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Managing diseases and insects in home orchards

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This pest management guide was prepared for the home gardener. It doesn't meet the exacting requirements of the commercial fruit grower. In the home orchard, more pest damage generally can be tolerated than in commercial orchards. The number of suggested materials and the times of application have been kept to a minimum. Many fungicides and insecticides are available, which, when used according to the label directions, are effective in managing diseases and insects listed on the label. For more complete information, consult the *PNW Pest Management Handbooks* or local pest management guides.

To effectively manage diseases and insects in your orchard, you'll need to combine a number of techniques. In addition to using pesticides, there are cultural and biological practices that can help prevent and/or manage diseases and insects. Timing and thorough spray coverage are the keys to good pest management. Good coverage means thoroughly wetting the leaves, twigs, and branches, which can be difficult with hand sprayers. Wettable powders tend to settle out after mixing, so be sure to shake or stir the spray mix frequently during application.

To avoid excess chemical residues, observe the rate and proper interval between the last spray and harvest, as indicated on the label. Table 1 lists the pre-harvest interval for all the recommended pesticides. Be sure to rinse fruit with water before eating.



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Table 1. Homeowner/small orchard products.

Common name	Some brand names	Some uses ¹	Preharvest interval ²
Acetamiprid	Ortho Max Flower, Fruit & Vegetable Insect Killer	Codling moth	7
<i>Bacillus thuringiensis</i> (Bt)	Thuricide	Leafrollers	0
<i>Beauveria bassiana</i>	Naturalis-O	Aphids	?
Bifenthrin	Ortho Max Lawn & Garden Insect Killer (pears only)	Codling moth	14
Botanical oils such as neem and jojoba ⁶	E-Rase; Rose Defense	Powdery mildew	Not specified
Captan	Hi-Yield Captan	Diseases	1
Carbaryl	Sevin	Many insects	3
Chlorothalonil (Daconil)	Bonide Fung-onil; GardenTech Daconil; Ortho Daconil 2787	Diseases	Do not apply after shucksplit
Codling moth granulosis virus	Cyd-X	Codling moth	0
Combination spray ³	Home Orchard Spray	Diseases and insects	3 to 7 ⁵
Dormant oil ⁶	Dormant Oil	Winter diseases, insects, mites	Use only during dormant season
Esfenvalerate	Bug-B-Gone	Husk fly, codling moth	21 to 28 ⁵
Fixed copper	Copper Fungicide; Kop-R-Spray; Microcop	Diseases	Use only early in season or postharvest
Horticultural mineral oils (HMO) ⁶	Volck Oil	Spring/summer diseases, insects, mites	0
Insecticidal soap ⁶	Safer's Insecticidal Soap	Soft-bodied pests like mites and aphids	0
Kaolin clay	Surround at Home	Pear psylla, apple maggot	Not specified
Lime sulfur ⁶	Dormant Spray for Disease Control; Polysul Summer and Dormant Spray	Diseases and mites	Use only early in season or postharvest.
Malathion	Malathion	Many insects	1 to 7 ⁵
Myclobutanil ⁷	Spectricide Immunox	Diseases	1 day stone fruits, 14 days apples
Neem ⁶	Concern Garden Defense; Green Light Rose Defense	Many insects	Not specified
Permethrin	Astro	Many insects	1 to 14 ⁵
Potassium bicarbonate	Bi-Carb Old-fashioned Fungicide	Powdery mildew	Not specified
Rotenone	Only available in a mix with other insecticides	Many insects	1
Spinosad	Bull's-Eye; Entrust	Leafminers, leafrollers	7 to 14
Sulfur ⁶	Safer's Garden Fungicide; Sulfur; Sulfur Dust	Diseases and mites	1
Thiophanate-methyl ⁷	Halt Systemic Fungicide	Diseases	1

¹ See charts for complete list of uses.² Days to wait after spraying until picking³ Contains fungicides and insecticides. See caution about bee kill under "Applying pesticides safely."⁴ Do not use commercial or orchard strength formulations; they are highly toxic and require special safety precautions.⁵ For the fruit or nut tree you are spraying, check the manufacturer's label for the proper interval.⁶ Soaps and oils are not compatible with sulfurs. Mixing together or using one right after the other can result in plant damage.⁷ Frequent use can lead to the development of diseases resistant to the chemical.

Importance of controlling diseases and insects in commercial fruit districts

Many commercial fruit growers in Oregon are adopting nonchemical approaches to managing orchard pests. These “soft” control practices may become less effective if pests spread from unmanaged trees nearby. If homeowners maintain fruit trees for fruit production, it is critical that they help prevent the spread of pests to commercial orchards. Because of recent changes in pesticide registrations, home orchardists will have to use diligence to provide the degree of control necessary to prevent damage to nearby commercial orchards. If you have fruit trees in your yard or landscape that are maintained primarily for shade or aesthetic value, you might consider replacing those trees with types that do not harbor economically important pests. Contact your local Extension office for suggested trees.

Applying pesticides safely

Numerous organic and synthetic formulations of pesticides are available for home garden use. Many are variations with the same active ingredient. Look for pesticides that can be used on a wide range of fruit, vegetables, and ornamentals, so you can limit the number of pesticides you need to purchase and store.

The pesticides listed in this publication were selected on the basis of their effectiveness, availability, and safety to you, the applicator and consumer. Always apply pesticides according to the label instructions—this is very important. The label contains valuable application information and safety precautions to protect you, others, and the environment. Before you purchase or open the container, read the label. Read it again before you mix, store, or dispose of the product.

Be cautious when using products that contain a combination of one or more insecticides and fungicides, such as the various “home orchard sprays.” Some of these products call for applications during bloom to control fungal diseases at that time. However, if you apply an insecticide during bloom, you run the risk of reducing or eliminating bees that are critical for pollination. A better strategy, especially during the spring, is to use products that contain only a single type of pesticide and only when really needed. This approach is less convenient but may save you trouble in the long run.

Not every effective pesticide is included here, but space prevents listing them all. Some of these other pesticides may be packaged in larger quantities for commercial growers, making them impractical if you have only a few trees. Check with your local Extension agent, Oregon State University Master Gardener, or nursery professional for additional information.

Managing diseases and insects without pesticides

A wide variety of cultural and biological techniques can be used to manage or prevent disease and insect damage. Consult your local Extension agent, OSU Master Gardener, or nursery professional for more information.

✂️ **Select the proper cultivar for your climate and soil.** For example, Liberty, Prima, Akane, and Chehalis apples are resistant to apple scab, while Granny Smith and Gala are not. Apricots are not well adapted west of the Cascades. Wet springs prevent fruit set and result in high disease incidence.

💧 **Water and fertilize properly.** Over-watering can lead to root rot, while over-fertilizing can increase disease and insect problems. A soil test is the best first step in managing soil fertility.

✂️ **Proper pruning.** Proper pruning improves fruit quality, air circulation, and pesticide spray coverage.

✂️ **Good sanitation.** Remove and burn diseased branches and leaves. Remove and destroy old fruit from the tree and the ground. Do not use diseased leaves as mulch.

🕷️ **Pest monitoring.** Know which pests are likely to attack your trees, and when they might appear. Inspect your orchard regularly. Pheromone and sticky traps are useful pest management tools. Contact your local Extension agent or nursery professional for more information.

🦋 **Biorational pesticides.** Insecticidal soaps and oils are effective against a wide range of tree fruit pests. Microbial pesticides like *Bacillus thuringiensis* (*Bt*) control certain caterpillars.

🦋 **Biological control.** Enhanced control by natural enemies can be achieved by limiting the total number of pesticide sprays, and by using selective pesticides when possible. See PNW 343, *Beneficial Organisms Associated with Pacific Northwest Crops*, for more information (Stoltz et al. 2004).

Apples

Time of application	Insect or disease	Materials or practices
Late winter (dormant)	Apple anthracnose and scab	Proper pruning to open tree canopy and improve air circulation. Remove and burn diseased branches and fallen leaves. Also remove from the orchard any mummified fruit left in the tree.
	Scale, aphids, and mite eggs	Dormant oil.
Prepink (before pink bloom shows)	• Scab only	Captan, lime sulfur, myclobutanil, or thiophanate-methyl.
Pink (just before blossoms open)	• Powdery mildew	Lime sulfur, myclobutanil, or thiophanate-methyl.
	• Scab	Captan, lime sulfur, myclobutanil, or thiophanate-methyl.
Petal fall	• Powdery mildew	HMO, insecticidal soap, lime sulfur, myclobutanil, or thiophanate-methyl.
	• Scab	Captan, lime sulfur, myclobutanil, or thiophanate-methyl.
	Aphids	<i>Beauveria bassiana</i> , insecticidal soap, neem, permethrin, or malathion. May require two sprays about 10 days apart.
Summer to harvest	• Codling moth	To be effective, insecticide coverage must be maintained whenever fruit and moths are present. Applications every 7–14 days may be necessary, especially near commercial orchards. Acetamiprid, Bifenthrin, carbaryl, Cyd-X, esfenvalerate, Gamma cyhalothrin, kaolin, malathion, and spinosad are registered for homeowner use. Pheromone traps can be used to accurately time the first spray.
	Apple maggot	Kaolin, malathion, or spinosad. Where apple maggot occurs, treat from late July until harvest at 10- to 14-day intervals. Sticky traps can be used for monitoring and control.
	Spider mites	<i>Beauveria bassiana</i> or insecticidal soap.
	San Jose or lecanium scale crawlers	Malathion or neem.
	Aphids	<i>Beauveria bassiana</i> , insecticidal soap, malathion, neem, or permethrin. May require two sprays about 10 days apart.
Postharvest	Apple anthracnose	Fixed copper. Remove and destroy cankered branches from the orchard and any rotted or mummified fruit from the tree.
Leaf fall	Scab	Rake and dispose of leaves by burning, burying, or completely composting. Do not use as a mulch near the orchard.

Thiophanate-methyl may cause russetting on some apple cultivars such as Golden Delicious, Rome, and Stayman. It also kills earthworms, which help decompose leaves.

Lime sulfur rates are lower after bud break, so read label carefully.

Walnuts

Time of application	Insect or disease	Materials or practices
Early prebloom	Bacterial blight	Fixed copper.
Late prebloom	Bacterial blight	Fixed copper.
Early postbloom	Bacterial blight	Fixed copper.
Mid-July to mid-August	Walnut husk flies	Esfenvalerate, neem, permethrin, or spinosad. Use yellow sticky traps to time spray applications.

Commercial growers must control diseases and insect pests of walnuts. In most instances, it is impractical for homeowners to attempt these control practices on large walnut trees.

Note: Several Oregon counties have ordinances dealing with backyard fruit tree production that require minimum spray programs to prevent disease/insect spread to commercial orchards. See “Required spray programs” for information about requirements in specific counties. The sprays denoted with a (*), if applied at the correct time, should meet the requirements of most counties. Check with your local Extension agent if you are not sure.

Pears

Time of application	Insect or disease	Materials or practices
Late winter (dormant)	Scab and other diseases	Proper pruning to open trees and improve air circulation. Remove and burn diseased branches and fallen leaves. Also remove any mummified fruit left in the tree.
	Pseudomonas blight	Fixed copper before buds open.
	Scale, aphid, pear psylla, and mite eggs	Lime sulfur with or without dormant oil.
Prepink (before pink bloom shows)	• Scab only	Lime sulfur or thiophanate-methyl.
	• Blister mites	Lime sulfur.
	• Pear psylla	Insecticidal soap, kaolin, or neem.
Pink (just before blossoms open)	• Scab and powdery mildew	Lime sulfur or thiophanate-methyl.
Petal fall	• Scab and powdery mildew	Lime sulfur or thiophanate-methyl.
	Aphids	Neem or insecticidal soap. May require two sprays about 10 days apart.
Spring (especially after main bloom)	Fire blight (not common in the Willamette Valley)	Remove and destroy infected branches. Make cuts 12 inches below infected branches. Disinfect pruning tools between cuts with shellac thinner (70% ethyl alcohol) or 10% bleach. Remove late blooms when noticed. Difficult to control. Antibiotics are labeled but difficult to use properly.
Summer to harvest	Pseudomonas blight (for Asian pears)	Summer pruning will help reduce branch dieback caused by this disease.
	• Codling moth	To be effective, insecticide coverage must be maintained whenever fruit and moths are present. Applications every 7–14 days may be necessary, especially near commercial orchards. Bifenthrin, Carbaryl, Cyd-X, esfenvalerate, malathion, and spinosad are registered for homeowner use. Pheromone traps can be used to accurately time the first spray.
	Spider mites	HMO or insecticidal soap.
	San Jose scale crawlers	Malathion or neem.
	Pear psylla	Insecticidal soap, kaolin, or neem.
	Aphids	Insecticidal soap or neem. May require two sprays about 10 days apart.
Postharvest (in fall after all fruit is harvested)	Blister mites, pear rust mites	Lime sulfur with or without oil.
Leaf fall	Scab	Rake and dispose of leaves by burning, burying, or completely composting. Do not use as a mulch near the orchard.

Hazelnuts (Filberts)

Time of application	Insect or disease	Materials or practices
Dormant period	Eastern filbert blight	Remove and destroy cankers before bud break.
Bud break (and every 2 weeks for four sprays)	Eastern filbert blight	Chlorothalonil (120-day pre-harvest interval).
Spring (about May 1)	Leafrollers	<i>Bt</i> , carbaryl, neem, or spinosad.
	Aphids	<i>Beauveria bassiana</i> or insecticidal soap.
Summer (about July 1 and 3 weeks later)	Filbertworm	Carbaryl, esfenvalerate, or spinosad. Pheromone traps can be used to properly time sprays.
	Aphids	<i>Beauveria bassiana</i> , insecticidal soap, or neem.
August or September (before fall rains)	Bacterial blight	Fixed copper. Generally only a problem on trees less than 5 years old.

Commercial growers must control diseases and insect pests of hazelnuts. In most instances, it is impractical for homeowners to attempt these control practices on large walnut trees.

Note: Several Oregon counties have ordinances dealing with backyard fruit tree production that require minimum spray programs to prevent disease/insect spread to commercial orchards. See “Required spray programs” for information about requirements in specific counties. The sprays denoted with a (+), if applied at the correct time, should meet the requirements of most counties. Check with your local Extension agent if you are not sure.

Peaches and Nectarines

Time of application	Insect or disease	Materials or practices
Winter dormant	Cytospora canker and Pseudomonas	Can cause branch dieback. Remove and burn infected wood.
Dormant (two sprays: Dec. 15 and before Jan. 15)	• Leaf curl, shothole	Chlorothalonil or fixed copper.
Late February	Aphid and mite eggs, scale	Dormant oil. For best results, do not combine with leaf curl spray.
	Leaf curl	Chlorothalonil or lime sulfur.
Bloom stages	Brown rot blossom blight	Captan, chlorothalonil, or thiophanate-methyl. Spray once per week, from first showing pink through petal fall.
Prepink and petal fall	Leafrollers	Esfenvalerate, neem, or spinosad.
One week after blossom petals fall and/or at shucksplit	Shothole	Captan or chlorothalonil.
Early June	• Peach twig borer	Spinosad. Pheromone traps can be used to time sprays. Permethrin on peach only.
Summer spray (early July and again 3 weeks later)	Peachtree borer	Esfenvalerate or spinosad. Spray trunk and lower limbs, allowing solution to puddle around base of tree. Do not spray fruit. Pheromone traps can be used to time sprays. Young trees are especially susceptible to injury from peachtree borers.
Fruit set to harvest	Brown rot	Regularly remove and destroy any fallen or rotted fruit prior to harvest.
14 to 21 days before picking	Western spotted cucumber beetles	Carbaryl (western Oregon only).
	Brown rot	Captan, sulfur, or thiophanate-methyl.
	Earwigs	Carbaryl. Spray trunk and base of tree thoroughly.
Autumn or early winter when leaves begin to fall	• Shothole and leaf curl	Chlorothalonil or lime sulfur.
Anytime before bud break	Brown rot	Remove and destroy any rotted or mummified fruit remaining in or around the tree.

Choose one timing for leaf curl and shothole in arid areas; use all timings in the Willamette Valley.
 Shucksplit = shedding of the papery sheath surrounding the small, young fruit shortly after bloom.

Apricots

Time of application	Insect or disease	Materials or practices
Late winter (dormant)	Scale, mite eggs	Dormant oil.
Bloom stages (first showing pink to petal fall)	Brown rot	Captan, chlorothalonil, or thiophanate-methyl.
Shucksplit	• Coryneum blight (Shothole)	Captan or myclobutanil. Fungicide needed only if rain is expected within 2 weeks.
Summer spray	Peachtree borer	Esfenvalerate or spinosad. Spray trunk and lower limbs, allowing solution to puddle around base of tree. Do not spray fruit. Pheromone traps can be used to properly time sprays.
Two weeks preharvest	Brown rot	Captan or thiophanate-methyl. Fungicide needed only if rain is forecast.
Fall (before rains begin)	• Coryneum blight (Shothole)	Chlorothalonil or fixed copper.
	Brown rot	Remove and destroy any rotted or mummified fruit in or around the trees.

Do not use sulfur products on apricots.
 Shucksplit = shedding of the papery sheath surrounding the small, young fruit shortly after bloom.

Note: Several Oregon counties have ordinances dealing with backyard fruit tree production that require minimum spray programs to prevent disease/insect spread to commercial orchards. See "Required spray programs" for information about requirements in specific counties. The sprays denoted with a (*), if applied at the correct time, should meet the requirements of most counties. Check with your local Extension agent if you are not sure.

Cherries

Time of application	Insect or disease	Materials or practices
Late winter (dormant)	Aphid and mite eggs, scale and leafrollers	Dormant oil.
Bloom stages (first showing pink to petal fall)	Brown rot blossom blight	Captan, chlorothalonil, or thiophanate-methyl. Spray once or twice during early bloom.
Petal fall stage	Black cherry aphid	<i>Beauveria bassiana</i> , esfenvalerate, insecticidal soap, malathion, or neem.
	Leafrollers	<i>Bt</i> or spinosad. Spray after bloom to prevent accidental poisoning of bees during the pollination period.
	Cherry leaf spot and brown rot	Captan, chlorothalonil, or myclobutanil.
Shucksplit	Cherry leaf spot and brown rot	Captan, chlorothalonil, or myclobutanil.
	Powdery mildew (a problem east of the Cascades)	Myclobutanil, oils (botanical or HMO), or sulfur.
Early summer when fruit flies emerge (about Memorial Day)	• Cherry fruit fly	Esfenvalerate, malathion, or spinosad. Applications may need to be repeated at 7- to 14-day intervals. Traps can be used to properly time treatments.
	Powdery mildew (a problem east of the Cascades)	Myclobutanil, oils (botanical or HMO), or sulfur.
Summer (if pests appear)	Aphids, spider mites	<i>Beauveria bassiana</i> or insecticidal soap.
	Aphids only	<i>Beauveria bassiana</i> , esfenvalerate, insecticidal soap, malathion, or neem.
One to 2 weeks before harvest (only if rain is likely)	Brown rot fruit rot	Sulfur or thiophanate-methyl.
After harvest during dry weather	Bacterial canker and/or <i>Cytospora</i>	Can cause branch dieback. Remove and destroy infected wood.
Leaf fall	Leaf spot	Rake and destroy fallen leaves. Do not use as a mulch near the orchard.
	Brown rot	Remove and destroy any mummified fruit in or around trees.

Shucksplit = shedding of the papery sheath surrounding the small, young fruit shortly after bloom.

Prunes and Plums

Time of application	Insect or disease	Materials or practices
Late winter (dormant)	Aphid and mite eggs, scale	Dormant oil.
	<i>Cytospora</i> canker and <i>Pseudomonas</i>	Can cause branch dieback. Remove and destroy infected wood.
Bloom stages (first showing pink to petal fall)	Brown rot blossom blight	Captan, chlorothalonil, or thiophanate-methyl. Spray once or twice during bloom.
Petal fall stage	Aphids	<i>Beauveria bassiana</i> , insecticidal soap, or neem.
	Leafrollers	<i>Bt</i> , esfenvalerate, or spinosad. Spray after bloom to prevent accidental poisoning of bees during the pollination period.
	Leaf spots and brown rot	Captan, chlorothalonil, myclobutanil, or thiophanate-methyl.
Shucksplit	Leaf spots and brown rot	Captan, chlorothalonil, myclobutanil, or thiophanate-methyl.
Summer spray (early July and 3 weeks later)	Peachtree borer	Esfenvalerate. Spray trunk and lower limbs, allowing solution to puddle around base of tree. Do not spray fruit. Pheromone traps can be used to properly time sprays.
Preharvest	Brown rot	Captan or sulfur if rain is forecast within 1 to 2 weeks of harvest.
Leaf fall	Brown rot	Remove and destroy any rotted or mummified fruit left in or around trees.

Shucksplit = shedding of the papery sheath surrounding the small, young fruit shortly after bloom.

Note: Several Oregon counties have ordinances dealing with backyard fruit tree production that require minimum spray programs to prevent disease/insect spread to commercial orchards. See "Required spray programs" for information about requirements in specific counties. The sprays denoted with a (*), if applied at the correct time, should meet the requirements of most counties. Check with your local Extension agent if you are not sure.

Moss and lichen

These plants do not damage fruit and nut trees. Regular pruning and the dormant chemical sprays (copper fungicides or lime sulfur) you use for disease and insect control will reduce the amount of moss and lichen in trees.

Safety tips

☛ Most accidents occur during mixing, so wear rubber gloves and protect your eyes from spilling or splashing chemicals. Avoid getting pesticides on your skin, and wash your hands when you finish. While spraying, you should wear a long-sleeve shirt, full-length pants, unlined rubber gloves, and goggles or some type of eye protection. All clothes should be washed after spraying.

☛ Never eat or smoke when using pesticides. Blow your nose AFTER spraying, not during—keep your fingers away from mouth and nose.

☛ Check your sprayer for leaking hoses or connections, plugged or worn nozzles, and clean filters to prevent accidents. Mix the pesticide at the recommended rate on the label. Mix only the volume needed to complete the task. Don't exceed the label rate; putting more pesticide into the environment than you need for good control is wasteful and dangerous. When you finish, clean your sprayer immediately and dispose of the rinse water properly.

☛ Apply pesticides at the right time and under the right weather conditions. Never apply pesticides when winds will cause drift of the chemical off the target area or when temperatures exceed 85°F. Be careful not to let pesticides contaminate neighboring ponds or streams. You are liable for any off-site damage that may result from your misuse of pesticides.

☛ Store pesticides in a safe, secure place, out of the reach of children and in their original container. Never keep pesticides in beverage bottles or other previously used food or drink containers. Properly dispose of empty glass, metal, and plastic pesticide containers after first rinsing them three times with plenty of water.

☛ Accidents can happen. You can reach the Poison Center at **1-800-222-1222**.

Required spray programs

Several Oregon counties have ordinances dealing with backyard fruit tree production that require minimum spray programs to prevent disease/insect spread to commercial orchards. For example, codling moth must be controlled in Wasco, Jackson, Umatilla, and Hood River counties.

The sprays denoted with a (•), if applied at the correct time, should meet the requirements of most counties. Check with your local Extension agent if you are not sure.

The following counties require spray control:

Hood River—apple maggot, codling moth, San Jose scale, scab, pear psylla, cherry fruit fly, leaf curl, Coryneum blight, and peach twig borer

Jackson—apple maggot, codling moth, and pear psylla

Josephine—apple maggot

Lane, Linn, Marion, Polk, Union, and Yamhill—cherry fruit fly

Umatilla—apple maggot, codling moth, San Jose scale, scab, and cherry fruit fly

Wasco—apple maggot, codling moth, San Jose scale, and cherry fruit fly

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