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Commercial Blackberry, Strawberry, and Blueberry Insect and Disease Control – 2007

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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*	*Material (Group)*	*Amount of Materials Needed*[1] *Per Gallon*[2]	*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 and Spur Blight (raspberries only)	Lime-sulfur (M4) Kocide 50WP (M4)	See label 2 lbs	12-24 gal 4 lbs
PRE-BLOOM: Just before blossoms open. To protect bees do not use insecticides during bloom.	Leafhoppers Aphids Leafrollers	Malathion 25W (1B) Atrapa 8E (1B)	2 tbs –	4 lb 2 pts
	Raspberry crown borer[3]	Diazinon AG500 (1B)	1.33 tbs	2 qt/100 gal/A
	Phytophthora Root Rot	Aliette 80WDG (21) Ridomil Gold EC (4) (raspberries only)	 See label	 See label

BLACKBERRIES (continued)

Application and Timing	*Pests Involved*	*Material (Group)*	*Amount of Materials Needed*[1] *Per Gallon*[2]	*Per Acre*
Fungicide applications prior to bloom should not be necessary unless these diseases have been a serious problem.	Anthracnose, Cane Blight and Spur Blight (raspberries only)	Abound (11) Cabrio (11) Pristine (11, 7)	– – –	6.2-15.4 oz 14 oz 18.5-23 oz
	Rusts, Powdery Mildew and Leaf Spots	Nova 40W (3) Captan 80 WDG (M4)	1.25-2.5 oz 2.5 lb	
BLOOM THROUGH HARVEST		Same as Pre-Bloom		
ANYTIME AFTER HARVEST (Sept. 15-Oct. 1)	Cane Borers	Remove and burn infested canes.		
	Raspberry Crown Borer[4]	Capture 2EC[r] (3)	–	6.4 oz
	Rusts, Powdery Mildew	Nova 40WP (3)	–	2.5 oz

[r] Restricted Use Pesticide

[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] 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 to 100 gallons/acre) water is applied with the material. This is a restricted use chemical, not recommended for homeowners.

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

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/.

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*	*Material (Group)*	*Amount of Materials Needed*[1] *Per Gallon*[2]	*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 Sevin 50W (1A) or Malathion 57% EC (1B) Brigade WSB[r] (3)	4-6 tbs 2-4 tbs 0.66-0.2 tbs –	4-6 lb 2-4 lb 1.5-2.5 pt 8.0-32.0 oz
	Phytophthora diseases	Ridonil Gold EC (4) Aliette 80 WDG (21)	– –	1 pt 2.5-5 lb
BLOOM	Botrytis Blossom Blight and Fruit Rot	Topsin M WSB (1) Elevate 50WG (17) Switch (9) Captan 50WP (M4)	– – – –	.75-1lb 1.5 lb 11-14 oz 6 lb
	Anthracnose	Abound (11) Cabrio (11) Pristine (11,7) Switch (9) Captan 50WP (M4)	– – – – –	6.2-15.4 oz 14 oz 18.5-23 oz 11-14 oz 6 lb
	Leaf Spots	Nova 40W (3) Cabrio (11) Pristine (11, 7) Topsin M WSB (1)	– – – –	2.5-5 oz 14 oz 18.5-23 oz .75-1 lb

STRAWBERRIES (continued)

Application and Timing	*Pests Involved*	*Material (Group)*	*Amount of Materials Needed*[1] *Per Gallon*[2]	*Per Acre*
	Powdery Mildew	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
		Topsin M WSB (1)	–	.75-1 lb
POST BLOOM: After the blossoms have fallen.	Aphids	Brigade WSB[r] (1)	–	8.0-32.0 oz
		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
		Thionex (2A)	–	1.3 qt
		Atrapa 8E (1B)	–	2 pts
	Leafrollers	Danitol 2.4EC (3)	–	10.66 oz
	Spittlebugs	Javelin (B.t.) (11B2)	0.24-1.4 tsp	0.5-4.0 lbs
	Sowbugs			
		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
	Mites	Abacus[r] (6)	–	16.0 oz
		Acramite 50WS (25)	–	0.75-1.0 lb
		Atrapa 8E (1B)	–	2 pts
		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
		Dicofol 4E (20)	–	2 pts
		Kelthane 35WP (20) or	0.5 tbs	0.9 lb
		Kelthane MF (20)	1 tsp	2 pts
		Vendex 50WP (12B)	–	1.5-2 lb
		Zeal (10B)	–	2-3 oz
	Leaf Diseases, Anthracnose, Powdery Mildew, and Fruit Rot	Same as Bloom. Subsequent applications may be necessary. Check label for recommendations and restrictions near harvest.		

[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 Thiram will not control powdery mildew.

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.

Application and Timing	*Pests Involved*	*Material (Group)*	*Amount of Materials Needed*[1] *Per Gallon*[2]	*Per Acre*
DELAYED DORMANT: Just before bud break	Scale insects	Superior Oil or	4 tbs	3 gal
		Lime sulfur (M4)	7 tbs	5 gal
	Phomopsis Twig Blight	Lime sulfur (M4)	7 tbs	5 gal
	Phytophthora Root Rot	Ridomil Gold EC (4)	–	3.6 pt
		Aliette 80WDG (21)	–	5 lb

BLUEBERRIES (continued)

Application and Timing	*Pests Involved*	*Material (Group)*	*Amount of Materials Needed*[1] *Per Gallon*[2]	*Per Acre*
PRE-BLOOM: Just before blossoms open	Leafrollers	Javelin (B.t.) (11B2)	0.12-0.5 tsp	0.5-4.0 lb
		Sevin 50W (1A)	2-4 tbs	2-4 lb
	Blossom Weevil	Sevin 50W (1A)	2-4 tbs	2-4 lb
	Phomopsis Twig Blight and Mummy Blight (shoot phase)	Ziram (76DF, Granuflo) (M4)	2 tbs	3lb
MID-BLOOM: Do not use chemical insecticides during bloom.	Leafrollers	Dipel, Javelin or Thuricide (11B2)	2 tsp 1.5 tsp	2 qt 1 lb
	Phomopsis Twig Blight, Anthracnose and Mummy Blight	Abound (11)	–	6.2-15.4 oz
		Cabrio (11)	–	14 oz
		Pristine (11, 7)	–	18.5-23 oz
		Switch (9)	–	11-14 oz
		Ziram (76DF, Granuflo) (M4)	2 tbs	3 lb
	Anthracnose and Mummy Blight	Captan (50W, 80WDG, 4L) (M4)	–	See label.
FIRST POST-POLLINATION: (about May 25 to June 1)	Leafrollers Leafhoppers	Javelin (B.t.) (11B2) (Leafrollers only)	0.12-0.5 tsp	0.5-4.0 lb
	Leaf Miners	Lannate LV[r] (1A)	1 tsp	1.5-3 pt
	Cherry Fruitworm	Sevin XLR Plus (1A)	1 tbs	1.5-2 qt
	Aphids Plum Curculio	Atrapa 8E (1B)	–	2 pts
	Phomopsis Twig Blight Anthracnose, and Mummy Berry	Same as Mid-Bloom Spray.		
SECOND POST-POLLINATION: 7-12 days after First Post-Pollination Spray	Leafrollers Leafhoppers Leaf Miners Cherry Fruitworm	Same as First Post-Pollination Spray.		
	Phomopsis Twig Blight and Blight, Anthracnose	Same as First Post-Pollination Spray		
ADDITIONAL COVER SPRAYS: Apply every 7-12 days as needed.	Leafrollers Leaf Miners Fall Webworms	Javelin (B.t.) (11B2) (Not for Leaf Miners or Leafhoppers)	0.12-0.5 tsp	0.5-4.0 lb
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 (1A)	–	.75-1.5 pts
POST-HARVEST: When 2/3 leaves have dropped. Repeat after 14 days.	Phomopsis Twig Blight	Lime sulfur (M4)	7 tbs	5 gal

[r] Restricted Use Pesticide.
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.

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	—	1	—
Agri-mek 0.15 EC	–	3	–
Aliette 80 WDG	60	0	0
Atrapa 8E	1	3	1
Brigade WSB	0	0	–
B.t. (Dipel, Javelin, Thuricide)	0	0	0
Cabrio	0	0	0
Captan	0	0	0
Dicofol 4E	–	2	–
Elevate 50WG	0	0	–
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
Thionex	–	1	–
Topsin M WSB	1	1	–
Vendex 50WP[r]	–	4	–
Zeal	–	1	–
Ziram	–	–	14

[r] Restricted Use Pesticide.

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 educator should have a recent list of adaptive and resistant cultivars that are available for planting in Oklahoma.

Maintaining proper soil moisture and fertilization can ensure 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 prunings 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 Extension Fact Sheet F-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 to 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 mycelia 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.

Publications that may be helpful:

F-6213, Weed Management in Small Fruit Crops
F-6214, Growing Strawberries in the Home Garden
F-7612, Plant Disease Diagnostic Service
F-6239, Commercial Blackberry Production
F-6215, Home Culture of Blackberries

The Oklahoma Cooperative Extension Service
Bringing the University to You!

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

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