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Controlling Pests of Trees and Shrubs – Guide for Home Gardeners
Michigan State University
Cooperative Extension Service
Home and Family Series

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Revised March 1975
5 pages

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Controlling Pests of Trees and Shrubs

Guide for Home Gardeners

Extension Bulletin E-534 • Revised Mar. 1975 • House and Garden Series
COOPERATIVE EXTENSION SERVICE • MICHIGAN STATE UNIVERSITY

By William E. Wallner, Extension Specialist in Entomology

CONTROL MEASURES given in this folder are recommended as a guide to the home gardener for controlling the more common pests of trees and shrubs. Many of these pests can cause serious plant injury in a short period of time. Therefore, it is suggested that periodic inspection of plantings be an integral part of any grounds maintenance program. Replacement of woody plants is a costly and sometimes impossible operation. Learn to recognize and direct control measures against the pest before serious plant injury occurs.

Insect control does not always rely upon the use of chemicals; certain insects may be controlled by biological insecticides such as *Bacillus thuringiensis* or physical measures. Such non-chemical control procedures are suggested where known and should be employed when possible. However, if you use a chemical for pest control remember to properly identify the pest problem, select an appropriate remedial chemical and handle and apply the chemical according to instructions on the label.

Even though "all purpose" spray mixtures may be used on a time schedule to prevent insect attack, periodic inspection and corrective treatment is preferred. "All purpose" sprays are more costly, may destroy beneficial organisms and will not control all insects. Best results are achieved with specific, well timed controls. The timing of physical or chemical control measures is given for a certain time during the year to control a particular stage of the pest. Failure to comply with these suggestions will often lead to disappointing results.

Pesticides are sold as wettable powder or as emulsifiable concentrate formulations. Both types are designed to be diluted in a given amount of water and applied as sprays. Generally, emulsion type insecticides will give longer lasting residues than wettable powder formulations. Furthermore, it is recommended that emulsions be used in sprayers that lack agitation since there will be less problems with their remain-

ing in suspension.

RATES OF APPLICATION

Following are the chemicals and their rates of application recommended for controlling the various pests in this folder. Be accurate in your dilution rates; too much chemical may cause plant injury; too little chemical will result in poor pest control.

CHEMICAL	AMOUNT OF WATER	
	3 gals.	100 gals.
Bacillus thuringiensis (Thuricide, Dipel, Biotrol)	4 tbsp.	2 qts.
Chlordane 72% emulsion	1 tbsp.	1 pt.
Diazinon 50% wettable powder 48% emulsion	3 tbsp. 1 tbsp.	1 lb. 1 pt.
Dormant Oil emulsion*	1½ cups	2 gals.
Kelthane 18.5% wettable powder 18.5% emulsion	6 tbsp. 2 tbsp.	2 lbs. 1 qt.
Lindane 25% wettable powder 20% emulsion	3 tbsp. 4.5 tsp.	1 lb. 1½ pts.
Liquid Lime Sulfur suspension†	2.5 pts.	11 gals.
Malathion 25% wettable powder 57% emulsion	1 cup 2 tbsp.	4 lbs. 1 qt.
Methoxychlor 50% wettable powder 25% emulsion	6 tbsp. 3 tbsp.	2 lbs. 2 qts.
Sevin 50% wettable powder 4 flowable	6 tbsp. 2 tbsp.	2 lbs. 1 qt.
Teclon 25% wettable powder 10% emulsion	3 tbsp. 2 tbsp.	1 lb. 1 qt.

*Apply according to manufacturers' directions in spring before plant growth begins when temperature is above 45° F. and danger of freezing nights has passed.

†Discolors stone, paint and brick; therefore, use with caution around buildings.

INSECT CONTROL GUIDE

PEST	INJURY AND PLANTS ATTACKED	WHEN TO TAKE ACTION	WHAT TO DO
APHIDS	Soft-bodied <i>grays, green, red or black</i> insects about 1/8 inch long. Suck juices from leaves and new growth of many deciduous trees and shrubs as well as several conifers. Liberate large amounts of sticky honeydew, which eventually turns black.	<i>Dormant</i> — During April before plant growth begins for controlling overwintering eggs. or <i>Spring or Summer</i> — From May through August to control active forms.	Spray Dormant Oil to twigs and branches. Spray Malathion or Diazinon to foliage.
BAGWORMS	Caterpillars within bags up to 2 inches long rapidly devour foliage of many evergreens (especially arborvitae) and several deciduous trees.	When caterpillars first noticed — usually during mid-June.	Pick bags from trees and destroy them or spray with Malathion or Sevin or Diazinon to foliage.
BIRCH LEAF MINER	Flattened, white, legless larvae feed between upper and lower leaf surfaces, causing leaves to blister and turn brown.	When eggs have hatched but before leaf mines exceed 3/8 inch — usually during mid-May.	Spray Malathion or Diazinon or Sevin to the foliage.
BOXELDER BUG	Black and red bugs about 1/2 inch long feed on seed pods and leaves of boxelder, maple and ash, but cause little injury. Chiefly a nuisance pest because it invades dwellings for overwintering.	When insects congregate in May and June or in the fall.	Spray Sevin to the foliage or to bases of trees or building foundations where the insects cluster.
BRONZE BIRCH BORER	White, legless larvae tunnel beneath bark, girdling branches, causing them to die. Die-back of branches begins in the top, but all woody portions may be attacked.	About June 7 followed by a second spray in 10 to 14 days.	Cut out dead branches before June 1 and destroy them. Apply a lindane spray to the back of branches and trunk.
CANKERWORMS	Inchworms about 1 inch long consume the leaves of elm, maple, linden, oak, and many others during May and June.	During early May when larvae begin to feed.	Apply a spray of Bacillus thuringiensis or Sevin or Malathion to the foliage.
COTTONY MAPLE SCALE	White, cottony scales about 1/4 inch long on the twigs suck plant juices and cause leaves to yellow and drop prematurely. Tree vigor is reduced and individual branches may be killed.	<i>Dormant</i> — Before plant growth begins in the spring to control overwintering scales. or <i>Summer</i> — During late June or early July to control immature scales.	Spray Lime Sulfur to the bark of all branches and trunk. Spray Sevin or Diazinon to all plant parts.
EASTERN TENT CATERPILLAR	Hairy caterpillars up to 1 1/2 inches long with a light stripe along their backs form nests in branch crotches starting in May. Leaves on small trees or branches of large trees are completely chattered off by the caterpillars.	During the spring when the weather is cloudy and cool and the tents are small usually during mid-May. or If tents are extremely numerous or it is impossible to remove all tents during mid to late May.	Remove tents and destroy them. Apply a spray of Bacillus thuringiensis or Malathion or Sevin to the tents and the foliage.
EUONYMUS SCALE	Brown, oval females and white, elongated males infest the stems and leaves of evergreen and deciduous varieties of euonymus. Leaves turn yellow, then drop prematurely, eventually the entire plant dies.	<i>Dormant</i> — Before plant growth begins in spring to control overwintering scales. or <i>Summer</i> — In late May or early June to control immature scales. Repeat again in 10 days.	Spray Dormant Oil applied to upper and lower leaf surfaces and stems. Malathion or Diazinon to stems and upper and lower leaf surfaces.
ELM LEAF BEETLE	Olive green beetles (1/4 inch long with a dark stripe along each wing cover) chew holes through leaves or dull yellow larvae (slug-like with 2 rows of black spots down the back), skeletonize leaves of Chinese, Camperdown and American elm beginning in June. Adults may be a nuisance as they often invade homes to hibernates.	When the larvae appear — usually when the leaves are fully expanded. A second brood usually occurs during late July but brood doesn't require treatment.	Spray the foliage with Sevin or Methoxychlor. Caulk or seal dwellings to prevent adults from gaining entry. Adults in the home will not cause damage and can be removed by sweeping or vacuuming up and destroying.
FALL WEBWORM	During August or September the foliage of one limb or entire tree or shrub may be stripped and webbed together to form a nest. Mature larvae are 1 inch long, pale green in color and have numerous whitish hairs.	If webs are not too numerous, prune out and destroy them as soon as they are discovered. If webs are numerous apply a spray, generally during early August.	Apply a spray of Bacillus thuringiensis or Sevin or Diazinon or Malathion to webs and the foliage.
FLATHEAD APPLE TREE BORER	Newly transplanted or weakened trees may be killed by larvae boring in the sapwood. Creamy-white, legless larvae have a flattened enlargement behind the head. Entire young trees or branches on mature trees may be killed by the inch-long larvae.	The first week in June, followed by two more sprays at 3 week intervals.	Cut out dead branches before mid-May and destroy them. Spray the entire tree with a lindane spray.
FLETCHER SCALE	Brown, oval, hemispherical scales 1/4 inch long suck the juices from the twigs of taxus, arborvitae and juniper. Heavy infestations cause needles to yellow and drop; branches or entire plants may be killed.	<i>Dormant</i> — Before plant growth begins in spring to control overwintering scales. or <i>Summer</i> — In late June and repeat in 10 days.	Spray Dormant Oil with pressure to all plant parts. Spray Malathion or Sevin or Diazinon with pressure to the foliage.
HONEY LOCUST POD GALL MIDGE	Oblong, pinkish green galls about 1/4 inch in diameter are produced by pink, legless larvae which feed on the new leaves.	While galls may be numerous, they seldom cause serious injury to the tree. Hence, chemical control is not suggested.	At the present time there is no insecticide registered with the Environmental Protection Agency to control this insect.
JUNIPER SCALE	Grayish-white scales 1/20 inch in diameter with a yellow center suck juices from the foliage and twigs. Plants turn yellow and branches or entire trees die.	<i>Dormant</i> — Before plant growth begins in spring. or <i>Summer</i> — In mid-May. This spray should be repeated in 10 days if immature scales continue to emerge over an extended period of time.	Spray Lime Sulfur or Dormant Oil to all plant parts. Spray Malathion or Sevin or Diazinon to all plant parts.
LEAFHOPPERS AND PLANT BUGS	These green to dark brown insects about 1/4 inch long suck juices from a variety of trees and shrubs. Their damage is most apparent on locust which may drop all of its foliage during mid to late summer.	Late June or early July or when large numbers of insects are noted on the foliage.	Spray Sevin or Malathion or Diazinon to the foliage.
LECANIUM SCALES	Mahogany brown, oval, hump-backed insects 1/4 to 3/8 inches long infest woody portions of many plants. Suck juices from trees reducing their vigor and causing leaves to yellow and wilt. Branches of mature trees or entire immature trees may be killed. Scales excrete fine droplets of clear sticky honeydew, which adheres to plant parts and other objects it falls upon, which eventually turns black.	<i>Dormant</i> — before plant growth begins in spring to control overwintering scales. or <i>Summer</i> — in late June and repeat in 10 days.	Spray Dormant Oil to all woody parts. Spray Malathion or Sevin or Diazinon to all plant parts.
LILAC BORER	Cream-colored larvae with brown heads about 1 inch in length bore into the main stem of lilac, ash, and privet causing leaves to wilt and shoots to break off. Older, rough-barked stems are most susceptible to attack.	Cut and burn heavily infested shoots before the end of April. Apply spray at 3-week intervals beginning the first week in May.	Apply a lindane spray to woody parts, particularly the larger rough-barked stems.
MAPLE BLADDER GALL	Green, red, or black bladder-shaped galls on the upper leaf surfaces of silver and red maples are caused by microscopic mites. While galls may be numerous, they cause little injury to the tree.	After leaves have dropped in the fall or during April before plant growth begins. Since this mite causes questionable harm to the tree, control is warranted only under special cases.	Spray Sevin or Malathion or Liquid Lime Sulfur to all twigs and branches.
MAY OR JUNE BEETLES	Brown, robust beetles 1/2 to 3/4 inch long feed at night on the leaves of oak, birch, linden, maple and other specimen trees, often causing defoliation.	During late May or early June when adults are feeding. Immature beetles (grubs) feed on the roots of a variety of plants but often cause severe damage to lawns. While lawns may be protected with insecticides, trees can still be defoliated by beetles which fly in from untreated areas. Therefore, grub treatments are an unreliable method for protecting foliage.	Spray the foliage with Sevin or Methoxychlor.
MOUNTAIN ASH SAWFLY	Yellow-green larvae (up to 3/4 inch long with irregular black spots and yellow heads) feed on the foliage of mountain, American and European ash. Young larvae feed along the edge of the leaves and when disturbed, raise their abdomens in the form of an "S".	During mid-June or when larvae are first noticed.	Spray Malathion or Sevin to the foliage.

OAK GALLS	Growth on leaves or smaller branches are produced by the attack of a number of small wasps. These wasps may be round, flattened, smooth, bumpy or irregular in appearance. Each insect produces a characteristic gall and can usually be found within it. White galls may be numerous they seldom cause injury to the tree.	Summer — late June, or when galls are first noted. Early Spring — when leaves are $\frac{3}{4}$ expanded to reduce new gall formation.	Pick or prune out galls after they form if they are not too numerous. If severe damage is evident, apply a lindane spray to all plant parts.
OAK LEAF SKELETONIZER	The foliage of various oaks but especially red oak is skeletonized leaving only the veins and upper leaf surfaces intact. Pale yellow larvae about $\frac{3}{16}$ inch in length spin down on slender twigs and form white cocoons which are ridged longitudinally. Cocoons are attached to leaves, bark, or sides of houses.	Outbreaks of this insect rarely last longer than 2-3 years and are primarily associated with mature trees. While the appearance of trees may be adversely affected, serious injury seldom occurs.	At the present time there is no insecticide registered with the Environmental Protection Agency to control this insect.
OYSTERSHELL SCALE	Gray-brown, oystershell-shaped scales about $\frac{1}{4}$ inch long completely encrust branches and twigs of lilac, ash, willow, apple, viburnum, and many other trees and shrubs. Trees are stunted, foliage is yellowed, and branches or entire trees die.	Dormant — Before plant growth begins in spring, or Summer — Apply in late May and repeat in 2 weeks to control immature scales.	Spray Dormant Oil to all woody parts. Spray Malathion or Sevin or Diazinon to leaves, twigs, and trunk.
PINE NEEDLE SCALE	White, elongated scales about $\frac{1}{8}$ inch long suck juices from needles of Scotch, red, Austrian, and white pines as well as white and blue spruces. Trees are stunted, needles turn yellow and drop prematurely. If uncontrolled, this insect may kill entire trees.	Dormant — Apply in April before plant growth begins. Summer — Apply when lilac is in full bloom (late May) and repeat again in late July.	Spray Liquid Lime Sulfur complete coverage of all needles. Spray Malathion or Sevin or Diazinon to needles and branches.
PINE SAWFLIES	Larvae about $\frac{1}{8}$ inch long (gray-green with black stripes or white with rows of black spots) feed in clusters and completely strip the older needles from Scotch, red, Austrian, mugo, and jack pines. When disturbed, larvae raise back their heads.	During early May when larvae hatch from overwintering eggs.	Spray Malathion or Sevin to entire foliage.
ROSE CHAFER	During June, tan beetles $\frac{1}{2}$ inch long with spiny red legs are particularly damaging to rose, peony, iris and other floricultural crops. However, adults also feed on the foliage of elm, apple, cherry, virginia creeper, and others.	Control of the immature grub stage is usually impractical, but adults are easily controlled during early June.	Spray Sevin or Methoxychlor to the foliage when adults congregate.
SAN JOSE SCALE	Gray-black scales $1\frac{1}{16}$ inch in diameter with a black central nipple encrust branches and trunk of apple, flowering cherry, firethorn, cogonaster, quince, dogwood, elm, ash, and many others. Scales suck large amounts of juices reducing plant vigor, often killing branches or the entire tree.	Dormant — During April before plant growth begins. Summer — In late June and again in 10 days; repeat in early August and again 10 days later to control immature scales.	Spray Dormant Oil or Liquid Lime Sulfur to all woody parts. Sevin or Malathion or Diazinon. Spray to all plant parts.
SPIDER MITES	Several different mites feed on the leaves of elm, oak, linden, ash, flowering crab, pyracantha, pine, arbutus, juniper, spruce, and many others. Mites pierce tissues and suck juices, giving leaves or needles a stippled or bronzed appearance and causing them to drop prematurely. Mites can be detected by forcibly jarring a portion of the foliage over a white piece of paper; mites will appear as tiny moving specks.	Dormant — During April before plant growth begins. or Spring through Fall — To control active mites.	Spray Dormant Oil to all plant portions. (Caution — oil will remove bloom from blue spruce.) Kelthane or Tedion. Spray to all leaf surfaces.
SPRUCE GALL APHIDS	Abnormal green to brown swellings which encompass the tips of Colorado blue, Englemann, and sitka spruces, or pineapple galls at the bases of twigs of Norway, red, white, and black spruces are caused by the feeding of two different aphids. Galls disfigure trees, but do not kill them.	During late June after galls have formed. or During April before plant growth begins.	Pick off and destroy galls if they are not too numerous. Lindane or liquid lime sulfur — To all twigs and branches.
TAXUS MEALYBUG	All varieties of yew, especially the more compact forms, are subject to attack by this white, fluffy, slow-moving insect that sucks juices from the branches and trunk. Infested plants accumulate abundant brown needles and become blackened with honeydew.	Dormant — During April before plant growth begins. or Early Summer — In late May or early June before insects produce protective cottony material.	Spray Dormant Oil to bark of all branches and trunk. Spray all plant parts thoroughly with Malathion.
TAXUS WEEVIL	White, legless grubs about $\frac{1}{2}$ inch long feed on the small roots of yew, rhododendron, andromeda, arbutus, hemlock, and many other herbaceous plants, causing old growth to yellow and reducing new growth. Black adult weevils about $\frac{2}{3}$ inch long hide in the soil during the day and feed at night by chewing notches in needles particularly those closest to the soil.	During late June after all adults have emerged from the soil.	Spray Chlordane with pressure to the plant and the soil beneath it.
WILLOW LEAF BEETLES	Metallic blue or blue-black beetles about $\frac{1}{4}$ inch long chew holes in the leaves. Larvae, black slug-like creatures $\frac{1}{4}$ inch long, skeletonize leaves by chewing-off upper tissues.	During early May to control adults or later in early summer to control larvae.	Spray Sevin to all leaf surfaces.

HOST GUIDE TO COMMON PESTS

APPLE aphids bagworm cottony maple scale eastern tent caterpillar fall webworm flatheaded apple tree borer lecanium scales May or June beetles mites oystershell scale rose chafer San Jose' scale	mountain ash sawfly oystershell scale San Jose' scale	BIRCH aphids birch leaf miner bronze birch borer fall webworm lecanium scales May or June beetles	COTTONY MAPLE SCALE elm leaf beetle fall webworm lecanium scales mites rose chafer San Jose' scale	EUONYMUS euonymus scale	FLOWERING FRUITS aphids eastern tent caterpillar fall webworm lecanium scales May or June beetles mites rose chafer San Jose' scale	JUNIPER bagworm Fletcher scale juniper scale mites	LILAC lilac borer oystershell scale San Jose' scale	LINDEN aphids	COTTONY MAPLE SCALE bagworm cottony maple scale fall webworm May or June beetles oystershell scale San Jose' scale	LOCUST cottony maple scale honey locust pod gall midge leafhoppers plant bugs mites	MAPLE aphids bagworm boxelder bug cankerworms cottony maple scale lecanium scales maple gall mites May or June beetles flatheaded apple tree borer oystershell scale	OAK aphids cankerworms cottony maple scale eastern tent caterpillar fall webworm flatheaded apple tree borer leafhoppers lecanium scales May or June beetles mites oak galls oak leaf skeletonizer	PINE aphids bagworm mites pine needle scale pine sawflies	PRIVET lilac borer mites	PYRACANTHA mites San Jose' scale oystershell scale	SPRUCE bagworm mites pine needle scale spruce gall aphids	TAXUS (YEW) Fletcher scale taxus mealybug taxus weevil	VIBURNUM aphids oystershell scale	WILLOW aphids cottony maple scale fall webworm flatheaded apple tree borer leaf beetles lecanium scales lilac borer
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EQUIPMENT

There are many types and sizes of sprayers suitable for spraying ornamental shrubs and trees. The type of equipment you select will depend on the magnitude of your spray operation and your preference.

Hose-on Sprayer. Simple to operate, these small sprayers are designed to be attached to a garden hose. They require no spray tank but operate by metering out a desired amount of chemical into a stream of water under household pressure. Problems encountered in some types of these sprayers have been poor spray distribution, clogging of nozzles and non-mixing of the insecticide with the water.

Trombone Sprayer. Spray mixture can be prepared in any size container and applied by inserting the intake apparatus into it and moving the slide in a trombone-like motion. A uniform spray concentration can be obtained since the insecticide is mixed in a known quantity of water. However, the insecticide mixture should be periodically agitated when using wettable powder formulations.

Compressed Air Sprayer. Air is pumped into the tank and forces the spray out when the nozzle is opened. Compressed air sprayers with 3- to 5-gallon capacity have wide adaptability for spraying small plantings. It is advisable to shake the sprayer periodically when using wettable powder insecticides to keep them in suspension.

Knapsack Sprayer. Carried on the back this sprayer operates by hand pumping a piston which supplies the spray pressure. The capacity of these sprayers is 3- to 5-gallons and allows for considerable movement in treating plants widely spaced from each other.

For treating large trees, high-pressure power sprayers are necessary. Should it be necessary to treat large trees, you should consult a commercial spray operator.

GENERAL WARNINGS

All pesticides are poisonous in some degree to warm-blooded mammals. They should be handled cautiously to prevent poisoning pets, livestock, chil-

dren, or the user. When using any chemical, observe the following safe-use procedures:

1. Always read the label before using any chemical. Note warnings and cautions each time before opening the container. **REMEMBER — IT IS ILLEGAL TO USE AN INSECTICIDE TO CONTROL A PEST UNLESS IT IS STATED ON THE LABEL.**

2. Keep chemicals out of the reach of children, pets, and irresponsible people. Pesticides should be stored in their original container outside the home in a locked cabinet or shed.

3. Avoid inhaling pesticide sprays or dusts and, as directed on the label, wear protective clothing and mask. A handkerchief fitted to the face and long-sleeved shirts and gloves will help prevent excessive inhalation and contact with the material.

4. Do not spill sprays or dusts on the skin or clothing. If they are spilled, wash yourself immediately with soap and water and launder your clothing before wearing it again.

5. Dispose of empty pesticide containers in trash or by burning or burying them. When burning them, avoid inhaling the smoke.

6. Use separate equipment for applying hormone-type herbicides and separate equipment for applying pesticides in order to avoid accidental injury to susceptible plants.

7. Do not apply an insecticide listed in this folder to vegetables, fruits, livestock, or garden soils unless the label or up-to-date Michigan State University Cooperative Extension Service literature says you can safely do so.

8. Dispose of excess spray mixtures correctly by dumping into a sanitary land fill dump. If such a dump is not available, dig a hole at least 18" deep, pour in the excess spray and cover with soil. **DO NOT DUMP EXCESS SPRAY MATERIAL INTO SEWERS OR DRAINS OR DISPOSE OF THEM IN SOIL TO BE USED FOR GROWING EDIBLE PLANTS.**

Effort has been made to suggest only those chemicals which will adequately control the target pest with maximum safety to the user and other wildlife. Proper handling and application of these pesticides will further minimize undesirable side effects.