

FRUIT PEST CONTROL

Fruit Gardens



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Pest management in fruit gardens and home orchards should begin with good growing practices including:

- Selecting varieties adapted to Kansas, with resistance to pests whenever possible.
- Annual pruning for good sunlight exposure of leaves and to remove infected wood.
- Practicing good sanitation; rake and destroy leaves and damaged fruit.
- Keeping plant material healthy with appropriate nutrition for the kind of fruit.

Gardeners who plant a few fruit trees, brambles, grapes or strawberries, would like to produce fruits as fine as those pictured in the catalog or purchased from well-managed commercial orchards. To produce such high quality fruit, free of disease and insect pests, requires following a spray program similar to that used by commercial fruit growers. Pest injury may be objectionable to some gardeners, but to others lower fruit quality may be acceptable.

Plant parts (including fruit, foliage and wood) are subject to attack by pests beginning before growth starts each spring until leaf fall. Some pests cause permanent damage to the plant, reduce plant vigor, limit production and may kill the plant if not controlled. It is difficult for the home gardener to know when these pests are present, so prevention is more effective than control measures after the attack.

Effective pest control programs must be adjusted for such conditions as stage of fruit development, temperature and rainfall.

Important Conditions to Consider

1. Dormant sprays are important; some pests attack before visible growth begins. A dormant oil spray is applied to control scale insects, aphids, and mite eggs.
Fungicides are applied during the dormant period to control such diseases as peach leaf curl.
2. Some diseases begin before or during the bloom period, while others develop later in the season.
3. During a single growing season there may be two or more broods of an insect. Some insects may cause damage early in the season while others cause injury during the summer.
4. As branches, leaves and fruits grow, chemicals must be reapplied regularly to protect these new tissues.
5. Rainy weather favors disease spread and may wash protective chemicals from the plant.
6. To be effective, protective chemicals must be thoroughly distributed over wood, fruit, and foliage. This is accomplished by thoroughly spraying the plants to runoff.
7. Chemicals will not solve all fruit problems! Good cultural practices such as pruning,

fertilizing and weed control must be done properly if trees are to remain vigorous, productive and have resistance to pests.

Avoid Planting Infected or Infested Plants

Numerous damaging viruses, fungi, nematodes and some bacteria and insects can be carried with your planting stock or on soil clinging to the roots. The damage may spread to other plants. Some diseases are not controllable by a spray program and must be avoided altogether. Whenever possible, purchase plants certified free of diseases and insects. Don't give away or accept contaminated or infected plant material.

Using Pesticides Properly **Storage**

Properly stored, most pesticides will retain their strength for a second or third season. However, it is advisable to buy only enough material for one season's use. Most pesticides gradually lose their effectiveness when exposed to moisture, air, light and high temperatures. Freezing temperatures may cause liquid formulations to separate, making them ineffective or unsafe to use.

Chemicals should always be kept in the container in which they were purchased. Keep the label clean so instructions can be studied to assure proper use of the chemical. Store garden chemicals in a locked cabinet or storage area separate from paint, animal food, oil, seeds and other commonly used products. In case of accidental spillage or ingestion, consult a physician at once and take the label with you to the office.

Spray Equipment

To adequately control pests, thoroughly cover fruit plants with pesticides according to the recommendations on the labels. Use a sprayer that is durable, easy to clean, and powerful enough to reach all parts of the plant, including treetops, with the spray. Suitable sprayers come in various types and sizes.

Compressed air sprayers are 1- to 3-gallon tanks with built-in hand pumps. The spray is delivered through an attached hose with a hand shutoff valve and nozzle tip. Larger, motor-operated units (up to 25 gallons) are also available.

Backpack sprayers are compressed air sprayers that can be carried on one's back. These sprayers, which range in size from 3 to 5 gallons, also are equipped with hand shutoff valves and have a hand pump

that must be pumped. The pumping builds up pressure in the tank and forces the spray through a hose and nozzle tip at an even, steady rate. The compressed air and backpack sprayers are satisfactory for a few small fruit trees, vines, bushes, or strawberry plants. They do not have the capacity to spray mature standard-size trees.

Trombone or slide-type sprayers consist basically of two small-diameter tubes. One slides within the other, compresses the liquids and sprays the pesticide solution through a small hole in the end of one tube. These sprayers can deliver the spray to the tops of most fruit trees and are suitable for small plantings.

Motor-powered sprayers with various size tanks are most effective for large trees, and are very effective for obtaining thorough spray coverage.

Garden hose sprayers, which attach to the end of a garden hose, are most acceptable for liquid formulations and wettable powders that can plug nozzle tips. The pesticides must be mixed uniformly with the water.

Accessory equipment

Home fruit growers need two other pieces of equipment—a 1-quart graduated measuring cup, and a set of measuring spoons. Keep these items separate from kitchen equipment. Mark them for pesticides only and store them with the pesticides. Measuring equipment is needed to measure pesticides accurately, ensuring the best control and least possibility of plant injury.

Handle Pesticides Carefully

The materials suggested in this circular are relatively low in toxicity, but careless use can cause illness.

- Read the label and follow all precautions and directions.
- Keep pesticides in their original containers, lock them away from children and pets and don't store them with food or feed.
- Avoid getting spray materials and spray on the skin. If an accident happens, wash the area liberally with soap and water IMMEDIATELY!
- Mix sprays in a well-ventilated area to avoid breathing spray dust and fumes.
- Wear a cap, long-sleeved shirt, and full-length pants when spraying to protect the skin from spray drift. Avoid breathing the dust or spray.

- Spray on days when there is little or no wind and apply the chemicals so any air movement will carry drift away from you.
 - Don't smoke or eat while spraying or handling spray chemicals.
 - Wash hands and face with soap and water after spraying.
 - Wash clothes used for spraying separate from other laundry.
 - Avoid spray drift on non-target plants, bird baths, fish ponds and animal water supplies.
 - Dispose of containers properly, in a manner that will prevent their reuse.
7. Wash out sprayer immediately after using. A 24-hour delay may result in a clogged sprayer.
 8. Control tree height by pruning so spray can reach all tree parts.
 9. Do not use the same sprayer for disease and insect control that is used to apply weed control chemicals.
 10. Spray carefully and thoroughly to cover all parts of wood, leaves and fruit. Spray until plant parts are thoroughly covered. The amount of spray solution needed for various size trees with fruits and leaves is shown below.

Ten Tips for Spraying

1. Mix fresh spray for each application. Add spray materials to 1 to 2 pints of water in a clean container. Smooth out all lumps before pouring materials into sprayer. Straining the spray mixture through a screen when filling the sprayer helps to prevent spray nozzle clogging.
2. Stir the spray mixture or shake the sprayer often to prevent the chemicals from settling out.
3. A commercial spreader-sticker will help sprays to cover and adhere to the leaf and fruit surfaces. A household detergent (¼ teaspoon per gallon of water) will disperse chemicals on the plant parts, but will not increase retention during and following rains.
4. Apply dormant sprays only when the temperature is above freezing and will remain above freezing while the chemicals dry.
5. As a general guideline, when pesticides are dried on foliage and fruit before rainfall occurs, about 1 inch or more of rain is required to wash off spray residues. If residues have not dried before rainfall or if rainfall is heavy, pesticides should be reapplied as soon as possible to prevent pest damage. Spray more frequently during rainy periods or if sprinkling systems regularly wet foliage and fruit.
6. Discard leftover spray; never save spray for future use since chemicals may settle out or create hazardous conditions. Spray materials suggested in this publication may be used on shrubs and shade trees.

Tree height (feet)	Spread (feet)	Gallons to apply
5–8	3–6	½ to 1
8–12	6–9	1 to 3
12–18	9–15	3 to 5
15–20	15–25	4 to 8

Chemicals for Fruit Pest Control

The following information may be helpful in controlling pests in the fruit garden or home orchard. The chemicals listed are among those available in garden-size packages and effective for controlling disease and insect problems.

Disease Control

Benomyl and thiophante methyl are broad spectrum fungicides used to control apple scab and summer apple diseases. They are not effective on cedar apple rust and must be mixed with another protectant such as ferbam to control this disease.

Captan, one of the best general purpose fruit fungicides, is compatible with most other fungicides and insecticides. It is the fungicide often found in commercial multipurpose fruit sprays. However, it is not compatible with oil, lime or alkaline materials. When combined with ferbam it gives fair to good control of rust, black rot, frog-eye leaf spot, sooty blotch, fly speck, bitter rot, brown rot, white rot (*Botryosphaeria* rot), cherry leaf spot, anthracnose of brambles, dead arm of grape and downy mildew. It will not control cedar-apple rust, powdery mildew or fireblight.

Chlorothalonil is labeled for control of peach leaf curl.

Copper fungicides are used to control a number of different fruit diseases. They are occasionally used as the main fungicide in multipurpose fruit spray mixtures. Unfortunately, copper fungicides are often toxic to plant tissues, and care must be taken when applying these products to certain fruit crops. **Bordeaux mixture** is a combination of copper sulfate and hydrated lime. It is a broad-spectrum protectant fungicide commonly used to control peach leaf curl, although it is also labeled for other diseases of apple and grape. This fungicide may cause russet on certain apple varieties. Fixed copper formulations, including copper hydroxide, are less injurious to plant tissue, but their use is still somewhat limited.

Ferbam is a black, wettable powder with a wide compatibility range. It is very effective against rust, raspberry anthracnose, several fruit rots, and as a dormant spray to control peach leaf curl. Ferbam may cause fruit finish problems when used on

Golden Delicious and Red Delicious apples.

Myclobutanil is a systemic fungicide used to control diseases of apples (scab, rust and mildew), grapes (black rot and powdery mildew), cherries (cherry leaf spot and mildew) and peaches (brown rot). This fungicide may be a good choice for those who have a relatively large fruit planting.

Streptomycin sulfate is an antibiotic widely used for fireblight control in apple and pears. It should be applied alone (not combined with other chemicals) several times during the bloom period. Follow label directions. It will provide acceptable control if coupled with pruning out of diseased branches.

Sulfur is available as liquid lime sulfur (calcium polysulfides) or as wettable sulfur (elemental sulfur). Liquid lime sulfur injures foliage so should be used only during dormant periods. The formulation may vary from 4 to 30 percent calcium polysulfides; in general, formulations of 25

Table 1. Effectiveness of Fungicides and Bactericides Against Fruit Diseases

	Benomyl and Thiophanate Methyl (2)	Bordeaux Mix	Captan	Chloro- thalonil	Ferbam	Lime- Sulfur	Strepto- mycin	Wettable Sulfur	Triadi- mefon
Apple and Pear									
Scab	G	M-O	G	O	M	O	NG	G	NG
Fireblight	NG	P	NG	NG	NG	NG	G	NG	NG
Rust	NG	O	NG	O	G	O	NG	NG	G
Powdery Mildew	G	O	NG	O	NG	O	NG	G	G
Black rot	G	M	M	O	M	O	NG	NG	NG
Sooty blotch, fly speck	G	M	M	O	M	O	NG	NG	NG
Stone Fruits									
Brown rot	G	NG	G	O	M	M	NG	G	O
Scab	G	NG	G	O	M	O	NG	G	O
Leaf curl	NG	G	P	G	G	G	NG	G	O
Cherry leaf spot	G	O	G	O	M	O	NG	NG	O
Grape									
Black rot	G	M	P	O	G	O	NG	O	G
Raspberries, Blackberries									
Anthracnose & other cane cankers	O	O	O	O	O	G	NG	O	O
Strawberries									
Fruit rots	G	O	G	O	O	O	NG	O	O
Leaf spots	G	O	G	O	O	O	NG	O	O
Root rots	NG	O	NG	O	NG	NG	NG	NG	O

(1) G = good; M = moderate; P = poor; NG = no good; O = not recommended

(2) Do not use repeated sprays of Benomyl alone; fungi may build up resistance to it.

percent or greater are more effective. Wettable sulfur can be used during the growing season; however, it will burn or russet leaves and fruit of some varieties, especially during hot, wet weather. Grapes are very sensitive to sulfur.

Triadimefon is primarily used to control rust on apple. It must be combined with another protectant such as captan to provide acceptable control of apple scab. This product is also labeled for black rot disease of grape.

Insect and Mite Control

Effective chemical control of insect and mite pests is dependent upon pesticide applications. Timely applications are dependent upon the understanding of pest life cycles and the actual detection of their presence. Pest detection can be accomplished via visual inspections and / or (in some instance) the utilization of pheromone traps.

Once pests are detected, periodic monitoring can be used to determine overall number of pests and their potential to cause economic losses. Thus, treatments can be applied if needed before the occurrence of substantial damage.

Insecticides/Miticides

Be sure to read product labels before purchasing / using any pesticides. Use products only according to labeled directions. Make special note of the minimum number of days between application and harvest.

Diazinon (diazinon) is registered for use against a wide variety of pests of tree fruits and small fruits and berries. It is a poor miticide.

Dursban (chlorpyrifos) is primarily used to control peach tree borers.

Horticultural oils are most effective on soft-bodied insects and mites and their eggs. Oils can be applied when trees are in a dormant stage or during the active growing season. Oils do not provide residual control and , therefore, must be reapplied if pests persist or new pests arrive.

Imidan (phosmet) is registered for use against a variety of pests of tree fruits. It performs best against chewing insects. It is a poor miticide.

Insecticidal soaps are most effective on soft-bodied insects and mites. Like oils, soaps do not provide residual control.

Kelthane (dicofol) is a miticide.

Lindane is primarily registered for use against flat-headed and round-headed borers (larval stages of beetles) on apple, cherry and peach trees, and peach tree borers (larval stages of a clear winged moth) on peach.

Malathion (malathion) is registered for use against a wide variety of pests of tree fruits and small fruits and berries. It performs best against sucking insects. Because there are varying reports as to malathion's effectiveness against mites, its use as a miticide might be considered chancy.

Metaldehyde is a bait used to control slugs on strawberries.

Methoxychlor is used primarily against codling moth, oriental fruit moth and curculio. It also performs well against insects which cause fruit deformation.

Pesticide Effectiveness Rankings¹

Table 2. Effectiveness of Insecticides Against Tree Fruit Insects and Mites

Insecticides (Trade Names)	Sevin	Diazinon	Dursban	Imidan	Lindane	Mala- thion	Methoxy- chlor	Hort. Oil	Insect. Soap	Thiodan
Aphids	O	G	O	M	O	G	O	G	G	G
Codling moth	G	G	O	G	O	M	M	O	O	M
Mites	O	O	O	O	O	O	O	G	G	O
Oriental fruit moth	G	G	O	G	O	O	M	O	O	G
Plum curculio	M	M	O	G	O	M	G	O	O	M
Leaf-roller	M	O	O	M	O	M	O	O	O	M
Scale crawlers	M	G	O	O	O	G	O	G	G	M
Catfacing insects	G	O	O	M	O	M	M	O	O	M
Peach tree borers	O	M	G	M	G	O	M	O	O	G

(1) G = good; M = moderate; P = poor; NG = no good; O = not recommended

Sevin (carbaryl) is registered for use against a wide variety of pests of tree fruits and small fruits and berries. Because it may cause fruit drop in apples, it is suggested that this product not be used prior to the first of June. Mite population flareups are sometimes associated with Sevin usage.

Thiodan (endosulfan) is a broad-spectrum insecticide. It is not recommended as a miticide.

Vendex (fenbutatin-oxide) is a miticide.

Peach Tree Borer

This wasp-like moth emerges in early June and deposits eggs on the bark near the base of the tree. Whitish larvae hatch just beneath the bark, usually just beneath the soil line. Young trees or ones heavily infested may be killed as a result of the girdling activity. A tree under attack may suddenly lose vigor. The presence of a large, dark flattened mass of gum around the base is a telltale sign of infestation. When this is removed, the injured tissue, galleries, or larvae (depending upon time examined) are exposed. Young trees and older stressed trees are very susceptible. Management should stress prevention.

Preventive Practices

1. Spray thoroughly around the lower trunk and base of the trees. Thoroughly saturate the bark and soil around the base of the trees. Begin in early June and repeat the treatment at 3-week intervals at least twice with the Lindane treatment when the harvest interval allows.

Use: Lindane, 3 teaspoons of 20% E.C. per gallon of water (do not apply to fruit or foliage, do not apply within 60 days of harvest), labeled for use on apples, peaches and cherries; **or** 7 oz. of 6.3% chlorpyrifos (Dursban) per gallon. Use chlorpyrifos only once per season. Do not use within 14 days of harvest, for use on peaches and nectarines only; **or** ¼ oz. (2 tsp.) of Thiodan 50% W.P. per gallon of water. Do not use within 21 days of harvest on peaches, apricots, or cherries, or within 7 days of harvest on plums. **Note:** look at the active ingredients of products identified as “Borer Control” or “Borer Killers.” Several are for ornamental use, but a few are specifically labeled for use on fruit trees.

2. A practice that may help reduce borer infestations is to take time to spray the lower limbs and tree trunks each time you make a foliar application. See Table 1 for the relative efficacy of insecticides.

3. There use to be a way to eliminate peach tree borers from infested trees through the use of PDB (paradichlorobenzene) crystals. However, because PDB crystals are unavailable for use as a fumigant rescue treatment, this makes preventive control practices against peach tree borers even more critical now.

Fruit Pesticide Mixtures

Insecticides and fungicides are often needed at the same time on a plant. Several manufacturers package all-purpose fruit sprays (fruit spray mixture) that contain one or more insecticides (Malathion, Methoxychlor, Imidan) mixed with Captan. These multi-purpose sprays may come in liquid or wettable powder formulations and generally are effective against a wide range of insect pests and diseases. Nevertheless, these spray mixtures may not control some of the major pest problems such as peach leaf curl, cedar apple rust, scale, or peach tree borers. Chemicals to control these problems (see Tables 1 and 2) can be added to the mixture or applied separately.

Additional pesticides can be used to achieve better pest control than with the mixture only. In most instances the additional chemicals can be combined, but there are some limitations. It is advisable to combine like formulations, not mix wettable powders and liquid concentrates. Combining them may cause burned spots on leaves and fruit, due to the action of the oil in the liquid concentrates with the fungicide Captan. This burning could be harmful to the foliage. **Don't apply a liquid concentrate within 2 to 3 weeks of a Captan spray.**

If you are in doubt about spray combination injury, check the label or apply the mixture of a small area and observe what happens. Spray burns should show up in 24 to 48 hours. If burn results, don't apply the combination.

Preparation of sprays

The sprays recommended in the following spray schedules can be made by mixing the exact quantities of the appropriate chemicals with the amount of water designated in Table 3. Care should be taken not to breathe or inhale any chemicals.

Weeds

Weeds compete with fruit plants, vines, and trees for soil moisture, plant nutrients, and light. In fruit gardens and home orchards, weeds can be con-

Table 3. Quantity of Insecticides, Miticides, and Fungicides to Use in Preparing Sprays

Material	Amounts to Add in Water to Make:	
	10 gallons	1 gallon
Benomyl 50% WP (fungicide)		
Apple only	2 Tbsp	¼ Tbsp
All other crops	1 oz	¾ Tbsp
Captan 50% WP (fungicide)	3 oz	2 Tbsp
Carbaryl (Sevin) 50% WP (insecticide)	3 oz	2 Tbsp
Chlorothalonil (Daconil) 29.6% EC	4 oz	¾ Tbsp
Diazinon (Diazinon) 25% EC (insecticide)	6 Tbsp	2 tsp
Dormant oil (miticide and insecticide)	1 qt	5 Tbsp
Dursban 6.3% EC (insecticide; peach tree borer)	1.2 qt	7 Tbsp
Ferbam 76% WP (fungicide)	3 oz	2 Tbsp
Imidan 50% WP (insecticide)	2 oz	1 Tbsp
Lime-sulfur, 26% liquid (fungicide: Dormant spray)	1.5 qt	10 Tbsp
Sulphur, dry (fungicide)	12.5 oz	2½ Tbsp
Lindane 20% EC (insecticide: peach tree borer)	3 Tbsp	4 tsp
Malathion 57% EC (insecticide)	2.4 oz	⅔ Tbsp
Malathion 25% WP (insecticide)	5 oz	3 Tbsp
Methoxychlor 50% (insecticide)	4 oz	2 Tbsp
Thiodan 9.7% EC	3 oz	2 Tbsp
Kelthane 35 WP (miticide)	2 oz.	¼ oz
Vendex 4L (miticide)	3.2 oz	2 tsp
Triadimefon 25% WP	2–4 tsp	¼–½ tsp

ABBREVIATIONS

Tbsp = tablespoon; tsp = teaspoon; lb = pound; oz = ounce; qt = quart; Use level measures.

WP = wettable powder EC = Emulsion concentrate

NOTE: Additional formulations of some of the above chemicals are available and effective when used according to their label instructions.

trolled by a combination of shallow tilling, hoeing, hand pulling, mulches, or herbicides. Cultivation, hoeing, or tilling will effectively remove weeds about 1 inch high or less. If this weed cutting is done under dry and hot conditions, the weeds wilt and don't regrow. Do not disturb the soil below a depth of about 2 inches or you may damage small roots of the fruit plants, and you could promote germination of more weed seeds.

Mulches spread around the plants can be used for weed control. Besides helping to control weed growth, mulch materials will reduce moisture evaporation and help improve the soil condition as the organic material decomposes and is incorporated into the soil. Plant materials that are good for

mulching include compost, dried grass clippings, straw, hay, wood chips, and sawdust. The depth of the mulch should be about 4 to 5 inches for the coarse materials such as wood chips and straw, and 2 to 3 inches for the finer grass clippings or sawdust. Leave a 1 to 2 inch space open around tree trunks for air circulation. Usually, nitrogen will need to be applied to help decompose the organic matter and to prevent nitrogen deficiency for the trees or vines.

Chemical control of weeds is generally not recommended in fruit gardens and home orchards since it is difficult to accurately apply the recommended amount of chemical around trees, vines, and plants.

Table 4. Waiting Time (Days)—Last Application Until Harvest

	Captan	Carbaryl (Sevin)	Daconil	Diazinon	Ferbam	Imidan	Lindane	Malathion	Methoxy- chlor	Thiodan	Kelthane	Vendex
Apples	4	1	—	14	7	7	—	3a	7	21	7	14
Blackberries	4	7	—	b	—	—	—	1	14	—	2	—
Cherries	4	1	—	10	NTL	7	c	3	7	21	—	14
Grapes	4	7	—	10	7	7	—	3	14	—	—	28
Nectarines	4	3	PF	10	b	a	—	—	21	—	—	—
Peaches	4	1	PF	20	21	14	c	7	21	30	—	14
Pears	4	1	—	14	7	7	—	1	7	7	7	14
Plums	4	1	—	14	7	7	c	3	7	7	—	—
Raspberries	4	7	—	b	—	—	—	1	14	—	2	—
Strawberries	4	1	—	5	14	—	—	3	14	4	2	1

Notes: Read label for specific data on reentry periods and waiting intervals.

NTL = no time limitation (pesticides can be applied up to time of harvest).

a = See label restrictions for use.

b = Do not use after fruit begins to form.

c = As a trunk spray only.

PF = Do not apply after petal fall on apples or shuck split on peaches.

— = Not labeled on this crop.

Product labels: The information printed on the container label includes specific directions that should be read and followed. Where trade names are used, no endorsements are intended, nor is criticism implied of similar products not named.

Other Pests

Preventing Rabbit Damage

In fall, winter and early spring when food is scarce, rabbits may eat the bark from the trunk and lower limbs of young fruit trees. They also eat the bark from blackberry and raspberry bushes. Rabbits seldom cause much damage to older fruit trees.

Fences or other barriers can prevent rabbit damage unless deep snow crust allows rabbits to cross over or eat above the barrier. For young trees, use a circular metal guard 18 inches tall and 6 inches in diameter made from an 18-inch square piece of ¼-inch mesh hardware cloth. Or wrap the trunk and lower branches with several layers of newspaper from early November until April. Each fall, weeds and tall grass should be removed from the orchard floor to eliminate hiding areas.

The most practical means of protecting blackberry and raspberry plants from rabbits is an 18- to 24-inch high (buried 4 inches) chicken wire fence surrounding the planting.

Commercially prepared repellents containing thiram are effective against rabbits. Spray or paint the plant parts that are subject to rabbit feeding in October and, if necessary, spray again in February or March.

Preventing Mouse Damage

Mice are serious pests of apple trees and sometimes other fruit trees. They eat bark from the main roots and trunk near and below the ground, and may damage both young and old trees. Damage may occur at any time during the year, but is usually more serious in late fall, winter and early spring when other food is scarce.

Natural predators such as cats, hawks, owls, and foxes will greatly reduce the mouse population if protective cover is eliminated. Mow the grass closely under the trees and throughout the orchard. Hoe out all grass and weeds within 1 foot of the trunk, leaving the ground bare.

Mouse traps and anticoagulant baits (for example, Warfarin) may be used. A repellant on the trunk near the ground line will help protect trees from mouse damage. Spray or paint the lower trunk in late November and again in February with a commercially prepared repellant.

A gravel collar around the tree trunk discourages mice and helps control grass and weeds. The collar should be 6 to 8 inches deep and about 2 feet in diameter. The gravel must remain loose to prevent damage to the trunk.

Preventing Bird Damage

Birds are especially destructive to grapes, cherries and blueberries, and they frequently damage other fruits. Covering the fruit plant with netting just before the fruit ripens is the most positive method of protection. Picking fruit promptly as it ripens will also reduce losses.

Aluminum pie pans and other reflecting objects, or artificial snakes or other scare devices, hung in fruit plants provide some protection until the birds become adjusted to their presence.

Spray Schedules for Pest Control on Apple, Crabapples and Pears

Time to Spray	Materials to Use (Rates listed in Table 1)		Insects and Diseases most likely to be a problem at the specific time (first column) during growing season
	Apple Crabapple	Pear	
Dormant— Early spring before buds swell	Dormant oil Note: Do not spray when temperature is below 40°F (5°C), or likely to drop below 40°F within 24 hours. Dormant oil is a special, highly refined oil prepared for fruit tree spraying.	Dormant oil	Oil for scale insects, mites, pear psylla, and pear leaf blister mite.
Half-inch green— When blossom buds show ½ inch green	Captan, Benomyl, thiophanate methyl, or wettable sulfur	No spray needed	Fungicide for control of scab. Last chance to apply dormant oil on apples, if not applied in dormant spray. Sulfur may cause foliar burning on certain varieties. Do not apply sulfur with Captan or at temperatures above 90°F.
Pre-pink to pink— When blossoms first show pink to just before blossoms open	Captan, Benomyl, thiophanate methyl or wettable sulfur plus Malathion OR fruit spray mixture. Add Ferbam for cedar apple rust.	No spray needed	Fungicide for control of scab, black rot, and cedar apple rust. Insecticide for European red mite and aphids. If European red mites have been a problem, apply horticultural oil. Ferbam or triadimefon must be used to protect rust-susceptible varieties.
Bloom— When 90% blossoms are open Bloom spray	Note: To protect bees—do not use insecticide during bloom. Fireblight (apple, pear) Sold under trade names such as Agrimycin, Agristrep, etc. For best results, do not combine with other materials.	Streptomycin ½ tsp.	During bloom is the most critical time to protect trees from infection by fire blight. Omit if blight is not serious. Cut or break out all blighted twigs. Repeat Streptomycin every 4 days during bloom and petal fall on serious blighting varieties. Important during hot and wet bloom periods.
Petal fall— When last petals are falling	Same fungicides as pink spray plus Malathion or Imidan OR fruit spray mixture. Add Ferbam for cedar apple rust.	Captan or Ferbam or Sulfur plus Imidan or Sevin OR fruit spray mixture.	Fungicide for control of scab, black rot, calyx rots, blotch, and cedar apple rust. Insecticide for codling moth, Plum curculio, pear psylla and plant bugs.
First cover— 7 days after petal fall spray	Same as petal fall.	Same as petal fall.	Fungicide for control of scab, black rot, calyx rots, blotch, and cedar apple rust. Insecticide for codling moth and plum curculio.
Second cover— 2 weeks after first cover spray	Captan or wettable sulfur plus Imidan or Sevin OR fruit spray mixture.	Captan plus Imidan OR fruit spray mixture.	Fungicide for control of scab, fruit rots, blotches and leaf spots. Insecticide for codling moth, plum curculio and mites.
Third cover— 2 weeks after second cover	Captan plus Imidan or Sevin OR fruit spray mixture.	Captan plus Imidan OR fruit spray mixtures.	Fungicide for control of scab, fruit rots and blotches. Insecticide for codling moth and pear psylla.
Remaining covers— Spray every 2 weeks	Captan plus Imidan or Sevin OR fruit spray mixture. Continue sprays to within 2 weeks of harvest for variety.	Captan plus Imidan OR fruit spray mixture. Apply two more sprays as above.	Fungicide for control of scab, fruit rots and blotches. Insecticide for codling moth, leafhoppers and pear psylla.

Spray Schedules for Pest Control on Peaches, Cherries, Plums and Apricots

Time to Spray	Materials to Use (Rates listed in Table 1)			Insects and Diseases most likely to be a problem at the specific time (first column) during growing season
	Peaches Nectarines Apricots	Plums	Cherries	
Dormant— For peaches and nectarines. Early spring before buds swell	Ferbam or liquid lime-sulfur, or Bordeaux or Chlorothalonil Note: Do not spray when temperature is below 40°F (5°C), or likely to drop below 40°F within 24 hours.			This is the only spray that controls peach leaf curl. The spray should be applied before the buds begin to swell.
Half-inch green— When blossoms buds show ½ inch green	No spray needed Note: Use precaution listed in Dormant. Dormant oil is a special, highly refined oil prepared for fruit tree spray.	Dormant oil	Dormant oil	Oil for control of scale insects, European red mites and aphids.
Pink— Just before blooms open	Captan or wettable sulfur	Captan or wettable sulfur	No spray needed	Fungicide for control of brown rot.
Bloom— When 90% blossoms open	Same as pink Note: To protect bees—do not use insecticide during bloom.	Same as pink	Captan or Benomyl or wettable sulfur	Same as Pink.
Petal fall— When last petals are falling	Captan or wettable sulfur plus Imidan or Sevin, OR fruit spray mixture.	Captan or wettable sulfur plus Imidan or Sevin, OR fruit spray mixture.	Captan or wettable sulfur plus Imidan or Sevin, OR fruit spray mixture.	Insecticide for control of plum curculio, European red mite, Oriental fruit moth, plant bugs and stink bugs. Fungicide for scab and brown rot. If European red mites have been a problem, apply horticultural oil.
Early to mid-June	Lindane or Thiodan or Dursban	Lindane or Thiodan	Lindane or Thiodan	Peach tree borer control sprays. Spray lower limb and trunk areas. Repeat at about 3-week intervals for 3 applications. Dursban: Only one application per season. Registered only for peach trees.
Remaining covers— Continue spraying at 10- to 14-day intervals	Captan or wettable sulfur plus Imidan or Sevin OR fruit spray mixture.	Captan or wettable sulfur plus Imidan or Sevin OR fruit spray mixture.	After a second spray no further spray needed.	Insecticide for control of same pests as listed above for petal fall. Fungicide for scab, brown rot, cherry leaf spot.
Final spray— Within 1 week of harvest	Captan or Benomyl or wettable sulfur	Captan or Benomyl or wettable sulfur	No spray needed	For control of brown rot.
Note: Do not continuously spray Benomyl; mix or rotate with another suggested fungicide.				

Spray Schedules for Pest Control on Brambles (Blackberries and Raspberries)

Time to Spray	Materials to Use (Rates listed in Table 1)	Insects and Diseases most likely to be a problem at the specific time (first column) during growing season
Delayed dormant—When buds begin to break and show silver	Liquid lime-sulfur Note: This spray is critical for good disease control.	Lime-sulfur for anthracnose.
After bloom	Sevin	Insecticide for cane borers.
Pre-harvest— As fruit begins to color	Malathion	Insecticide for cane borers.
Post-harvest	Sevin	Insecticide for cane borers.

Spray Schedules for Pest Control on Grapes

New growth 2 to 4 inches long	Captan or Ferbam plus Methoxychlor and Sevin Note: If powdery mildew is a problem, a fungicide (listed) plus triadimefon may be used.	Fungicides for control of black rot. Insecticide for flea beetles and climbing cutworms. Methoxychlor or Sevin may be needed just before buds show green for flea beetles. Bordeaux mixture or triadimenfon may be substituted for Ferbam or Captan in all sprays; however do not tank-mix Bordeaux with insecticides.
Pre-bloom— Just before first blossoms open	Ferbam (See note above on use of triadimefon)	Fungicides for control of black rot and powdery mildew.
Post- bloom— After all blossoms have fallen	Ferbam plus Imidan or Sevin or Methoxychlor. (See note above on triadimefon) Note: In wet weather, do not wait until all blossoms have fallen, especially if black rot is a problem.	Fungicide for black rot, powdery mildew and downy mildew. Insecticides for mites, grape berry-moth and leafhoppers.
First-cover—10 days after bloom	Captan or Ferbam plus Sevin or Methoxychlor plus Imidan. (See note above on use of triadimefon.) Note: If black rot is present on leaves or berries, use Ferbam.	Fungicides for control of black rot, powdery mildew and downy mildew. Insecticides for control of mites, grape berry-moth, leafhoppers and sap beetle.
Second-cover— 12-days after post bloom. Repeat at 2-week intervals until harvest	Captan plus Imidan or Sevin or Methoxychlor	Fungicides for control of downy mildew. Insecticide for grape berry-moth, leaf-roller and sap beetle.

Spray Schedules for Pest Control on Strawberries

Time to Spray	Materials to Use (Rates listed in Table 1)	Insects and Diseases most likely to be a problem at the specific time (first column) during growing season
Pre-bloom— When blossom buds are visible in the crown	Captan plus Malathion	Fungicide for control of fruit rots and leaf spots. Insecticide for spider mites, leaf aphids, weevil and spittlebug. If mites are a problem, apply Kelthane or Vendex.
Early bloom—When blossom stems have pushed out of crown	Same as pre-bloom	Same as pre-bloom.
Full bloom—	Captan Note: No insecticide should be used during bloom.	Fungicide for fruit rots. Read label for use restrictions.
Post bloom— Begin 10 days after full bloom spray and continue spray every 7 days until harvest	Captan plus Sevin and Malathion OR fruit spray mixture	Fungicide for fruit rots, and leaf spots. Insecticide for aphids, leaf roller, spittlebug and plant bugs.
Harvest	Metaldehyde baits	For slugs and sap beetles. Avoid fruit contact with bait.
Post-harvest—Apply one or more times after renovation to protect the new foliage for next year's crop	Captan plus Sevin or Diazinon	Fungicide for leaf spot. Insecticide for strawberry leafroller and leafhoppers. Fungicide sprays after harvest usually are not necessary.

Minimum Fruit Pest Control Guide

The following guide lists the periods when pesticides should be applied to tree fruits to control some of the main disease and insect problems. This schedule generally will NOT result in complete pest control, but may help to reduce some pest problems and pest damage.

Time to Spray	Pests	Material per 1 gallon water	Trees, bushes to spray
Tree Fruits			
Dormancy—When leaves are off and before bud swell in spring	Peach leaf curl	Lime-sulfur 26% OR Ferbam	Peach, Plum
Dormant to new green growth ½ inch long; temperature at least 40°F so spray dries before freezing.	Scale	Dormant oil	All fruit trees
Pink—just before blossoms open	Apple scab Cedar apple rust	Ferbam	Apples
Petal fall—when three-fourths of petals have fallen	Brown rot Scab Codling moth Curculio Plant bugs	Fruit spray mixture as recommended on label	All tree fruits
Summer sprays—at about 14-day intervals after petal fall and before harvest.	Same as petal fall	Fruit spray mixture as recommended on label	All tree fruits
Small Fruits			
Delayed-Dormant—just as shoots emerge in Spring	Anthracnose	Liquid Lime-sulfur	Raspberries Blackberries
When new shoots are 1–2 and 8–12 inches long	Black rot Anthracnose	Fruit spray mixture—read label	Grapes
Pre-bloom—just as first blooms open	Black rot	Same	Grapes
Petal fall—right after bloom	Black rot	Same	Grapes

Trade names are used for product identification. No endorsement is intended, nor is criticism of unnamed products implied.

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