, etc. To further identify pests and obtain details on life histories, habits, and precise timing for control measures, consult reference books and Extension Division leaflets as they become available. The most complex group is scale insects. There is great variation in seasonal development patterns, and hence in timing the application of control measures. Extension Agents and Specialists at Virginia Tech can provide additional assistance on pest problems.

Determining the need for control measures.

Applying insecticides at the wrong time of year or when unnecessary may constitute a misuse of pesticides. In cases of serious common pests, it is important to apply control measures before populations become large. Often, an insect infestation is found after it becomes intense and conspicuous. Then, in most cases, it is NOT the best time to apply control measures. Yet many people feel the urgency of taking remedial action immediately. Pesticides must be applied at the proper time to be effective. Frequently, it is unnecessary to apply sprays at all if the pest is minor and only present in small numbers. For numerous pests, especially gall insects, there is no known control; spraying is not feasible. Finally, it is usually unnecessary to use insecticides after an infestation has peaked and begun to subside. Parasites and predators are often present and help reduce the remaining number of pests. They can be favored by avoiding the use of pesticides. For common serious pests, applications of chemicals early when populations are first getting established is most effective. Natural enemies are not adversely affected when the pest is controlled before the beneficial insects appear. Remember that unnecessary or untimely applications may be considered as a serious MISUSE of pesticides. It is not a good policy to spray all plants simply because it seems like a good idea.

Insect and mite control

Pesticides are essential to the preservation of plant materials which enhance man's environment where he lives and works. Used as recommended they do much more to improve than upset it. Relatively few serious insect and mite pests of woody ornamental plants can be controlled by other than chemical means.

More and more, public demands and governmental regulations require minimizing the use of pesticides. Therefore, this guide recommends relatively few materials for use around the home. These are the least toxic in nature, exhibit the least potential threat to the environment, and are essential for effective results. However, certain pests may be more difficult to control, require more costly chemicals, and require more frequent use of other pesticides.

The pesticides recommended in these recommendations can be used effectively and safely. They must be used according to directions. Misuse or overuse may result in excessive and unnecessary chemicals in the environment. For example, chlordane for grub-proofing of lawns according to recommendations results in 3 lbs. of actual chlordane per acre in 6-10 years. The misuse of annual applications results in 18-30 lbs. per acre in that period. Properly used, insecticides and miticides will preserve ornamental trees, shrubs, ground covers, and turfgrass which enhance the quality of our environment.

Pesticide names.

There are four ways to identify pesticide products: the chemical name; the accepted common name; the Trade name; and the Brand name. Brand names (such as Isotox, Nutro, Black Flag, etc.) denote the manufacturer or distributor but do not indicate the chemical ingredients. Trade names (such as Sevin, Kelthane, Tedion, etc.) are trade-mark names for specific insecticides. Common names (such as carbaryl, dicofol, tetradifon, chlordane, malathion, etc.) are coined names accepted by industry, scientists, and governmental agencies for specific insecticides. Chemical names for complex

organic chemicals may be found on labels but are meaningless to the average user. It is essential to know which insecticides or miticide and what concentration is in each pesticide formulation that is to be used for the desired purpose.

Insecticides and miticides.

It is essential to use some residual insecticides to protect trees, shrubs, and turf. Many destructive insects emerge over an extended period of time or are highly mobile. Non-residual chemicals kill only those insects contacted at the time of application. It is not feasible to spray diverse ornamentals frequently enough to protect them from many types of pests. Residual insecticides are highly effective for those species and are essential until suitable alternatives can be developed. Systemic insecticide-miticide materials are not recommended for the home gardener, except oxydemetonmethyl (MetaSystox-R) and dimethoate (Cygon, DeFend).

Pesticides vary greatly in their properties. Malathion remains toxic to insects for a very short period, normally not exceeding one or two days. Diazinon may remain effective somewhat longer. Carbaryl may last 7 to 10 days or much longer. The other insecticides and miticides have varying residual properties depending on how they are used. Lindane and methoxychlor will protect bark and wood for 2-3 months or more, but for much shorter periods on foliage. Chlordane provides grub control in lawns for 6 to 10 years, requiring only one treatment over a long period of time. Most miticides have considerable residual effectiveness.

Pesticides also vary in their effects on pests. Carbaryl, chlordane, lindane, and methoxychlor kill insects but not mites. The use of carbaryl actually encourages larger mite populations than if it is not used at all. Each of the four insecticides are effective against some species but not others or all pests. Malathion and diazinon have some effect in depressing mite populations but are not adequate for thorough control of mite infestations. They are also much more effective against certain pests than others. Systemic insecticides kill both insects and mites.

When using pesticides it is essential to treat only when necessary with accurate amounts of the recommended chemical. Overspraying is ineffective, uneconomical, potentially hazardous, and may result in environmental imbalances favoring certain pests. Obtaining the correct dilution of spray with small garden equipment requires the measurement of very small quantities of chemical, such as teaspoon or tablespoons. The percentage of error from inaccuracy can be high. Be sure to measure slightly rounded but not heaping spoonfuls. The quantities suggested in these recommendations are for 3 gallons of spray. Mixing directions are also provided on the label of each pesticide. Be sure to read the amounts carefully when preparing insecticidal sprays.

Formulations.

Most pesticides are not soluble in water and cannot be applied effectively without dilution. Insecticides must be diluted greatly in order to apply very small amounts effectively without plant injury. Therefore, insecticides are first dissolved in organic solvents to make a liquid or mixed with inert dry dilutents to make a "powder". By the addition of an emulsifier or wetting agent, either an emulsifiable concentrate (EC) or wettable powder (WP) formulation is produced to be mixed in water for applying extremely dilute, small quantities of toxicant evenly over the very large surface area to be protected. In addition to emulsifiable concentrates and wettable ("sprayable") powders, insecticides may be formulated and used without further dilution as dusts (D) for direct dry applications to plants, or granules (G) for direct soil or ground surface treatments. Dusts or granules should never be mixed with water for making applications.

Still another common formulation in the small-package or home-garden market is the pressurized can or aerosol. A true aerosol utilizes a propellant chemical which dispenses very fine droplets that float in the air. Such a space spray is for flying insects and will not provide a surface deposit to kill crawling insects. Residual spray applicators are available, either pressurized or containing a propellant, which are suitable for spraying plants. These produce

coarse droplets which wet the insects and the plants. It is most important to be sure the product is intended for use on ornamentals. Pressurized sprays for household pests may contain solvents which cause severe injury to plants and are intended for use only on or in wood or other manufactured materials.

Sprayers and spraying.

The most important consideration is to fit the spray equipment to the job to be done. Sprayers vary from finger-depressor pumps in small bottles to large high-powered machinery. The most convenient and effective is the compressed air or knapsack sprayer. Hose-on sprayers are the most convenient but far from the most effective. Small power sprayers or "estate" sprayers are highly desirable if more than a small area is to be treated regularly. Portable-mist blowers are effective for plants up to 20-30 feet high, but can give erratic results and plant injury if not used properly. For large areas and tall shade trees, the services of qualified arborists or custom applicators with heavy-duty spray equipment should be engaged.

To be effective, sprays must wet the surface treated or come into contact with the insects. Plants with highly waxy foliage often retain little spray material. Insects such as mealybugs and scale insects are protected under dense waxy secretions. It is frequently advisable to put additional spreader-sticker or more wetting agent in the spray. However, if an additive is used at all times, increased run-off and less deposit of spray material may result on non-waxy surfaces. If a wetting agent is needed and not convenient to obtain in stores, a non-sudsing detergent can be used at the rate of 1 teaspoon in 3 gallons of spray mixture.

Emulsifiable concentrates are most resistant to washing off by rain. Wettable powder sprays are not as persistent, while dusts are readily washed off by rain or irrigation. Any type of spray will be washed off if rain occurs before the sprays have dried. If sprays dry thoroughly, rain does not remove appreciable amounts of residue; the process is gradual over a period of time, depending on the amount of precipitation and the residual toxicity, chemically, of the pesticide used.

Spray injury.

It is very important to read all the directions and precautions on the label. Some plants are sensitive to certain insecticides. Carbaryl may cause injury to tender foliage if plants are wet when treated or in the presence of high humidity. Carbaryl will cause severe foliage injury and leaf drop on Boston ivy and Virginia creeper. Malathion is injurious to several ferns and eleagnus. Dimethoate is highly variable in phytotoxicity to plants; some varieties of azalea are completely defoliated while others show minor leaf burn or no effects. Dimethoate may defoliate burford and Chinese holly; andromeda and elm foliage may be injured. Dormant oils may injure sugar and Japanese maples and numerous thin-barked trees. It should not be used on hickory, beech, birch, douglas fir, and juniper and will remove the bluish bloom from spruces. The label on the insecticide container specifies plants susceptible to injury. Be sure to read ALL of the directions and use insecticides only for those pests specified on the label.

* INDEX TO INSECTS AND MITES BY HOSTS

ABELIA scale insects
ALDER aphid (woolly), borers, defoliators, lacebug, scale insects, spider mites
ALTHEA (Hibiscus) aphids, defoliators, scale insects, weevils
ANDROMEDA lacebug, scale insects, spider mites
ARAUCARIA mealybugs, scale insects
ASH aphid, flower gall mite, borers, defoliators, lacebug, leafminer, leaf roller, rhinoceros beetle, sawfly, scale insects, spider mites
AUCUBA scale insects, spider mites
AZALEA aphid, lacebug, defoliators, leafminer, leaf tier, scale insects, spider mites, borers, weevils, thrips, whitefly
BALSAM FIR aphids
BARBERRY aphid, scale insects, webworm
BAYBERRY defoliators, mealybug, scale insects
BEECH aphid (woolly), borers, erineum mite, defoliators, Japanese beetle, leafhoppers, scale insects, spider mites
BIRCH aphids, borers, Japanese beetle, lacebug, leafminer, leaf skeletonizer, leaf tier, scale insects
BITTERSWEET aphids, scale insects
BOXELDER aphid, borers, boxelder bug, defoliators, scale insects, spider mites, webworm
BOXWOOD giant hornet, leafminer, psyllid, scale insects, spider mites, webworm
BUCKEYE defoliators, mealybugs, scale insects, spider mites
BUTTERNUT aphids, borers, defoliators, gall insects, gall mites, lacebug, scale insects
CAMELLIA aphids, defoliators, leafroller, mites, scale insects, weevils
CATALPA aphid, defoliators, scale insects
CEDAR (Cedrus) aphid, bark beetle, borers, sawfly, scale insects, weevils
CHAMAECYPARIS aphid, scale insects, spider mites, weevils
CHERRY-LAUREL aphid, scale insects, weevils, whitefly
CHESTNUT aphid, borers, defoliators, scale insects, webworm, weevils
CHOKECHERRY borers, defoliators, scale insects, tent caterpillar
CITRUS aphid, bagworm, borers, defoliators, leafroller, mites, scale insects, thrips, weevils
CRAPEMYRTLE aphid, scale insects, weevil
CYPRESS aphid, bark beetle, borer, defoliators, scale insects, spider mites
DEUTZIA aphids, leafminer, scale insects, weevil
DOGWOOD aphids, borers, cicada, gall midge, defoliators, leafhopper, leafminer, leafroller, sawflies, scale insects, whitefly
DOUGLAS FIR aphids, bark beetles, borers, budworm, defoliators, scale insects, weevils
ELEAGNUS aphids, scale insects
ELM aphids, bagworm, bark beetles, borers, case bearers, defoliators, gall insects, gall mites, Japanese beetle, lacebugs, leafhoppers, leafminer, rust mites, spider mites, scale insects, weevils
EUONYMUS aphids, scale insects, weevils
FIR aphids, bagworm, bark beetles, borers, budworm, defoliators, needleminer, sawflies, spider mites
FLOWERING FRUITS aphids, aphids (woolly), bark beetles, borers, bud moth, casebearers, defoliators, fruit moths, Japanese beetle, lacebugs, leafhopper, leafroller, leaf skeletonizer, leaf tier, mealybugs, mites, plant bugs, sawflies, scale insects, tent caterpillar, thrips, webworm, weevils
FORSYTHIA plant bugs, scale insects, weevils
GARDENIA aphid, mealybugs, scale insects, spider mites, thrips, weevils, whitefly

*The more common and injurious pests which usually require treatment are underscored.

GINGKO defoliator, scale insects
 HACKBERRY bark beetles, borers, lacebug, defoliators, gall mites, psyllids
 HAWTHORN aphids (woolly), bark beetle, borers, bud moth, casebearer, defoliators, Japanese beetle, leafminer, leaf roller, leaf skeletonizer, sawfly, scale insects, spider mites, weevil
 HEMLOCK aphids, bark beetle, borers, defoliators, needleminer, sawfly, scale insects, spider mites
 HICKORY aphids, bark beetle, borers, casebearer, cicada, defoliators, gall aphids, gall mites, lacebugs, leaf roller, sawflies, scale insects, spider mites, webworm, weevils
 HOLLY aphid, bud moth, berry midge, defoliators, leafminers, leaf tier, rust mite, scale insects, spider mites
 HONEY LOCUST bagworm, borers, mimosa webworm, pod gall midge, rust mite, spider mites
 HONEYSUCKLE aphids, defoliators, leaf roller, plant bugs, sawfly, spider mites, webworm
 HORSECHESTNUT bagworm, borer, Japanese beetle, leaf roller, scale insects, spider mites
 IVY (Boston) defoliators, Japanese beetle, leafhopper, scale insects, weevil
 IVY (English) aphids, scale insects
 JUNIPER aphid, bagworm, bark beetle, midge, scale insects, spider mites, webworm, weevils
 LARCH aphid (Woolly), bagworm, bark beetle, borers, bud moth, casebearer, defoliators, sawfly, weevil
 LAUREL bud moth, psyllid, scale insects, weevils
 LIGUSTRUM scale insects
 LILAC aphid, borers, giant hornet, rhinoceros beetle, rust mite, scale insects, thrips, weevils, whitefly
 LINDEN aphids, bagworm, borers, defoliators, lacebugs, leafrollers, sawflies, scale insects, rust mites, spider mites, whitefly
 LOCUST (Robinia) aphid, bagworm, borers, defoliators, leafminers, leaf roller, treehoppers, scale insects, spider mites
 LONDON PLANETREE borers, scale insects
 MAGNOLIA borers, scale insects, weevil, whitefly
 MAHONIA scale insects, webworm
 MAPLE aphids, aphid (woolly), bagworm, borers, defoliators, gall mites, Japanese beetle, leafhoppers, leaf roller, leaf skeletonizer, scale insects, spider mites
 MIMOSA scale insects, webworm
 MOUNTAIN ASH aphid, bark beetle, borers, lacebug, sawfly, scale insects, spider mites
 MOUNTAIN LAUREL borers, lacebug, scale insects, spider mite, weevils, whitefly
 MULBERRY lacebug, scale insects, whitefly
 MYRTLE aphids, mealybug, scale insects
 NANDINA scale insect
 OAK aphids, borers, cicada, defoliators, gall insects, Japanese beetle, lacebugs, leafminers, leafrollers, leaf skeletonizers, leaf tier, rust mites, sawflies, scale insects, spider mites, treehoppers, webworm, weevils
 OSMANTHUS scale insects, webworm
 PACHYSANDRA scale insects, spider mites
 PALM scale insects, spider mites, thrips
 PERSIMMON borers, defoliators, mealybug, psyllid, scale insects, thrips, whitefly
 PHOTINIA scale insects
 PINE aphids, bagworm, bark beetles, borers, budworm, defoliators, rust mites, sawflies, scale insects, spider mites, spittlebugs, tip moth, webworm, weevils
 POPLAR aphids, borers, defoliators, gall insects, giant hornet, lacebug, leafminers, leafroller, sawflies, scale insects, spider mites, treehoppers, webworm, weevil
 PRIVET aphid, borer, leafhopper, leafminer, rust mite, scale insects, spider mites, thrips, weevils
 PYRACANTHA aphids, lacebugs, scale insects, spider mites, webworm, leaf crumpler, weevils
 REDBUD leaf roller, scale insects, treehopper
 RHODODENDRON aphids, borers, budworm, giant hornet, Japanese beetle, lacebugs, scale insects, spider mites, thrips, weevils, whitefly

ROSE aphids, borers, budworm, defoliators, Japanese beetle, leafhopper, leafroller, leaf tier, midge, sawflies, scale insects, spider mites, thrips, treehopper, webworm, weevils, whitefly

SASSAFRAS defoliators, Japanese beetle, leaf roller, scale insects, weevil

SERVICEBERRY borers, leafminer, sawfly, scale insects, spider mites

SOURGUM borer, leafminer, scale insects

SPIREA aphids, defoliators, leafhopper, leaf roller, scale insects, spider mites

SPRUCE aphids, bark beetles, borers, bud moth, budworm, defoliators, gall aphids, needleminer, scale insects, spider mites, weevils

STEPHANOTIS scale insects

SWEETGUM bagworm, borers, defoliators, leaf tier, scale insects, webworm

SYCAMORE aphids, bagworm, borers, defoliators, Japanese beetle, lacebugs, scale insects, treehopper, webworm, weevils

TAXUS (Yew) gall mite, scale insects, weevils

TULIP TREE aphids, borers, scale insects, weevil

TUPELO aphids, leaf miner

TURFGRASS ants, aphids, armyworms, billbug, chinchbugs, cutworms, frit fly, leafhoppers, spider mites; sod webworms, white grubs, wireworms

VIRGINIA CREEPER aphid, defoliators, Japanese beetle, leafhoppers, scale insects, weevils

WALNUT aphids, borers, casebearer, defoliators, lacebugs, rust and gall mites, sawfly, scale insects, spider mites, webworm

WEIGELIA plant bug, scale insects, weevil

WILLOW aphids, borers, defoliators, gall insects, giant hornet, Japanese beetle, lacebugs, leafhoppers, sawflies, scale insects, spider mites, spittlebug, thrips, treehopper, webworm, weevils

WISTERIA aphids, defoliators, leaf roller, scale insects, spider mites, webworm, weevil

WITCH-HAZEL defoliators, gall insects

YUCCA plant bug, mealybugs, scale insects

Insect Pest	Insecticide	Formulation	Amount to Use Per 1,000 sq. ft.	Remarks
WASPS AND HORNETS	carbaryl (Sevin)	1% S	Apply directly to nests at night.	For nests below ground, apply insecticide and close ground opening with a shovelful of dirt. Use the wettable powder formulation or dusts to prevent damage to vegetation. Commercial hornet and wasp aerosol sprays are available.
	-----	-----	Wettable powders may be used as dry dusts. Repeat	
	-----	-----	treatment, if necessary. Remove nest when no activity is seen.	
WHITE GRUBS (Japanese beetle, masked chafer, Asiatic garden beetle, etc.)	-----	-----	-----	Diazinon provides effective control of grubs. Best results obtained when applied in August and September.
	-----	-----	-----	
	milky spore disease		40 tsp.	Apply 1 level teaspoonful in spots 5 feet apart with 5 feet between rows. This results in a rate of 8 lb. per acre. If the powder is broad- cast or applied with a spreader, use at least 30 lb. per acre. <u>It is most effective against Japanese beetle grubs.</u> Treat permanent turf where insecticides are not used.

*Whenever Dursban is used, keep out of fishpools and other bodies of water. Do not apply where runoff is likely to occur. Keep children and pets off treated area until spray is dry, or until granules are watered into the soil and the area is dry.

**Do not allow children or domestic animals on lawns until this product has been watered in and the completed area is completely dry. Clean up spills on walks and patios.

INSECT PESTS OF SHRUBS, VINES, AND TREES

Pest or Pest Group	Major Hosts	Insecticide and Formulation	Amt./3 gal.	Remarks
APHIDS *	General on most tree and shrubs**	malathion 50% WP	6 tbsp.	Begin applications when winged females first attack plants. Repeat applications weekly during migration period. Some aphids have one host; other, alternate hosts. Infestation periods vary with the host. See "Spray Injury," p. 4.
		57% EC	2 tbsp.	
		diazinon 25% EC	2 tbsp.	
		dormant oil miscible	6 tbsp.	
BAGWORM	arborvitae, white cedar, juniper, honeylocust, Chinese elm, sycamore **	carbaryl (Sevin) 50% WP	6 tbsp.	Treat in early June when larvae are very young and bags are small. Older larvae are resistant to insecticides. Add a miticide when using carbaryl, particularly on conifers (see mites). See "Spray Injury," p. 4.
		diazinon 50% WP	3 tbsp.	
		25% EC	2 tbsp.	
		malathion 50% WP	6 tbsp.	
BARK BEETLES	maple, aspen, poplar, ash, willow, elm, locust	lindane 20% EC	1 pt./5 gals. of water	Spray bark of weakened trees not yet infested as protection. Apply during May and in July. Once trees are infested, death usually results. Bark beetles are secondary pests, especially in pines.
	lindane 20% EC	6 tbsp.		
BORERS Moths	dogwood, lilac, rhododendron, peach	lindane 20% EC	6 tbsp.	Thoroughly wet the bark of the trunk and branches. Lindane may not be fully effective. It may be advisable to engage a commercial arborist to control severe borer problems.
		lindane 20% EC	3 tbsp.	
Beetles	sugar maple, dogwood, pine, black locust	lindane 20% EC	3 tbsp.	Lindane may not be fully effective. Spray or paint the bark of the trunk, branches, and twigs.

* Uses for specific pests are given on each label.

** Uses for specific hosts are listed on the label for each insecticide.

INSECT PESTS OF SHRUBS, VINES, AND TREES

Pest or Pest Group	Major Hosts	Insecticide and Formulation	Amt./3 gal.	Remarks
BOXELDER BUG	boxelder (female tree only)	carbaryl 50% WP (Sevin)	6 tbsp.	Although sprays can provide control, it is often not practical. Removal of seed-bearing (female) trees is a good preventative if done area-wide. Apply sprays in September. See "Spray Injury," p. 4.
CICADA	oaks, numerous other trees	carbaryl 50% WP (Sevin)	6 tbsp.	Contract spraying by arborists with large equipment is most practical. Egg-laying injury occurs mostly on large shade trees. Sprays should be applied 10-14 days after the first males are heard "singing." See "Spray Injury," p. 4.
DEFOLIATORS Certain leaf feeding caterpillars, loopers, cankerworms, leaf beetles, skeletonizers, leaf tiers, leaf rollers, chafers, casebearers, Japanese beetles*	elm, mimosa, poplar, oak, willow, catalpa, linden, roses, walnut, beech, hickory, maple, apple, flowering fruits, and other trees and shrubs	carbaryl 50% WP (Sevin)	6 tbsp.	For large shade trees, it is essential to engage a commercial arborist with large spraying equipment. Elms may require spraying every year in late May. Cankerworms frequently build up to destructive numbers on elm, beech, linden, oak, and other trees; applications should be made in late April. Carbaryl may contribute to mite buildup. Add a miticide to sprays applied during the summer months. See "Spray Injury," p. 4.
GALL INSECTS County oak gall, horned oak gall, hickory leaf stem gall aphid, many others	most woody plants	no insecticide known effective		The named gall insects are the most destructive, but normally occur in low numbers and do not constitute a hazard to the health of a tree. Other types of insect galls on foliage, stems, or buds are seldom injurious. Removal and destructions of galls when insects are within may help reduce buildup.

* Uses for specific pests are given on each label.

INSECT PESTS OF TREES, SHRUBS, AND VINES

Pest or Pest Group	Major Hosts	Insecticide and Formulation	Amt./3 gal.	Remarks
JAPANESE BEETLE	apple, birch, elm, linden, maple, roses, willow, and many other trees and shrubs	carbaryl 50% WP (Sevin)	6 tbsp.	Adults first appear in mid-June, feed and lay eggs in July and August. Two to four sprays at 2-week intervals may be needed. Carbaryl encourages mites. Adults continually migrate to susceptible hosts. See "Spray Injury," p. 4.
LACEBUGS	andromeda, azalea, rhododendron, pyracantha, sycamore, walnut, oak and numerous other hosts	carbaryl 50% WP (Sevin)	6 tbsp.	Lacebugs overwinter as adults on deciduous plants. Treat in late May and repeat in June and July. On evergreen, lacebugs overwinter as eggs. Treat in mid-May and repeat twice at monthly intervals. See "Spray Injury," p. 4.
LEAFHOPPERS	most shade trees, roses	carbaryl 50% WP (Sevin)	6 tbsp.	Leafhoppers are active throughout the growing season. Usually damage is not serious. When populations are increasing, spray applications may be needed. See "Spray Injury," p. 4.
LEAFMINERS Evergreens	Azalea, American and English holly varieties, boxwood, arborvitae	dimethoate 23% EC (Cygon, DeFend)	2 tbsp.	Best timing is early June, but may be applied as late as the end of July effectively. Addition of a wetting agent is desirable. <u>DO NOT USE</u> dimethoate on Chinese or burford holly. See "Spray Injury," p. 4.
		diazinon 25% EC	2 tbsp.	
		oxydemeton-methyl (MSR) 25% SC	3 tsp. (holly only)	
		diazinon 25% EC	2 tbsp.	
Deciduous plants	azalea, hawthorn, birch, lilac, oak	malathion 57% EC	2 tbsp. (birch, boxwood only)	Spray before the mines become 1/8-1/4" in diameter. Timing varies depending on the species and the host. Applications should be repeated for species which have more than 1 generation per year. See "Spray Injury," p. 4.
		oxydemeton-methyl (MSR) 25% SC	3 tsp. (birch only)	

INSECT PESTS OF TREES, SHRUBS, AND VINES

Pest or Pest Group	Major Hosts	Insecticide and Formulation	Amt./3 gal.	Remarks
MEALYBUGS	numerous hosts as specified on the label	malathion 57% EC	3 tbsp.	Spray when mealybugs are first noticed and repeat 2 or 3 times at 10-day intervals. Taxus mealybugs has only one generation per year, requiring a single application. Use a wetting agent with wettable powder. A forceful spray is more effective than light mist coverage. See "Spray Injury," p. 4.
		----- 50% WP	3 tbsp.	
		carbaryl 50% WP (Sevin)	2 tbsp.	
		diazinon 25% EC	6 tbsp.	
MIMOSA WEBWORM	mimosa, honey locust	carbaryl 50% WP (Sevin)	6 tbsp.	Spray foliage in July or when damage first begins to appear. Add a miticide to carbaryl on honey locust (see mites) or use diazinon. See "Spray Injury," p. 4.
		----- diazinon 25% EC	1 tbsp.	
MITES Rust, gall mites	hemlock, privet, maple, elm, linden, beech, walnut, wild cherry, oak	dicofol 35% WP (Kelthane)	5 tbsp.	Gall mites and erineum mites on maple, elm, beech, and wild cherry seldom warrant control. Rust mites frequently cause damage to elm, linden, hemlock, privet, and others. On hemlock, spray in late February or early March on warm days. For elm, linden, and other shade trees, spray in late June and repeat in one month.
		----- diazinon 25% EC	1 tbsp.	
Spider mites	roses, mountain ash, flowering fruits, honey locust, elm, oak, linden, azalea, willow, boxwood, spruce, hemlock, arborvitae, juniper	dicofol 35% WP (Kelthane)	5 tbsp.	Spray broadleaved and needled evergreens in early May or early fall. Spray deciduous trees and shrubs in early June and again in mid-July. Treat roses regularly at 2-3 week intervals, alternating miticides once or twice during the season.

INSECT PESTS OF TREES, SHRUBS, AND VINES

Pest or Pest Group	Major Hosts	Insecticide and		Amt./3 gal.	Remarks
		Formulation			
PINE BARK APHID	white and Scotch pine	diazinon	25% EC	2 tbsp.	Apply 2 applications at weekly intervals in mid-to-late April and repeat in mid-June.
			50% WP	3 tbsp.	
		malathion	57% EC	3 tbsp.	
			50% WP	3 tbsp.	
PINE TIP MOTH	Scotch, mugho, Monterey, loblolly, and most other 2 and 3 needle pines	dimethoate (Cygon, DeFend)	23% EC	4 tbsp.	Spray in mid-to-late April and again in mid-June when moths are flying. Timing varies with the season and geographic location. See "Spray Injury," p. 4.
PLANT BUGS	honeysuckle, boxelder, forsythia, wiegelia, dogwood	carbaryl (Sevin)	50% WP	6 tbsp.	Seldom serious on woody plants, more injurious to annual and perennials. See "Spray Injury," p. 4.
PSYLLIDS	hackberry, laurel, boxwood	carbaryl (Sevin)	50% WP	6 tbsp.	Spray hackberry in early May or when adults emerge in large numbers in the fall. Spray in mid-to-late April on boxwood when new growth has started. Add a spreader-sticker. See "Spray Injury," p. 4.
ROSE SLUGS	roses	carbaryl (Sevin)	50% WP	6 tbsp.	Spray when small larvae are first seen. Timing depends on the species and the host. Most sawflies are gregarious, working in groups localized on certain branches of the host. See "Spray Injury," p. 4.

INSECT PESTS OF TREES, SHRUBS, AND VINES

Pest or Pest Group	Major Hosts	Insecticide and Formulation	Amt./3 gal.	Remarks	
<p>SCALE INSECTS</p> <p>(Uses for specific pests are given on the insecticide label.)</p>	<p>practically all major ornamentals may be attacked by soft or armored scales. Approximately 150 scale insect species known in Virginia.</p> <p>(See extension leaflet for crawler periods and correct timing).</p> <p>(Uses for specific hosts are given on the insecticide label).</p>	malathion 57% EC	3 tbsp.	<p>Sprays must be applied during the crawler stage or when crawlers have just settled. It is necessary to repeat applications 2 or 3 times at weekly intervals for species with extended hatching periods. Do not use malathion on ferns or eleagnus. See "Spray Injury," p. 4.</p> <p>For Japanese wax scale, carbaryl is primarily effective for some but not all scales. For wax scale, treat in early June. See "Spray Injury," p. 4.</p> <p>Apply in late spring before leaves open. Spray when temperature is above 50° and freezing will not occur for 24 hours. Avoid sensitive trees; see label precautions. Not effective against oystershell, pine needle, euonymus, juniper scale, and some others. See "Spray Injury," p. 4.</p> <p>Apply in late May and again in mid-June. Do not use for other scale insects.</p>	
		-----	-----		-----
		carbaryl (Sevin) 50% WP	6 tbsp.		
		dormant oil miscible	6 tbsp.		
	hemlock	dimethoate (Cygon, DeFend) 23% EC	2 tbsp.		
TENT CATERPILLARS	apple, wild cherry, flowering fruits	carbaryl (Sevin) 50% WP	6 tbsp.	Treat when leaves are 1/3 developed. Older larvae are difficult to kill. Sprays are not effective when larvae begin to migrate from trees. See "Spray Injury," p. 4.	
THRIPS	numerous hosts (Uses for specific hosts are given on the label)	carbaryl (Sevin) 50% WP	6 tbsp.	Spray when insects first appear, usually in late May or early June. Repeat in 3-4 weeks. Add a spreader-sticker. See "Spray Injury," p. 4.	
		-----	-----		
		diazinon 25% EC	2 tbsp.		
		-----	-----		
		diazinon 50% WP	3 tbsp.		

INSECT PESTS OF TREES, SHRUBS, AND VINES

Pests or Pest Group	Major Hosts	Insecticide and		Amt./3 gal.	Remarks
		Formulation			
WEBWORMS	barberry, honey-locust, juniper, mimosa, pine, poplar, pyracantha, and major shade tree species (fall webworm)	diazinon	50% WP 25% EC	3-9 tbsp. 2 tbsp. (follow label directions for amount)	Spray for fall webworm in late June and early July; juniper webworm in late July or early August; pine webworm in late August or early September; leaf crumpler on barberry and pyracantha in June. Use a forceful spray to penetrate webbing. See "Spray Injury," p. 4.
WHITE PINE WEEVIL	white pine, Norway spruce, scotch pine, white spruce	lindane	20% EC	3 tbsp.	Spray <u>ONLY</u> the terminal upright leader down to the first whorl of branches. Do <u>not</u> spray entire tree. Treat before April 1-15, prior to egg laying by adults.
WHITEFLIES	numerous hosts as specified on the label	diazinon	25% EC	2 tbsp.	Spray 2 or 3 times at weekly intervals starting when insects are first seen. Coverage must be thorough on undersides of leaves.

Trade and brand names are used only for the purpose of information and the Virginia Cooperative Extension Service does not guarantee nor warrant the standard of the product, nor does it imply approval of the product to the exclusion of others which may also be suitable.

KEYS TO PROPER USE OF PESTICIDES

1. Read the label on each pesticide container before each use. Follow instructions to the letter; heed all cautions and warnings, and note precautions about residues.
2. Keep pesticides in the containers in which you bought them. Put them where children or animals cannot get to them, preferably under lock and away from food, feed, seed, or other material that may become harmful if contaminated.
3. Dispose of empty containers in the manner specified on the label.

SEE YOUR DOCTOR IF SYMPTOMS OF ILLNESS OCCUR DURING OR AFTER USE OF PESTICIDES.

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