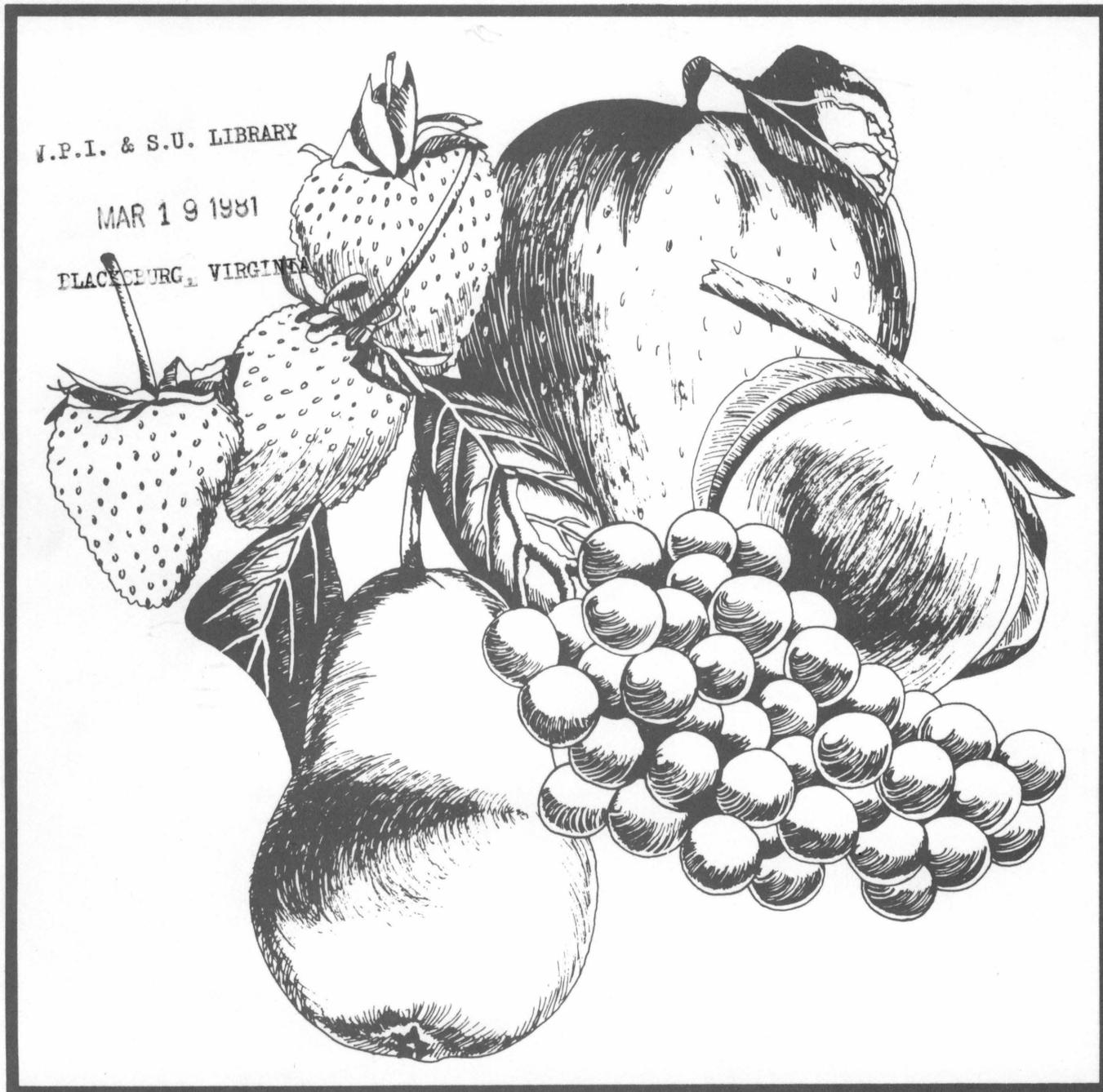


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VIRGINIA COOPERATIVE EXTENSION SERVICE
PEST MANAGEMENT GUIDE 8
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Chemicals for the Control of Diseases, Insects, and Weeds of Commercial Tree and Small Fruits



EXTENSION DIVISION ●
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY ●
BLACKSBURG, VIRGINIA ●

DISEASES AND INSECTS OF FRUIT

C. R. Drake, Professor and Extension Specialist, Plant Pathology
K. S. Yoder, Assistant Professor, Plant Pathology
R. L. Horsburgh, Associate Professor, Entomology

Effective control of pests that occur in commercial fruit crops is obtained only through the continual use of several control measures that include practices of good management, nutrition and sanitation. If possible, close observation should be used to determine which pests are present and when treatments should be applied to be most effective. Pesticides are used most frequently by the grower for pest control. These pesticides are usually applied as sprays or occasionally as dust. The problem of properly selecting the correct pesticide to do a specific job continues to be complex and challenging to commercial orchardists. The success or failure of any spray program is not due entirely to the specific pesticide or amount placed in the sprayer tank; but proper timing and thorough application of sprays are essential to quality fruit production.

The pesticides recommended here have proven to be effective and useful in the control of various common pests. Differences may exist among them in their effectiveness against specific pests. It has become increasingly evident that no one spray program can provide equally satisfactory results in all orchards or plantings for all pests.

In selecting a pesticide for control of fruit pests, there are several factors that must be considered. Degree of control desired, type of fruit finish required by the market, type of spray used, compatibility with other pesticides and effectiveness against other organisms are some of the important factors that must be weighed. Today there are a large number of pesticides available for grower use and these vary somewhat in their spectrum of activity and effectiveness on individual pests.

Generally, pesticides may be used alone for specific pest or in combination for various pests occurring at any one time, but reference should be made to the pesticide compatibility chart, on the front of the Virginia Spray Bulletin for Tree Fruits, Va. Coop. Ext. Ser. Pub. 219, before mixing pesticides in the spray tank.

The recommended concentration of pesticides for control of fruit pests is based on a regular dilute (1X) spray. The application rate for apples is based on 300 to 400 gal of dilute spray per acre during the pre-bloom and bloom periods and from 300 to 500 gal per acre in the post-bloom period. The application rate for stone fruit is based on 150 to 200 gal of dilute spray per acre during the pre-bloom and bloom period and from 250 to 350 gal per acre in the post-bloom period. If pesticides are to be applied as concentrate sprays, the amount of actual material to be applied per acre is approximately 20% less than that used for dilute sprays. Recommended amounts to use are listed in the "dosage table" for various spray concentrations for airblast sprayers on the following page. The application rate for grapes is based on 100 gal per acre during the pre-bloom period, 200 gal during early post-bloom, and gradually increased to 300 gal during the late post-bloom period. The application rate for strawberries is based on 100 to 150 gal per acre. The application rate on brambles is based on 150 to 250 gal per acre. Whether to use low, intermediate or high gallonage per acre will depend on tree or plant size, foliage development, and prevailing weather conditions.

For more specific information on tree fruit pest control, use the 1980 Virginia Spray Bulletin for Tree Fruits, Va. Coop. Ext. Ser. Publication 219; Disease of Apples and Their Control in Virginia, Va. Coop. Ext. Ser. Publication 374; Fire Blight of Apple and Pear and its Control, Va. Coop. Ext. Ser. Publication 35; Diseases of Stone Fruits and Their Control in Virginia, Va. Coop. Ext. Ser. Publication 475; Chemical Pest Control Information for Home Fruit Production, Va. Coop. Ext. Ser. Pest Management Guide 17 and periodical cicada control in orchards, Va. Coop. Ext. Ser. Pub. 812. For additional information on grape diseases and their control, request Va. Coop. Ext. Ser. Publication 32 and Pest Management Guide 18. Also, additional information on strawberry and bramble diseases and their control is available in Va. Coop. Ext. Ser. Control Series 70 and 72, respectively.

Only Pomace which has been tested and shown to be free of pesticides should be fed to livestock.
Do not graze or feed forage from treated orchards or other treated areas.

Airblast Sprayer Calibration

Step 1. Determine the rate of travel at which the sprayer will be pulled through the orchard. Ground speeds of 2.0 or 2.5 miles per hour are recommended.

Step 2. Refer to Dosage Table to determine the number of gallons of spray output needed per minute from both sides of the sprayer to give the desired amount per acre. The figure given in the table should be divided by 2 to determine the amount for each side of the sprayer.

Step 3. Determine the pressure at the location of the nozzle at which the sprayer will be operated.

Step 4. Obtain from the sprayer dealer a data table showing the capacity in gallons per minute of the nozzles used in the sprayer. Note that the capacity of the nozzle varies with the pressure, with the capacity of the whirl plate or whirler used in some nozzle assemblies, and with the size of the hole or orifice in the disc. Select from the disc sizes (and whirl plates if needed) those required to obtain the necessary output in gallons per minute. Disc sizes should be selected and distributed along the manifold to allow a delivery of 85% of the spray volume from the upper 2/3 of the active airstream; 50% of the volume should be delivered from the top 1/3 of the nozzles. Example: Sprayer with 10 nozzles per side; need 12.9 gal/min for both sides of machine to deliver 100 gpa at 2.0 mph with 32 ft spacing; thus 12.9 divided by 2 = 6.45 gal/min needed for each side; $6.45 \times .50 = 3.2$ gal/min to be distributed among upper 3 nozzles; $6.45 \times .85 = 5.5$ gal/min to be distributed among the top 7 nozzles including the top 3; $6.45 \times .15 = 0.95$ gal/min to be distributed between the bottom 3 nozzles.

Step 5. After discs have been placed in nozzles, fill sprayer with water and determine the time necessary to spray-out the entire contents. The theoretical time required can be calculated by dividing the number of gallons of water in the tank by the total sprayer output per minute; thus a sprayer delivering 12.9 gal/min should deliver 500 gallons in 38.76 minutes. It is very common for this final check to show that the machine is not delivering the calculated amount of spray. Check the machine to see that it is operating properly, and then adjust disc sizes until the rate of delivery is correct.

Dosage Table. Sprayer output in gal/min needed for various rates per acre for two ground speeds.

Row Width in Feet	Gallons Per Acre Desired							
	20	30	40	50	60	80	100	400
<u>Sprayer output (gal/min) needed for a ground speed of 2.0 mph</u>								
18	1.5	2.2	2.9	3.6	4.4	5.8	7.3	29.1
20	1.6	2.4	3.2	4.0	4.9	6.5	8.1	32.2
22	1.8	2.7	3.6	4.4	5.3	7.1	8.9	35.6
24	1.9	2.9	3.9	4.9	5.8	7.8	9.7	38.8
26	2.1	3.2	4.2	5.3	6.3	8.4	10.5	42.0
28	2.3	3.4	4.5	5.7	6.8	9.1	11.3	45.3
30	2.4	3.6	4.9	6.1	7.3	9.7	12.1	48.5
32	2.6	3.9	5.2	6.5	7.8	10.4	12.9	51.8
34	2.8	4.1	5.5	6.9	8.2	11.0	13.7	55.0
36	2.9	4.4	5.8	7.3	8.7	11.6	14.5	58.1
38	3.1	4.6	6.1	7.7	9.2	12.3	15.4	61.4
<u>Sprayer output (gal/min) needed for a ground speed of 2.5 mph</u>								
18	1.6	2.7	3.6	4.6	5.5	7.3	9.1	36.4
20	2.0	3.0	4.0	5.1	6.1	8.1	10.1	40.4
22	2.2	3.3	4.4	5.6	6.7	8.9	11.1	44.4
24	2.4	3.6	4.9	6.1	7.3	9.7	12.1	48.5
26	2.6	3.9	5.3	6.6	7.9	10.5	13.1	52.6
28	2.8	4.2	5.7	7.1	8.5	11.3	14.1	56.6
30	3.0	4.6	6.1	7.6	9.1	12.1	15.2	60.6
32	3.2	4.9	6.5	8.1	9.7	12.9	16.2	64.6
34	3.4	5.2	6.9	8.6	10.3	13.8	17.2	68.7
36	3.6	5.5	7.3	9.1	10.9	14.6	18.2	72.7
38	3.8	5.8	7.7	9.6	11.5	15.4	19.2	76.8

GUIDE FOR THE CHEMICAL CONTROL OF FRUIT DISEASES

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
APPLE DISEASES				
Apple Scab (<i>Venturia inaequalis</i>)	Dodine 65% WP	0.5 lb	1.5 lb	Apply Benlate with hydraulic ground equipment only. Apply spray every 6 to 7 days from the time first leaves appear until petal fall, then at 10-day to 2-week intervals for the remainder of the season. NOTE: Beginning with second cover, reduce the rate of dodine to 0.4 lb. There is a 5-day waiting period before harvest for dodine; 7 days for ferbam; 15 days for Polyram; 21 days for Dithane M-45 and Dikar; and 30 days for Manzate 200. Do not graze or feed forage from treated areas. Do not use apples treated with dodine in the manufacture of apple pomace for use in livestock feeds.
	OR			
	Captan 50% WP	2.0 lb	6.5 lb	
	OR			
	Dikar 76.7% WP	2.0 lb	6.5 lb	
	OR			
	Folpet 50% WP	2.0 lb	6.5 lb	
	OR			
	Polyram 80% WP	2.0 lb	6.5 lb	
	OR			
	Dithane M-45 80% WP	2.0 lb	6.5 lb	
	OR			
	Manzate 200 80% WP	2.0 lb	6.5 lb	
	OR			
*Benomyl 50% WP (Benlate) + Superior Oil + Dithane M-45 or Manzate 200 80% WP	2.0-3.0 oz	8.0-12.0 oz		
OR				
Superior Oil + Dithane M-45 or Manzate 200 80% WP	1.0 qt 12.0 oz	1.0 gal 3.5 lb		
OR				
Benomyl 50% WP + Mancozeb 80% WP (Dithane M-45, Manzate 200)	2.0-3.0 oz 12.0 oz	8.0-12.0 oz 3.5 lb		
OR				
Benomyl 50% WP + Polyram 80% WP	2.0-3.0 oz 1.0 lb	8.0-12.0 oz 3.5 lb		
OR				
Benomyl 50% WP + Captan 50% WP	2.0-3.0 oz 12.0-16.0 oz	8.0-12.0 oz 3.5 lb		
Remarks:	*A combination of benomyl 50WP (3.0 oz /100.0 gal dilute or 1.0 lb/A Conc) plus Dithane M-45 or Manzate 200 80WP (12.0 oz/100.0 gal dilute or 3.5 lb per acre concentrate) plus superior oil (1.0 qt/100.0 gal dilute or 1.0 gal/A Conc) or dodine 65% WP (8.0 oz/100.0 gal or 1.5 lb/A Conc) are effective in suppression of established apple scab (apply 2 applications at 7-day intervals back-to-back, then apply at regular intervals).			
	In those orchards where oil is used, Thiram 65% WP 2.0 lb or Ferbam 76% WP 2.0 lb or Polyram 80% WP 2.0 lb or Dithane M-45 or Manzate 200 80% WP 2.0 lb should be used in the first two (2) sprays. Starting 7 days after the oil spray, Dikar 76% WP may be used for combined control of apple scab, rust, and fruit rots.			
Caution:	Do not use captan or folpet with oil or within 4 and Dikar 7 days of an oil application. Folpet may cause more injury to fruit finish than captan, and its all-season use is suggested primarily in those orchards where fruit rots are difficult to control. High rates of dodine and benomyl may increase fruit russet of Golden Delicious and should be used with caution where fruit finish is of primary concern.			
Special Caution:	The apple scab fungus is resistant to benomyl in at least one area of Virginia. Benomyl should not be used when resistance is suspected. To suppress the potential for development of resistant strains of the apple scab fungus in areas where resistance is not yet known, benomyl should be used only in combination with other scab fungicides in the spray program. Resistance of the apple scab fungus to dodine has been shown also in some areas of the eastern U.S.A.; therefore, dodine should be used with caution under heavy scab conditons.			

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
APPLE DISEASES (Cont'd)				
Apple rusts, cedar-apple-rust (<u>Gymnosporangium juniperi virginianae</u>)	Ferbam 76% WP	0.6 lb	2.0 lb	Apply spray at 6-7 day intervals from open cluster through petal fall and then at 10-day to 2-week intervals through second cover. There is a 7-day waiting period for ferbam and a 15-day waiting period for zineb. *Thiram is not approved for quince rust.
	OR *Thiram 65% WP	1.0 lb	3.0 lb	
	OR Zineb 75% WP	0.6 lb	2.0 lb	
Quince rust (<u>Gymnosporangium clavipes</u>)				
Remarks: In those orchards where Polyram 80% or Dikar 76.7% or Mancozeb 80% (Dithane M-45 or Manzate 200) is used as the scab fungicide, no additional rust fungicide is required.				
Powdery mildew (<u>Podosphaera leucotricha</u>)	Benomyl 50% WP (Benlate) + Superior Oil	2.0-3.0 oz	0.5 lb	Apply 6-7 day intervals from tight cluster stage through petal fall, and 10-day to 2-week intervals until new growth hardens off, usually through fourth cover. There is a 21-day waiting period before harvest for dinocap and Dikar. Prebloom.
	OR Dinocap 19% WD	1.0 qt	1.0 gal	
	OR Liquid conc. 37% LC	0.5 lb	1.5 lb	
	OR Dikar 76.7% WP	4.0 oz	12.0 oz	
	OR Kolospray 81% WP	2.0 lb	6.5 lb	
	OR Kolodust Xtra Dust or Spray 53% WP	2.0-3.0 lb	7.0-10.0 lb	
		2.0-3.0 lb	7.0-10.0 lb	
Note: Dinocap, Dikar, and Benlate + oil in repeated sprays, have suppressed mite population.				
Fire blight (<u>Erwinia amylovora</u>)	Streptomycin sulfate (15 to 21% WP)	60 ppm	no more than 100 ppm	The first application should be completed just before the center blossoms begin to open, and repeated at 5-day intervals until the petals have fallen. Spray to wet only, streptomycin is locally systemic and overspraying may cause foliage chlorosis and reduced fruit set. See Va. Coop. Ext. Ser. Publication 35 for further specific information on fire blight and streptomycin. Do not apply within 50 days of harvest.

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
APPLE DISEASES (Cont'd)				
Apple rots: White rot (<u>Botryosphaeria ribis</u>)	Folpet 50% WP OR Captan 50% WP	2.0 lb 2.0 lb	6.5 lb 6.5 lb	Apply sprays at 6-7 day intervals from open cluster through petal fall, and at 10-day to 2-week intervals through rest of growing season (cover sprays). If only bitter rot present, start at second cover. There is a 21-day waiting period for Dikar and Dithane M-45, 30-day for Manzate 200, and a 15-day for Polyram and zineb. Do not graze Polyram-treated areas. Dikar is not registered for white rot, but if used for other rots, white rot usually will not be a problem. Benomyl, Dithane M-45 and Manzate 200 are not registered for white rot. Zineb is not registered for bitter rot.
Black rot (<u>Physalospora obtusa</u>)	Captan 50% WP + Zineb 75% WP OR Dikar 76.7% WP	1.0 lb 1.0 lb 2.0 lb	3.5 lb 3.5 lb 6.5 lb	
Bitter rot (<u>Glomerella cingulata</u>)	Polyram 80% WP OR Benomyl 50% WP + Mancozeb (Dithane M-45, Manzate 200) 80% WP OR Mancozeb 80% WP	2.0 lb 2.0-3.0 oz 12.0 oz 2.0 lb	6.5 lb 8.0-12.0 oz 48.0 oz 6.5 lb	
Apple rots: Blossom end rot (<u>Botrytis cinerea</u>)	Captan 50% WP	2.0 lb	6.5 lb	
Brook's spot (<u>Mycosphaerella pomii</u>)	Benomyl 50% WP + Polyram 80% WP OR Captan 50% WP + Zineb 75% WP OR Dikar 76.7% WP	2.0-3.0 oz 1.0 lb 1.0 lb 1.0 lb 2.0 lb	8.0-12.0 oz 3.5 lb 3.5 lb 3.5 lb 6.5 lb	
Sooty blotch (<u>Gloeodes pomigena</u>)	Dikar 76.7% WP OR Polyram 80% WP	2.0 lb 2.0 lb	6.5 lb 6.5 lb	
Fly speck (<u>Mycrothyriella rubi</u>)	Captan 50% WP OR Folpet 50% WP	2.0 lb 2.0 lb	6.5 lb 6.5 lb	

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
APPLE INSECTS				
Aphids (several species)	phosphamidon 8 EC	2.5 oz	8.0 oz	Delayed dormant applications: Pink, petal fall or midseason sprays. Several other insecticides - Zolone, malathion, Lannate, trithion, and Lorsban, have aphicidal properties. Check labels carefully before use. Combination of oil & insecticide in delayed dormant sprays may help in suppression of aphids. Check with extension office; new products may have been registered.
	OR demeton (Systox) 6 EC	3.0 oz	10.0 oz	
	OR dimethoate 25 W	1.0 lb	3.0 lb	
	OR endosulfan (Thiodan) 50 W	1.0 lb	3.0 lb	
Bud moth (Tufted apple) also variegated leaf roller and red banded leafroller	pennncap-M	16.0-31.0 oz	48.0-96.0 oz	Red banded leafrollers hatch (peak) from early laid eggs in mid-May, but overwintering larvae of V.L.R. and T.A.B.M. become active about a month earlier. Thus, if the latter two are serious problems, a spray should be applied that covers the ground at the base of the tree as well as the foliage at the pink stage (avoid open bloom). If T.A.B.M. or V.L.R. are not problems, leafroller sprays may be delayed until mid-May. Use pheromone traps in early May for red banded leafroller and from early June through August for T.A.B.M. and V.L.R. to determine if treatment is necessary. Follow ALL label instructions.
	OR methomyl (Lannate, Nudrin)	32.0 oz	96.0 oz	
	OR parathion 15 W	1.0 lb	3.0 lb	
	OR diazinon 50 W	1.0 lb	3.0 lb	
	OR azinphosmethyl 50 W	0.5 lb	1.5 lb	
Codling moth	azinphosmethyl 50 W	0.5 lb	1.0 lb	Pheromone traps are available to monitor this pest. Sprays (if needed) are best timed to prevent egg laying, usually commencing with first cover spray and continuing at 10-day intervals thereafter if reinfestation is a problem. This pest has two-three generations a year depending on the nature of the season.
	OR phosmet (Imidan) 50 W	1.0 lb	3.0 lb	
	OR phosalone (Zolone) 3 EC	16.0 oz	48.0 oz	
	OR methomyl (Lannate)	32.0 oz	96.0 oz	
	OR parathion 15 W	1.0 lb	3.0 lb	
	OR pennncap M	16.0-31.0 oz	48.0-96.0 oz	
	OR diazinon 50 W	1.0 lb	3.0 lb	

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
APPLE INSECTS (Cont'd)				
Fruitworms (several species)	aziphosmethyl 50 W	0.5 lb	1.5 lb	Attack newly forming fruits but the worms hatch in the pink and during bloom. Several different species are found in Virginia. All make a deep feeding hole in the side of tiny fruits. Apply treatments in pink or immediately following petal fall where this is an annual problem. Avoid spraying any open bloom on tree or ground. Methoaxyl, Pennacp-M, trithion, malathion, diazinon and other pesticides will give control but such strong materials are generally not required specifically for fruitworm control.
	OR phosmet (Imidan) 50 W	1.0 lb	3.0 lb	
	OR phosalone 50 W	1.0 lb	3.0 lb	
	OR other (see remarks at right)			

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
APPLE INSECTS (Cont'd)				
Leafhoppers (several species)	dimethoate 4 EC	2.0 pt	6.0 pt	Injury most severe on young trees. Some species cause deformed, backward curling leaves; others remove chlorophyll (green color) along the mid-vein and other major veins of the leaf. Droppings (speckles) on the fruit are objectionable. Adults are annoying to pickers. There are two generations a year in Virginia - mid-May and October. Other insecticides used during regular season for other pests may contain leafhopper populations (e.g. methomyl). For specific outbreak situations use materials at left.
	OR carzol 92 SP	6.0 oz	18.0 oz	
Mites, European red mite	*demeton 6 EC	3.0 oz	10.0 oz	Many predators feed on mites and normally keep them under control. Pesticides used to control other pests frequently kill the predators which in turn lets the mites reach outbreak numbers. This seriously reduces the tree's ability to produce a satisfactory crop. Weekly observation of mite population is important. Treat when populations reach 4 per leaf or before, unless you follow an I.P.M. program. Mites hatch from overwintering eggs in mid-April when buds are in pink. There may be eight to ten generations a year. If control is difficult, consult an entomologist. *Use when aphids are also a problem. **Suppresses mites when used as the fungicide throughout the season.
	OR *dimethoate 4 EC	1.0 pt	3.0 pt	
	OR *dimethoate 25 WP	2.0 lb	6.0 lb	
	OR plictran 50 W	4.0 oz	12.0 oz	
	OR carzol 92 SP	4.0 oz	12.0 oz	
	OR omite 50 W	1.5 lb	4.5 lb	
	OR dikofol (Kelthane) 35 W	1.0 lb	3.0 lb	
	OR **Dikar 77 W	2.0 lb	6.0 lb	

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
PEACH INSECTS				
Oriental fruit moth	imidan 50 W OK	1.0 lb	2.5 lb	Pheromone traps are commercially available. Moths begin to appear in late April. First generation larvae (mid-May) burrow in new terminals and cause flagging. Subsequent second or third generation larvae burrow in fruit causing wormy peaches. Watch days to harvest for each insecticide as indicated on label.
	phosalone (Zolone) 25 W OK	1.0 lb	2.5 lb	
	parathion 15 W OK	2.0 lb	5.0 lb	
	aziphosmethyl (Guthion) 50 W OK	0.5 lb	1.2 lb	
	penncap-M	32.0 oz	96.0 oz	
Plant bugs (and other catfacing insects)	endosulfan (Thiodan) 50 W OR	1.0 lb	2.5 lb	The most serious peach and nectarine pests in 1979. The highly mobile insects rapidly reinfest orchards once the toxicity of a pesticide has been lost. (Weathering, etc.) Most injury is done during three weeks following bloom but many insects may be present pre-bloom. Apply sprays as late as possible before bloom and as soon as possible following bloom. Avoid spraying open bloom on trees or ground cover because of effect on pollinating insects.
	*parathion 15 W OK	2.0 lb	5.0 lb	
	*aziphosmethyl (Guthion) 50 W OK	0.5 lb	1.2 lb	
	*proiate (Imidan) 50 W OR	1.0 lb	2.5 lb	
	*thosalone (Zolone) 50 W OR	1.0 lb	2.5 lb	
	methoxy EC (Lannate L)	1.5 pt	4.0 pt	
*These materials are not specifically registered for plant bug control. Their use in the spray program when necessary to control other insects will also tend to reduce plant bug problems.				
Plum curculio	endosulfan (Thiodan) 50 W OR	1.0 lb	2.5 lb	This problem is often most severe around the edges of the orchard, especially near woodland or rough area borders. Examine orchard immediately before and following bloom by tapping limbs over a cloth tray. Look for hard, long-nosed (proboscis) tiny beetles about 1/8 inches long. They make a crescent shaped mark on fruit when egg laying. Fruit infested by first generation larvae falls. Second generation (east of Blue Ridge Mountains) hangs on tree as wormy fruit. If infestation is found close up intervals between petal fall and shuck fall spray to about 1 week.
	parathion 15 W OK	2.0 lb	5.0 lb	
	aziphosmethyl (Guthion) 50 W OK	0.5 lb	1.2 lb	
	proiate (Imidan) 50 W	1.0 lb	2.5 lb	
Scale insects (several species)	chlorpyrifos (Lorsban) 4 E +	0.5-1.0 pt	2.0-2.5 pt	*Delayed dormant (before any green showing) applications only. This application will also help to control mites and aphids. Parathion used in regular spray schedule when crawlers are active will also aid in suppression. Very important to completely cover tops and centers of tree and thoroughly soak all bark surfaces.
	superior oil*	2.0 gal	5.0-6.0 gal	

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
NECTARINE DISEASES				
<u>Pre-Bloom and Bloom Spray</u>	Captan 50% WP	2.0 lb	4.5 lb	Apply when the buds show pink and during the bloom period. Do not graze treated areas.
	OR Sulfur 95% WP	6.0 lb	15.0 lb	
<u>Brown rot (Monilinia fructicola)</u>	*Benomyl 50% WP (Benlate) + Captan 50% WP	4.0-6.0 oz	3/4-1.0 lb	
	OR Benomyl 50% WP (Benlate) + Sulfur 95% WP	4.0-6.0 oz	3/4-1.0 lb	
	OR Funginex 18.2% EC	12.0-16.0 fl oz	36.0-48.0 fl oz (dilute only)	
*Caution: Because of the potential for development of benomyl and thiophanate-methyl resistant strains of the brown rot and peach scab fungi, benomyl and thiophanate-methyl should not be used as the only fungicide in the spray program. If benomyl or thiophanate-methyl resistance is suspected discontinue its use. There is a tank mix registration for benomyl (Benlate) and captan. Similarly there is a tank mix registration for benomyl (Benlate) and sulfur. It is anticipated that the use of tank mixtures with benomyl will help suppress tolerant strains of the brown rot and scab fungi.				
<u>Post-Bloom and Pre-Harvest Sprays</u>	Captan 50% WP	2.0 lb	4.5 lb	Apply captan or sulfur sprays when the petals are approximately 1/2 down, shuck-split, shuck-fall and continue at 7-10 day intervals until harvest. Nectarines are extremely susceptible to brown rot and satisfactory control depends on good cultural practices and correct timing of sprays. Captan is more effective than sulfur for brown rot control for the last 2 sprays before harvest. Apply benomyl (Benlate) or Thiophanate-methyl (Topsin-M) during late petal to early shuck-split, 3 weeks before harvest and again 1 week before harvest. Benomyl can be used during harvest if necessary to control brown rot, but Topsin-M can only be applied to within 1 day of harvest. Do not graze treated areas.
	OR Sulfur 95% WP	6.0 lb	15.0 lb	
<u>Brown rot (Monilinia fructicola)</u>	Benomyl 50% WP (Benlate)	0.5 lb	1.2 lb	
	OR Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb	
	OR Benomyl 50% WP (Benlate) + Captan 50% WP	4.0-6.0 oz	3/4-1.0 lb	
	OR Benomyl 50% WP (Benlate) + Sulfur 95% WP	4.0-6.0 oz	3/4-1.0 lb	
	OR Sulfur 95% WP	3.0-6.0 lb	6.0-9.0 lb	
<u>Rhizopus rot (Rhizopus nigricans)</u>	Botran 75% WP + Captan 50% WP	1.0 lb	2.5 lb	For Rhizopus (on nectarine only) and continued brown rot control, apply the recommended combination of Botran and Captan 8 and 1 day before harvest. *Caution: Do not use Botran later than 1 day before harvest.
		1.0 lb	2.5 lb	

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
NECTARINE DISEASES (Cont'd)				
Scab (<u>Cladosporium</u> <u>carpophilum</u>)	Sulfur 95% WP	6.0 lb	15.0 lb	Starting at shuck-fall, make 3 applications 10-14 day intervals. In orchards where scab is a severe problem, apply a fourth spray 30-34 days after shuck-fall. To assure better control of scab during first bearing year, apply 5 sprays of sulfur at 7-10 day intervals beginning at shuck-split the year before the first crop of fruit. Sulfur is more effective than captan for scab control. Benomyl (Benlate) provides good scab control except in those orchards where tolerant strains of the scab fungus have been found. Apply benomyl at shuck-split and again at shuck-fall. If benomyl is used for brown rot control, no additional applications will be needed for scab. The same comments and application timing for Benlate also apply to Topsin-M. Do not graze treated areas.
	OR			
	Captan 50% WP	2.0 lb	4.5 lb	
	OR			
	Benomyl 50% WP (Benlate)	0.5 lb	1.2 lb	
	OR			
	Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb	
	OR			
	Benomyl 50% WP (Benlate)	4.0-6.0 oz	3/4-1.0 lb	
+				
Captan 50% WP	1.0-2.0 lb	3.0-4.0 lb		
OR				
Benomyl 50% WP (Benlate)	4.0-6.0 oz	3/4-1.0 lb		
+				
Sulfur 95% WP	3.0-6.0 lb	6.0-9.0 lb		
NECTARINE INSECTS AND INSECTICIDES (Same as for Peach)				
PLUM AND PRUNE DISEASES				
Brown rot (<u>Monilia</u> <u>fructicola</u>)	<u>Pre-bloom and bloom spray</u>			Apply immediately before blossoms open and at late full bloom.
	Benomyl 50% WP (Benlate)	0.5 lb	1.2 lb	
	OR			
	Captan 50% WP	2.0 lb	4.5 lb	
	OR			
	Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb	
	<u>Post-bloom sprays</u>			
	Captan 50% WP +	1.0 lb	3.0 lb	
	Benomyl 50% WP (Benlate)	4.0-5.0 oz	10.0-12.0 oz	
	OR			
	Benomyl 50% WP (Benlate)	0.5 lb	1.2 lb	
	OR			
	Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb	
	<u>Pre-harvest spray</u>			
	Benomyl 50% WP (Benlate)	0.5 lb	1.2 lb	
OR				
Captan 50% WP	2.0 lb	4.5 lb		
OR				
Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb		
PLUMS, PRUNES and CHERRIES				
Black knot (<u>Dibotryon</u> <u>cordosum</u>)	Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb	Apply pre-bloom, petal fall, and 14, 28 and 42-days after petal fall.

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
PLUM AND PRUNE INSECTS				
Aphids	(See aphids under peaches)			
Borers	(See borers under peaches but note that chloropyrifos (Lorsban) is only labeled as a delayed dormant application for scale or aphid control on plum.)			
Mites	(See mites on peaches.) DO NOT repeat applications of dicofol within 30 days. DO NOT apply endosulfan more than twice during fruiting period.			
Plum curculio	(See plum curculio under peaches.)			
Scale insects	(See scale insects under peaches.)			

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
CHERRY DISEASES				
Brown rot (<i>Monilinia fructicola</i>)	<u>Early-season sprays</u>			Apply spray immediately before blossoms open, at late full blossom, petal-fall and shuck-fall. Do not graze livestock in treated areas.
	Benomyl 50% WP (Benlate)	0.5 lb	1.2 lb	
	OR			
	Captan 50% WP	2.0 lb	4.5 lb	
	OR			
	Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb	
	<u>Mid-season and pre-harvest</u>			
	Captan 50% WP	2.0 lb	4.5 lb	
	OR			
	Benomyl 50% WP (Benlate)	0.5 lb	1.2 lb	
OR				
Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb	Apply 10-days after shuck fall and 4 and 1 week before harvest and during harvest if necessary for brown rot control. Do not graze livestock in treated areas. Do not apply Topsin-M within 1-day of harvest.	
Leaf spot (<i>Coccomyces hiemalis</i>)	<u>Post-bloom sprays</u>			Apply at petal-fall, shuck-fall and first cover (10 days after shuck-fall). Benomyl, use same timing as brown rot of cherries. Do not graze livestock in treated areas.
	Benomyl 50% WP (Benlate)	0.5 lb	1.2 lb	
	OR			
	Folpet 50% WP	2.0 lb	4.5 lb	
	OR			
	Captan 50% WP	2.0 lb	4.5 lb	
	OR			
Ferbam 76% WP	2.0 lb	4.5 lb		
OR				
Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb		

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
CHERRY DISEASES (Cont'd)				
Leaf spot (<i>Coccomyces hiemalis</i>)	Mid-season and pre-harvest sprays			Two weeks after first cover (about June 1) and 1 week before harvest. Do not graze livestock in treated areas.
	Benomyl 50% WP (Benlate)	0.5 lb	1.2 lb	
	OR			
	Captan 50% WP	2.0 lb	4.5 lb	
	OR			
	Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb	
	Post-harvest sprays			
	Bordeaux mixture	2-6-100	---	
OR				
Dodine 65% WP	0.5 lb	1.2 lb		
OR				
Benomyl 50% WP (Benlate)	0.5 lb	1.2 lb		
OR				
Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb		
Powdery mildew (<i>Podosphaera oxycanthae</i>)	Post-bloom sprays			Apply spray at petal-fall, shuck-fall and first cover (10 days after shuck-fall).
	Sulfur 95% WP	1.4 lb	4.0 lb	
	OR			
	Benomyl 50% WP (Benlate)	0.5 lb	1.2 lb	
	OR			
	Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb	
CHERRY INSECTS				
Aphids	endosulfan (Thiodan) 50 W	1.0 lb	2.5 lb	Apply when aphids become numerous and if predators are not abundant. First application normally about time of bud break and second two weeks later. Examine label for specific cautions.
	OR			
	azinphosmethyl (Guthion) 50 W	0.5 lb	1.5 lb	
	OR			
	parathion 15 W	2.0 lb	6.0 lb	
Borers	(Same as for peaches)			
Fruit flies (<i>Rhagoletis cingulata</i> and <i>R. fausta</i>)	azinphosmethyl (Guthion) 50 W	0.5 lb	1.5 lb	Use pheromone traps. Apply in a regular (14 day) schedule or as required (indicated by trap catches.)
	OR			
	parathion 15 W	2.0 lb	6.0 lb	
	OR			
	phosalone (Zolone) 50 W	1.0 lb	3.0 lb	
	OR			
prolate (Imidan) 50 W	1.0 lb	3.0 lb		
Leafrollers	azinphosmethyl (Guthion) 50 W	0.5 lb	1.5 lb	Apply as pink and in regular schedule if necessary. Use pheromone traps to assess problem (Red banded leafroller.)
	OR			
	parathion 15 W	2.0 lb	6.0 lb	
Plum curculio	(Same as for peaches)			
Mites	dicotol (Kelthane) 35 W	1.0 lb	3.0 lb	As required.
	OR			
	superior oil	2.0 gal	6.0 gal	Delayed dormant only.

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
STRAWBERRY DISEASES				
Leaf spot (<u>Mycosphaerella fragariae</u>)	Captan 50% WP OR Thiram 65% WP	3.0 lb 2.5 lb	No No	Use approximately 150 gal of spray per acre. Apply the spray at 7- to 10-day intervals from the time new growth starts to within 3 days of harvest. Captan can be applied during harvest to control rot. Apply sprays as needed to control diseases after harvest. Remove thiram residues by washing if applications are made within 3 days of harvest. Captan not registered for leaf scorch and blight.
Leaf scorch (<u>Marrsoni fragariae</u>)	Benomyl 50% WP (Benlate) OR Thiophanate-methyl 70% WP (Topsin-M)	1.0 lb 1.0 lb	No No	
Leaf blight (<u>Dendrophoms obscurans</u>)				
Grey mold (<u>Botrytis cinerae</u>)				
STRAWBERRY INSECTS				
Aphids, Leafrollers, Spittlebugs, Tarnished plant bugs, Cyclamen mite	carbaryl (Sevin) 50 W plus malathion 25 W OR azinphosmethyl (Guthion) 50 W OR endosulfan (Thiodan) 50 W	2.0 lb 2.5 lb 1.0 lb 1.0 lb	4.8 lb 6.0 lb 2.4 lb 2.4 lb	First cover (10 days after first bloom). Avoid all insecticides while bloom is present to protect pollinators.
BRAMBLE DISEASES (Blackberries and Raspberries)				
Anthracnose (<u>Elsinoe veneta</u>)	<u>Dormant or late dormant sprays</u> Liquid lime sulfur (24-31% solution) OR Bordeaux mixture = Copper sulfate + Hydrated lime	10.0 gal 8.0 lb 8.0 lb	--- --- ---	Apply spray in late winter or early spring when new growth is less than 1/2 inch long. Be sure to thoroughly clean equipment after using Bordeaux mixture or liquid lime sulfur.
Anthracnose (<u>Elsinoe veneta</u>)	<u>Pre- and post-bloom and post-harvest sprays</u> Captan 50% WP OR Ferbam 76% WP	2.0 lb 2.0 lb	--- ---	Apply spray just before blossoms open, when new growth canes are 1-1/2 to 2 ft long and just after harvest. There is a 40-day waiting period before harvest for ferbam.

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
BRAMBLE DISEASES (Cont'd)				
Leaf spot (<u>Mycosphaerella rubi</u>)	Folpet 50% WP OR Captan 50% WP	2.0 lb 2.0 lb	--- ---	Apply the spray just before blossoms open, when new growth canes are 1-1/2 to 2 ft long and just after harvest. There is a 40-day waiting period before harvest for ferbam. Folpet and captan are not registered for bramble leaf spot, but if either is used for cane blight, leaf spot will probably not be a problem. Captan is not registered for cane blight on brambles, but, if used for anthracnose, cane blight will not be a problem. Ferbam is not registered for leaf spot, but, if used for other diseases, leaf spot will not be a problem.
Cane blight (<u>Leptosphaeria coniothyrium</u>)	OR Ferbam 76% WP	2.0 lb	---	
Fruit rots (<u>Monilia fructicola</u>), (<u>Botrytis cinerea</u>) etc.	Captan 50% WP	2.0 lb	---	

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
BRAMBLE INSECTS				
Leafrollers (*), Raspberry sawfly (*), Raspberry fruit worm (*), Raspberry fruit worm (**)	(*) (**) azinphosmethyl 50 W OR (*) (**) azinphosmentyl 2 EC OR (**) malathion 50 WP	1.0 lb 2.0 pt 2.0 lb	2.0 lb 4.0 pt 4.0 lb	<u>A PRE-BLOOM SPRAY</u> Apply when blossom buds begin to break.
Leafrollers (*), Raspberry cane borer (*), Aphids (**)	(*) azinphosmethyl 50 W OR (*) azinphosmethyl 2 EC OR (**) diazinon 50 W OR (**) diazinon 4 EC	1.0 lb 2.0 pt 1.0 lb 1.0 pt	2.0 lb 4.0 pt 2.0 lb 2.0 pt	Use as <u>FIRST COVER SPRAY</u> when control is needed for these pests. NOTE: Cane borers girdle youngshoots with two rings about 1 inch apart. Cut off wilted tips a few inches below girdle when seen, and destroy. Remove wild brambles from area of plantings.
Aphids (**)	(**) As above			<u>PRE-HARVEST SPRAYS</u> Apply only if aphids or mites increase to threatening levels.
Mites (***)	(***) Kelthane 35 WP	1.25 lb	2.5 lb	<u>PRE-HARVEST SPRAYS</u> Apply only if aphids or mites increase to threatening levels.
Aphids (**), Raspberry crown borer (**)	(**) diazinon 50 W OR (**) diazinon 4 EC OR (++) demeton (Systox) 6 EC	1.0 lb 2.0 pt 0.25 pt	2.0 lb 4.0 pt 0.50 pt	Where cane borers are a serious pest apply diazinon as a drenching spray at 400-500 gal per acre in October or November, or to the crown area in early spring at about the time growth begins.
GRAPE DISEASES				
Black rot (Guignardia bidwellii)	Folpet 50% WP OR Captan 50% WP OR Ferbam 76% WP OR Dithane M-45 80% WP	2.0 lb 2.0 lb 2.0 lb 2.0 lb	--- --- --- ---	Apply spray when new growth is 1 to 2 inches long, 6 to 8 inches long, just before blossom, just after blossom, before berries touch in cluster (pea-size), 10 to 14 days later (berries touch in cluster), and at 2-week intervals during June and July. There is a 7-day waiting period before harvest for ferbam. Do not apply Dithane M-45 within 66 days of harvest. Maneb 80% WP (Dithane M-22 special or Manzate D) 2.0 lb/100 gal of water can be used to within 7 days of harvest.
Dead arm (Phomopsis viticola)	Folpet 50% WP OR Captan 50% WP OR Dithane M-45 80% WP	2.0 lb 2.0 lb 2.0 lb	--- --- ---	Apply when shoots are 1 to 2 inches long. Repeat when new shoots are 6- to 8-inches long. Do not apply Dithane M-45 within 66 days of harvest. Maneb 80% WP (Dithane M-22 special or Manzate D) 2.0 lb/100 gal of water can be used to within 7 days of harvest.

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
GRAPE DISEASES (Cont'd)				
Downy mildew (<u>Plasmopara viticola</u>)	Captan 50% WP	2.0 lb	---	Apply just before bloom, just after bloom, 7 to 10 days later, and 2 to 3 weeks later. There is a 7-day waiting period before harvest for ferbam. Do not apply Dithane M-45 within 66 days of harvest. Maneb 80% WP (Dithane M-22 special or Manzate D) 2.0 lb/100 gal of water can be used to within 7 days of harvest.
	OR Folpet 50% WP	2.0 lb	---	
	OR Ferbam 76% WP	2.0 lb	---	
	OR Dithane M-45 80% WP	2.0 lb	---	
Powdery mildew (<u>Uncinula necator</u>)	See comments under Remarks			There is limited registration of fungicides for powdery mildew control on grapes. If folpet is used for downy mildew control, however, powdery mildew will not be a problem.
Anthracnose (<u>Elsinoe ampelina</u>)	Bordeaux mixture =			Apply during the dormant stage before buds open. This spray is necessary only in those vineyards where anthracnose has been a problem. Thoroughly clean spray tank and pump after using Bordeaux mixture.
	Copper sulfate + Hydrated lime	8.0 lb 8.0 lb	--- ---	

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
<u>GRAPE INSECTS</u>				
Grape berry moth and Grape flea beetle	carbaryl (Sevin) 50 W	2.0 lb	4.0 lb	<u>PRE-BLOOM SPRAY</u>
	malathion 25 W	2.0 lb	4.0 lb	If control necessary apply one of the materials listed. Do not spray open bloom under any circumstances.
	azinphosmethyl 50 W	0.5 lb	1.0 lb	
	Imidan 50 W	1.0 lb	2.0 lb	
Grape berry moth*, Grape flea beetle*, and Grape phylloxera**	(*) As above (**) endosulfan (Thiodan) 50 W	1.0 lb	2.0 lb	<u>POST BLOOM SPRAY</u> Before applying Thiodan check label carefully. It may injure some varieties.
As above	As above			<u>PEA-SIZE SPRAY</u> (Up until berries touch in clusters.)
As above	As above			<u>BERRIES TOUCHING SPRAY</u> Check number of days before harvest permissible for each material prior to use.
As above plus Japanese beetles, Wasps, June beetles	As above, but some restrictions. See (1) below.			<u>JUNE AND JULY SPRAYS</u> Check days permitted for use of each material prior to harvest.

NOTE: (1) Carbaryl (Sevin), malathion or azinphosmethyl (Guthion) are not registered for wasps; malathion and thiodan not registered for berry moth; malathion, azinphosmethyl and Imidan not registered for June beetle or Japanese beetle. However, where these insecticides are used for pests for which they are registered, the unlabeled pests are usually not a problem.

NEMATODE CONTROL IN TREE AND SMALL FRUITS

K. S. Yoder, Assistant Professor, Plant Pathology
C. R. Drake, Professor and Extension Specialist, Plant Pathology

Nematodes Controlled	Chemical	Rate	Residue Tolerance PPM	Remarks
BLACKBERRIES, RASPBERRIES and STRAWBERRIES				
All plant parasitic nematodes	Dichloropropene: (Telone II)	13.0-15.0 gal/A	None established.	Broadcast treatment: Fall application preferred, 30 days or more prior to planting; space chisels 12 inches apart and apply chemical 10 inches deep.
	Dichloropropene + Dichloropropene: (D-D, Vidden D)	20.0-40.0 gal/A	None established.	
STRAWBERRIES (ONLY)				
	Methyl Bromide 67% and Chloropicrin 33% (Brozone, Dowfume MC-33, Terr-O-Gas 67)	350.0 lb/A	30	Prepare seedbed as you would for seedling; crop residues should be worked into soil and allowed time to decompose before treating. Soil temperatures should be between 50° and 80°F at the 5-inch level. Treated soil must be sealed immediately after application by rolling or cultipacking and covering immediately with gas-tight plastic. Aerate 14 days prior to setting transplants in treated areas. Not registered on Brambles.
PEACHES, APPLES and NECTARINES				
	Dichloropropene-Dichloropropene: (D-D)	40.0-60.0 gal/A	None	Apply as preplant treatment. Space chisels 12 inches apart and inject at 10-12 inches depth. Seal soil immediately. Treat a 10 ft wide strip in which new trees are to be planted. Individual tree sites can be treated by injecting with a handgun in a 10 ft by 10 ft area. Inject 10-12 inch deep with spacings 12 inches apart. Seal soil. Allow 2 to 6 months to elapse between treating and planting, or longer if the odor remains in the soil.
	Dichloropropene (Telone II)	24.0-36.0 gal/A	None	Same as above.
	Ethylene dibromide (Soilbrom 85) (not for cyst-forming nematodes)	15.0 gal/A	None	Same as above. Do not use for individual site treatment.
	Methyl Isothiocyanate (20%) Chlorinated C3 Hydrocarbons (80%) (Vorlex)	10.0-15.0 gal/A	None	Apply as a preplant, broadcast treatment. Space chisels 6-8 inches apart and inject at 8 inch depth. Seal with drag and smooth roller immediately after application. In soils 70°F or higher at 6 inch depth, special attention must be given to sealing soil surface; tarping gives best seal. Allow 5 weeks to lapse between treatment and planting.

Nematodes Controlled	Chemical	Rate	Residue Tolerance PPM	Remarks
Lesion	Nemacur 15G	66.0-133.0 lb/A	None	Apply specified dosage per TREATED acre in a 4- to 6-foot band in orchard row. May be applied ONLY to non-bearing trees.
Rootknot Sting Lesión	Vydate L	See Remarks.	None	Apply as a foliar treatment using 2 to 8 pt/100 gal of water on a 2-3 week schedule for 4 applications. May be applied ONLY to non-bearing trees.

WEED CONTROL IN FRUIT CROPS

C. L. Poy and N. K. Rogers

The use of weed control chemicals in fruit has increased significantly in recent years. Boom-type sprayers with flat fan-type nozzles are desirable for most weed spraying. Pressures of 25-50 pounds per square inch (psi) are adequate. Do not use pressures in excess of 50 psi for weed control.

The optimum spray volume per acre varies with the type of weed problem. For application of preemergent sprays to clean soil, volumes of 20-50 gallons per acre (gpa) are adequate. Foliar-acting herbicides applied to rank weed growth may require 100 gpa to get good coverage.

Wettable powders require by-pass agitation to keep chemicals from settling out. If spray solution is left in the tank for any period of time, make sure it is agitated before spraying is resumed.

Proper calibration of spray equipment is essential.

Do not apply herbicides by making a circle around a tree. This causes heavy distribution at the center of the circle and injury may result. To obtain uniform distribution of material on an 8 ft x 8 ft area, apply a 4 ft x 8 ft band on either side of the tree.

Apply herbicides according to label directions. Use only those brands that include the fruit on the label. Avoid application to trunks, foliage, or fruit. Golden Delicious apples have shown minor injury from certain chemicals, but where accurate and proper applications are made, there is little likelihood of injury to this variety.

Crop	Weeds Controlled	Chemical Rate/A (Product/A)	Remarks
APPLES and PEARS*	Poison ivy, most annuals and perennials, general contact	AMS 57.0 lb (Ammate X 60.0 lb + 4.0-8.0 oz of sticker- spreader)	Apply as a directed spray to annual weeds, poison ivy and honeysuckle when they are actively growing. This is a contact killer and has little residual activity. <u>Corrosive</u> material: Wash tank and sprayer thoroughly with clear water after spraying. Can be used on bearing and nonbearing trees. Spray only if bark is well developed and shows no green. Avoid excessive wetting of bark.
	Grasses	dalapon 7.4 lb (Dowpon 10.0 lb + 4.0-8.0 lb)	Apply as a directed broadcast spray to grass when trees have been established 4 or more years and before grass is in heading stage (preferably 6-10 inches high). Repeat application in 2 weeks if necessary for good control of annual and perennial grasses. Do not graze livestock on treated areas. Do not apply within 30 days before harvest. Keep spray off crop foliage and fruit. Wet grass thoroughly without runoff. Do not make more than 2 applications per year. Dalapon is cleared for use in peaches at 1/2 rate.
	Most annuals, quackgrass	dichlobenil 6.0 lb* (Casoron 4G 150.0 lb or 3.0 oz per 56 sq ft)	Apply dry granules in late winter or early spring after clean cultivation. Shallow incorporation may improve weed control. Do not apply within 4 weeks after transplanting. Short residual activity, regrowth usually occurs in late summer. Do not graze livestock in treated areas. Do not make application within 1 month of harvest.

* All herbicides recommended for apple orchards may also be used in pears with the following exceptions: terbacil (Sinbar 80W) is not registered for use in pears; weed oil is registered for use on pears, but lacks registration on apples.

Fruit Crops (Cont'd)

Crop	Weeds Controlled	Chemical Rate/A (Product/A)	Remarks
APPLES and PEARS (Cont'd)	All weeds, general contact	dinoseb 9.0-10.5 lb (Dow Premerge 3.0-3.5 gal + 1.0-2.0 qt surfactant) OR dinoseb 1.25-10.0 lb (Dow General 1.0-8.0 qt + 2.0-20.0 gal diesel oil or crop oil)	Apply 100 gal of spray per acre as a directed spray to orchard floor. Keep spray off foliage and fruit. Do not spray higher than 12 inches on the tree trunk. Avoid spraying base of young trees as girdling may result. Do not graze livestock on treated areas. Do not exceed 100 gpa. Do not apply within 30 days of harvest. TOXIC: Handle with caution. Use protective clothing when mixing or spraying. Emergency information number, call collect, 517/636-4400.
	Most annuals and some perennials	diuron 3.2 lb** (Karmex 80W 4.0 lb)	Apply once as a directed spray to orchard floor in early spring (March- May) before fruit sets. Does not kill emerged weeds but may be used in conjunction with a contact herbicide. Apply only to trees established 2 years or more. Do not use on dwarf or semi-dwarf trees. Do not use on light (sand, loamy sand, or gravelly) soil or on soils having less than 1% organic matter. Avoid contact of foliage or fruit. Do not replant treated area to any crop within 2 years after last application.
		diuron 0.8-1.6 lb** + terbacil 0.8-1.6 lb (Karmex 80W 1.0-2.0 lb + Sinbar 80W 1.0-2.0 lb)	Use on apples only. Terbacil is not registered for use on pears. Apply tank mixture either in the spring or after harvest in the fall before weeds emerge or during early seedling stage of weed growth. Use only under trees established for at least 2 years. Use lower rates on light soils and soils with low organic matter (1-2%); higher rates on soils with a higher percentage of organic matter. Do not use on soils with less than 1% organic matter, or on eroded areas where tree roots are exposed. Do not replant treated areas to any crop within 2 years after the last application. Avoid spraying tree foliage and fruit.
	Annuals and perennial grasses and broadleaves	glyphosate 1.5-4.0 lb (Roundup 1.5-4.0 qt)	Apply 1.5 qt in 20-60 gal of water per acre for control of annual weeds. Use 2-4 qt per acre for control of perennial grasses and weeds (see label for specific rates). Apply as a directed spray. Do not contact bark or foliage of trees or severe injury may result. Extensive care must be exercised to avoid contact of spray, drift or mist with green foliage, green bark or bark of trees established less than 2 years, suckers, or fruit of desirable trees. Spray contact with other than mature bark on main trunk can cause serious localized or translocated damage. Injury may become increasingly severe the second season. WARNING: Do not mix, store, or apply Roundup spray solution in galvanized metal or unlined steel tanks. Chemical reaction produces hydrogen gas which is very explosive.

Fruit Crops (Cont'd)

Crop	Weeds Controlled	Chemical Rate/A (Product/A)	Remarks
APPLES and PEARS (Cont'd)	All weeds, general contact	paraquat 0.5-1.0 lb (Ortho Paraquat CL 1.0-2.0 qt + 4.0-8.0 oz of nonionic sticker spreader)	Apply as directed spray in at least 50 gal of water per acre to emerged weeds. Most effective on small (1-6 inches) actively growing weeds. Repeat application will be necessary to give sustained control. Do not allow spray to contact foliage, fruit, or green stems of trees. Do not allow animals to graze on treated areas. Wash tank and sprayer thoroughly with clear water after spraying to avoid corrosion of equipment. TOXIC: Handle with caution. Wear protective clothing when handling concentrate. Avoid working in spray mist or contacting wet vegetation. Emergency information number, 415/233-3737.
	Most annuals and some perennials	simazine 2.0-4.0 lb* (Princep 80W 2.5-5.0 lb or 90W 2.4-4.4 lb)	Apply once per year to clean cultivated soil (orchard floor) before weeds emerge and where trees have been established 1 year or more. Does not kill emerged weeds but may be used in conjunction with a contact herbicide. It may be used as a tank mix with paraquat. Use lower rates on light soils and low in organic matter; higher rates on heavy soils and soils high in organic matter. Do not use on sandy or gravelly soils. Keep spray off crop foliage and fruit.
	Annuals and many perennials	terbacil 1.6-3.2 lb*** (Sinbar 80W 2.0-4.0 lb)	<u>Use in apples only not registered for use in pears.</u> Apply once in early spring as directed spray to orchard floor where trees have been established 3 years or more. Kills most existing weeds and gives residual control of annuals weed seedlings. Use lower rates on light soils and soils with low organic matter (2% or less); higher rates on heavy soils with 2% or more organic matter. Do not use on sand, loamy sand, gravelly soils, soils with less than 1% organic matter, nor on eroded areas where tree roots are exposed. Do not replant treated areas to any crop within 2 years after last application. Keep spray off crop foliage and fruit.
	Broadleaf weeds	2,4-D 2.0 lb	Apply as directed spray to young weeds. Useful to control broadleaf perennials that escape earlier treatment. Will not control grasses and certain broadleaf perennials. Keep spray off fruit, branches and trunks of trees. Use coarse spray and low pressure to avoid drift to susceptible crops. Only the acid- and oil-soluble amine formulations have label clearance for use on apples and pears.
	All weeds, general contact	Weed oil up to 100 gal (nonselective)	<u>Use on pears only.</u> Currently lacks registration on apples. Apply as a directed spray to orchard floor. Spray when weeds are small for most effective control. Thoroughly wet weed foliage; keep spray off crop stem or foliage.

Fruit Crops (Cont'd)

Crop	Weeds Controlled	Chemical Rate/A (Product/A)	Remarks
APPLES AND PEARS (Cont'd)	Annual grasses and broadleaf weeds	napropamide 4.0 lb* (Devrinol 50 WP 8.0 lb)	Use in trees established one year or more. Apply to the soil surface in the fall through early spring prior to weed emergence. Do not apply to frozen ground. Does not control existing weeds but may be used in combination with or following paraquat. Use as a directed spray and avoid contact with fruit or foliage. Do not apply when fruit is on the ground during the harvest period. Do not graze treated areas. Make only one application per season.
	Annual grasses and some broadleaf weeds	oryzalin 2.0-4.0 lb (Surflan 75W 2.66-5.33 lb or 4AS 2.0-4.0 qt)	Use only on non-bearing trees. Areas to be treated should be free of weeds. Remove or thoroughly mix trash into the soil before application. Use lower rate for short-term control (4 months) and higher rate for long-term control (6 to 8 months). Apply as a directed spray and avoid spray contact with leaves, branches or trunks of trees. Do not apply to newly transplanted trees until soil has settled and there are no cracks present. Make only one application per growing season.

HERBICIDES FOR USE IN STONE FRUITS

An "X" in any block of the table below indicates that the herbicide in the left column is registered and may be used for weed control in that crop at the same rate(s) and under the same conditions as recommended for use in apples and pears. If the space is blank, the herbicide is not registered for use in that particular crop.

Most research on herbicide performance and fruit crop safety to chemicals at Virginia Tech has been conducted on apples and peaches. However, the use of the herbicides mentioned for other tree fruits is also believed to be valid, based on the best information available from other sources and limited experimentation in Virginia.

HERBICIDES	CHERRIES	NECTARINES	PEACHES	PLUMS
dichlobenil	X	X	X	X
dinoseb	X	X	X	X
diuron*	-	-	X	-
diuron + terbacil**	-	-	X	-
napropamide	X*	X*	X***	X*
oryzalin****	X (sweet)	-	X	X
paraquat	X	X	X	X
simaizine	X (sour)	-	X	-
terbacil	-	-	X	-
weed oil	-	-	X	X
glyphosate****	X	-	-	-

* Use only on trees established 1 or more years.

** Use only on trees established for 2 or more years.

*** Use only on trees established 3 years or more. Do not use within 3 months of harvest. Do not plant to any other crop for 2 years after last treatment..

****Use only on nonbearing trees.

Herbicides for Use in Small Fruits

Crop	Weeds Controlled	Chemical Rate/A (Product/A)	Remarks
BLACKBERRIES and RASPBERRIES	Annual weeds	dinoseb 1.9 lb (Dow General, 3.0 pt)	Apply in fall after harvest or in early spring before bloom. Do not apply during suckering or layering. Keep spray off foliage (directed spray).
	Annual grasses and broadleaf weeds	simazine 2.0-3.0 lb (Princep 80W 2.5-3.75 lb)	Apply in the spring or as a split application--1/2 in spring and 1/2 in fall. Use only 1/2 rate on new plantings (less than 6 months old). Do not apply to foliage or while fruit is present.
	All weeds, general contact	paraquat 0.5-1.0 lb (Ortho Paraquat CL 1.0-2.0 qt) + 4.0-8.0 oz of nonionic sticker spreader	Apply in a minimum of 50 gal of water per acre before emergence of new canes. May be applied to the row middles during the growing season. Caution must be used to prevent spray from contacting green canes. See remarks for paraquat under apples.
GRAPES	Most annuals	dinoseb 9.0-10.5 lb (Dow Premerge 3.0-3.5 gal + 1.0-2.0 qt surfactant)	See remarks for dinoseb under apples. Apply only after vines are established 2 years. Do not spray higher than 2 inches on the main grape stem.
		diuron 2.0 lb (Karmex 80W 2.5 lb)	Apply a single application per year in early spring after clean cultivation in vineyards established 3 years. Do not replant to any crop within 2 years after application.
	Annuals and perennial grasses and broadleaves	glyphosate 1.5-4.0 lb (Roundup 1.5-4.0 qt)	Use as a directed spray in established vineyards or for site preparation prior to transplanting new vines. Do not apply when green shoots or canes or foliage are in the spray zone. Do not allow spray, drift or mist to contact green foliage, green bark, suckers or vines and renewals less than 3 years of age. Spray contact, other than with mature bark on the main trunk, can result in serious localized or translocated damage. If repeat treatments are necessary, do not exceed a total of 10.6 qts per acre per year. Do not treat between 14 days to harvest to fall dormancy when no green vegetation, canes or shoots exist.
		simazine 2.0-2.5 lb (Princep 80W 2.5-3.12 lb)	Apply a single application per year in the fall or spring after clean cultivation. Vineyards must be established at least 3 years.
All weeds, general contact	paraquat 0.5-1.0 lb (Ortho Paraquat CL 1.0-2.0 qt) + 4.0-8.0 oz of nonionic sticker spreader	Apply as a directed spray in at least 50 gal of water per acre. See remarks under apples. Paraquat is toxic.	

Herbicides for Use in Small Fruits (Cont'd)

Crop	Weeds Controlled	Chemical Rate/A (Product/A)	Remarks
GRAPES (Cont'd)	Annual grasses and broadleaf weeds	napropamide 4.0 lb (Devrinol 50 WP 8.0 lb)	Use in vineyards established three years or more. Apply to the soil surface in the fall through early spring prior to weed emergence. Do not apply to frozen ground. Does not control existing weeds but may be used in combination with or following paraquat. Use as a directed spray and avoid contact with fruit or foliage. Do not apply when fruit is on the ground during the harvest period. Do not apply when fruit is on the ground during the harvest period. Do not graze areas. Make only one application per season.
	Annual grasses and some broadleaf weeds	oryzalin 2.0-4.0 lb (Surflan 75 W 2.66-5.33 lb or 4 AS 2.0-4.0 qt)	Use in non-bearing vineyards. Areas to be treated should be free of weeds. Remove or thoroughly mix trash into the soil before application. Use lower rate for short-term control (4 months) and higher rate for long-term control (6 to 8 months). Apply as a directed spray and avoid contact with leaves, branches or trunks of vines. Do not apply to newly transplanted vineyards until soil has settled and there are no tracks present. Make only one application per growing season.
STRAWBERRIES	Annual grasses	DCPA 9.0 lb (Dacthal 75W 12.0 lb)	Apply at transplanting or in established plantings in fall or early spring before crabgrass starts to germinate. Do not apply after first bloom.
	Most annuals, including chickweed	2,4-D amine 1.0 lb (Dow Formula 40 1.0 qt)	Apply in established beds in the early spring when the strawberries are dormant or immediately after last picking. Do not apply during bud, flower or fruit stage; or during runner formation. Do not apply unless some injury is acceptable.
		diphenamid 4.0-6.0 lb (Enide 50W 8.0-12.0 lb)	On newly transplanted beds, do not apply until they become established and show active growth. Apply to established plants after plant bed renovation and clean cultivation. Do not apply within 60 days of harvest.

Herbicides for Use in Small Fruits (Cont'd)

Crop	Weeds Controlled	Chemical Rate/A (Product/A)	Remarks
STRAWBERRIES (Cont'd)	Crabgrass, chickweed, horsenettle, lambsquarters, pigweed, and partial control of orchardgrass and quackgrass	terbacil 0.4-1.0 lb (Sinbar 80 W 0.5-1.25 lb)	Apply only to plants established in the field at least 6 months. Make a single broadcast application immediately after post harvest renovation. Complete removal of old leaves is essential but before new growth begins or in the dormant season from fall to late winter. Treat before weeds are 2 inches tall or across. Do not overapply or overlap or injury will occur. Certain varieties (i.e. Guardian) are known to be sensitive. Limit first application to a small area until tolerance is determined with your varieties and conditions. Do not use on sands, loamy sands, gravelly soils nor on soils of less than 2% organic matter. Do not plant to other crops not listed on the label within 2 years after application as crop injury may occur.
	Annual bluegrass, barnyardgrass, bristly foxtail, quineagrass, johnsongrass seedlings, sandbur, Texas panicum, large crabgrass, ripgut brome, southwestern cupgrass, wild barley, wild oats, comon chickweed, common fiddleneck, prostrate knotweed, little mallow, common purslane, annual sowthistle, filaree, groundsel, horse purslane, lambsquarters, prickly lettuce, and redroot pigweed	napropamide 4.0 lb (Devrinol 50 WP 8.0 lb)	Use on newly transplanted and established strawberries. Delay application until the desired number of daughter plants have become established. Do not apply from bloom to harvest. Make only one application per season. Does not control established weeds.

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks

GRAPE (Cont'd)				
Downy mildew (<u>Plasmopara viticola</u>)	Captan 50% WP	2.0 lb	---	Apply just before bloom, just after bloom, 7 to 10 days later, and 2 to 3 weeks later. There is a 7-day waiting period before harvest for ferbam. Do not apply Dithane M-45 within 66 days of harvest. Maneb 80% WP (Dithane M-22 special or Manzate D) 2.0 lb/100 gal of water can be used to within 7 days of harvest.
	OK			
	Folpet 50% WP	2.0 lb	---	
	OK			
	Ferbam 76% WP	2.0 lb	---	
	OK			
	Dithane M-45 80% WP	2.0 lb	---	

Powdery mildew (<u>Uncinula necator</u>)		See comments under remarks		There is limited registration of fungicides for powdery mildew control on grapes. If folpet is used for downy mildew control, however, powdery mildew will not be a problem.

Anthracnose (<u>Elsinoe ampelina</u>)	Bordeaux mixture =			Apply during the dormant stage before buds open. This spray is necessary only in those vineyards where anthracnose has been a problem. Thoroughly clean spray tank and pump after using Bordeaux mixture.
	Copper sulfate + Hydrated lime	8.0 lb 8.0 lb	--- ---	

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
APPLE INSECTS (Cont'd)				
SCALE INSECTS				
A. Delayed dormant treatments	chlorpyrifos (Lorsban 4 E)	1.0 pt	2.5 pt	Thoroughness of application is essential; scale insects may be found in tiny cracks and crevices or up behind loose bark chips. Tops and centers of trees must be thoroughly wetted. DO NOT use oil when temperature is above 85 F or below 35 F. Check label of all pesticides used with, or following oil to avoid problems with incompatibility. Delayed dormant sprays will aid in mite and aphid suppression.
	OR			
	carbophenothion (Trithion 8 E)	4.0 oz	12.0 oz	
	OR			
	ethion 8E plus superior oil (60-70 sec)	4.0 oz 2.0 gal	8.0 oz 6.0 gal	
B. Pre-bloom treatments (if scale is a severe problem)	diazinon 50 W	1.0 lb	3.0 lb	Male San Jose scale adults become active about the time Red Delicious blossoms show pink. One or two sprays (if possible BEFORE BLOOM OPENS) will kill many males before mating occurs, thus reducing the problem.
C. Post-bloom treatments	parathion 15 W	1.0 lb	3.0 lb	If infestation is heavy use two successive treatments (a week apart) when crawlers of each generation hatch from the egg. In central Virginia, about mid-May and late July for first and second generations, respectively. Hatching may vary slightly in other areas of the state. Again, the tops and centers of the trees must be thoroughly covered.
	OR			
	Pennacap-M	16.0-32.0 oz	48.0-96.0 oz	
	OR			
	Diazinon 50 W*	1.0 lb	3.0 lb	
				*May russet yellow varieties, e.g. Golden Delicious.

NOTE: Many other insects occasionally cause problems on apple, including cicada, Japanese beetle, tarnished plant bug. For assistance with specific problems not covered above, contact an entomologist or attend an area fruit school held regionally each spring. Dates for your area available from county extension agent.

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
PEACH AND NECTARINE DISEASES				
<u>Dormant Spray Only</u>	Ferbam 76% WP	2.0-3.0 lb	No	Apply spray in the fall after most leaves have fallen but before hard freezing weather (sunny days in November) or in the spring before bud swell. Caution: Thoroughly clean the spray tank and pump after using Bordeaux mixture or liquid lime sulfur.
Leaf curl (<u>Taphrina deformans</u>)	OR Bordeaux mixture = Copper sulfate + Hydrated lime	2.0 lb 4.0 lb	No	
	OR Liquid lime sulfur (29-31% solution)	4.0 gal	No	
PEACH DISEASES				
<u>Pre-Bloom and Bloom Sprays</u>	Captan 50% WP	2.0 lb	4.5 lb	Apply when the buds show pink and during the bloom period. Do not graze treated areas.
Brown rot (<u>Monilinia fructicola</u>)	OR Sulfur 95% WP**	6.0 lb	15.0 lb	
	**That Flowable Sulfur is a 52% 6.0 lb per gal flowable sulfur that is registered for brown rot and powdery mildew control on peach. Generally, it has shown good results for brown rot control on peaches in experimental research plots. Tank-mix of That Flowable Sulfur 1.0 pt with benomyl 50W (Benlate) 4.0 oz has provided good to excellent control of brown rot on nectarines and peaches for three consecutive growing seasons. That Flowable Sulfur should be used according to the manufacturer's label until further research is completed.			
Do not use any sulfur products within two weeks before or after the application of an oil spray.				
*Caution: Because of the potential for development of benomyl and thiophanate-methyl resistant strains of the brown rot and peach scab fungi, benomyl and thiophanate-methyl should not be used as the only fungicide in the spray program. If benomyl or thiophanate-methyl resistance is suspected discontinue its use. There is a tank mix registration for benomyl (Benlate) and captan. Similarly there is a tank mix registration for benomyl (Benlate) and sulfur. It is anticipated that the use of tank mixtures with benomyl will help suppress tolerant strains of the brown rot and scab fungi.				
<u>Post-Bloom and Pre-Harvest Sprays</u>	Captan 50% WP	2.0 lb	4.5 lb	Apply captan or sulfur sprays when the petals are approximately 1/2 down, shuck-split, shuck-fall and continue at 10-14 day intervals until 1 week before harvest. Captan and sulfur sprays may be applied during harvest if necessary to control brown rot. Apply benomyl (Benlate) or Topsin-M during late petal-fall, to early shuck-split, 3 weeks before harvest and again 1 week before harvest. Benomyl can be used during harvest if necessary to control brown rot, but Topsin-M can only be applied to within 1-day of harvest. Do not graze livestock in treated areas.
Brown rot (<u>Monilinia fructicola</u>)	OR Sulfur 95% WP	6.0 lb	15.0 lb	
	OR *Benomyl 50% WP (Benlate)	0.5 lb	1.2 lb	
	OR Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb	
	OR Benomyl 50% WP (Benlate) + Captan 50% WP	4.0-6.0 oz 1.0-2.0 lb	3/4-1.0 lb 3.0-4.0 lb	
	OR Benomyl 50% WP (Benlate) + Sulfur 95% WP	4.0-6.0 oz 3.0-6.0 lb	3/4-1.0 lb 6.0-9.0 lb	

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
PEACH DISEASES (Cont'd)				
Rhizopus rot (<u>Rhizopus</u> <u>nigricans</u>)	Botran 75% WP +	1.0 lb	2.5 lb	For Rhizopus (on peaches only) and continued brown rot control, apply the recommended combination of Botran and captan 8 and 1 day before harvest. *Caution: Do not use Botran later than 1 day before harvest.
	Captan 50% WP	1.0 lb	2.5 lb	
<u>Post-Harvest Treatment</u>	Botran 75% WP	1.0 lb	No	This is a post-harvest treatment in the hydrocooler. Botran at the same rate would be added to each additional 100 gal of water added to the hydrocooler during operation. Benlate 50% WP can be used in the hydrocooler at the rate of 0.5 lb/100 gal of water for brown rot control. Benlate will not control Rhizopus rot but it can be used in combination with Botran for better brown rot control for freezing and canning only.
Rhizopus and Brown rot				
Scab (<u>Cladosporium</u> <u>carpophilum</u>)	Sulfur 95% WP	6.0 lb	15.0 lb	Starting at shuck-fall, make 3 applications 10-14 day intervals. In orchards where scab is a severe problem, apply a fourth spray 30-34 days after shuck-fall. Sulfur is more effective than captan for scab control. Benomyl (Benlate) provides good scab control except in those orchards where tolerant strains of the scab fungus have been found. Apply benomyl at shuck-split and again at shuck-fall. If benomyl is used for brown rot control, no additional applications will be needed for scab. The same comments and application timing for Benlate also apply to Topsin-M. Do not graze treated areas.
	OR Captan 50% WP	2.0 lb	4.5 lb	
	OR Benomyl 50% WP (Benlate)	0.5 lb	1.2 lb	
	OR Thiophanate-methyl 70% WP (Topsin-M)	0.5 lb	1.2 lb	

