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Commercial Blackberry, Strawberry, and Blueberry Insect and Disease Control – 2011

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The amount of insecticide or fungicide to use is given in per gal amounts for the home or backyard grower and in per 100 gal/acre amounts for the commercial grower. The home or backyard grower can determine the amount of spray needed to cover their plants completely by filling their sprayer with water and then spraying their plants until the water is almost ready to drip off the leaves. Determine how much water was used and add the correct amount of chemical from the appropriate table below. Commercial growers should calibrate their sprayers by spraying a measured area, measure the amount of water needed to refill the tank. Divide this amount by the fraction of an acre sprayed to get the gallons applied per acre. Mix the amount of chemical desired per acre with water to give this much spray material.

BLACKBERRIES*

For commercial growers, use the rate/acre column regardless of the amount of water you are spraying per acre. Read and follow all label directions. For home gardeners, if no rate is given then the product(s) are not recommended for home use.

Application and Timing	*Pests Involved*	*Amount of Materials Needed*[2] *Material*[1] *(MOA Group)*	*Per Gallon*	*Per Acre*
DORMANT: February - before bud break. Remove and destroy dead canes. This is a critical spray for good disease control especially if these diseases have been a serious problem	Anthracnose Cane Blight Spur Blight (raspberries only)	Lime-sulfur (M4) Kocide 50WP (M4)	See label See Label	12-24 gal 4 lbs
	Phytophthora Root Rot	Aliette 80WDG (21) Ridomil Gold EC (4) (raspberries only)	See label	See label
PRE-BLOOM: Just before blossoms open. To protect bees do not use insecticides during bloom.	Leafhoppers Aphids Leafrollers	Malathion 25W (1B) Guthion 50WP[r4] (1B) Brigade 2EC[r] (3) Mustang-Max[r] (3) Adjourn[r](3)	2 tbs – – – –	4 lb 0.5-0.63 lb 3.2-6.4 oz 4 oz 4.8-9.6oz
	Raspberry crown borer[3]	Brigade 2EC[r] (3)	–	6.4 oz 2 qt/100 gal/A

BLACKBERRIES (continued)

Application and Timing	*Pests Involved*	*Amount of Materials Needed*[2] *Material*[1] *(MOA Group)*	*Per Gallon*	*Per Acre*
Fungicide applications prior to bloom should not be necessary unless these diseases have been a serious problem. This especially true if a dormant application of lime-sulfur is made.	Anthracnose, Cane Blight *Raspberry leaf spot, *Septoria leaf spot	Abound (11) Cabrio (11) Pristine (11, 7) Captan 80 WDG (M4)	– – – –	6.2-15.4 oz 14 oz 18.5-23 oz See label
	Rusts, Powdery Mildew, *Raspberry leaf spot, * Septoria leaf spot	Nova 40WP (3) Cabrio (11) Pristine (11, 7)	See Label – –	2.5 oz 14 oz 18.5-23 oz
BLOOM THROUGH HARVEST: During bloom make three fungicide applications. The first should occur no later than 5% bloom; make the second application at full bloom; follow with the third application as petals begin to fall.	Anthracnose, Cane Blight and Spur Blight (reds only), *Raspberry leaf spot, *Septoria leaf spot	Same as Pre-Bloom		
	Rusts, Powdery Mildew, *Raspberry leaf spot, *Septoria leaf spot	Same as Pre-Bloom		
	Botrytis fruit rot (only)	Rovral 50WP (2) Elevate 50WG (17) CaptEvate 68WDG (17, M4) Pristine (11, 7)	– – – –	1-2 lb 1.5 lb 3.5 lb 18.5-23 oz
ANYTIME AFTER HARVEST (Sept. 15-Oct. 1) Post harvest sprays are probably most important for leaf spot diseases. When diseases are severe, most defoliation occurs post harvest.	Cane Borers	Remove and burn infested canes.		
	Raspberry Crown Borer[4]	Brigade 2EC[r] (3) Capture	– –	6.4 oz 6.4 oz
	*Raspberry leaf spot, *Septoria leaf spot	Same as Bloom through harvest.		

[r] Restricted Use Pesticide

MOA Group Tables start on page 46 of E-834 Extension Agents Handbook of Insect, Disease and Weed Control.

[1] See Table 1 for date of last application prior to harvest.

[2] tbs = tablespoon; lb = pound; gal = gallon.

[3] Apply 2-4 qt/acre in a minimum of 100 gal of water as a drench to the crown area and lower canes. Drench will kill borers already hatched in soil. Not recommended for homeowners.

[4] Guthion is a highly toxic insecticide. It should be used by commercial grower only.

[5] Raspberry crown borer is a significant pest of caneberries in Oklahoma and will eventually cause the demise of plants if left uncontrolled. Seasonal treatment each year is recommended. Capture applied in late October or early November as a soil drench to the lower canes and soil around the canes will provide excellent control if adequate (50-100 gallons/acre) water is applied with the material. This is a restricted use chemical, not recommended for home-owners.

* All diseases, information and fungicide treatments are applicable to both blackberries and raspberries unless otherwise noted.

STRAWBERRIES

Read and follow all label directions. For commercial growers, use the rate per acre column, regardless of the amount of water you are spraying per acre. For home gardeners, if no rate is given then the product is not recommended for home use.

Application and Timing	*Pests Involved*	*Amount of Materials Needed*[2] *Material*[r] *(MOA Group)*	*Per Gallon*	*Per Acre*
PRE-BLOOM: Just before bloom (separation of blossom buds). Timing is important in controlling the strawberry weevil. To protect bees do not use insecticides during bloom.	Strawberry Root Weevil	Malathion 25W (1B) or	4-6 tbs	4-6 lb
		Sevin 50W (1A) or	2-4 tbs	2-4 lb
		Malathion 57% EC (1B)	0.66-0.2 tbs	1.5-2.5 pt
		Brigade WSB[r] (3)	–	8.0-32.0 oz
	Leaf Spot, Leaf scorch, Leaf blight, Powdery mildew Anthracnose[3]	Captan 50WP (M4)	–	6 lb
		Nova 40WP (3)	–	2.5 – 5.0 oz
		Cabrio 20EG (11)	–	14 oz
		Pristine (11, 7)	–	18.5 – 23 oz
		Abound (11)	–	6.2 – 15.4 oz
	Phytophthora diseases (red stele and Leather rot)	Ridomil Gold EC (4)	–	1 pt
		Aliette 80 WDG (21)	–	2.5-5 lb
BLOOM: This is the most critical period for control of Botrytis fruit rot with fungicides.	Botrytis Blossom Blight and Fruit Rot	Topsin M WSB (1)	–	¾-1lb
		Elevate 50WG (17)	–	1.5 lb
		Switch (9)	–	11-14 oz
		Captan 50WP (M4)	–	6 lb
		Pristine (11, 7)	–	18.5 – 23 oz
	Anthracnose	Abound (11)	–	6.2-15.4 oz
		Cabrio (11)	–	14 oz
		Pristine (11, 7)	–	18.5-23 oz
		Switch (9)	–	11-14oz
		Captan 50WP (M4)	–	6 lb
	Leaf Spot, Leaf scorch, Leaf blight, Powdery mildew[3]	Abound (11)	–	6.2-15.4 oz
		Cabrio (11)	–	14 oz
		Pristine (11, 7)	–	18.5-23 oz
		Nova 40W (3)	–	2.5-5 oz
		Procure 50WS (3)	–	4-8 oz
POST BLOOM: After the blossoms have fallen.	Aphids	Brigade WSB[r] (3)	–	8.0-32.0 oz
		Guthion 2L[r] (1B)	–	2 pts
		Lannate LV[r] (1A)	–	1.5-3.0 pts
		Malathion 25W (1B) or	2.5 tbs	2.5 lb
		Malathion 57% EC (1B)	0.66 tbs	1.5 pts
		Pasada 1.6F (4A)	–	3.75 oz
		Thiodan 3EC (2A)	–	1.3 qt
	Leafrollers	Danitol 2.4EC (3)	–	10.66 oz
	Spittlebugs	Javelin (B.t.) (11B2)	0.24-1.4 tsp	0.5-4.0 lbs
	Sowbugs	Guthion 2L[r] (1B)	–	2 pts
		Malathion 25W (1B) or	4-6 tbs	4-6 lb
		Sevin 50W (1A) or	2-4 tbs	2-4 lb
		Malathion 57% EC (1B)	0.66-1.5 tbs	1.5-2.5 pts
	Lygus Bugs	Brigade WSB[r] (3)	–	8.0-32.0 oz
		Danitol 2.4EC (3)	–	16.0-21.33 oz
		Malathion 25W (1B) or	4-6 tbs	4-6 lb
		Malathion 57% EC (1B)	0.66-1.5 tbs	1.5-2.5 pts

STRAWBERRIES (continued)

Application and Timing	*Pests Involved*	*Material[1] (MOA Group)*	*Amount of Materials Needed[2] Per Gallon*	*Per Acre*
	Mites	Acramite 50WS (25)	–	0.75-1.0 lb
		Agri-mek 0.15 EC (6)	–	16 fl oz
		Brigade WSB[r] (3)	–	16.0-32.0 oz
		Danitol 2.4EC (3)	–	16.0-21.33 oz
		Vendex 50WP[r] (12B)	–	1.5-2 lb
		Zeal (10B)	–	2-3 oz
	Botrytis Blossom Blight and Fruit Rot	Same as Bloom. Subsequent applications may be necessary. Check label for recommendations and restrictions near harvest.		
	Anthracnose			
	Leaf Spot, Leaf scorch, Leaf blight, Powdery mildew[3]			

MOA Group Tables start on page 46 of E-834 Extension Agent's Handbook of Insect, Disease and Weed Control.

[1] See Table 1 for date of last application prior to harvest. If no number is provided then that chemical cannot be used on that crop

[2] tbs = tablespoon; tsp = teaspoon; pt = pint; qt = quart; lb = pound; gal = gallon.

[3] Nova is highly effective for control of powdery mildew and leaf blight. Captan and will not control powdery mildew. Cabrio, Pristine, and Abound are registered for Leafspot, Powdery Mildew and Anthracnose.

Chemical classifications can be found at the following Web sites: **Herbicides**-http://www.plantprotection.org/hrac/; **Insecticides**-http://www.irac-online.org/; and **Fungicides**-http://www.frac.info/.

BLUEBERRIES

For commercial growers, use the rate/acre column regardless of the amount of water you are spraying per acre. Read and follow all label directions. For home gardeners, if no rate is given, then the product is not recommended for home use.

DELAYED DORMANT: Just before bud break	Scale insects	Superior Oil or	4 tbs	3 gal
		Lime sulfur (M4)	7 tbs	5 gal
	Phomopsis cane and Twig Blight	Lime sulfur (M4)	7 tbs	5 gal
	Phytophthora Root Rot	Ridomil Gold EC (4)	–	3.6 pt
		Alliette 80WDG (21)	–	5 lb
PRE-BLOOM: Just before blossoms open	Leafrollers	Javelin (B.t.) (11B2)	0.12-0.5 tsp	0.5-4.0 lb
		Mustang-Max[r] (3)	–	4 oz
		Sevin 50W (1A)	2-4 tbs	2-4 lb
	Blossom weevil	Sevin 50W (1A)	2-4 tbs	2-4 lb
	Mummy berry (shoot blight phase)	Ziram 76DF (M4)	2 tbs	3 lb
		Captan 50WP (M4)	–	5 lb
		Indar 75 WSP (3)	–	2 oz
	Stem Canker and Stem blight	Captan 50WP (M4)	–	5 lb
		Ziram 76DF (M4)	–	3 lb
MID-BLOOM: Do not use chemical insecticides during bloom.	Leafrollers	Dipel, Javelin or	2 tsp	2 qt
		Mustang-Max[r] (3)	–	4 oz
		Thuricide (11B2)	1.5 tsp	1 lb
	Mummy berry (blossom infection), botrytis blight, Stem canker and stem blight, Anthracnose	Abound (11)		6.2-15.4 oz
		Cabrio (11)		14 oz
		Pristine (11, 7)		18.5-23 oz
		CaptEvate 68WDG (17, M4)	–	3.5-4.7 lb
		Ziram 76DF (M4)	–	3 lb

Application and Timing	*Pests Involved*	*Amount of Materials Needed*[2] *Material*[r] *(MOA Group)*	*Per Gallon*	*Per Acre*
	Botrytis blight	Elevate 50WG (17)	–	1.5lb
		Captevate 68WDG (17, M4)	–	3.5 – 4.7lb
FIRST POST-POLLINATION: (about May 25 to June 1)	Leafrollers Leafhoppers Leaf Miners	Javelin (B.t.) (11B2)	0.12-0.5 tsp	0.5-4.0 lb
		Mustang-Max[r] (3) (Leafrollers only)	–	4 oz
	Cherry Fruitworm	Lannate LV[r] (1A)	1 tsp	1.5-3 pt
	Aphids	Sevin XLR Plus (1A)	1 tbs	1.5-2 qt
	Plum Curculio	Adjourn[r](3)	–	4.8-9.6 oz
	Anthracnose, Stem canker and stem blight	Abound (11)	–	6.2-15.4 oz
		Cabrio (11)	–	14 oz
		Pristine (11, 7)	–	18.5-23 oz
		Captan 50WP (M4)[3]	–	5 lb
SECOND POST-POLLINATION: 7 to12 days after First Post-Pollination Spray	Leafrollers Leafhoppers Leaf Miners Cherry Fruitworm	Same as First Post-Pollination Spray.		
	Anthracnose, Stem canker and stem blight	Same as First Post-Pollination Spray		
ADDITIONAL COVER SPRAYS: Apply every 7 to 12 days as needed.	Leafrollers Leaf Miners Fall Webworms	Guthion 50WP[r] (1B)	0.5 tsp	1.5 lb
		Javelin (B.t.) (11B2) (Not for Leaf Miners or Leafhoppers)	0.12-0.5 tsp	0.5-4.0 lb
	Anthracnose, Stem canker and stem blight	Same as Second Post-Pollination Spray		
MAGGOTS: When flies start to lay eggs (about June 28). Repeat every 10 days through harvest.	Blueberry Maggot	Malathion 25WP (1B)	2 tbs	4 lb
		Sevin XLR Plus (1A)	1 tbs	1.5-2 qt
		Lannate LV[r] (1A)	–	0.75-1.5 pts
POST-HARVEST: If canker is a problem, apply post-harvest sprays at 4 to 6 week intervals until leaf drop in the fall.	Stem canker and stem blight	Captan 50WP (M4)	–	5lb

[r] Restricted Use Pesticide.

MOA Group Tables start on page 46 of E-834 Extension Agent's Handbook of Insect, Disease and Weed Control.

[1] See Table 1 for date of last application prior to harvest.

[2] tbs = tablespoon; tsp = teaspoon; pt = pint; qt = quart; gal = gallon; lb = pound[3]Apply only if these diseases are a problem. Observe harvest restrictions.

Chemical classifications can be found at the following Web sites: **Herbicides**-http://www.plantprotection.org/hrac/; **Insecticides**-http://www.irac-online.org/; and **Fungicides**-http://www.frac.info/.

Table 1. Days Waiting Time — Last Application Before Harvest.

CHEMICAL	Number of Days Before Harvest		
	BLACKBERRIES	STRAWBERRIES	BLUEBERRIES
Abacus[r]	–	3	–
Abound	0	0	0
Acramite			
Agri-mek 0.15 EC	–	3	–
Aliette 80 WDG	60	0	0
Atrapa 8E	1	3	1
Brigade 2EC[r]	3	–	–
Brigade WSB[r]	0	0	–
B.t. (Dipel, Javelin, Thuricide)	0	0	0
Cabrio	0	0	0
Captan	3	0	0
Dicofol 4E	–	2	–
Elrvate 50WG	0	0	–
Guthion[r]	14	5	–
Imidan 50WP or 70WP	–	–	–
Javelin	0	0	0
Kelthane	–	2	–
Lannate LV[r]	–	3 (Fresh)	3
	–	10 (Processing)	–
Lorsban 4E[r]	–	21	–
Malathion	1	3	1
Nova 40W	0	0	–
Pasada	–	7	–
Pristine	0	0	0
Procure 50WS	1	1	–
Ridomil Gold EC	60 (raspberries only)	–	–
Sevin	7	–	–
Switch	0	0	0
Thiodan 3EC	–	1	–
Topsin M WSB	1	1	–
Vendex 50WP[r]	–	4	–
Zeal	–	1	–
Ziram	–	–	14

[r] Restricted Use Pesticide.

*Guthion 2L - up to 3 oz - 0 days; above 3 oz - 7 days. Application by backpack or hand wand sprayers is prohibited. Re-entry period is 4-5 days, 5 days if area receives less than 24 inches of annual rainfall.

Publications that may be helpful: Fact Sheet 6213, Weed Management in Small Fruit Crops; Fact Sheet 6214, Growing Strawberries in the Home Garden; Fact Sheet 7612, Plant Disease Diagnostic Service; Fact Sheet 6239, Commercial Blackberry Production; Fact Sheet 6215, Home Culture of Blackberries.

CULTURAL CONTROL METHODS

With more chemicals being removed from the market, growers must have successful ways of controlling disease and insects through cultural means. Disease and insects may be controlled or the effects of these pests can be reduced using cultural methods. The methods to consider are site selection, maintaining good soil conditions, sanitation, and purchase of healthy, and where available, resistant varieties.

A well chosen site includes good air drainage to reduce spring frost damage, circulation, and adequate soil water drainage. Sites with these qualities improve plant growth and decrease plant susceptibility to insects and disease. Orienting rows for good sun exposure and natural air movement will dry leaves and fruit quickly. Raised beds improve soil drainage and reduce infections by root diseases. Proper site selection to decrease plant stresses, such as cold injury and buffeting by winds, can reduce attack by insects and diseases. New plantings located near old established areas may have greater risks of insect and disease populations from the old sites than plantings on isolated areas. Destroying native plant species in the immediate area that harbor harmful insects or diseases can reduce pest problems.

An important disease and insect control procedure is the planting of adapted, healthy, disease and insect resistant varieties. Plants should be purchased from reliable sources, and only healthy looking stock planted. Variety selection should be based on adaptation to the area, such as cold hardiness, heat tolerance, adaptation to soils, and ability to produce acceptable yields of high quality fruit. Varieties will vary in the degree of susceptibility to an insect or disease. The nursery, supplier or county agent should have a recent list of adaptive and resistant cultivars that are available for planting in Oklahoma.

Maintaining proper soil moisture and fertilization can insure healthy plants. These plants will be more resistant to disease and insect damage than plants over or under fertilized or watered. Annual leaf analysis and soil analysis can be used to determine fertilization rates. Rainfall and soil moisture should be monitored to determine when to irrigate plants. Tensiometers, watermarks or some other form of measuring soil moisture may be used to determine when irrigation is necessary in larger plantings. This may not be necessary in smaller plantings where rainfall and stress of plants can be monitored directly.

Sanitation is important in controlling some insects, and especially in controlling diseases. Diseased and dead branches should be removed and when necessary, entire plants should be removed to reduce overwintering sites for insects and pathogens. These infected materials should be burned or removed from the site. Unharvested fruit, leaf litter and pruning's should be removed to decrease the spread and population increase of insects and diseases. Pruning equipment should be disinfected before, during and after use to avoid transmitting disease during pruning. A solution of 10 percent chlorine bleach and 90 percent water is a good disinfectant.

Weed control is essential for plant growth and production. Economic losses due to weeds are sometimes greater than those caused by insects or diseases. Weeds compete directly with crops for nutrients, water and light and serve as hosts for insects and diseases. Weeds may also interfere with pesticide application, harvesting and air circulation in planting. To control weeds, an integrated program using cultural practices (such as pulling or hoeing weeds) along with herbicides is the most effective. Suitable herbicides for weed control in small fruit plantings are listed in Fact Sheet HLA-6243, "Weed Control in Small Fruit Crops."

The above cultural practices along with timely applications of pesticides will produce high quality fruit. It is usually necessary to use each of these cultural methods along with pesticides to attain good control leading to healthier plants, higher quality fruit and greater yields.

Following is a list of specific cultural methods for controlling various insects and diseases in blueberry, strawberry and blackberry production. These methods can be used alone or in conjunction with insecticides and fungicides to limit the spread of insects and diseases.

BLUEBERRY

Red and necrotic ringspot and blueberry stunt

Plant disease-free stock. Remove and burn diseased plants. Control insects which may be vectors of disease.

Phytophthora root rot

Limit movement of soil and water to lessen disease damage.

Anthracnose

No cultural method of control.

Botrytis, blossom and fruit rots

Ensure good air circulation and sun exposure to quickly dry wet leaves.

Phomopsis twig and cane blight

Prune and burn diseased wood.

Stem canker (various fungi)

Purchase disease-free stock. Purchase resistant varieties. Remove dead and dying branches 6-8 inches below diseased wood.

Climbing cutworm

Hand pick off of blossom when they become numerous enough to warrant control.

Blueberry bud mite

Selectively prune out old canes to reduce populations. Choose non-susceptible varieties.

Fall webworm

Destroy webs by hand.

STRAWBERRY

Strawberry weevil

Use the same bed less than three years. Plow under old beds immediately after harvest. Renovate existing beds by mowing or removing foliage and mulch.

Mites

Purchase mite-free stock. Isolate new plantings from established plantings. Make sure plants are healthy and well-watered. Use a water hose to wash mites from plants.

Lygus bugs

Control weeds in and near planting to reduce host plants from insects and disease.

Weeds or alfalfa that have been growing should not be removed during the strawberry blossom period, because the insects will move into the strawberries.

Leaf spot

Plant disease-free stock.

Powdery mildew

Kill or burn leaves which fungal structures are on. Purchase resistant varieties.

Leaf scorch

Frequent renewal of plantings. Purchase resistant varieties.

Anthracnose

Remove plant debris and mulch. Purchase resistant varieties, where available. Use only enough fertilizer to establish plants, but do not over fertilize them. If any signs of anthracnose occur, discontinue all applications of nitrogen and potassium.

BLACKBERRY

Anthracnose

Remove and burn old canes.

Cane boreres

Remove and burn infested canes.

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