

Extension Bulletin 0848 April 1982

COMMERCIALY GROWN STRAWBERRIES

**insect, disease, and
weed control guide for
Washington state**



NOTE

- Descriptions and biologies of strawberry pests are outlined in the *Strawberry Production Guide—EM 3905*.
- List of chemicals in this publication indicate legally registered materials, and sequence of listing does not indicate better performance of one material over the other.
- The materials marked with the following insignia (★) are materials that are very dangerous to applicators and should be handled with extreme caution.

WHEN TO SPRAY

The purpose of this spray schedule is to help growers know when to be on the lookout for various diseases, insect pests, and weeds—not to recommend routine sprays for all the problems listed. Some diseases and other pests of strawberries occur almost every year and require routine preventative treatments. Examples are fruit rot, certain weevils, and annual weeds. However, other problems, e.g., two-spotted spider mite, are sporadic in frequency and location and should be treated only as the need arises. This requires constant vigilance by the grower, so a problem, if it does occur, will not advance beyond remedy. However, the reward is a lower bill for pesticides and application, as well as protection of natural control agents which help to further reduce the "cost" of pesticides.

- Note that diseases and insects are listed according to relative occurrence: rarely encountered, occasionally encountered, or commonly encountered. These terms serve as guidelines in order to prevent or avoid continuous prophylactic or preventative sprays for pests that do not occur regularly.

Preplant Treatments. Application of insecticides to the soil prior to planting requires only that enough water be used for even distribution, usually 50 to 100 gallons per acre. The chemicals should be incorporated as soon as possible by double-discing or rotary tillage. Soil fumigation for nematodes is best accomplished in early fall while soil temperatures are above 45 degrees F.

Foliage Treatment. Application of pesticides to strawberry foliage requires enough water for good coverage and sufficient pressure to cover the interior foliage. A spray of 100 gallons of water per acre with 150 pounds pressure will help accomplish this. An arrangement of one nozzle above and one low on each side of the row and angled up at the plants helps to provide good coverage over the plant, including the underside of the leaves.

BEE POISONING

Honey bees and various species of wild bees or other insects are necessary for complete pollination of strawberry flowers. Poor pollination results in smaller and misshapen berries and, therefore, lower yields.

Many of the insecticides recommended for the prebloom or postharvest periods are highly toxic to bees and should not be used during bloom. The chemicals Thiodan, methoxychlor, and Metasystox-R may be used during bloom if they are applied in early morning or evening when bees are not present. None of the fungicides recommended are toxic to bees.

Contact nearby beekeepers whenever you plan to use a material hazardous to bees. This will prevent accidental bee kills and help establish better cooperation between growers and beekeepers.

EXPLANATION OF FORMULATIONS

Many of the materials listed are presented as EC, F, or WP. EC means emulsifiable concentrate which contains a pesticide and an emulsifying agent in a suitable solvent. These are diluted with water to form an emulsion and applied as sprays. F means flowable, a formulation which contains a pesticide impregnated on small particles, such as clay, added to a small amount of liquid, such as water, to make a thick paste or cream. When added to the spray tank, a suspension is formed which can be maintained with little agitation. When preceded by a number, such as 2 EC or 2 F, this means that there are 2 pounds of actual toxicant per gallon of formulation. WP means wettable powders which are dry forms of pesticides in which the toxicant is carried on powders that can be readily mixed with water because a wetting agent has been added. These forms a suspension-type spray which must be kept agitated in a sprayer tank. When preceded by a number, such as 50 WP or 50 W, this means that there is 50 percent actual toxicant per pound of material.

**DISEASE AND INSECT
CONTROL GUIDE**

Disease or Insect and Relative Occurrence	Pesticide (use one)	Amount of Formulation Per Acre*	Minimum Days Be- tween Last Application and Harvest	Remarks
PREPLANT TREATMENT				
Nematodes (occasional)	DD Telone Vidden D Vorlex	Follow manu- facturer's direc- tions.	Preplant only	Have nematode analysis made and base fumigation on results. It is best to fumigate in late summer or early fall before <i>anticipated planting in spring</i> .
Strawberry root weevil Black vine weevil Rough strawberry root weevil (common)	No chemicals registered for pre-planting application. See post-harvest period.			
Woods weevil Obscure root weevil (common)				
Garden symphylan (rare)	fonofos (Dyfonate)	2 qt of 4 EC 20 lb of 10% granules		Apply Dyfonate to the soil just prior to planting. Disc into soil. Will protect plants only during summer following transplanting. Fumigation as explained above for nematodes, may be used.

ESTABLISHED PLANTINGS—HARVEST YEARS
Dormant & Prebloom Periods

Leaf Spot (common)	Bordeaux or Benomyl*** (Benlate)	6-6-100 1/2-1 lb of 50% WP (Apply in 100 gal water)	See remarks See remarks	<i>Do not</i> combine Bordeaux with insecticides or other fungicides. Where leaf spot has been a problem, make initial application when growth begins and repeat at 10-14 day intervals. If Bordeaux is used, discontinue at first bloom. Fruit rot program helps control leaf spot.
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NOTE: All recommendations are made as formulations (the way it comes in the package); not to be confused with recommendations as active ingredient (actual pesticide) as may appear in other more technical publications.

CONTROL GUIDE (continued)

Disease or Insect and Relative Occurrence	Pesticide (use one)	Amount of Formulation Per Acre*	Minimum Days Between Last Application and Harvest	Remarks
Powdery mildew (common)	benomyl*** (Benlate)	1/2-1 lb 50% WP applied in 100 gal water.	See remarks	Begin applications in early spring and discontinue well before harvest. Sulfur dust may burn foliage in hot weather. Plant damage has been reported from northwest Washington at rates of sulfur above 2 lb/100 gal. Consult fieldman for processor regulations.
	sulfur dust or sulfur spray	20-30 lb	See remarks	
		4-6 lb applied in 100 gal water.	See remarks	
Spittlebug (common)	azinphos-methyl (Guthion)	1 lb of 50% WP	5	Apply when blossom clusters start to separate. Control is more difficult after the spittle masses are formed. Use 100 gal of water per acre. <i>WARNING: Do not apply Guthion during bloom because of hazard to bees.</i> Apply Thiodan in evening or early morning to avoid bee poisoning.
	or			
	endosulfan (Thiodan)	2/3 qt of 3 EC	4	
		1 qt of 2 EC	4	
		1 lb of 50% WP	4	
Aphids: (common)	Aphid sprays involve a special schedule that is aimed at the control of virus spread. Read the remarks below and refer to detailed spray schedule on page 9.			
	Metasystox-R, Guthion, and diazinon are all recommended for strawberry aphid control. Thiodan may also be used, but in many areas strawberry aphids are resistant to it. Spraying should begin in early April and be repeated at 3- to 5-week intervals until at least September. The use of Metasystox-R in Washington is restricted to three applications per season. The third application must be applied after harvest. It is suggested that two of these be applied in April and May when the aphid is multiplying most rapidly. Fields should be watched closely, and when any aphids are again seen, the field should be resprayed.			
Cyclamen mite (rare)	endosulfan (Thiodan)	2/3 qt of 3 EC	4	Direct spray into crowns. Apply in 100 gal of water per acre. Apply in evening or early morning to avoid bee poisoning.
		1 qt of 2 EC	4	
		1 lb of 50% WP	4	

CONTROL GUIDE (continued)

Disease or Insect and Relative Occurrence	Pesticide (use one)	Amount of Formulation Per Acre*	Minimum Days Between Last Application and Harvest	Remarks
Bloom Period				
Fruit rot (common)	Captan	5 lb of 50% WP applied in 100 gal water.	0	Begin applications at first bloom and obtain good spray coverage.
	or			
Leaf spot (common)	benomyl*** (Benlate)	1/2-1 lb of 50% WP applied in 100 gal water.		Apply Captan at about 8-day intervals or after each rainy period, but no more than 2 sprays in any 6-day period.
	or			Apply Benlate at 10-14 day intervals.
	Ronilan	1 1/2-2 lb of 50% WP applied in at least 100 gal water	0	Apply Ronilan at about 8-day intervals or after each rainy period, but no more than 35 lb/acre/year. Under low disease pressure (drier weather) apply at 10-14-day intervals.
	or			
	Topsin-M***	3/4-1 lb of 70% WP applied in 100 gal water	1	Apply Topsin-M at 7 to 10 day intervals.
Omnivorous leaftier (occasional)	Methoxy-chlor	3 lb of 50% WP	14	Apply during first or second week of bloom. Reapply in 3 weeks if necessary.
	Guthion, Sevin, and other chemicals which would probably control this insect are not recommended during the bloom period because of their high toxicity to bees.			See Bee Poisoning section on page 2.
Aphids: (common)	See pages 5 and 9.			
Twospotted spider mite (common)	cyhexatin (Plictran)	2 lb of 50% WP	1	Good coverage of undersides of leaves is essential. Tedion is most effective when used against low mite populations as its main action is against eggs and miniature mites. Do not reapply Tedion within 35 days.
	or			
	dicofol (Kethane)	1 1/2 qt of 18 1/2% EC	2	
		1 1/2 lb of 35% WP	2	
	or			
	tetradifon (Tedion)	Use as manufacturer directs.	3	In some areas, mites may be resistant to Kethane or Tedion.

CONTROL GUIDE (continued)

Disease or Insect and Relative Occurrence	Pesticide (use one)	Amount of Formulation Per Acre*	Minimum Days Between Last Application and Harvest	Remarks
Harvest Period				
Fruit Rot (common)	Captan or Benlate or Ronilan or Topsin-M			See details under "Bloom Period."
Slugs (occasional)	metaldehyde Consult your fruit buyer before using metaldehyde. In areas with a history of problems with slugs, it may be helpful to bait around margins of the fields during the year of establishment to reduce migration into the fields.	25-50 lb of 2-4% bait.	6	Apply when slugs appear and repeat as needed. Apply between the rows to avoid contaminating fruit or foliage. Bait must contain no other pesticide which would leave an illegal residue at harvest.
Postharvest Period				
Twospotted spider mite (common)	Same as in bloom-period. Serious damage is rare at this time.			
Cyclamen mite (rare)	Same as in prebloom period			
Aphids: (common)	See pages 5 and 9.			
Strawberry leafroller (occasional) (rare)	azinphos-methyl (Guthion) or ★parathion	1 lb of 50% WP 1 pt of 4 EC 2 lb of 25% WP		Apply if population reaches two larvae per plant or foot of matted row. See Bee Poisoning section on page 2.

CONTROL GUIDE (continued)

Disease or Insect and Relative Occurrence	Pesticide (use one)	Amount of Formulation Per Acre*	Minimum Days Between Last Application and Harvest	Remarks
Obscure root weevil (common)	azinphos-methyl (Guthion)	1 lb of 50% WP		Apply Guthion in 100 gal water per acre to the foliage. Begin treatments immediately after harvest. Repeat in 2 weeks. Do not apply unless root weevils are definitely present. See below for Furadan application instructions.
	*carbofuran (Furadan)	2 qt of 4 F		
Strawberry root weevils Black vine weevil Woods weevil (common)	*Furadan	2 qt of 4 F		Apply 2 qt of 4 lb/gal. flowable Furadan in 100 gal of water per acre. Concentrate in a 12-inch wide band over the rows. Incorporate by use of 1-2 inches of water through sprinklers. Application may be between last harvest and October 1, but it is recommended that it be applied approximately August 1. Do not apply if any berries are present. Do not apply more than once per season. (See WSU EM 4046 for additional information.)

* EC=emulsifiable concentrate; WP=wettable powder; F=flowable (see page 1).

** Registration of chlordane has been suspended for this use by EPA; however, existing stocks can be used according to label directions. No substitute is registered for preplant treatment. See postharvest period.

*** Certain fungi can build up resistance rapidly to Benlate or Topsin-M. Repeated applications of these fungicides should be avoided. Captan or Ronilan used as alternate sprays, or tank mixtures of Benlate plus Captan, or Benlate plus Ronilan, or Topsin-M plus Captan will reduce the possibility of resistance developing. Fungi resistant to Benlate are also likely to be resistant to Topsin-M, thus alternation or tank mixtures of these two fungicides is not suggested.

Spray Schedule for Strawberry Aphids in Established Strawberry Fields

Date ^a	Chemical ^{b,c}	Amount of Formulation Per Acre*	Min. Days Application to Harvest	Remarks
April 1-7	Metasystox-R	2 pts of 25% EC	3	<i>WARNING: Do not apply diazinon or Guthion during bloom because of hazard to bees.</i>
Just before bloom	Guthion	1 lb of 50% WP or 2 pts of 2S or 2L	5	
May 30 or Immediately after harvest	Metasystox-R	2 pts of 2S or 2L	3	Apply Metasystox-R in evening or early morning to avoid bee poisoning.
	Metasystox-R or	2 pts of 25% EC	3	
	Guthion	1 lb of 50% WP or 2 pts of 2S or 2L	5	
	or diazinon	1 pt of 4 EC or 1 lb of 50% WP		
Sept. 1-15	Metasystox-R or Guthion	2 pts of 25% EC	3	Each of the listed chemicals is to be used at the rate of 1/2 pound of <i>actual toxicant</i> per acre.
		1 lb of 50% WP or 2 pts of 2S or 2L	5	
	or diazinon	1 pt of 4 EC or 1 lb of 50% WP	5	

^a These dates are for Oregon and Clark County, Washington. Delay approximately 5-7 days for Pierce County and 10-14 days for Skagit and Whatcom Counties, Washington.

^b All chemicals to be used at 0.5 lb of actual toxicant per acre. Formulations are given for growers' convenience and equal 0.5 lb actual toxicant per acre. If Plictran must be used for mites, combine with Guthion wettable powder, or apply a week after Metasystox-R.

^c Do not apply Guthion or diazinon when blossoms are present in order to prevent bee poisoning. Apply Metasystox-R only in the evening when bees are not present.

* EC=emulsifiable concentrate; WP=wettable powder; F=flowable (see page 1). S and L mean essentially the same as EC.

SPRAY COMPATIBILITY (ABILITY TO MIX) CHART FOR FUNGICIDES AND INSECTICIDES

It may be to your advantage to control several problems with one spray by combining several chemicals. *Read the label* and follow the manufacturer's directions when making these mixtures. This compatibility chart is provided to help you in preliminary planning only. Compatibilities can vary from those indicated on this chart because of change in solvents and emulsifying agents, etc. It is a good idea before making a tank mixture to mix the chemicals in a jar of water at approximately the recommended dilution rate and look for any reactions that would cause solids to form and separate out of the solution. Some mixtures may create phytotoxicity problems (plant injury), so unless a label specifies otherwise, either experiment on a few plants or avoid doing it.

	Topsin-M	Thiodan	Tedion	Sulfur	Ronilan	Plictran	Parathion ★	Methoxychlor	Metasystox-R	Guthion	Diazinon	Captan	Benlate
Benlate			C	X									
Captan		1					1	1		1			
Diazinon													
Guthion				1	?							1	
Metasystox-R						C							
Methoxychlor				1								1	
Parathion												1	
Plictran									C				
Ronilan	?			?						?			
Sulfur	X				?			1		1			X
Tedion	C												C
Thiodan												1	
Topsin-M			C	X	?								

Blank=Normally compatible, however, newer compatibility charts suggest not to mix unless approved by manufacturer.

C=Caution

X=Incompatible

1=Use wettable or soluble powder forms

Note: Furadan is missing from the above chart because the compatibility data for this material are unavailable to us at this time.

WEED CONTROL GUIDE

Chemicals will give good control of annual weeds in both new and established strawberry plantings. However, they must be used with caution. It takes accurate application, timing, and amounts to obtain good weed control without injuring the plants or reducing their yields.

PERENNIAL WEED CONTROL

Chemicals that kill perennial weeds also damage strawberry plants. Therefore, weeds such as quack-grass, sheep sorrel, field horsetail, Canada thistle, and others that grow from old roots and stems must be killed before strawberries are planted.

To maintain an income while bringing perennial weeds under control, other crops that are resistant to perennial weedkillers can be grown. Glyphosate in corn and 2,4-D, MCPA, dicamba or glyphosate in cereal grain are a few of the ways in which weedkillers can be combined with crop production to obtain perennial weed control.

Perennial weeds also can be controlled by tillage alone. Therefore, advantages and costs of chemical applications must be weighed against costs and time spent in a clean cultivation program.

ANNUAL WEED CONTROL

Herbicides will give selective control of germinating and seedling weeds in strawberry plantings. Since several herbicides can be used safely and effectively, the choice depends upon several interrelated factors: weed species present, management practices, age of the strawberry planting, soil type, and weather conditions.

Diphenamid (Enide)

Diphenamid is effective against germinating seeds of many annual weed species. It will not kill weeds that are growing at the time of treatment. It sometimes persists in the soil for as long as five months, although under most conditions its weed-killing activity lasts only 2 to 3 months. Rainfall or overhead irrigation following application is essential for effectiveness. Under dry conditions, a shallow (1 to 2 inch) soil incorporation will improve weed control.

In new plantings, apply 2-6 weeks after transplanting. Weeds that have germinated should be removed by cultivation before application. A second application can be made 6 months later. In established plantings, application can be made either after harvest following renovation of beds or in the fall (October through December).

Rate of application¹ depends upon soil texture. Use 4 pounds active ingredient (8 pounds of 50 WP or 4.4 pounds of 90 WP Enide) per acre in coarse soils (sand, loamy sand, sandy loam); 5 pounds active ingredient (10 pounds of 50 WP or 5.6 pounds 90 WP Enide) per acre on medium soils (loam, silt loam, sandy clay loam) and 6 pounds active ingredient (12 pounds of 50 WP or 6.6 pounds 90 WP Enide) per acre on fine soils (clay, clay loam, silty clay).

Precautions:

1. Do not apply within 60 days of harvest.
2. Do not apply within 6 months of the last application.
3. Do not plant edible crops other than Irish potatoes, sweet potatoes and strawberries within 6 months after the last application of diphenamid.
4. Do not use cover crops for food or feed.
5. Do not graze livestock on treated areas.
6. Do not use in combination with fertilizers, insecticides or fungicides.
7. Follow wettable powder precautions.²
8. Under dry soil conditions, weed control will be poor.
9. Once weeds have become established, little or no control will be obtained.

Resistant weed species. Black nightshade, shepherdspurse, various species of mustard, smartweed, groundsel, all *established* perennial weeds.

Susceptible weed species. Annual bluegrass, barnyardgrass, witchgrass, green foxtail, yellow foxtail, wiregrass, annual ryegrass, chickweed, knotweed, lambsquarters, redroot pigweed, purslane.

Chloroxuron (Tenoran)

Chloroxuron is a soil-residual herbicide that also has foliar activity. Best results are obtained before the seedling weeds have developed the first true leaf. Rainfall or sprinkler irrigation following application is necessary to control germinating weeds. Persistence of chloroxuron activity in the soil depends on many things, but in general, spring and summer applications will last 4 to 6 weeks, fall applications 6 to 8 weeks.

In new plantings, delay application until strawberry plants are established. Annual weeds should not be past the first true-leaf stage of growth at the time of application. Chloroxuron can be applied to new plantings again in the fall (October or November) for control of fall-germinating annual weeds.

In established plantings, apply either after harvest following renovation of beds or in the fall (October or November) just after fall rains have initiated winter-annual, weed-seed germination. Chloroxuron can also be used in the spring on established plantings provided application is made 60 days before first harvest.

Rate of application² is 4 pounds active ingredient (8 pounds of 50 WP Tenoran) per acre. At this rate of application, do not add spreader-sticker to spray mix. However, during the dormant season, the addition of a spreader-sticker makes it possible to kill fully grown chickweed with no injury to the strawberries.

Precautions:

1. Do not apply more than two times during any one year.
2. Do not apply within 60 days of harvest.
3. Use other herbicides when grasses are the major weed problem; chloroxuron is a poor grass killer.
4. Will not control established perennial weeds.
5. Do not apply chloroxuron when air temperature is 75°F or higher to avoid excessive burn injury on strawberry foliage.

6. Do not apply to strawberry plants under stress.
7. Follow wettable powder precautions.²
8. Thoroughly rework soil before planting succeeding crops.

Resistant weed species. Annual grasses, prostrate knotweed, pineappleweed, all *established* perennial weeds.

Susceptible weed species. Black nightshade, chickweed, shepherdspurse, lambsquarters, redroot pigweed, smartweed, spurry, various species of mustard.

Napropamide (Devrinol)

Napropamide can be used in Washington for weed control in new and established plantings of strawberries. It has a good margin of safety and controls many different species of annual weeds. Control of germinating weed seed has lasted as long as 8 months and sometimes longer. At least one inch of rainfall or overhead irrigation following application is essential for effectiveness otherwise the material is degraded by sunlight. The surface 2 to 4 inches of soil must be wet within one day after application during the summer and within 10 days during late fall in order to obtain good control of germinating weed seed. Since napropamide has little or no effect on emerged weeds, it should be applied before they emerge.

In new plantings, apply napropamide soon after transplanting but before weed-seed germination. In established plantings, application can be made during October through March to weed-free soil.

Rate of application¹ is 4 pounds active ingredient (8 pounds of 50 W Devrinol) per acre.

Precautions:

1. At least 1/2 inch of rainfall or irrigation within a week after application is necessary for weed control.
2. Napropamide will not control established weeds.
3. Do not apply more than once per season.
4. When applied to new plantings, the setting of runners is sometimes inhibited.
5. Follow wettable powder precautions.²
6. Do not use on soils with over 10% organic matter.
7. Weed control will be reduced when soil is heavily covered with leaves or trash.
8. Do not plant alfalfa, small grains, corn, lettuce, or beets for 12 months after application.
9. Use an alternate herbicide in the last harvest year to avoid residue injury on the crop following strawberries.
10. Do not apply from bloom to harvest.
11. Application of the material should be delayed until the desired number of daughter plants have become established.

Resistant weed species. Shepherdspurse, species of mustard, henbit, minerslettuce, black nightshade, smartweed, all *established* perennial weeds.

Susceptible weed species. Annual bluegrass, barnyardgrass, wild oats, chickweed, common fiddleneck, knotweed, little mallow, purslane, common sowthistle, filaree, groundsel, lambsquarters, pineapple-weed, prickley lettuce, redroot pigweed.

Simazine (Princep)[□]

Simazine should only be used on established plantings. It may be applied in irrigated fields after post-harvest renovation and again during October through November. In non-irrigated fields apply it once during September through November as determined by expected weed seed germination and rainfall. Weeds that have germinated should be hoed out before application.

Rate of application¹ is 1 pound active ingredient (1.25 pounds of 80 WP Princep) per acre.

Precautions:

1. Rainfall or irrigation soon after application is necessary for good weed control.
2. Do not apply during late winter or in the spring.
3. Do not apply to very loose, sandy, or coarse soil.
4. Limit irrigation to 1/2 inch after postharvest renovation application.
5. Adequate control of weeds in northwestern Washington requires two applications per year.
6. Follow wettable powder precautions.²

Resistant weed species. All established perennial weeds, triazine resistant lambsquarters, and redroot pigweed.

Susceptible weed species. Annual bluegrass, chickweed, groundsel, lambsquarters, nightshade, redroot pigweed, mustard spp, and smartweed.

Simazine plus Napropamide

This combination increases the number of weed species controlled and greatly increases the length of effective control. Apply during October through November. Do not apply in the spring. Follow all precautions as given previously for simazine and napropamide alone.

Rate of application¹ is 1 pound active ingredient (1.25 pounds of Princep 80 WP) plus 4 pounds active ingredient (8 pounds of Devrinol 50 W) per acre.

Terbacil (Sinbar)

Based on field testing in western Washington over the last three years, as well as on label recommendations, the following use directions should prove effective and selective in western Washington strawberry fields. Apply immediately after postharvest renovation or in the dormant season (late fall through late winter). Rate of application is .4 to 1 pound active ingredient (.5 to 1.25 pounds of 80W Sinbar) per acre.

[□]A special local needs registration has been granted for this use in Washington under Section 24(c), FIFRA.

Restrictions/Precautions:

1. Use only on plants established in the field for at least 6 months.
2. Use the lower rate on course-textured soils (sands, sandy loams, loamy sands, etc.); higher rate on fine-textured soils (clays, silts, silt loams, etc.). Do not use on soils with less than 2% organic matter.
3. When application is made after postharvest renovation, complete removal of old leaves, stems, etc., is essential. Apply Sinbar before new growth begins.
4. When application is made during the dormant season (usually mid-November to early February), treat before weeds are 2 inches tall or 2 inches across.
5. Strawberries growing in low-lying or poorly drained areas will be severely injured or killed by Sinbar treatment.
6. Do not tank-mix Sinbar with other herbicides or liquid fertilizers and pesticides.
7. Sinbar may reduce runner production or plant stand.
8. Do not apply to strawberries under stress due to drought, insect or plant disease infestations, poor drainage, etc.
9. Certain varieties (Totem) may not be tolerant to Sinbar treatment.
10. Do not plant any crop within 1 year after last application of Sinbar.

Resistant Weed Species. All established perennial weeds.

Susceptible Weed Species. All annual weeds.

Other Herbicides

Herbicides listed below are currently registered for use in strawberries; however, they have been judged unsuitable in western Washington for one or more of the following reasons: (1) a high probability of strawberry injury, (2) ineffectiveness on the weed species commonly infesting strawberries, (3) inappropriate under the usual environmental conditions and/or managerial practices common to western Washington agriculture and, (4) availability of better and less costly alternative herbicides.

DCPA (Dacthal)

Dinoseb (Premerge 3)

2,4-D amine (several trade names)

Methods of Application

Uniform application is absolutely necessary if herbicides are to provide the desired results.

Treatment rates are low. For example, only 1.25 pounds of 80 WP Princep are needed per acre. Such a small amount of material spreads very thinly over an acre. Variations in the spray pattern, overlap, speed of the rig, worn nozzle tips, etc., will change the application rate sufficiently to damage the crop or reduce the weed control.

To get uniform application, be sure that your sprayer:

1. Can apply material at low pressures, 30 to 40 pounds per square inch.
2. Can apply 40 to 60 gallons of spray per acre.
3. Has nozzles spaced evenly, 12 to 18 inches apart, along a boom that can be adjusted for height.
4. Can move at a constant ground speed between 2 and 4 miles per hour.
5. Will cover the entire area with a broadcast application.
6. Has nozzle tips that deliver the rated volume of spray (test the output of the individual tip to determine its accuracy).

¹All rates of application are given in pounds active ingredient per acre; also rates of application are based on complete (overall) coverage. Reduce amounts used per acre proportionately for band or strip treatment. Rate of application per square foot treated should remain the same.

²Wettable powder formulation precautions should be observed—wettable powders go into suspension, not solution. Therefore, constant agitation is required to keep the powder in suspension for uniform spraying. Mechanical agitation is preferred over hydraulic agitation. Line and nozzle strainers should be at least 50 mesh to permit free passage of the wettable powder spray mixture through the spraying system. Since wettable powders are abrasive, sprayers should be recalibrated frequently.

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APPROXIMATE METRIC WEIGHTS AND MEASURES

COMMON EQUIVALENTS

Metric	U.S.	U.S.	Metric
Millimeter	0.039 inches	Inch	2.54 centimeters
Centimeter (10 mm)	0.39 inches	Foot (12 in)	30.5 centimeters
Meter (100 cm)	39.4 inches	Yard (3 ft.)	0.91 meters
Kilometer (1,000 m)	0.62 miles	Mile (5,280 ft.)	1.6 kilometers
Square Centimeter	0.155 square inches	Square Inch	6.5 square centimeters
Square Meter	1.2 square yards	Square Foot (144 sq. in.)	930 square centimeters
Hectare (10,000 sq m)	2.47 acres	Square Yard (9 sq. ft.)	0.84 square meters
Square Kilometer (100 ha)	247 acres	Acre—43,560 sq. ft.	0.405 hectares
Gram	0.035 ounces	Square Mile—640 acres	259 hectares
Kilogram (1,000 g)	2.2 pounds	Ounce	28.3 grams
Ton (metric) (1,000 kg)	1.1 tons (US)	Pound—16 oz.	0.454 kilograms
Milliliter	0.034 fluid ounce	Ton (US)—2,000 lb.	0.907 tons (metric)
Liter (1,000 ml)	1.056 quarts	Tablespoon—3 teaspoons	14.79 milliliters
Cubic Meter (1,000 l)	264.17 gallons (US)	Fluid Ounce—2 tablespoons	29.6 milliliters
		Cup—8 fl. oz.	0.237 liters
		Pint—2 cups	0.473 liters
		Quart—4 cups	0.946 liters
		Gallon (US)—4 qts.	3.8 liters
		Cubic Foot	28.3 liters

PROPORTIONS

Metric	U.S.	U.S.	Metric
100 g/ha	1.4 oz./acre	1 oz./acre	70 g/ha
1 kg/ha	0.9 lb./acre	1 lb./acre	1.12 kg/ha
1 ton (metric)/ha	0.446 tons (US)/acre	1 ton (US)/acre	2.24 tons (metric)/ha
1 l/ha	0.4 qt./acre	1 fl.oz./acre	73 ml/ha
1 kg/1000 l	1 lb./100 gals.	1 gal./acre	9.39 l/ha
1 g/1000 kg	1 ppm	1 lb./100 gals.	1 kg/1000 l
1 km/hr	0.6 mph	1 ppm	1 g/1000 kg
		1 mph	1.6 km/hr

TEMPERATURES

Celsius (Centigrade)	Fahrenheit	Fahrenheit	Celsius (Centigrade)
-30	-22	0	-18
-20	-4	10	-12
-10	14	20	-7
0	32	30	-1
10	50	40	4
20	68	50	10
30	86	60	16
40	104	70	21
		80	27
		90	32

To convert: Celsius to Fahrenheit — multiply by 9/5 (1.8) and add 32.
 Fahrenheit to Celsius — subtract 32 and multiply by 5/9 (0.56).

ABBREVIATIONS

mm — millimeter, cm — centimeter, m — meter, km — kilometer, ha — hectare, mg — milligram, g — gram, kg — kilogram, l — liter, ml — milliliter

