

Crop Profile for Raspberry in Ohio

Rosaceae Rubus spp.

Prepared: September, 2000

General Production Information

- Acres in Ohio: 245
- Percent of US Acreage/Rank: 1.4%/6th
- Number of Growers: 181

Location Of Production:(1)

Counties with the most acres in raspberries are located in the Northeast and West-Central regions of the state. The following counties have significant acres devoted to raspberry production in the state: Lake (25A), Champaign (22A), Columbiana (17A), Portage (16A) and Lorain (14A).

Production Methods:(3)

Good site selection is important in raspberry production. The site should have full exposure to sun, good air circulation, protection from cold in winter and well-drained soil. New raspberries are planted in raised beds about 8 inches high and 4 feet wide. Raspberries should not be planted in areas where potatoes, tomatoes or eggplant had been previously planted to protect against verticillium wilt, or near wild brambles because they can harbor insect pests and diseases. One to two years before planting, adjust the soil pH (6 – 6.5), phosphorus content (25 – 40 lbs.), potassium content (280 – 320 lbs.) and organic matter content (2 – 4%). Plant only disease-free certified plants in rows at least 8 feet apart but preferably 10 – 12 feet to allow for good air circulation and enough room for pruning and harvesting.

If proper nutrients have been added prior to planting, nitrogen should be the only nutrient needed during the first year of growth. Broadcast 20 – 30 lbs. of nitrogen 1 – 2 weeks after planting using a low nitrogen fertilizer to reduce plant injury. Broadcast 40 – 70 lbs. of nitrogen in the second and later years as determined by the vigor of the current year's fruiting and the height and diameter of the canes.

Pruning is an important practice for vigorous growth and pest management. Remove old second year canes in the fall and thin out the weak first year canes. In early spring, thin out remaining canes, leaving those with good height, large cane diameters and no symptoms of winter injury or insect and disease damage. When finished there should be not more than 3 – 4 canes per square foot of row. The canes that have been cut should be removed from the field and destroyed.

Insect Pests

Japanese Beetle

The Japanese beetle is about ½ inch long and copper colored, with metallic green markings and tufts of white hairs on the abdomen. The larvae develop in pastures, lawns and other types of turf, where they live in the soil and feed on the roots of grasses. The adults move to raspberries to feed on flowers, leaves and fruit. Japanese beetles begin to emerge in June and July when they feed on foliage but prefer ripe red raspberries, especially those exposed to full sunlight. Leaves are skeletonized by Japanese beetles and ripe berries destroyed. Japanese beetles are most troublesome during the first 2-3 years after a planting is established.

Occasional Insect Pests:(in order of importance)

Raspberry Crown Borer

This pest takes two years to complete its life cycle. The adult moths are active during daylight beginning in late July or August, and live for about one week. The moth is clearwinged and has a wingspan of 1 ¼ inches. The moth resembles a yellowjacket wasp because it has yellow bands across its black abdomen. Starting a day after emergence, the females lay eggs singly on the lower surface of the raspberry leaves. After 30-60 days the eggs hatch and the larvae crawl down the cane and form a blister-like hibernation cavity at the base of the cane, below the soil line. The following spring the larvae tunnel into and girdle new canes and the crown. They pass the second winter in the raspberry roots and pupate inside the plant base in mid to late summer of the second year. The canes damaged by the crown borer will wilt and become weak and spindly. Foliage may turn prematurely red and then die. Crowns infested with the larvae often swell and eventually die along with all of the canes from the crown. Infested canes will break easily. When injured plants are dug up, roots and crowns may be girdled and marked with swellings, gall, cracks and cavities. Piles of frass may be present.

Red-necked Cane Borer

The adult red-necked cane borer is a slender, metallic black beetle with a reddish thorax and short antennae. It feeds long leaf margins from May through early August. The female deposits eggs on the bark of new growth near the bottom of the cane in May and June. The eggs hatch into larvae that tunnel up and down the cane in a spiral pattern. The larvae will reach full size in the fall and overwinter in the canes, pupating in the spring. The infested canes will develop galls at the site of the larval tunneling. The canes often break near these swellings while the unbroken infested canes wither and die. Swollen canes are usually observed in July or August.

Raspberry Fruitworm

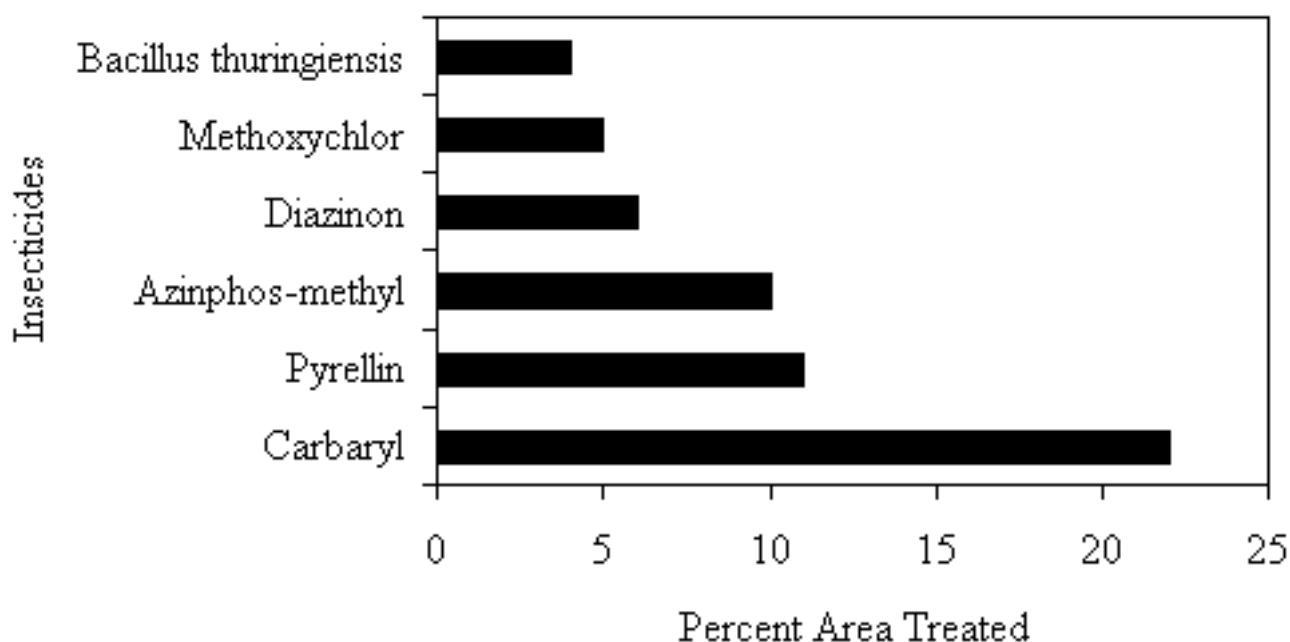
Raspberry fruitworms overwinter as pupae in the soil around the brambles. The adults, small yellowish brown beetles, emerge in late April to early May as the raspberry leaves unfold. They first feed along the midrib of folded leaves and then move onto flower bud and eventually the flowers. The females usually lay their eggs on the unopened flower buds. The eggs will hatch in a few days and the yellowish white larvae emerge. The larvae have a light brown section of the top of each segment and a light brown head.

They tunnel into the flower receptacle to feed and then into the center of developing fruits. The larvae will feed for about 30 days. Many flowers and fruit can be destroyed by an infestation of this insect. Early fruit is more at risk of attack than late fruit.

Raspberry Leafrollers

The raspberry leafroller larvae are small and dark green with a black head and thorax. When fully grown the larvae usually fold over a part of a leaf, forming a cavity to pupate in. The adult moths will appear about two weeks later. The moths have a wingspan of about ½ inch with dull yellow or greenish brown forewings that are irregularly marked and ahs brown hind wings. The primary damaged caused by the leafroller is the webbing together of terminal leaves into a twisted mass.

Chemical Insect Controls:(2,4)



Carbaryl (Sevin)

Percent acres treated: 22%

Target pests and timing: Japanese Beetle from post-bloom through harvest and Grasshoppers

Average rate of most common formulations and frequency of application:(4)

Sevin 80S – 2 lbs/A, twice, OR

Sevin XLR Plus – 1 qt/A, twice

PHI: 7 days

Efficacy rating: Average to Good

Pyrethrins+Rotenone (Pyrellin)

Percent acres treated: 11%

Target pests and timing: Japanese Beetles from post-bloom through harvest

Average rate of most common formulation and frequency of application:

Pyrellin EC – 1.5pt/A, once

PHI: 0 days

Efficacy rating: Good

Azinphos-methyl (Guthion)

Percent acres treated: 10%

Target pests and timing: Leafrollers from post-bloom to harvest

Average rate of most common formulation and frequency of application:

Guthion 50WP – 8 oz/A, once

PHI: 14 days

Efficacy rating: Good to Very Good

Diazinon

Percent acres treated: 6%

Target pests and timing: Raspberry crown borer at pre-bloom

Average rate of most common formulation and frequency of application:

Diazinon 50WP – 2lbs/A, once

PHI: 7 days

Efficacy rating: Good

Diazinon is no longer labelled for use on raspberries in Ohio.

Methoxychlor

Percent acres treated: 5%

Target pests and timing: Red-necked cane borer

Average rate of most common formulation and frequency of application:

Methoxychlor 50WP – 2.25lb/A, once

PHI: 14 days

Efficacy rating: Good

***Bacillus thuringiensis* (Agree, Dipel)**

Percent acres treated: 3%

Target pests and timing: Leafrollers at pre-bloom and Raspberry Fruitworm

Average rate of most common formulation and frequency of application:

Dipel 2X – 1lb/A, once

PHI: 0 days

Efficacy rating:

Cultural Controls:

Prune and destroy damaged canes by raspberry cane borer and red-necked cane borer and remove crowns infested by raspberry crown borer. Harvest promptly to remove all ripe berries and cull berries to help manage Japanese beetles. Cultivate in early fall to kill fruitworm larvae and pupae and Japanese beetle pupae. To prevent blackberry psyllid infestations, avoid planting near conifer trees.

Diseases

Major Diseases(3)

Anthracnose:

Anthracnose is caused by the fungus *Elsinoe veneta*. It is one of the most common and widespread diseases of brambles in the US. The fungus overwinters in the bark of within lesion on infected canes. In early spring the spores are rain-splashed, blown or carried by insects to young, succulent, rapidly growing plant parts that are susceptible to infection. The spores germinate in a film of water and penetrate into the plant tissue. Symptoms appear about a week later. Anthracnose can cause symptoms on canes, leaves, fruit and stems of berry clusters. The most striking symptoms appear on the canes. Infected canes will first show small purplish spots that grow in diameter and become oval in shape. The centers become sunken and are lighter in color. The margins are raised and purple to purplish-brown. If numerous the lesions may merge and cover large portions of the cane and the diseased tissue will extend down into the bark, partially girdling the cane. As the canes dry in late summer and early fall, diseased tissue often crack. In the following year, fruit produced on severely diseased canes may fail to develop to normal size. On leaves anthracnose first appears as small yellowish-white spots on the upper surface. The spots enlarge and develop darker margins. The light centers may drop out producing a "shot hole" effect.

Botrytis Fruit Rot (Gray Mold):

Gray mold is caused by the fungus *Botrytis cinerea*. It can cause great damage during wet, warm seasons. The fungus overwinters in infected plant debris. In the springs spores are spread by wind and deposited on blossoms and fruit. The spores germinate when moisture is present and infection quickly occurs. The fungus usually enters the fruit through flower parts, where it remains inactive within the tissues of green fruit. As the fruit matures, the fungus becomes active and rots the fruit. Infected berries usually become covered with a gray, dusty, or powdery growth of the fungus. Even though infection occurs during bloom, symptoms are usually not observed until harvest. Temperature between 70-80°F and moisture on the foliage are ideal which are carried by wind to cause additional infections on other flowers and ripe fruit.

Phytophthora Root Rot:

Phytophthora root rot is caused by several related species of the soilborne fungi of the genus *Phytophthora*. This disease can be extremely destructive on susceptible cultivars where conditions favor its development. The fungi persist in infected roots or as dormant resting spores in the soil. In water-soaked soil the spores can spread to infect plant roots or crowns. Symptoms include a general lack of vigor and a sparse plant stand. Apparently healthy canes may suddenly decline and collapse during the late spring or summer. In such cases, leaves may turn yellow, orange or red or may begin scorching along the edges. As the disease progresses, affected canes wilt and die. To properly diagnose the disease the infected plant should be dug up and its roots examined. On plants with Phytophthora root rot, the tissue just beneath the epidermis will be a characteristic brick red. Spring and fall are particularly favorable periods for infection but it is assumed that infection can occur throughout the growing season if soil moisture conditions are favorable.

Cane Blight:

Cane blight is caused by the fungus *Leptosphaeria coniothyrium*. The fungus overwinters on infected dead canes. In the spring spores are blown, splashed by rain, and carried by insects to nearby canes. Under moist conditions the spores germinate and enter the plant through pruning wounds, insect damage, fruit stem breaks and other wounds. The fungus can then rapidly kill bark and other cane tissue. Dark brown to purplish cankers form on the new canes near the end of the season. The cankers enlarge and extend down the cane or encircle it causing lateral shoots to wilt and eventually die. Infected canes commonly become cracked and brittle and break easily. This disease is usually most severe during wet seasons.

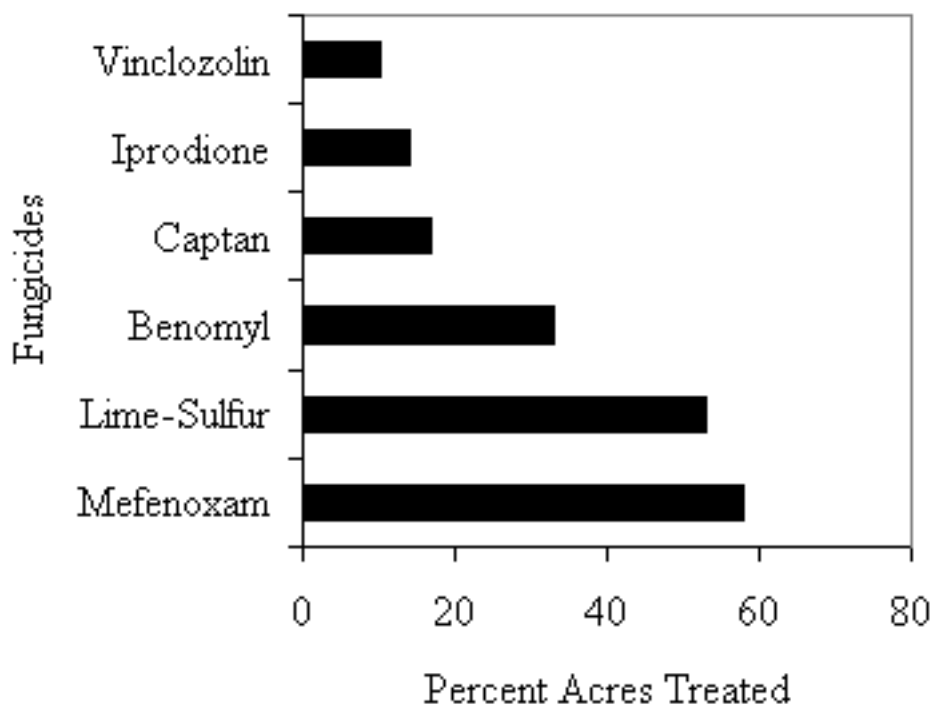
Septoria Leaf Spot:

Septoria leaf spot is caused by the fungus *Septoria rubi*. The fungus overwinters in dead plant debris and on infected canes. In the spring, large numbers of spores are released and carried to young susceptible leaves and canes by splashing or wind-driven rain. The fungus spores germinate in a film of moisture and penetrate the leaf. Infected leaves will develop lesions that have a whitish to gray center, surrounded by a brown to purple border. Leaves of severely infected plants become badly spotted. The disease can cause premature defoliation that will produce weak plants more susceptible to winter injury.

Orange Rust (on black raspberries):

Orange rust is caused by the fungus *Arthuriomyces peckinaus*. The orange rust fungus grows systemically throughout the plant and is perennial inside the below ground plant parts. The bright orange spores are spread by wind or splashing rain to susceptible leaves. When environmental conditions favorable for infection occur, the spores germinate and penetrate the leaf. Secondary spores are produced that infect buds on cane tips as they root. The fungus becomes systemic in these young plants, growing into the crown at the base of the infected shoot, and into newly formed roots. The symptoms of orange rust include weak and spindly new shoots with leaves that are stunted or misshapen and pale green to yellowish. Within a few weeks the lower surface of infected leaves are covered with pustules that are waxy at first but soon turn powdery and bright orange. Rusted leaves wither and drop in late spring or early summer.

Chemical Disease Controls:(2,4)



Mefenoxam (Ridomil Gold)

Percent acres treated: 58%

Target diseases and timing: Phytothphora Root Rot at delayed dormant stage

Average rate of most common formulation and frequency of application:

Ridomil Gold EC-0.5 pt/A, once

PHI: 45 days

Efficacy rating: Good to Very Good

Lime-sulfur

Percent acres treated: 53%

Target diseases and timing: Anthracnose and Cane Blight at delayed dormant stage

Average rate of most common formulation and frequency of application:

Lime-sulfur – 9 gal/A, once

PHI:

Efficacy rating: Good

Rational for use:

Benomyl (Benlate)

Percent acres treated: 33%

Target diseases and timing: Anthracnose and Cane Blight during pre-bloom through harvest

Average rate of most common formulation and frequency of application:

Benlate 50WP – 12 oz/A, twice

PHI: 3 days

Efficacy rating: Good

Captan

Percent acres treated: 17%

Target disease and timing:

Average rate of most common formulation and frequency of application:

Captan 50WP – 2.5 lbs/A, twice

PHI:

Efficacy rating: Good

Iprodione (Rovral)

Percent acres treated: 14%

Target diseases and timing: Botrytis Fruit Rot from first bloom through harvest

Average rate of most common formulation and frequency of application:

Rovral 50WP – 1.8 lbs/A, once

PHI: 0 days

Efficacy rating:

Vinclozolin (Ronilan)

Percent acres treated: 10%

Target diseases and timing: Botrytis Fruit Rot from first bloom through harvest

Average rate of most common formulation and frequency of application:

Ronilan 50WP – 1.5lbs/A, once

PHI: 9 days

Efficacy rating: Good

Ronilan will no longer be registered for use on raspberries after 2001.

Myclobutanil (Nova)

Percent area treated: Nova is new registered for use on raspberries. There are no use numbers at this time.

Target disease: orange rust

Cultural Controls:(3)

Always start with healthy virus indexed nursery stock from a reputable nursery and use disease resistant

cultivars when available. In choosing a site for new plantings make sure that the site has well-drained soil, full exposure to sunlight, good air circulation, no past history of disease problems, and no nearby established or wild bramble plants. Avoid excessive fertilization and practice effective weed control within and between rows.

Remove and destroy all diseased fruit, plant parts and whole plants. Avoid or change production practices that cause any injury or infection in the plant.

Weeds

Broadleaves and grasses

Chemical Controls:(2,4)

Simazine (Princep)

Percent of acres treated: 86%

Target Weeds: Most annual grasses and broadleaf weeds except Canada thistle

Average rate of most common formulation and frequency of application:

Princep – 2lbs/A, once

PHI: 120 – 150 days

Efficacy rating: Average to Good

Sethoxydim (Poast)

Percent acres treated: 53%

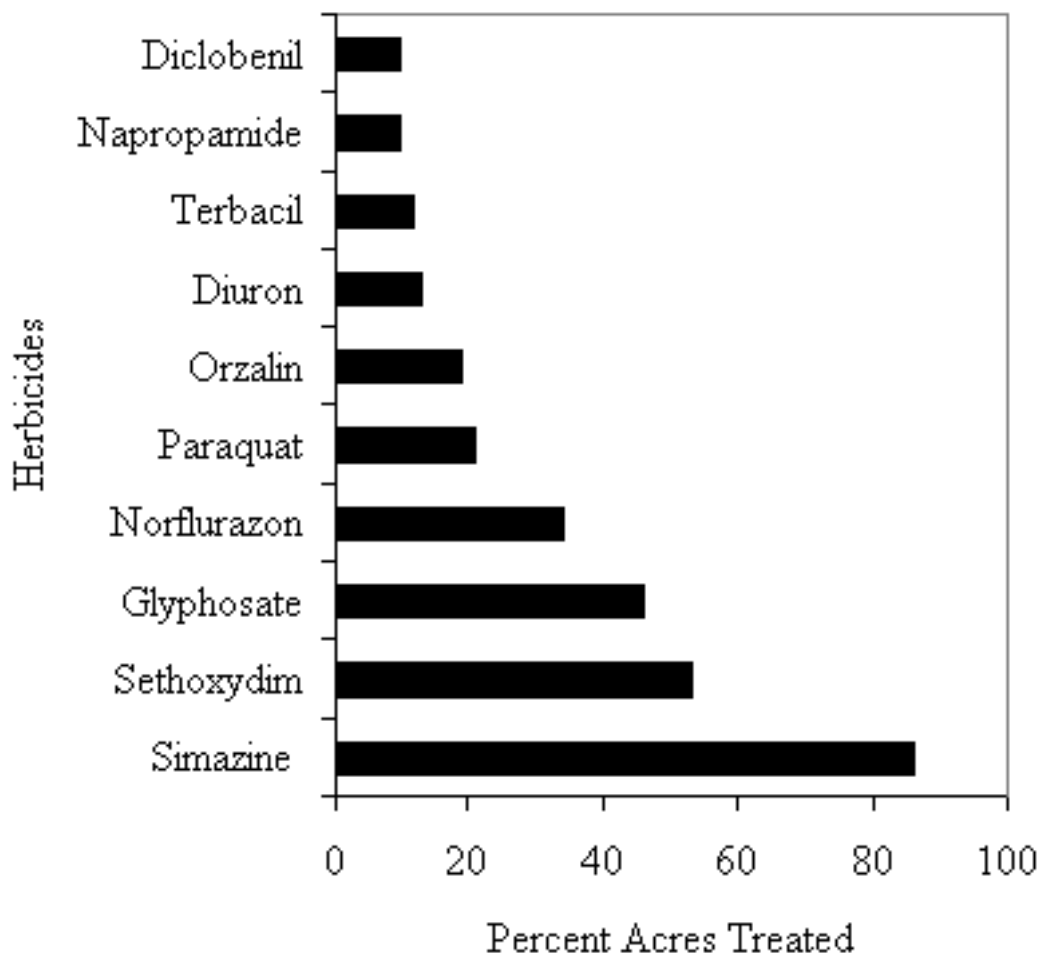
Target weeds: grasses

Average rate of most common formulation and frequency of application:

Poast 1.5 EC – 1.5 pt/A, once when grass is actively growing

PHI: 45 days

Efficacy rating: Good



Glyphosate (Roundup)

Percent acres treated: 46%

Target weeds: broadleaf weeds

Average rate of most common formulation and frequency of application:

Roundup – 2.5 qt/A, once before planting, can be toxic to raspberry plants

PHI: 80 days

Efficacy rating: Very Good as spot spray

Norflurazon (Solicam)

Percent acres treated: 34%

Target weeds: Grasses, sedges and broadleaf weeds

Average rate of most common formulation and frequency of application:

Solicam – 4 lbs/A, once

PHI: 150 days

Efficacy rating: Very Good

Rational for use:

Paraquat (Gramoxone)

Percent acres treated: 21%

Target weeds: most annual weeds and top kill of perennial weeds

Average rate of most common formulation and frequency of application:

Gramoxone– 1 pt/A, once

PHI: 80 days

Efficacy rating: Good

Oryzalin (Surflan)

Percent acres treated: 19%

Target weeds: Annual grasses and broadleaf weeds

Average rate of most common formulation and frequency of application:

Surflan – 2.6 lbs/A, once

PHI: 120 days

Efficacy rating: Good

Diuron (Karmex)

Percent acres treated: 13%

Target weeds: Emerging and young broadleaf weed and grasses

Average rate of most common formulation and frequency of application:

Karmex DF – 1.75 lbs/A, once

PHI: 80 days

Efficacy rating: Good

Terbacil (Sinbar)

Percent acres treated: 12%

Target weeds: Many annual and some perennial weeds

Average rate of most common formulation and frequency of application:

Sinbar - 5.5 oz/A, 1-2 times

PHI:

Efficacy rating: Average to Good

Napropamide (Devrinol)

Percent acres treated: 10%

Target weeds: Annual grasses and broadleaf weeds

Average rate of most common formulation and frequency of application:

Devrinol 50DF - 6 lbs/A, once
PHI: 70 to 90 days
Efficacy rating: Very good

Diclobenil (Casoron)

Percent acres treated: 10%
Target weeds: Canada thistle, nutsedge and grasses
Average rate of most common formulation and frequency of application:
82 lbs/A, once
PHI:
Efficacy rating: Good (depending upon rate and type of application)

Cultural Controls:(3)

Eliminate all perennial weeds before planting. Use mulch around plant and cultivate or plant sod to help control weeds between rows.

Contacts

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3. 1999 Small Fruit Survey, Pesticide Impact Assessment Program, The Ohio State University.
4. Personal communication with Dick Funt, May 1999.