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6-1-2003

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Recommended Citation
"PB1622-Disease and Insect Control in Home Fruit Plantings," The University of Tennessee Agricultural Extension Service, PB1622 5M 6/03 (Rev) E12-4615-00-037-03, http://trace.tennessee.edu/utk_agexgard/9

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Agricultural Extension Service
The University of Tennessee
PB 1622

Disease and Insect Control in Home Fruit Plantings

Disease and Insect Control in Home Fruit Plantings

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Entomology and Plant Pathology

Growing fruit in the home garden can be an interesting, fun and rewarding hobby. Many novices dream of plucking perfect fruit off trees in their yards. This does not happen without a great deal of work. Control of **pests (insects and diseases)** is an integral part of the care necessary to achieve good results.

This publication provides guidelines for spraying home fruit plantings, but good pest control is not possible if spraying is the only action taken. Cultural practices such as pruning, sanitation, variety selection and selecting open, sunny sites for planting are necessary for good pest control. Specific cultural practices for each type of fruit are provided with the spray charts.

How to Use the Spray Schedules

Most **fungicide** (disease control product) and some **insecticide** (insect control product) applications are effective only if applied preventatively, because it is not possible to control the pest satisfactorily after the fact. The timing of these preventive sprays is based on the growth stage of the plant and forms the foundation of the spray charts that follow.

In very rainy seasons, sprays may need to be applied more frequently than the schedule given in the following charts. Wet weather favors development of the disease-causing organisms; thus, more chemical protection is needed. Also, rains can wash off the **pesticides** (fungicides and insecticides). When rain occurs before a spray has dried or if rainfall totals more than 1 inch within 24 hours, the spray should be re-applied. Fungicides provide more benefit when applied before a rain than after, because protection from infection by disease-causing organisms is needed when plant surfaces are wet.

Additional Spray Tips

Thorough coverage of all above-ground plant parts is needed for good pest control. One of the biggest mistakes home fruit growers make is to allow their trees to grow too tall. If trees are maintained at a manageable height, it is easier to spray them properly, as well as to harvest the fruit. Proper pruning practices reduce the amount of spray needed and permit better coverage.

The type of sprayer used depends on the size of the fruit planting. For most plantings of small fruits or for a few small fruit trees, pump-up sprayers are adequate. Trombone-type sprayers are helpful for taller trees. For the increased spray volumes required by larger home orchards, power sprayers are recommended.

Rates of product application are not provided in these charts, because of the diversity of product concentrations offered. **The product labels give the rates; follow them.** The label rates are expressed as amount per gallon of water. The following table can be used to determine the amount of spray mixture needed.

Protect Pollinating Insects

Honey bees and other pollinating insects must be protected from insecticides, which will kill them. **Do not spray fruit plants with insecticides while the plants are in bloom.**

Amount of spray needed for each application

Height in feet	Spread in feet	Gal. per tree per application
5 to 8	3 to 6	½ to 1
8 to 10	4 to 8	1 to 2
10 to 15	8 to 15	3 to 5

Pesticide Safety

Most of the pesticides suggested for use in this publication are low-toxicity materials; however, some precautions are still needed.

- Keep pesticides in the original, labeled container.
- Keep pesticides in a locked storage cabinet, away from children or pets.
- Read the label each time before you use the product.
- Wear rubber gloves, goggles, a long-sleeved shirt, long pants and a hat when mixing and applying pesticides. Refer to the label for required protective gear.
- Handle the pesticide carefully when mixing. Avoid breathing dust or vapors. Wash any chemicals off the skin immediately with plenty of water.
- Never apply insecticides or fungicides with a sprayer that has been used for weed killers.
- Do not spray if it is windy.
- Mix only as much as you need. Do not store diluted spray mixtures from one application to the next. They will lose effectiveness and are unsafe.
- Observe the harvest intervals and reentry requirements given in the following table and on the product label.

Multipurpose Fruit Spray

Growers with small fruit plantings may want to consider multipurpose fruit spray products. These materials are widely available, convenient and will serve most pest control purposes. They are mixtures containing a fungicide (captan), and usually two insecticides (malathion and methoxychlor). Multipurpose sprays are produced by several companies and sold under names such as Home Orchard Spray®, Tree Fruit Spray®, All Purpose Fruit Spray®, General Purpose Fruit Spray® and others. Certain brands contain an additional insecticide, carbaryl (Sevin). Mixtures containing carbaryl should not be applied to apple or pear until 21 days after petal fall, as it causes the fruit to drop.

It appears that no products, including mixtures, are currently registered in Tennessee with residential uses of methoxychlor or phosmet. We have left these insecticides in this publication because currently you can use existing stock.

Harvest Restrictions

The following tables contain the most readily available home fruit pesticides, the crops on which they can be used and the harvest restrictions. If any information in the tables disagrees with the product label, **FOLLOW THE INFORMATION ON THE LABEL.**

Harvest Restrictions for Common Fruit Fungicides

Common Names	Example Brand Names[a]	Waiting period in days between final spray and harvest								
		Apple	Pear	Peach	Cherry	Plum	Blackberry Raspberry	Straw-berry	Grape	Blueberry
captan	Captan, Rescue, Orthocide	0	0	0	0	0	nr	0	0	0
chlorothalonil	Daconil, Fungi-Shield, Fungi-Gard	nr	nr	*	*	*	nr	nr	nr	nr
copper	Bordeaux Mix, Copper Fungicide	0	0	0	0	0	0	0	0	0
ferbam	Carbamate, Ferbam	7	7	21	0	nr	nr	14	7	nr
lime sulfur	Lime Sulfur	0	0	0	0	0	0	0	0	0
mancozeb	Manzate, Dithane, Mancozeb Flowable	nr	nr	nr	nr	nr	nr	nr	66	nr
maneb	Maneb Spray, Lawn & Garden Fungicide	nr	nr	nr	nr	nr	nr	nr	66	nr
myclobutanil	Immunox[b]	14	nr	0	0	0	nr	nr	14	nr
streptomycin	Agrimycin, Agristrep	50	30	nr	nr	nr	nr	nr	nr	nr
sulfur	Nutonex, Sulfur	0	0	0	0	0	0	0	0	0

nr = Not registered for this use.

* Chlorothalonil cannot be applied to peach, plum or cherry between shuck split and harvest.

[a] List of brand names is not complete and does not imply any preference or discrimination to other products of similar, suitable composition.

[b] Immunox is labeled for use on the indicated fruits. Immunox Plus, which contains an insecticide as well as myclobutanil, is labeled only for ornamentals.

Harvest Restrictions for Common Fruit Insecticides/Miticides

Common Names	Example Brand Names*	Waiting period in days between final spray and harvest								
		Apple	Pear	Peach	Cherry	Plum	Blackberry Raspberry	Straw-berry	Grape	Blueberry
carbaryl	Sevin	3	3	3	3	3	7	7	7	7
diazinon	Diazinon	nr	nr	21	21	21	7	5	28	nr
dicofol	Kelthane	7-14	7-14	nr	nr	nr	nr	3	7	nr
endosulfan	Thiodan	21-30	7	21-30	21	7	nr	15-35	nr	**
insecticidal soap	Insecticidal Soap	0	0	0	0	0	0	0	0	0
malathion	Malathion	3	1	7	3	3	1	3	3	1
methoxychlor	Marlate	7	7	21	7	7	14	14	14	14
phosmet	Imidan	7	7	14	7	7	nr	nr	14	nr

nr = Not registered for this use.

* List of brand names is not complete and does not imply any preference or discrimination to other products of similar, suitable composition.

** After harvest.

It appears that no products, including mixtures, are currently registered in Tennessee with residential uses of methoxychlor or phosmet. We have left these insecticides in this publication because currently you can use existing stock.

APPLE AND PEAR

Apple and pear trees are subject to serious damage from pests and, as a result, a preventive spray program is needed. The following practices will improve the effectiveness of the pesticides and may lessen the need for sprays.

Sanitation and Cultural Practices

- Plant disease-resistant varieties. This method of disease control is especially important for fire blight, where chemical control options are limited. Varieties resistant to cedar-apple rust, scab and powdery mildew are also available. See Extension publication PB746, *Tree Fruit, Tree Nut and Small Fruit Cultivar Recommendations for Tennessee*.
- Rake and destroy leaves in the fall, if apple scab, pear scab or pear leaf spot are problems. The organisms that cause these diseases overwinter in infected leaves.
- For cedar-apple rust control, elimination of the source of spores — cedar trees — is effective but not always possible. Removal of the galls caused by the fungus on cedar trees is helpful.

Pruning trees according to recommendations improves control of all above-ground diseases. In well-pruned trees, air circulation and sunlight penetration are improved. This helps control diseases by promoting rapid drying after rains and dew. Penetration of sprays into the canopy is also better if the trees are well-pruned.

- Prune out and destroy all dead or diseased shoots and limbs during the dormant season. This helps reduce fire blight, fruit rots and certain leaf spots, as the organisms that cause these diseases overwinter in the wood. Removing mummified (dark, shriveled, dry) fruit helps prevent the overwintering of the fruit rot organisms.
- Pruning out fire blight-affected shoots and blossom clusters during the growing season is warranted if it is done just as symptoms are appearing. Otherwise it is best to let the disease run its course.

Time to spray	Material to use	Remarks
Delayed dormant: When tips of leaves start to protrude from buds	Oil emulsion	For aphids, mites and scales
Bud break: From ½ inch long green leaves to tight cluster (when blossom buds are just visible)	Captan or ferbam	May be omitted on pear.
Pink: Just before blooms open	Captan or ferbam or Immunox plus malathion or endosulfan	If cedar-apple rust has been a problem in past, use ferbam or Immunox in this and the petal fall and first cover spray. Insecticides for plant bugs, aphids or leafminers.
Bloom: Begin at early bloom, repeat at 3- to 5-day intervals	Streptomycin Note: To protect bees, do not apply insecticides during bloom!	Only for fire blight control. USE ONLY IF NECESSARY.
Petal fall: When most of petals have fallen	Captan or ferbam or Immunox plus malathion or phosmet	Insecticide for plum curculio, codling moth, plant bugs, aphids, leafroller or leafminer.
First cover: 7 to 10 days after petal fall spray	Captan or ferbam or Immunox plus malathion or phosmet	Insecticide for plum curculio, codling moth, plant bugs, leafroller, leafhoppers or Oriental fruit moth.
Remaining covers: Apply at 2-week intervals until harvest restriction date	Captan plus malathion or phosmet	Miticides such as dicofol may be used at second cover spray if needed.

Notes:

- Multipurpose spray (see discussion) can be substituted for all of the above sprays except the dormant and bloom sprays. Multipurpose sprays will not control cedar-apple rust.
- **Read the pesticide label for the proper rates of chemical to use. Insecticides listed may not be effective against all insects listed.**

PEACH, PLUM AND CHERRY

Peach, plum, cherry and other stone fruits are commonly affected by serious pest problems and, as a result, a conscientious spray program is needed. The following sanitation and cultural practices will improve the chances of success and may lessen the need for sprays.

Sanitation and Cultural Practices

- Prune trees according to recommendations, to allow better air circulation and sunlight penetration. This helps control diseases by promoting rapid drying after rains and dew. Penetration of sprays into the canopy is also better if the trees are well-pruned.
- Remove the overwintering structure for the brown rot fungus, old mummified fruit left hanging in the tree or on the ground.
- Control of black knot of plum and cherry is dependent on removal of the knots before they begin to produce spores. In late winter, prune out and destroy these rough, black swellings or tumors that develop on limbs and twigs.
- Rake and destroy fallen cherry leaves, the overwintering site of the cherry leaf spot organism.
- Avoid planting peach varieties that are highly susceptible to bacterial leaf spot. Examples are Elberta, Halehaven, Rio-Oso-Gem and Sunhigh. Chemical control of this disease is very limited.

Time to spray or name of spray	Material to use	Remarks
Delayed dormant: When buds swell	Oil emulsion	For aphids, scales and mites
Bloom	Captan Note: To protect bees, do not apply insecticides during bloom!	Captan not needed on peach at this time if good sanitation is used to control brown rot. Needed on plum and cherry if black knot is a problem, but sanitation is required for good control.
Petal fall: When most of petals have fallen	Captan or sulfur or chlorothalonil plus malathion or endosulfan or phosmet	Insecticides for control of plum curculio, oriental fruit moth, plant bugs and stink bugs.
Shuck split: When flower shucks begin to split, or 7 days after petal fall	Captan or sulfur or chlorothalonil plus malathion or phosmet	
Cover sprays: Apply at 10- to 14-day intervals	Captan or sulfur plus malathion or phosmet	Cherry: After second cover spray, no other cover sprays may be needed. Carbaryl is good for beetle control and can be used beginning at second cover spray.
Preharvest spray: Within 1 week of harvest for each variety	Captan or Immunox	CRITICAL SPRAY FOR BROWN ROT CONTROL.
Trunk spray: August 1 or after harvest, whichever is later	endosulfan	Spray trunk and lower limbs for peach tree borer.
Early dormant: Late fall, after leaf drop	Ferbam or chlorothalonil or lime-sulfur	Needed on peach for leaf curl and on plum if plum pockets has been a problem.

Note: Multipurpose spray (see discussion) can be substituted for all of the above sprays except the dormant, bloom, and preharvest sprays.

Read the pesticide label for the proper rates of chemical to use. Many labels do not list plums. Insecticides listed may not be effective against all insects listed.

GRAPE

Most home grape plantings will require a preventive schedule of pesticides, since certain pests such as black rot can completely destroy a crop of fruit. However, the following sanitation and cultural practices will reduce the need for pesticides.

Sanitation and Cultural Practices

- Keep vines well-pruned according to recommendations, to prevent overgrowth of vines and dense canopy. Pruning promotes air circulation and sunlight penetration, thus more rapid drying after rains and dew. Penetration of sprays into the foliar canopy is also better if the vines are well-pruned.
- Remove mummified berries (shriveled, dry, raisin-like), as they provide an overwintering site for the fungus that causes black rot. Clusters on the vines as well as those that have fallen to the ground should be removed. Also, destroy infected canes that have been pruned off.
- For control of grape root borer, mounding soil makes it difficult for larvae to reach the roots or adults to emerge. Mound some soil 1 foot high for 1½ feet around each vine between early and mid-June. Remove the mounds around Thanksgiving.

Time to spray	Material to use	Remarks
New shoot sprays: Begin when first shoots are 2 to 4 inches long, and repeat every 7 to 10 days until bloom	Captan or ferbam or mancozeb or Immunox plus malathion or phosmet	Critical sprays for black rot control. Ferbam or mancozeb perform best against this disease. Insecticides for grape berry moth, flea beetle, plant bugs and grape phylloxera.
Petal fall: When most blooms have fallen	Captan or ferbam or mancozeb plus malathion or phosmet	If powdery mildew has been a problem in the past, add Immunox or sulfur to this and the cover sprays. Insecticides for grape berry moth, flea beetle, leafhopper and rose chafer.
Cover sprays: 7 to 10 days later, then at 2-week intervals until harvest restriction date	Captan or ferbam plus malathion or methoxychlor or carbaryl or phosmet	Insecticides for leaf hopper, berry moth, Japanese beetle, grape root borer. Carbaryl most effective for Japanese beetle.

Notes:

- Multipurpose spray (see discussion) can be substituted for all of the above sprays .
- Malathion EC may cause injury to Ribier, Italia, Cardinal and Almeria varieties.
- **Read the pesticide label for the proper rates of chemical to use. Insecticides listed may not be effective against all insects listed.**

STRAWBERRY

An intensive, preventive spray program is generally not needed on strawberry. Treatments can usually be made on an as-needed basis. The following sanitation and cultural practices will reduce the need for pesticides.

Sanitation and Cultural Practices

- Bed renovation immediately after harvest is crucial to managing pest problems. Renovation involves narrowing rows, mowing leaves, removing weeds and fertilization. Rake and destroy cut-off leaves and stems after renovation.
- Maintain narrow rows throughout the growing season (maximum 18 inches wide), to maintain good sunlight and air penetration of the canopy. This provides good berry formation and rapid drying after rains and dew.
- Plant varieties with resistance to red stele and leaf spot. See Extension publication PB746, *Tree Fruit, Tree Nut and Small Fruit Cultivar Recommendations* or SP284-A, *Recommended Varieties for Home Gardens*. Where anthracnose is a problem, consider the resistant varieties Delmarvel and Sweet Charlie.
- Control weeds throughout the growing season. Weeds increase disease by shading the plants and by interfering with air circulation. Weeds also harbor many insect and mite pests.
- Mulch with straw before berries begin to lie on the ground, to reduce gray mold and leather rot (fruit rots).
- Keep fruit picked to avoid attracting sap beetles.

Time to spray	Material to use	Remarks
Pre-bloom: When blossom buds appear in the spring	Carbaryl or malathion or endosulfan	Use as needed for crown borer, strawberry weevil, strawberry leafroller and catfacing insects
Bloom: At early bloom and again at full bloom	Captan Note: To protect bees, do not apply insecticides during bloom!	Needed for gray mold control if weather is rainy during bloom.
Post-bloom to harvest: Every 7 to 10 days as needed. Observe harvest restrictions.	Endosulfan or malathion or diazinon plus captan plus, if needed for spider mites: dicofol or insecticidal soap plus, if needed for slugs: metaldehyde bait	Insecticides for spittlebugs, aphids, strawberry rootworm, whiteflies and leafrollers. Captan not needed until berries begin to ripen, and then only if weather is rainy. Miticides should be applied 5 to 7 days apart.
Post-harvest: Every 10 to 14 days as needed.	Malathion or carbaryl plus, if needed for leaf blight or anthracnose: captan	Insecticides for root weevils, leafrollers and rootworm.

Note: Multipurpose spray (see discussion) can be substituted for all of the above sprays except the bloom spray.
Read the pesticide label for the proper rates of chemical to use. Insecticides listed may not be effective against all insects listed.

BLACKBERRY AND RASPBERRY

An intensive, preventive spray program is generally not needed on raspberry or blackberry. Treatments can usually be made on an as-needed basis. The following sanitation and cultural practices will reduce the need for pesticides.

Sanitation and Cultural Practices

- To reduce a source of pests, remove and destroy nearby wild brambles.
- Remove and destroy fruiting canes immediately after harvest.
- Promote rapid drying conditions and good air circulation in the canopy by controlling weeds, keeping the planting properly thinned and not allowing the row width to exceed 2 feet.
- Pick berries regularly during the harvest period so that overripe fruit do not accumulate. This will reduce problems with fruit rots, sap beetles, wasps and fruit flies.
- Destroy canes of cultivated or wild host plants with gall-like enlargements (red-necked cane borer) or wilting canes (raspberry crown borer) in June-July.
- Prune wilted plants 2 or more inches below where the cane is girdled due to raspberry cane borer.
- To control the spread of orange rust of blackberry and black raspberry, remove and destroy infected canes as soon as symptoms appear in the spring. Orange rust is recognized by a thin, willowy growth of new shoots, and the presence of orange spore pustules on the undersides of leaves.
- To control the spread of rosette of blackberry, remove and destroy infected canes before blooms begin to open. Rosette is recognized by the presence of clusters of stems on fruiting canes, producing a bunchy appearance. Sepals are extended and pinkish in color.
- Mow everbearing raspberry varieties after fall harvest to reduce disease carryover. This method produces a single, fall crop the following year.

Time to spray	Material to use	Remarks
Early to mid-bloom	Copper Note: To protect bees, do not apply insecticides during bloom, if possible. Malathion	Copper needed only on blackberry where rosette or anthracnose has been a problem, or on raspberry where leafspot has been a problem. Insecticide can be applied if necessary, but keep it off blooms.
Post-bloom: 3 to 4 additional applications at 2-week intervals. Observe harvest restrictions.	Copper	Same as above.

Read the pesticide label for the proper rates of chemical to use.

BLUEBERRY

As a rule, blueberry plants require the least amount of pesticides of all fruit crops. Treatments can usually be made on an as-needed basis. If diseases have been a problem in the planting in past years, captan can be used at 7- to 10-day intervals from bud break to harvest. Malathion or carbaryl can be used for occasional insect pests, but should not be used during bloom. Repeated use of carbaryl can lead to mite buildup.

Sanitation Practices

- If mummy berry disease has been a problem, rake the area beneath and around plants to collect or bury any mummified fruits from the previous year's crop.
- To reduce dieback diseases, prune out and destroy dead twigs and branches.

Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you mix, apply, store or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label. Persons who do not obey the law will be subject to penalties.

Disclaimer Statement

Pesticides recommended in this publication were registered for the prescribed uses when printed. Pesticide regulations are continuously reviewed. Should registration or a recommended pesticide be canceled, it would no longer be recommended by The University of Tennessee. Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others which may be of similar, suitable composition, nor does it

A UT Extension Reminder –

Safe Handling of Insecticides

Home gardeners can control insect pests with reasonable safety by observing these safety rules:

- Keep insecticides in the original, labeled container.
- Keep insecticides in a locked storage container.
- Read the label each time you use the insecticide.
- Measure the amount to be mixed carefully.
- Do not exceed the recommended rate of application.
- Handle the insecticide carefully when mixing to avoid splashing of liquid concentrates and billowing of dusts and powders.
- Wear protective clothing and other personal protective equipment as dictated by the label.
- To protect yourself when mixing insecticides, it is suggested that protective clothing and equipment, such as chemical-resistant gloves, a long-sleeved shirt, long pants and protective eyewear, be worn.
- Wash all insecticides off the skin immediately, using plenty of soap and water.
- Avoid breathing the spray mist or vapor.
- Always mix insecticides outdoors near a source of water.
- Clean up any spilled materials to prevent children from entering a heavily contaminated area.
- Apply insecticides to only those plants listed on the label.
- Observe the time intervals between the last application and harvest.

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PB1622 5M 6/03 (Rev) E12-4615-00-037-03
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