

Extension Bulletin 0849 April 1982

# **COMMERCIALY GROWN BLUEBERRIES**

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



## NOTE

- Lists of chemicals in this publication indicate legally registered materials, and sequence of listing does not indicate better performance of one material over the other.

## PESTS NOT ON PRODUCT LABEL

Some suggested uses of pesticides in this publication are for pests not listed on product labels. These are indicated by the symbol  $\Delta$ . Such uses comply with the federal law (FIFRA) which says a use is consistent with label directions provided the crop or site is on the label and directions concerning rates and interval before harvest are followed.

## 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. The purpose is not to recommend routine sprays for all the problems listed. Some diseases and other pests of blueberries occur almost every year and require routine preventative treatments. Possible examples are fruit rot, leafrollers, and annual weeds. However, other problems, e.g., nematodes, 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. The reward for vigilance 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 a guideline in order to prevent or avoid continuous prophylactic or preventative sprays for pests that do not occur regularly.

## BEE POISONING

Honey bees are necessary for complete pollination of blueberry flowers. Poor pollination results in lower yields, with small berries.

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 methoxychlor and malathion may be used during bloom if they are applied in the following manner: methoxychlor, during late evening, night, or early morning; malathion EC, only during late evening. None of the recommended fungicides or herbicides applied during bloom are toxic to bees.

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

**DISEASE AND INSECT  
CONTROL GUIDE**

<b>Disease or Insect and Relative Occurrence</b>	<b>Pesticide (use one)</b>	<b>Actual Toxicant Per Acre</b>	<b>Minimum days Be- tween Last Application and Harvest</b>	<b>Remarks</b>
<b>PREPLANT TREATMENT</b>				
Nematodes (rare)	DD or Telone or Vidden D or Vorlex	Follow manu- facturer's direc- tions	Preplant only	Have nematode analysis made and base fumigation on results. It is best to fumi- gate in late summer or early fall before anticipated planting in spring.
Strawberry root weevil Black vine weevil Rough strawberry root weevil (occasional)	There are no legally registered materials available that can be applied as preplant or prebloom treatment.			
Woods weevil Obscure root weevil (occasional)				
<b>ESTABLISHED PLANTINGS Dormant &amp; Prebloom Periods</b>				
Aphids $\Delta$ (common)	diazinon malathion $\Delta$	1 lb 1.25 lb	7 1	Apply to foliage as dust or spray in 100 gal of water per acre. Apply when aphids appear and repeat application if necessary.  Do not use diazinon if there is any bloom present—highly toxic to bees.
Godronia canker (occasional— rare)	Difolatan (4 flow- able)	2-4 lb	21	Apply at bud break and repeat at 4-6 week intervals.
Lecanium scale (occasional)	Dormant oil Superior (98%)  Dormant spray oil (80%)	2-2 1/2 gal  4 gal		Use 4 gal Dormant oil emulsion (80%) or 2-2 1/2 gal Superior-type oil (98%) in 100 gal of water. Apply while plants are dormant and when temperatures are above freezing.

## CONTROL GUIDE (continued)

Disease or Insect and Relative Occurrence	Pesticide (use one)	Actual Toxicant Per Acre	Minimum Days Between Last Application and Harvest	Remarks
Mummy Berry (common)	Funginex	0.3 lb (24 fl oz of 18.2% EC)	See remarks	Apply in 20-50 gal water or in 5 gal water for aerial application. Apply at bud break and 7-10 days later. If season is cold and buds develop slowly, second application may be delayed. A 14-day interval has given excellent control in Puyallup valley experimental plots.
<b>Bloom Period</b>				
Aphids $\Delta$ (common)	malathion $\Delta$	1.25 lb	1	Apply to foliage as a spray in 100 gal of water per acre. Apply when aphids appear and repeat application if necessary.  <i>Apply in Late Evening to Avoid Bee Kill. Do Not Use Dust Formulation.</i>
Lecanium scale $\Delta$ (occasional)	malathion $\Delta$	1.25 lb	1	Apply malathion as a spray in 100 gal of water per acre. After June, use 150 to 200 gal water per acre.
Mummy Berry (common)	Funginex	0.3 lb (24 fl oz of 18.2% EC)	See remarks	Apply at pink bud stage and repeat 7-10 days later. Make final application at only 16 fl oz/A between full bloom and petal fall.
Mummy Berry (common) and/or	Benlate or	1/2 lb	21	Apply at early bloom and at 10- to 14-day intervals through petal fall. Do not make more than four applications.
Botrytis gray mold (common)	Captan	1 lb	0	Less effective than Benlate but can be used as a tank mixture with Benlate, or as an alternative spray to help prevent build up of Benlate tolerant strains.
<b>Postbloom</b>				
Aphids (common)	Same treatments as in Prebloom Section			

## CONTROL GUIDE (continued)

Disease or Insect and Relative Occurrence	Pesticide (use one)	Actual Toxicant Per Acre	Minimum Days Between Last Application and Harvest	Remarks
Cherry fruitworm (occasional)	malathion	1 lb	1	Apply to foliage in 100 gal water per acre at blossom drop and <i>again</i> 2 weeks later. Cover foliage thoroughly.
Godronia canker (occasional—rare)	Difolatan (4 flow-able)	2-4 lb	21	Apply immediately after harvest and repeat at 4-6 week intervals until leaf drop.
Leafrollers $\Delta$ (common)	carbaryl (Sevin)	2 lb	0	Apply to foliage in 100 gal of water per acre. Can be applied up to time of harvest. Make the first application May 15 unless there are still blossoms, in which case apply it after bloom. One or two additional applications may be necessary at 2-week intervals if infestations are heavy.
	methoxy-chlor $\Delta$	2-3 lb	14	
<i>Warning:</i> Sevin is highly toxic to bees, so never apply it if there is any bloom in the field.				
Lecanium scale $\Delta$ (occasional)	malathion $\Delta$	1.25 lb	1	Apply malathion or parathion as spray in 100 gal water per acre. After June, use 150-200 gal water per acre.
	parathion	0.5 lb	14	
<i>Warning:</i> Parathion is highly toxic to bees, so never apply if there is any bloom in the field.				
Obscure root weevil $\Delta$ (occasional)	azinphos-methyl (Guthion) $\Delta$	1 lb	14	Apply to foliage in 100 gal water per acre. Cover foliage thoroughly. Spray about mid-June to kill adults before egg deposition. Use malathion if additional sprays are needed.
	malathion $\Delta$	2.5 lb	1	
<i>Warning:</i> To avoid bee poisoning, do not apply Guthion if there is any bloom in the field. Guthion is highly toxic to bees.				

\* Registration of heptachlor has been suspended for this use by EPA; however, existing stocks with these uses on the label can be used according to label directions. No substitute is registered for this use.

$\Delta$  Pest is not included on product label. See explanation on page 2.

### 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.

	Sevin	Parathion	Methoxychlor	Malathion	Heptachlor	Guthion	Diazinon	Benlate
Benlate					C			
Diazinon								
Guthion								
Heptachlor								C
Malathion								
Methoxychlor								
Parathion								
Sevin								

Blank=Normally compatible however it is suggested in newer compatibility charts to not mix unless approved by manufacturer.  
C=Caution

### BIRD CONTROL

Mesurool has received a Washington State registration for use on blueberries as a repellent for starlings, grackles, redwing blackbirds, jays, finches, and robins. Apply 2-2 2/3 pounds 75% WP per acre by air or ground equipment in a minimum of 5 gallons water per acre. Repeat as necessary with a minimum of 7 days between applications. A maximum of 8 pounds of product may be applied per season. Applications may be made up to the day of harvest.

*Note:* For maximum repellency of birds, apply as berries first begin to ripen.

## WEED CONTROL GUIDE

Chemicals will provide good weed control in established plantings as well as control annual weeds in new blueberry fields. Herbicide treatment of new plantings must be done with caution, because very young plants have small root balls that are near the soil surface and may be seriously injured by chemicals applied at too high rates. A wise policy would be to apply no herbicides until the blueberry plants have been in the field 6 months to 1 year.

Good weed control requires accurate application, timing, and amount of materials, if weeds are to be controlled without injury to the blueberry plants.

### A. NEW PLANTINGS

New blueberry plantings may be treated for control of annual weeds at reduced rates of certain herbicides the spring following the setting of plants.

#### Simazine (Princep)

Apply simazine at 1.6 pounds active ingredient (2 pounds of 80 W Princep) per acre. It has very little effect on growing weeds, so it must be applied before weeds emerge from the soil. Follow application with sprinkler irrigation.

### B. ESTABLISHED PLANTINGS

Herbicides will provide selective control of many annual and perennial weeds. Since several may be safely and effectively used, the choice depends on several interrelated factors: weed species present, soil type, and weather conditions.

#### Dichlobenil (Casoron)

Dichlobenil is effective against many annual and perennial weeds. For horsetail and annual weeds, apply at 6 pounds active ingredient (150 pounds of Casoron 4 G) per acre in the spring before weeds emerge. Application must be followed by rain or sprinkler irrigation. For perennials, such as sheep sorrel, quackgrass, orchardgrass, and Canada thistle, apply the same amount per acre while weeds are dormant in late fall to January.

#### Precautions:

1. Do not make more than one application per year.
2. Do not apply to plants which have been established in the field for less than one year.

Follow dichlobenil applications after 2 to 4 weeks with a complete weed foliage coverage of a contact herbicide, such as: (1) dinoseb (Dow General, Premerge, Sinox General) at 2.5 pounds active ingredient (.5 gallon of 5 pounds/gallon Dow General) plus 2 gallons of Summer Spray Oil in 50 gallons or more of water per acre; or (2) paraquat (Paraquat CL) at 1 pound active ingredient (.5 gallon of 2 EC Paraquat CL) per acre as a coarse directed spray at 30 p.s.i. to avoid drift injury to young canes from fine mist.

### **Simazine (Princep)**

Simazine at 4 pounds active ingredient (5 pounds of 80 W Princep) per acre is effective against a number of weeds and grasses. Apply in winter while plants are dormant.

#### **Precautions:**

1. Do not make more than one application per year.
2. Do not apply to plants that have been in the field less than one year.

For a more effective control of perennial weeds, follow simazine application with a complete weed foliage coverage using a contact herbicide, such as: (1) dinoseb at 2.5 pounds active ingredient (.5 gallon of 5 pounds/gallon Dow General) per acre plus 2 gallons of Summer Spray Oil per 50 gallons of water per acre; or (2) paraquat at 1 pound active ingredient (.5 gallon of 2 EC Paraquat CL) per acre. Using a contact herbicide will stop weed growth and give a simazine a better chance to work.

### **Diuron (Karmex)**

Diuron at 1.6 pounds active ingredient (2 pounds of 80 W Karmex) per acre, or simazine at 2 pounds active ingredient (2.5 pounds of 80 W Princep) per acre may be used to control annual weeds. Apply in October and again in the spring before emergence of annual weeds. This treatment is not effective against perennial weeds or weeds growing in muck or mulched soils.

## **PERENNIAL GRASS CONTROL**

Perennial grasses are most easily controlled by herbicide applications in November to January while grasses and crop plants are dormant.

### **Pronamide (Kerb)**

Pronamide will control most perennial grasses. Apply at 2 pounds active ingredient (4 pounds of 50 W Kerb) per acre. Applications must be followed by irrigation or precipitation. Make applications from November to January. Pronamide will not control groundsel, pineappleweed, sowthistle, wild lettuce, or Canada thistle. For control of these weeds, use with an early spring application of dichlobenil, terbacil, or simazine. Pronamide is not effective on muck soils or mulched plantations.

### **Chlorpropham (Furloe, CIPC)**

Chlorpropham will control some perennial grasses. Make application in late fall at 12 pounds active ingredient (3 gallons of 4 EC Furloe) per acre. For hard-to-kill grasses, make fall application and repeat in the spring before grasses emerge from the soil. Chlorpropham will control annual grasses: make application in spring before grasses emerge from the soil.

## **PERENNIAL AND ANNUAL BROADLEAF AND GRASS WEED CONTROL**

Terbacil (Sinbar) is effective in controlling many different weed species (including cinquefoil, hawkweed, red sorrel, crabgrass, orchardgrass, quackgrass, and annual sedge) in blueberry plantings that have been established in the field for at least one year. Make a single band or broadcast application



beneath bushes during late February to late March. Fall applications have not provided adequate control in western Washington due to heavy rainfall. Spring applications made after late March have caused severe injury on the lighter textured soils.

Terbacil has been used for weed control in blueberries grown on Camas clay loam, Puyallup sandy loam, Mossy Rock silt loam, and muck soils. Control has been excellent in most cases. Rates to use are governed by soil texture (see the table):

Soil Texture	Lb Active	
	1 to 3% Organic Matter	More Than 3% Organic Matter
1. Sandy, loamy sand	DO NOT USE	1.6 (2 lb 80 W Sinbar)
2. Sandy loam	.6 (2 lb 80 W Sinbar)	2.4 (3 lb 80 W Sinbar)
3. Loam, silt loam, silt, sandy clay, sandy clay loam	2.4 (3 lb 80 W Sinbar)	3.2 (4 lb 80 W Sinbar)
4. Silty Clay, silty clay loam, clay, clay loam	3.2 (4 lb 80 W Sinbar)	3.2 (4 lb 80 W Sinbar)

Terbacil should be applied before the weeds emerge from the soil or in the seedling stage, for best results. If weed growth is beyond the seedling stage use a surfactant, such as DuPont's Surfactant WK, Accutrol, Multifilm, X-77, or Adjuvant-T, at the rate of 1 pint per 25 gallons of water per acre. If weed growth is heavy, use 50 gallons or more of water per acre.

**Precautions:**

1. Do not apply after March since injury can result to plants grown on coarse-textured soils.
2. Do not use on sands or sandy loams containing less than 3% organic matter.
3. Do not make more than one application per year.
4. Do not permit spray to contact blueberry plant foliage.
5. Do not apply to soils where water may be standing for prolonged periods. Terbacil has a water solubility of 710 ppm and will be readily absorbed by blueberry roots causing injury.

Terbacil may be followed in 2 to 4 weeks with complete weed foliage coverage of a contact herbicide to knock down existing weed growth. The following herbicides may be used in 50 gallons of water per acre.

Herbicides	Lb Active Ingredient Per Acre
Paraquat	1.0 (.5 gal of 2 EC Paraquat CL)
Dinoseb (plus 2 gal Summer Spray Oil per 50 gal of water per acre)	2.5 (.5 gal of 5 lb/gal Dow General)

## METHOD OF APPLICATION

Uniform application is absolutely necessary if herbicides are to provide the desired results. Treatment rates are low. For example, only 2 pounds of 80% simazine powder are needed per acre. Such a small amount of material spreads very thinly over an acre. Variations in the spray pattern, 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 spray rig:

1. Can apply material at low pressures, 30 to 40 pounds per square inch as read on the gauge.
2. Can apply 40 to 60 gallons of spray per acre.
3. Has nozzles evenly spaced, 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, instead of just covering the row.
6. Has nozzle tips that deliver the rated volume of spray (test the output of the individual tip to determine its accuracy relative to the anticipated).

Simazine, dichlobenil, diuron, pronamide, and terbacil are wettable powders that do not dissolve in water. Consequently, you must take several additional precautions to insure maintaining a uniform application.

### Additional Precautions:

1. Screens in the lines and nozzles should be no smaller than 50 mesh to avoid clogging.
2. The material will settle to the bottom of the tank if not constantly agitated. Either continuous mechanical agitation by paddles in the tank or hydraulic agitation by return-flow jets is necessary.
3. Wettable powders are abrasive; therefore, these herbicides should not be used in gear, roller, or impeller pumps. The clearances in these positive-displacement pumps are close; therefore, they wear quickly when abrasives are pumped.
4. Nozzles wear readily, too. As a result, the amount of spray being pushed through the nozzle will constantly increase. The spray rig must, therefore, be properly designed and calibrated often if you are to be sure of the amount of material being applied per acre.

*Note:* All rates of application are given in pounds active ingredient per acre; also, rates of application are based on complete (overall) coverage, not just banded or over the row.

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## APPROXIMATE METRIC WEIGHTS AND MEASURES

### COMMON EQUIVALENTS

<b>Metric</b>	<b>U.S.</b>	<b>U.S.</b>	<b>Metric</b>
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

<b>Metric</b>	<b>U.S.</b>	<b>U.S.</b>	<b>Metric</b>
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

<b>Celsius (Centigrade)</b>	<b>Fahrenheit</b>	<b>Fahrenheit</b>	<b>Celsius (Centigrade)</b>
-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

