



GENERAL PEST MANAGEMENT GUIDELINES

Production of fruit in the home environment can be both rewarding and challenging. The challenge often comes in trying to protect fruit from insects and diseases that can attack and cause serious yield losses. This guide is designed to recommend products that can be used in home orchard production to reduce the incidence of fruit pests. Over the years products available for home fruit production have been reduced, leading to additional challenges in pest management and management recommendations.

When using this or any other pest management guide always read and follow label directions carefully.

Where Does Pest Management Begin?

The use of pesticides should be part of an integrated program for controlling insects and diseases. For an integrated pest management program to work you should select adapted varieties, choose a proper site (in the full sun, with well-drained soil and proper fertility), and provide proper care and maintenance throughout the year. You should be able to recognize common pests, and routinely monitor your home orchard for these pests. Understand that certain fruit crops are more susceptible to various diseases and insects and that the integrated program will vary by crop and location.

How to Apply Pesticides Correctly

Pesticides come in many different forms. Some are wettable powders, others liquid; some are wettable granules,

others dusts. Regardless of the formulation, special precautions need to be followed when handling the concentrated product. Chemical resistant gloves, long sleeves, and protective eye wear are recommended when mixing. Fill your sprayer with half the total amount of water you plan to use, add the recommended amount of pesticide, and finish filling with water to final volume.

Home owners are often limited in the type of equipment available to them for applying pesticides and most often use some type of pump-up sprayer. Pump-up sprayers are not easy to calibrate, so most labels will list the amount of material to use per 1 gallon of water instead of an amount of pesticide to apply per area.

Always store pesticide containers in well-ventilated and locked area.

General Guidelines for Amounts of Pesticides to Apply

- Mature peach tree (8 feet tall and 8 feet wide): use ¼ - ½ gallon dormant and ½ - 1 gallon fully leafed out.
- Mature muscadine or grape vine: use ¼ gallon per 20 feet of trellis.
- Mature citrus: use ¼ - ½ gallon per tree (6 feet X 6 feet).
- Blueberries and blackberries: use one gallon per 100 feet of row.
- **Thorough coverage just to the point of drip is desired; adjust the above guide as needed based on plant size and sprayer output.**

INSECT CONTROL

Table 1. Insect Management for Home Orchards¹

Time of Application	Material to Use	Pest Controlled	Pre-harvest Interval	Comments
APPLES AND PEARS (Intensive pest management required)				
Dormant	Horticultural oil 1% - 2% (volume/volume)	Scales and mites		Can be applied from bud swell to ½- inch green tip
Pink bud	Malathion	Aphids and plant bugs	3 days	DO NOT spray during bloom.

¹ Read and follow all label directions. Some products with the same active ingredients may not be labeled for home fruit use.

Time of Application	Material to Use	Pest Controlled	Pre-harvest Interval	Comments
APPLES AND PEARS (cont.)				
Petal fall	Malathion or Permethrin or MPFTS*	Plant bugs, oriental fruit moth, codling moth, plum curculio, stink bugs	3 days (apple) 1 day (pear) 14 days (pear) *	DO NOT apply permethrin to apples after petal fall.
	or Imidacloprid	Aphids, beetles, leafhoppers, scales	21 days some labels	Apply as a soil drench.
Cover sprays	Spinosad or	Leaf rollers, codling moth, oriental fruit moth	7 days	Spinosad will not control plum curculio or stink bugs.
	Bifenthrin or		14 days	For pears only. Allow at least 7 days between applications.
	Malathion or MPFTS* or	(listed above)	3 days (apple) 1 day (pear) (see label)	
	Carbaryl	(listed above)	5 days	Over use of carbaryl can flare mites and increase scale problems.
PEACH, NECTARINE, AND PLUM (Intensive pest management required)				
Dormant	Horticultural Oil (1% -2%) (volume/volume)	Scale and mite	*	Dormant or delayed dormant only. Use lower rate at early bud swell.
Petal fall	Malathion or MPFTS* or Carbaryl or	Plum curculio, tarnished plant bug, stink bug	7 days see label 5 days	Not labeled for nectarine or plum DO NOT repeat more than once per week. Over use may flare mites.
	Imidacloprid		21 days some labels	Apply as a soil drench (peach and plum). Do not apply more than once per season.
	Permethrin		7 days	Not labeled for nectarine and plum
	Cover sprays	(Same as above)		
Post-harvest (after all fruit has been harvested)	Permethrin	Peach tree borer	*	Saturate lower scaffolds and trunk. Application for peach tree borer should be made August 1 and again Sept. 1.

* MPFTS = multi-purpose fruit tree spray. Products contain ingredients for both insect and disease control. Read and follow all label directions. Some products with the same active ingredients may not be labeled for home fruit use.

Time of Application	Material to Use	Pest Controlled	Pre-harvest Interval	Comments
BLUEBERRY (Blueberries often need no insecticide treatments since pest levels seldom reach economic levels.)				
Petal fall through loose cluster	Malathion	Cranberry fruitworm	1 day	Monitor for cranberry fruitworm by observing webbing and damaged berries. Make no more than eight foliar applications per season.
	Spinosad		3 days	
Cover sprays through harvest	Permethrin		14 days	Do not apply pre-bloom or during bloom.
	Imidacloprid	Japanese beetles	7 days	
	Carbaryl		7 days	
	Malathion	Blueberry maggot, Japanese beetle, stink bugs	1 day	
	Carbaryl		7 days	
	Permethrin		14 days	Monitor blueberry maggot beginning in mid-May for early fruit damage. Use yellow baited sticky traps to monitor adult fly.
BLACKBERRIES				
Dormant	Horticultural Oil	Mites	0	Do not spray if temperatures are below 35°F.
Pre-bloom	Malathion	Strawberry weevil thrips, aphids	1 day	Apply during flower bud swell but prior to bloom. Toxic to bees
Post-bloom through pre-harvest	Horticultural Oil	Mites and aphids		Be sure to read and follow label. Oils can affect fruit finish.
	Imidacloprid	Aphids, whiteflies, rednecked cane borers	7 days	
	Malathion	Mites, aphids, sap beetles, Japanese beetles	7 days	
BUNCH AND MUSCADINE GRAPES				
Dormant	Horticultural Oil	Scale	*	Dormant use only
New growth (4 to 6 inches)	Spinosad	Grape berry moth, leaf rollers, thrips	7 days	Does not control flea beetles or plant bugs
	B.T. (<i>bacillus thuringiensis</i>)			Maximum of six applications per season. Does not control thrips
	MPFTS* or Malathion Carbaryl	Grape berry moth, leaf rollers, flea beetle, plant bugs, aphids	14 days	Do not spray during bloom.
Cover sprays	Imidacloprid	Sharpshooters, mealy bugs	30 days	Apply only once per season.
	MPFTS*	Grape berry moth, leaf rollers, flea beetles, plant bugs, aphids, Japanese beetle	14 days	Do not spray during bloom. Use only as needed when pests are present.
	Carbaryl	Japanese beetle, June beetle, grape berry moth	7 days	

* MPFTS = multi-purpose fruit tree spray. Products contain ingredients for insect and disease control. Read and follow all label directions. Some products with the same active ingredients may not be labeled for home fruit use.

Time of Application	Material to Use	Pest Controlled	Pre-harvest Interval	Comments
STRAWBERRIES				
Pre-bloom	Spinosad	Armyworm, leaf rollers, thrips	1 day	For Lepidoptera pests
	MPFTS*	Aphids, plant bugs, leafrollers, spider mites	3 days	Some MPTFS products do not list strawberries on the label.
	Malathion	Aphids, spider mites, flea beetles	3 days	
	Carbaryl	Strawberry weevil, flea beetles, leaf rollers	7 days	Can flare mites
Post-bloom to harvest	MPFTS*	Aphids, plant bugs, leafrollers, spider mites	3 days	Some MPTFS products do not list strawberries on the label.
	Imidacloprid	Aphids, whiteflies	14 days	Apply only once per season.
	Permethrin	Strawberry weevil, aphids, fleabeetles, field crickets, tarnished plant bug	14 days	Do not apply more than eight times per season
	Malathion 50% EC	Aphids, spider mites, flea beetles	3 days	
	Carbaryl	Strawberry weevil, flea beetles, leaf rollers	7 days	Can flare mites.

* MPFTS = multi-purpose fruit tree spray. Products contain ingredients for insect and disease control. Read and follow all label directions. Some products with the same active ingredients may not be labeled for home fruit use.

Table 2. Active Ingredients and Product Names

Active Ingredient	Product Name
Acetamiprid	Ortho Max Flower, Fruit, and Vegetable Insect Killer RTU
<i>Bacillus thuringensis</i>	Bonide Dipel 150 Dust Dipel Dust with BT Insecticide Green Light Thuricide Bacillus Thuringiensis (BT) Concentrate Southern Ag Thuricide HPC
Bifenthrin	Ortho BugBGon Max Lawn and Garden Insect Killer
Carbaryl	Bonide Fruit Tree Spray Concentrate * Ferti-lome Liquid Carbaryl Garden Spray Ferti-lome Hi-Yield 5% Carbaryl Garden and Pet Dust Ortho Sevin Liquid Brand Carbaryl Insecticide
Diatomaceous Earth	Ferti-lome Natural Guard Crawling Insect Control
Esfenvalerate	Bonide Bontox Multi-Purpose Insecticide Concentrate Ortho Bug-B-Gone Multi-Purpose Insect Killer
Imidacloprid	Bonide Annual Tree and Shrub Insect Control Greenlight Tree and Shrub Systemic Insect Killer Bayer Advanced Fruit, Citrus, and Vegetable Insect Control
Insecticidal Soap	Various sources
Malathion	Ortho Malathion 50 Insect Spray Bonide Fruit Tree Spray Concentrate * Bonide Cythion 50%, Malathion Insect Control Concentrate Ferti-lome Fruit Tree Spray * Ferti-lome Malathion Spray Hi-Yield 55% Malathion Security Home Fruit Spray *
Neem	Various sources
Permethrin	Bonide Borer-Miner Killer Concentrate Bonide Eight Insect Control Vegetable and Flower Concentrate Green Light Conquest Insecticide Concentrate
Petroleum Horticultural Oil	Bonide All Seasons Spray Oil Ferti-lome Dormant Spray Ortho Dormant Insect and Disease Control
Pyrethrins	Various sources
Spinosad	Ferti-lome Borer, Bagworm, Leafminer and Tent Caterpillar Spray Monterey Garden Insect Spray

* Indicates Multi-purpose Tree Fruit Spray (MPTFS), which contains one or more insecticide active ingredients plus a fungicide(s). This list of active ingredients and product names is provided as a guide only. Be sure to read the label and determine that crop(s) to be sprayed are listed on the label before use.

Table 3. Insect Management for Citrus Crops, Including Lemons, Limes, Mandarins (Satsumas), and Kumquats

Time of Application	Material to Use ¹	Pest Controlled	Pre-Harvest Interval	Comments
Post-Bloom (petals have fallen)	Imidacloprid	Aphids, Whiteflies, Psyllids, Leafminers, Leafhoppers, Scales	30 days	Apply only once per season. (drench)
	Malathion	Scales, Whiteflies, Mealybugs, Thrips	7 days	Do not apply in bloom.
	Spinosad	Thrips, Leafminers	1 day	
Summer Cover Sprays	Horticultural Oil or Oil + Malathion	Scales, Whiteflies, Mealybugs		Do not spray trees under stress. Foliage injury can occur
Pre-Harvest	Carbaryl or Malathion	Stinkbugs, Leaffooted bugs	5 days	
			7 days	
Post-Harvest	Horticultural Oil	Scales, Whiteflies, Mealybugs		Avoid early winter applications to reduce freeze injury.

¹ Labels for the same active ingredient can vary for a crop as well as pre-harvest intervals. Be sure to check the label before purchasing a product for citrus or other fruit crops to be certain the label covers its use.

DISEASE CONTROL

APPLES AND PEARS

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.

- 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 and will potentially reduce the need for sprays.
- Rake and destroy leaves in the fall, if apple scab or pear leaf spot are problems. The fungi that cause these diseases can survive through the winter in infected leaves.
- For cedar-apple rust control, the spores that infect apples come from cedar trees. Elimination of the source of spores (cedar trees) is effective, but not always possible. Where cedars are part of an established landscape, remove and destroy all galls caused by the rust fungus on cedars in the late fall. Inspect the cedars again in the early spring during or just after a rain when the orange, gelatinous fungus growth from any remaining galls is highly visible, and remove them.

- 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 can survive through the winter 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. Prune during dry weather and sterilize tools between cuts. See ANR-0542 for more information on control of fire blight.

Table 4. Disease Management for Home Orchards

Time of Application	Pest Controlled	Material to Use ¹	Comments
APPLES AND PEARS			
Delayed dormant: When leaves start to protrude from buds			
Bud break: From ½ inch long green leaves to tight cluster (when blossom buds are just visible)	Scab, powdery mildew, rust, apple rot	Captan	Maybe omitted for pear
Pink: Just before blooms open	Scab, powdery mildew, rust, apple rot, fire blight	Captan or Myclobutanil or MPFTS*	If cedar apple rust has been a problem in the past, use myclobutanil in this and petal fall and first cover applications.
Bloom: Begin at early bloom, repeat at 3 to 5 day intervals	Fire blight	Streptomycin sulfate	Use only if necessary; controls only fire blight
Petal fall: When most of the blooms have fallen	Scab, cedar apple rust, powdery mildew	Captan or Myclobutanil or MPFTS	
First cover: 7 to 10 days after petal fall spray	Bitter rot, white rot, cedar apple rust, scab	Captan or Myclobutanil or MPFTS	
Remaining covers: Apply at 14-day intervals until harvest restriction date	bitter rot, white rot, sooty blotch and fly speck	Captan or MPFTS	

¹ See Table 5 for a listing of commonly available products for each material listed.

* MPFTS (Multipurpose Fruit Tree Spray). Contains Captan and one or more insecticides.

PEACHES AND PLUMS

Peach, plum, and other stone fruits are commonly affected by several insect and disease problems each year and a spray program is needed for successful fruit production. The following sanitation and cultural practices will improve the chances of success and may lessen the need for sprays.

- Prune trees according to recommendations, to allow better air circulation and sunlight penetration. Pruning 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 and discard old mummified fruit left hanging in the tree or on the ground. These mummified fruit are the overwintering structures of the brown rot fungus. See ANR 1182, "Brown Rot of Stone Fruit," for more information on brown rot.

- Control of black knot of plum 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 galls that develop on twigs and branches. See ANR 1055, "Black Knot on Plum and Cherry Trees," for more information on black knot.

- Avoid planting peach varieties that are highly susceptible to bacterial spot as there are few options for control of this disease. Examples of highly susceptible cultivars are Elberta, Halehaven, Rio-Oso-Gem, O-Henry, Cresthaven, and Sunhigh.

Table 4. Disease Management for Home Orchards (cont.)

Time of Application	Pest Controlled	Material to Use ¹	Comments
PEACHES AND PLUMS			
Dormant season			
Late dormant	Peach leaf curl	Copper Fungicide or Chlorothalonil	Only needed if there is a history of leaf curl
	Bacterial spot	Copper Fungicide ²	
Petal fall: When most of the petals have fallen	Scab	Captan or Chlorothalonil or Sulfur or MPFTS*	Avoid use of sulfur when temperatures are above 90°F
Shuck split: When flower shucks begin to split	Scab, brown rot	Captan or Chlorothalonil or Sulfur or MPFTS	Do not apply chlorothalonil products after shuck split
Cover sprays: Repeat at 14-day intervals	Scab, Brown rot	Captan or Sulfur or MPFTS	
Preharvest sprays: Within one week of harvest	Brown rot	Captan or Myclobutanil	Critical spray for brown rot control

¹ See Table 5 for a listing of commonly available products for each material listed.

² Use caution with copper sprays because phytotoxicity can occur if they are applied after the late dormant period.

* MPFTS (Multipurpose Fruit Tree Spray). Contains Captan and one or more insecticides.

BLUEBERRY

Rabbiteye blueberries are relatively free of insects and diseases. 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 inter-

vals from bud break to harvest. 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. This will help reduce the incidence of mummyberry. To reduce dieback diseases, prune out and destroy dead twigs and branches.

BLACKBERRY

An intensive spray program is generally not needed. For blackberry, and fungicide and insecticide sprays can often be applied on an as-needed basis. The following sanitation practices will reduce the need for pesticide sprays.

- To reduce the source of pests, remove and destroy nearby wild blackberries.
- Remove and destroy fruiting canes immediately after harvest.
- Promote rapid drying and good air circulation within the canopy by controlling weeds and keeping the plants properly thinned.
- Pick berries often during the harvest period to minimize the amount of overripe fruit. This will reduce problems with berry rots, sap beetles, wasps, and fruit flies.

- Plants infected with orange rust should be promptly dug up and removed or destroyed as soon as symptoms appear in spring. Symptoms of orange rust include willowy growth of new shoots and the presence of orange spore pustules on the undersides of the leaves.

- To control the spread of rosette, 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 bunched appearance. Flower sepals are extended and pinkish in color on plant with rosette..

Table 4. Disease Management for Home Orchards (cont.)

Time of Application	Pest Controlled	Material to Use ¹	Comments
BLACKBERRY			
Early to mid bloom	Rosette or anthracnose	Copper Fungicide	Copper needed only where rosette or anthracnose has been a problem
Post-bloom: Three to four additional applications at 2-week intervals.	Rosette or anthracnose	Copper Fungicide	Copper needed only where rosette or anthracnose has been a problem

¹ See Table 5 for a listing of commonly available products for each material listed.

GRAPES

Most grape plantings, except muscadine, will require a preventative schedule of fungicide and insecticide sprays for successful production. Pests like black rot can completely destroy a crop of fruit. However, the following sanitation and cultural practices will reduce the need for pesticides.

- Keep vines well pruned according to recommendations, to prevent overgrowth of vines and a dense canopy. Pruning improves air circulation and sunlight penetration, thus promot-

ing rapid drying after rains and dew. Penetration of sprays into a foliar canopy is also better when vines are pruned.

- Fruit rot organisms of grapes can survive through the winter on old vines and dried fruit on the vines and ground. Remove and destroy mummified fruit (shriveled, dry, raisin-like) on vines as well as those on the ground. Also, prune and destroy vines with stem cankers as they are also a site for these fungi to survive through the winter.

Table 4. Disease Management for Home Orchards (cont.)

Time of Application	Pest Controlled	Material to Use ¹	Comments
GRAPES			
Dormant: After vines are pruned and before buds break.	Anthracnose, black rot, dead arm	Lime-sulfur	Do not apply lime sulfur and superior oil within 30 days of each other.
New shoot sprays: Begin when new shoots are 2 to 4 inches long, and repeat every 7 to 10 days until bloom	Black rot, powdery mildew, downy mildew, anthracnose	Captan or Mancozeb or Myclobutanil or MPFTS*	Critical spray for black rot control Do not make more than six applications of myclobutanil (at a rate of 2 ounces per gallon) per season. Do not apply mancozeb within 66 days of harvest.
Petal fall: When most of the blooms have fallen	Black rot, powdery mildew, downy mildew	Captan or Mancozeb or MPFTS	If powdery mildew has been a problem in the past, add myclobutanil or sulfur to petal fall and cover sprays
Cover sprays: 7 to 10 days after petal fall; then every two weeks until harvest restriction date	Black rot, powdery mildew, downy mildew	Captan or MPFTS	

¹ See Table 5 for a listing of commonly available products for each material listed.
* MPFTS (Multipurpose Fruit Tree Spray). Contains Captan and one or more insecticides.

STRAWBERRY

Many times, strawberry plants can be grown almost disease-free without spraying. Weather conditions, however, can cause diseases to develop and spread, and spraying will be necessary. The following practices will improve the effectiveness of the pesticides and may lessen the need for sprays.

- Dormant season sanitation will reduce disease pressure most years. Strawberry leaf spots and Botrytis blight pathogens can

survive through the winter on old leaves and debris on the bed. Clipping old leaves, raking, and composting or destroying aids in disease control.

- Control weeds during the growing season. Weeds increase disease by reducing light penetration and air circulation, and they intercept pesticide sprays. Weeds can also harbor insects and mite problems.

Table 4. Disease Management for Home Orchards (cont.)

Time of Application	Pest Controlled	Material to Use ¹	Comments
STRAWBERRY			
Bloom: At early bloom and again at full bloom	Gray mold and other fruit rots	Captan	Fungicides needed especially during rainy weather. In dry weather fungicides are generally not needed.
Post-bloom to harvest	Gray mold and other fruit rots	Captan	See remarks above.
Post-harvest: Every 10-14 days as needed	Leaf blight and anthracnose	Captan	As needed for leaf blight and anthracnose.

¹ See Table 5 for a listing of commonly available products for each material listed.

Table 5. Products Available in Small Packages for Disease Control in Home Fruit Crops

Active Ingredient	Product Name (Distributor)
Captan	Captan Fungicide (50% WP) (Hi-Yield) Captan Fruit and Ornamental (50% WP) (Bonide) Captan Fungicide (50% WP) (Southern Ag)
Chlorothalonil	Broad Spectrum Lawn and Garden Fungicide (Ferti-lome) Fung-onil Concentrate (29.6%) (Bonide) Fruit Tree, Vegetable, and Ornamental Fungicide (29.6%) (Monterey) Garden Disease Control (29.6%) (Ortho) Vegetable, Flower, Fruit, and Ornamental Fungicide (Hi-Yield)
Captan combination products or MPFTS ¹	Fruit Tree Spray (captan+carbaryl+malathion) (Bonide)
Copper fungicides	Liquid Copper Fungicide (31%) (Southern Ag)
Copper amonium complex	Liqui-Cop (31.4%) (Monterey)
Copper hydroxide	Copper Fungicide (Hi-Yield)
Copper salts	Copper Liquid Concentrate (Bonide) Concern Copper Soap Fungicide (Concern) Natural Guard Copper Soap Liquid Fungicide (Ferti-lome)
Mancozeb	Mancozeb Flowable (Bonide)
Myclobutanil	Immunox Multipurpose Fungicide (1.55%) (Spectricide)
Streptomycin sulfate	Fire Blight Spray (Ferti-lome)
Sulfur	Sulfur Dust (Bonide) Dusting Wettable Sulfur (Hi-Yield) Garden Fungicide (Safer)

2011 IPM-1308

For more information, contact your county Extension office. Visit <http://www.aces.edu/counties> or look in your telephone directory under your county's name to find contact information.

Use pesticides **only** according to the directions on the label. Follow all directions, precautions, and restrictions that are listed. Do not use pesticides on plants that are not listed on the label.

The pesticide rates in this publication are recommended **only** if they are registered with the Environmental Protection Agency or the Alabama Department of Agriculture and Industries. If a registration is changed or canceled, the rate listed here is no longer recommended. Before you apply **any** pesticide, check with your county Extension agent for the latest information.

Trade names are used **only** to give specific information. The Alabama Cooperative Extension System does not endorse or guarantee any product and does not recommend one product instead of another that might be similar.

Published by the Alabama Cooperative Extension System (Alabama A&M University and Auburn University), an equal opportunity educator and employer.

