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Virginia Cooperative Extension Service

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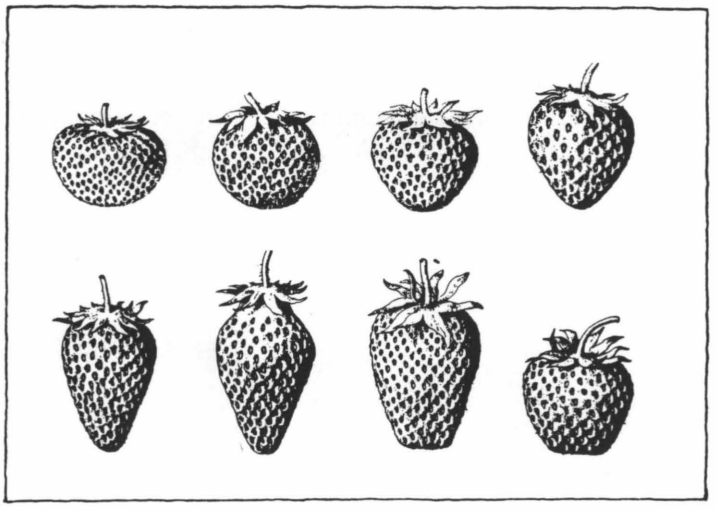
1988-89 Pest Management Guide for COMMERCIAL SMALL FRUIT PRODUCTION



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Produced by the Department of Entomology and the Department of Plant Pathology, Physiology and Weed Science, VA Tech. Coordinator: J. M. Luna, Department of Entomology

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Keys to the Proper Use of Pesticides

1. Read the label on each pesticide container before each use. Follow the printed instructions to the letter; heed all cautions and warnings; note precautions about residues.

2. Store pesticides in the containers in which you bought them. Put them where children and animals cannot get to them -- preferably locked-up and away from food, feed, seed and other materials that may become harmful if contaminated.

3. Dispose of empty pesticide containers in the manner specified on their labels.

SEE YOUR DOCTOR IF SYMPTOMS OF ILLNESS OCCUR DURING OR AFTER USE OF PESTICIDES

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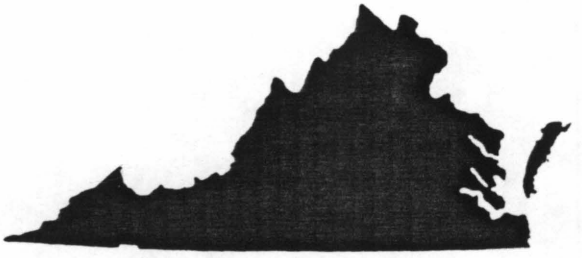
PEST MANAGEMENT GUIDES FOR VIRGINIA -- 1988-89



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Disease and Insect Pests of Small Fruits

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Effective control of pests that occur in commercial small fruit crops is obtained only through the judicious use of pesticides combined with sound management practices, nutrition and sanitation. 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, and they usually are applied as sprays or occasionally as dust. The problem of selecting the correct pesticide to do a specific job continues to be challenging to commercial growers. The success or failure of any spray program is not due entirely to the specific pesticide or amount placed in the sprayer tank; but is also influenced by proper timing, thorough application and weather conditions at the time of application.

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

In selecting a pesticide for control of small 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 pest are some of the important factors that must be weighed. There are a large number of pesticides available for grower use which vary somewhat in their spectrum of activity and effectiveness on an individual pest.

Generally, pesticides may be used alone for a specific pest or in combination for various pests occurring at any one time, but reference should always be made to a pesticide compatibility chart, e.g. on the front of the 1987-1988 Spray Bulletin for Commercial Tree Fruit Growers., VA Coop. Ext. Ser. Pub. 456-419, 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. 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 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 information on grape pests and their control, request VA Coop. Ext. Ser. Publications 456-232 and 456-018. Also, additional information on strawberry diseases and their control is available in Va. Coop. Ext. Ser. Publication 456-038. Pest Management Guide for Home Fruit Production, VA. Coop. Ext. Ser. Pest Management Guide 456-003.

Airblast Sprayer Callibration

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 operate.

Step 4. Obtain from the sprayer dealer at 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. Example: Sprayer with 10 nozzles per side; need 12.0 gal/min. for both sides of machine to deliver 100 gpa at 2.0 mph with 32 ft. spacing; thus 12.0 divided by 2 = 6.45 gal/min needed for each side.

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 gal 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
Sprayer output (gal/min) needed for a ground speed of 2.0 mph								
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	5.9	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
Sprayer output (gal/min) needed for a ground speed of 2.5 mph								
18	1.8	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	4.7	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

STRAWBERRY DISEASES

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
LEAF SPOT (Mycosphaerella tragariae)	Captan 50% WP	3.0 lb	4.5 lb	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. Remove thiram residues by washing if application are made within 3 days of harvest. Ronilan and captan can be applied during harvest to control rot. Apply sprays as needed to control diseases after harvest.
	Thiram 65% WP	3.0 lb	4.5 lb	
LEAF SCORCH (Marrsoni tragariae)	Benomyl 50% WP (Benlate)	1.0 lb	1.5 b	
LEAF BLIGHT (Dendrophoms obscurans)	Thiophanate-methyl 70% WP (Topsin-M)	1.0 lb	1.5 lb	
GRAY MOLD FRUIT ROT* (Botrytis cinerea)	Each of the above fungicides and rates can be used for fruit rots plus a new one as follows: Ronilan 50% WP	---	1.5-2.0 lb/A	
LEATHER ROT (Phytophthora cactorum)				
HARD ROT (Rhizoctonia sp.)				

*Strains of Botrytis resistant to benomyl and thiophanate-methyl are present in some areas of Virginia. Where resistance is suspected, use other fungicides.

STRAWBERRY INSECTS*

White grubs and root weevil	Lindane 25% W		2.0 lb	Preplant, apply lindane spray as drench directly to soil.
Spittlebug	Sevin 50% W	2.0 lb	4.0 lb	First cover: When blossom bud emerge 1/2 inch from crown.
Strawberry clipper	Lorsban 4E	1.0 pt	1.0 pt	Clipper: First cover repeat 10 to 14 days later. Early control is important.
Root weevil	Furadan 4F		2.0 pt	Apply a 10-12 inch band over row, between harvest and October 1.
Spider mites	Kelthane 35W	1.0 lb	2.0 lb	Rotation of acaricides is recommended.
	Plictran 50% W	12.0 oz	24.0 oz	

*Note: Based on dilute volume of 200 gal/acre.

Tarnished plant bug	Thiodan 50% W	1.0 lb	2.0 lb	Second cover: When blossoms separate in flower cluster.
Strawberry leafroller	Sevin 50% W	2.0 lb	4.0 lb	NOTE: Use extreme caution and read label thoroughly when using Guthion and other highly toxic materials.
	Guthion 50% W	1/2 lb	1.0 lb	
Strawberry clipper	See First Cover			
No insecticides at this time				Third cover: At 10% bloom.
No insecticides at this time				Fourth cover: At 50% bloom.

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
Tarnished plant bug	See Second Cover			Fifth cover: Berries half-grown, 7 to 10 days after Fourth cover.
Spittlebugs	See First Cover			
Leafroller	See Second cover			This second TPB spray may be needed. Do not apply within 15 days of first spray or more than twice within 35 days after fruit are formed.
Spider mites	See First cover			
Strawberry aphid	Thiodan 50% W	1.0 lb	2.0 lb	
Strawberry root weevil	Furadan 4F		2.0 pt	Post-harvest: Where root weevil has been a problem spray between harvest and October 1. Apply as a 10-12 in. band over row.
Strawberry leafrollers	See Second Cover			Leafrollers and aphids may need to be controlled to ensure continued growth, especially in young plantings.
Strawberry aphid	See Fifth Cover			
BRAMBLE DISEASES (Blackberries and Raspberries)				
Anthracnose (Elsinoe veneta)	Dormant or late dormant sprays Liquid lime sulfur (24-31% solution)	10.0 gal	---	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.
	Bordeaux mixture = Copper sulfate + Hydrated lime	 8.0 lb 8.0 lb	 --- ---	
Anthracnose (Elsinoe veneta)	Pre- and post-bloom and post-harvest sprays Captan 50% WP	 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.
	Ferbam 76% WP	2.0 lb	---	
Leaf spot (Mycosphaerella rubi)	Folpet 50% WP	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 but, if used for other diseases, leaf spot will not be a problem. Do not apply Benlate within 3 days of harvest.
	Captan 50% WP	2.0 lb	---	
Cane blight (Leptosphaeria coniothyriu)	Ferbam 76% WP	2.0 lb	---	
	Benlate 50% WP		0.75 lb	
Fruit rots (Monilinia fructicola), (Botrytis cinera) etc.	Captan 50% WP	2.0 lb	---	Apply spray during the period of fruit ripening and harvest (about 5 days before first picking and as needed.)

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
BRAMBLE INSECTS				
Leafrollers	Guthion 50% W	0.5 lb	1.0 lb	Prebloom: When buds breaking or new canes are 6 to 8 inches long.
	Diazinon 50% W	1.0 lb	2.0 lb	
Raspberry sawfly	Guthion 50% W	0.5 lb	1.0 lb	Guthion breaks down when mixed with Bordeaux mixture; spray immediately after mixing.
	Malathion 50% W	2.0 lb	4.0 lb	
Blackberry psyllid	Malathion 57EC	1.5 pt	3.0 pt	Spray for psyllid when adults appear on plants.
	Malathion 50W	2.0 lb	4.0 lb	
Raspberry cane borer	Malathion 57 EC	1.5 pt	3.0 pt	For cane borer remove all infested canes. Spray just before blossoms open.
	Guthion 50W	0.5 lb	1.0 lb	
Leafhopper	Diazinon 50% W	1.0 lb	2.0 lb	
Stinkbug and Tarnished plant bug	Guthion 50% W	0.5 lb	1.0 lb	
Aphids	Malathion 57EC	1.5 pt	3.0 pt	First cover: At petal fall.
	Malathion 50W	2.0 lb	4.0 lb	
Rednecked cane borer	Malathion 57 EC	1.5 pt	3.0 pt	Spray every 7-12 days from early May to early June if this pest has been a problem.
Leafrollers	See Prebloom Spray			
Blackberry psyllid	See Prebloom Spray			
Leafhoppers	See Prebloom Spray			
Aphids	See First Cover			Second cover: Ten days after petal fall.
Mites	Kelthane 35% W	1 1/4 lb	2 1/2 lb	
Japanese beetle	Sevin 80S	1.0 lb	2.0 lb	Third cover: Twenty days after petal fall.
	Sevin XLR Plus 75EC	---	2.0 qt	
Click beetle	Malathion 57EC	1 1/2 pt	3.0 pt	Spray for pests as needed.
Aphids	See First Cover			
Mites	See Second Cover			
Aphids	See First Cover			Postharvest: Spray for pests if needed.
Mites	See Second Cover			
Leafhoppers	See Prebloom Spray			
Raspberry crown borer	Diazinon 50% W	4.0 lb	8.0 lb	Crown borers: Prepare mix and drench to crown of plant, about 1 pt per plant.
BLUEBERRY DISEASES				
MUMMY BERRY CUPS (Monilinia vaccinil-corymbosi)	50% urea mix	---	200.0 lb	Apply when cups appear (usually Delayed Dormant). Urea mix is 50% urea prilis plus 50% inert materials. It supplies 45 lbs/acre nitrogen. Cups may also be covered with 1 to 2 inches soil by discing or raking.

Crop and Pest	Chemical and Formulation	Rate Per 100 Gal Dilute	Acre Conc.	Spray Timing and Remarks
PHOMOPSIS TWIG BLIGHT (Phomopsis spp.)	Benlate 50% WP	0.5 lb	1.0 lb	Spray Benlate from Delayed Dormant through Petal Fall at 7 to 10-day intervals. One Delayed Dormant application.
	Lime sulfur	2.5 gal	5.0 gal	
MUMMY BERRY TWIG/fruit infection	Funginex 1.6 EC	---	24 fl oz	Use Funginex from leaf bud break to pink bud at 7- to 10-day intervals. Maximum of 3 sprays. Apply 24 fl oz in 30-50 gal water/acre. May cause fruit russetting if used after pink bud stage. Benlate is applied from bud break to petal fall at 7- to 10-day intervals at regular 200 gal water/acre rates.
	Benlate 50% WP	0.5 lb	1.0 lb	
FRUIT ROTS (Anthracnose and Alternaria rot esp.) (Glomerella cingulata, Botrytis cinera and Alternaria tennissima)	Captan 50% WP	2.5 lb	5.0 lb	Early Bloom to Post Bloom, 7- to 10-day intervals. Early Bloom to Post Bloom, 7- to 10-day intervals.
LEAF SPOTS (Gloeosporium minus, Gloeocercospora inconspicua, Septoria albopunctata, Dothichiza caroliniana, Alternaria tenissima and Glomerella cingulata)	Captan 50% WP	2.5 lb	5.0 lb	Note: Benlate and Captan are more effective against Botrytis and most leaf of fruit pathogens. Post Bloom to August at 7- to 10 day intervals. Observe pre-harvest regulations. For leaf spot control after harvest, resume spray schedule 1 to 2 times.
	Benlate 50% WP	0.5 lb	0.5-1.0 lb	
PHOMOPSIS TWIG blight (Phomopsis spp.)	Lime sulfur	2.5 gal	5.0 gal	Single spray after leaf fall in late October.
BLUEBERRY INSECTS				
Blueberry tip borer	Sevin XLR Plus	---	2.0 qt	First cover: At petal fall.
	Sevin 80S	1 1/4 lb	2 1/2 lb	
	Malathion 25W	4.0 lb	8.0 lb	
Plum curculio	Diazinon 50W	1.0 lb	2.0 lb	
	Sevin 80S	1 1/4 lb	2 1/4 lb	
	Sevin XLR Plus	---	2.0 qts	
Cranberry fruitworm	Guthion 50W	1.0 lb	2.0 lb	Second cover: Ten days after first cover.
	Diazinon 50W	1.0 lb	2.0 lb	
	Sevin XLR Plus	---	2.0 qt	
Leafrollers	Guthion 50W	1.0 pt	1.0 qt	
	Diazinon 50W	1.0 lb	2.0 lb	
Aphids	Malathion 25W	4.0 lb	8.0 lb	
Blueberry tip borer	See First Cover			
Plum curculio	See First Cover			
Cranberry fruitworm	See Second Cover			Third Cover: Ten days after second cover.

Nematode Control in Small Fruits

K. S. Yoder, Plant Pathologist
C. R. Drake, Professor, Plant Pathologist

Nematodes Controlled	Chemical	Rate	Remarks
BLACKBERRIES, RASPBERRIES & STRAWBERRIES			
All plant parasitic nematodes	1,3-Dichloropropene (Telone II)	24.0-36.0 gal/A	Broadcast treatment: Fall application preferred, 30 days or more prior to planting; space chisels 12 inches apart and apply chemical 10 inches deep.
	Dichloropropene + Dichloropropane (D-D)	20.0-40.0 gal/A	
	1,3-Dichloropropene 74% Chloropicrine 16.5% (Telone C-17)	27.0-41.0 gal/A	
STRAWBERRIES (ONLY)			
Certain root rot fungi, all plant parasitic nematodes, and certain weeds seed	*Terr-O-Gas 67 (Methyl bromide 67% + Chloropicrin 33%)	225-350 lb/A	Prepare seedbed at least 8 inches deep, breaking all clods. Crop residues should be worked into soil and allowed time to decompose before treating. Soil temperatures should be 60° F at the 5-inch level or as stated on the label. Use chisel or shank intervals as stated on the label for each fumigant. 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 or time intervals according to label. *All of these fumigants are restricted use pesticides. NEVER apply without reading the manufacturers label and and following all instructions explicitly. As a rule of thumb all fumigants above 2% are extremely toxic and should be considered deadly poisons to mankind and other animals. If possible, have them applied by a qualified professional.
	*Terr-O-Gas 98 (Methyl bromide 98% + Chloropicrin 2%)	180-240 lb/A	
	*Brom-O-Gas (Methyl bromide 98% + chloropicrin 2%)	180-240 lb/A	
	*Chlor-O-Pic (Chloropicrin 96.5%)	150-200 lb/A	
	*Dowfume MC-33 (Methyl bromide 66% + Chloropicrin 33%)	250-300 lb/A	
	*Vorlex (1,3-dichloropropene 1,2-dichloropropane and closely related compounds 80%) + (Methyl Isothiocynate 20%)	25.0-40.0 gal/A	

Nematodes Controlled	Chemical	Rate	Remarks
All plant parasitic nematodes, certain root rot fungi and certain weeds seed	Vapam 32.7% (Sodium methyl dithiocarbamate)	40.0-100.0 gal/A	Before Vapam application, cultivate thoroughly the area to be treated, breaking up clods and loosening the soil deeply and thoroughly. Approximately one week before treatment moisten soil after cultivation to the desired depth (sprinkle or flood). This operation is important with all application methods. Immediately before application, cultivate lightly if soil has crusted. Where the entire area is to be treated by soil injection, space injection shanks 5 inches apart and inject 4 inches deep into well prepared soil. Follow immediately with a roller to smooth and compact soil. Light watering or a tarp (plastic) helps prevent gas escape. Apply when the soil temperature is 60-90° F (do not apply Vapam to the soil surface, as in the sprinkler method, when the air temperature is over 90° F) or during high winds. Sprinkler system uses 75-100 gal/A. Use sprinkler system that has large droplets. Run sprinkler 5 to 10 minutes. During the next 10 to 20 minutes, inject into the sprinkler system the amount of Vapam required for the area to be treated. On light soils, keep surface moist for 2 to 3 days. Before applying Vapam have your dealer contact a Stauffer Chemical Company representative about how to meter Vapam into the sprinkler system.

Weed Control in Small Fruits

J.F. Derr, Extension Weed Specialist

Crop	Weeds Controlled	Chemical Rate/A (Product/A)	Remarks
BLUEBERRIES, BLACKBERRIES and RASPBERRIES	Most annuals, fescue, quackgrass, dandelions, dock and other herbaceous perennials	dichlobenil 4.0-6.0 lb (Casoron, Norosac 4G 100.0-150.0 lb or 2.3-3.4 lb/1000 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. Do not apply over 4.0 lb of dichlobenil to blackberries or raspberries and do not apply during new shoot emergence.
	Annual and perennial grasses	fluazifop-butyl 0.5 lb a.i. (Fusilade 4E 1.0 pt + 1.0 qt crop oil concentrate or 1/2 pt nonionic surfactant per 25 gal)	Use a directed spray on actively growing grasses. Treat annual grasses before tillering for optimum results. Perennial grasses may need repeat treatment for total control. Do not treat canes to be harvested within one year of application. For spot-treatment use 0.5 fl oz Fusilade 4E or 1.5 fl oz Fusilade 2000 plus 1.5 fl oz crop oil concentrate or 0.5 fl oz nonionic surfactant per gallon.
		fluazifop-P-butyl 0.25 lb a.i. (Fusilade 2000 1.0 qt + 1.0 qt crop oil concentrate or 1/2 pt nonionic surfactant per 25 gal)	
	Annual and perennial and broadleaf weeds	glyphosate 1.5-5.0 lb (Roundup 1.5-5.0 qt for wiper application use 1 part Roundup to 2 parts water)	Can be applied prior to planting or to control emerged weeds after planting. Avoid contacting leaves or stems of crop plants or systemic injury could occur. For spot-treatment use 2 fl oz Roundup per gallon and spray to wet.
	Annual grasses and certain broadleaf weeds	napropamide 4.0 lb (Devrinol 50WP 8.0 lb)	Apply to a weed free surface. May be applied to newly planted and established crop. Must be incorporated by rainfall or irrigation within 24 hours of application for optimum results. May be tank-mixed with other herbicides for broader-spectrum weed control.
	Annual grasses and certain broadleaf weeds	oryzalin 2.0-6.0 lb (Surflan 75W 2.7-8.0 lb or 4AS 2.0-6.0 qt)	May be used immediately after planting or in established plantings. Must be applied to weed-free soil. Use lowest rate for short term control, 4.0 lbs for full season control, and the highest rate for long term (8 to 12 months) control. May be tank-mixed with such herbicides as simazine or terbacil to control a broader spectrum of weeds in established plantings.
	Annual weeds, contact activity only, will not control established perennial weeds	paraquat 0.5-1.0 lb (Gramoxone Super 3.0-5.0 pt + 8.0 oz spreader per 100.0 gal water)	Apply as coarse directed spray to thoroughly wet emerged weeds. Apply before emergence of new crop shoots. Do not allow spray to contact new shoots or green stems otherwise injury is likely.

Crop	Weeds Controlled	Chemical Rate/A (Product/A)	Remarks
	Annual and perennial grasses	sethoxydim 0.28-0.47 lb a.i. (Poast 1.5-2.5 pt + 1.0 qt crop oil concentrate)	Use on non-bearing plantings only. Apply in a minimum of 10 GPA of water. Apply the lower rate to annual grasses up to 6 inches tall and apply higher rate to annual grasses up to 12 inches tall and to perennial grasses. For spot treatment use 1.25 fl oz Poast plus 1.25 fl oz crop oil concentrate per gallon.
	Annual grasses and broadleaf weeds	simazine 2.0-4.0 lb (Princep 4L 2.0-4.0 qt, 80W 2.5-5.0 lb, 90W 2.2-4.4 lb, 4G 50.0-100.0 lb)	Apply to weed-free soil. Split application possible with 1/2 rate in Fall and 1/2 rate in Spring. On plantings less than 6 months old use 1/2 the total rate of application.
	Annual grasses and broadleaf weeds plus some perennial broadleaf weeds	terbacil 0.8-3.2 lb (Sinbar 80W 1.0-4.0 lb)	Only treat plantings established for 1 year or more. Use higher rate on heavy soils (clay) soils with high organic matter (3%+). May be applied in early spring or late fall. Do not apply over 1.6 lb of terbacil to blackberries or raspberries.
STRAWBERRIES (For complete discussion, see Publication 456-038)	Annual broadleaf weeds such as pusley, purslane, shepherdspurse, ragweed, lambsquarters, morningglory, pigweed, smartweed and mustards; weak on grasses	chloroxuron 3.0-4.0 lb (Tenoran 50W 6.0-8.0 lb)	Apply to established beds in early spring or to new plantings after plants are well-rooted. Preemergence and postemergence control of weeds less than 1 inch high. Do not apply within 60 days of harvest or more than twice per season. For better grass control, chloroxuron should be used in conjunction with one of the other herbicides which gives good grass control (diphenamid, DCPA, or napropamide).
	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.
	Annual grasses and certain broadleaf weeds	diphenamid 4.0-6.0 lb (Enide 90W 4.4-6.6 lb)	On newly transplanted beds, do not apply until crop becomes established and shows active growth. Apply to established plants after plant bed renovation and clean cultivation. Do not apply within 60 days of harvest.
	Annual grasses and certain broadleaf weeds	napropamide 4.0 lb (Devrinol 50WP 8.0 lb)	Use on established strawberries. Delay application until daughter plants in the desired number have become established. Do not apply from bloom to harvest. Make only one application per season. Does not control established weeds. Apply in fall through early winter. Early spring applications may also be made, but rainfall or irrigation will be needed for optimum weed control.
	Annual broadleaf weeds	2,4-D amine 1.0 lb (Formula 40 1.0 qt)	Apply to established beds in late winter when the strawberries are dormant or immediately after last picking 7 to 10 days before renovation. Do not apply during bud, flower or fruit stage, or during runner formation. Do not apply unless some injury is acceptable.

Crop	Weeds Controlled	Chemical Rate/A (Product/A)	Remarks
	Most annual weeds, partial control of certain perennials such as horse-nettle, orchardgrass and red sorrel	terbacil 0.4-0.5 lb (Sinbar 80 W 0.5-0.67 lb)	Apply only to plants established in the field at least 6 months or until daughter plants in the desired number have become established. May be applied as broadcast application after post-harvest renovation, after removal of foliage or in winter to dormant plants. Treat before weeds are 2 inches tall or across. Do not overapply or overlap or injury will occur. Certain varieties (i.e. Guardian, Darrow, Honeoye) are know 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.