

Diseases

Anthracnose (*Elsinoe veneta*)

Damage

This disease may cause considerable cane damage in some years, especially if weather remains wet into late spring. Infections that occur early in the season are more damaging than those that occur later. Uneven berry ripening may result from infected canes.

Symptoms

The first symptom is small, purplish circular patches on the cane. As the patches enlarge, the central portion takes on a greyish colour and becomes sunken and cracked. Margins become raised and purplish. The damaged patches are often so close together that they merge, forming large, irregular areas. Canes can eventually become girdled and die.

Disease Cycle

Anthracnose is caused by a fungus. The disease spreads by spores produced in the small black bodies which form in the grey patches in the fall. In the spring, splashing rain carries the spores to new shoots, leaves or fruit, where infection takes place.

Monitoring

Watch for sunken grey areas with purple raised margins on canes during late spring. The cane is most commonly infected from 15 to 75 cm above the ground. Prune out infected canes.

Management

Cultural control

Cultural practices usually give adequate control.

Avoid thick plantings.

Do not apply excessive nitrogen.

Prune out surplus canes during the growing season and old canes after harvest.

Resistant red raspberry varieties include Willamette, Nootka, Meeker and Heritage.

Biological control

None.

Chemical control

Where anthracnose has been a problem, apply:

Bordeaux Mixture (8-8-100). Apply from late dormant to delayed dormant (green-tip) stage. See [General Pests](#) section for details on mixing; or

Ferbam 76 WDG (76% Ferbam) at 3.75 kg/ha (1.5 kg/acre) as a delayed dormant spray. Apply in enough water for thorough coverage of all plant parts. Make a second application using 2.0 to 2.5 kg in 1000 L of water when the canes are 25 to 30 cm tall, a third spray just before bloom, and a fourth spray immediately after harvest. Do not apply to flowers or fruit; or

Note: Ferbam is not acceptable for some markets. Check with your packer before using.

Pristine WG (25.2 % boscalid, 12.8 % pyraclostrobin) at 1.3 to 1.6 kg/ha (0.52 to 0.64 kg/acre) in enough water to obtain good coverage. Apply beginning at early bloom. Spray in rotation with other fungicides on a 7 to 14 day schedule. Use the shorter interval when disease pressure is high. Do not apply more than 4 times per crop per season. Do not apply Pristine or other products containing Group 7 or 11 fungicides more than twice in succession. Do not re-enter treated fields for hand harvesting within 24 hours of application. Do not re-enter fields for all other activities until residues have dried. If mechanical harvesting, application can be made up to the day of harvest; or

Tanos 50 DF (25% famoxadone, 25% cymoxanil) at 840 g/ha (335 g/acre) in sufficient water volume to ensure thorough coverage of the crop. Do not apply more than 3 times per year. At least 12 days must pass between the first and second applications. At least 24 days must pass between the second and third applications. Do not re-enter fields within 9 days of application. Do not apply within 9 days of harvest; or

Lime sulphur, used to control spur blight, cane blight and yellow rust, will also control Anthracnose.

Bacterial Blight (*Pseudomonas syringae* pv. *syringae*)

Damage

This bacterial disease is seldom a problem but can occasionally cause severe losses.

Symptoms

Bacterial blight can occur at two periods during the year. In the spring, blight symptoms appear as a sudden wilting and blackening of new shoots, cane tips, laterals and leaves. Affected laterals have a distinct “crooking” or downward bend. This type of damage is often associated with temperatures just above 0°C and is usually not a problem after mid-May.

The most serious phase of the disease is believed to occur in the fall in fields that are actively growing later than normal. These fields seem to be susceptible to infection which shows as dead buds and black streaking of the cambium layer under the bark. This damage is usually not noticed until spring and can be confused with injury due to spur blight or winter injury.

Disease Cycle

The bacterium survives on leaf surfaces, in healthy buds and on weeds. It may be spread by splashing rain, wind, insects and infected planting stock.

Monitoring

Check developing laterals and young shoots for symptoms. Where fall conditions may have promoted the development of blight, inspect buds for damage. Look for black streaking under the bark near the buds.

Management

Cultural control

Avoid late growth due to excessive soil nitrogen, summer drought followed by resumption of growth with fall rains, or topping of canes too early in the fall.

Biological control

None

Chemical control

Spring infection. If needed apply:

Bordeaux Mixture (8-8-100). Apply one spray at the delayed dormant/bud-bursting stage. Apply a second spray in the fall before rains start. Thoroughly wet the canes. See [General Pest](#) Section for mixing directions; or

Copper Spray Fungicide or Copper Oxychloride 50 (50% copper oxychloride) at 2.0 kg in 1000 L of water per ha (0.8 kg in 400 L of water/acre). Begin protection at the bud-bursting stage. Apply in fast drying conditions to minimize the risk of plant damage. Repeat at 14-day intervals until three sprays have been applied. Thoroughly wet canes at each treatment. Do not re-enter treated fields within 48 hours of application. Do not apply within 2 days of harvest.

Caution: Do not use bluestone or copper sulphate alone as it washes off readily and may cause plant injury. Copper tolerant strains of this bacterium have been detected from blueberry.

Fall–winter infection. No satisfactory chemical control for the fall-winter infection period has been determined. The following may be beneficial:

Bordeaux Mixture (8-8-100). Apply spray before fall rains start (about October). Thoroughly wet the canes and apply in fast drying conditions. See [General Pest](#) Section for mixing directions; or

Copper Spray Fungicide or Copper Oxychloride 50 (50% copper oxychloride) at 2.5 kg/1000 L of water/ha (1 kg/acre in 400 L of water); or

Cueva (Copper octanoate 1.8%) Use a 0.5% to 2% solution, applied at 470-940 L/ha (188-377 L/acre). Apply at the start of flowering and continue every 7 to 10 days. Do not apply within 1 day of harvest, or

Serenade Opti (QST 713 strain-Bacillus subtilis) at 0.6 to 1.7 kg/ha (0.24 to 0.68 kg/acre). Apply before fall rains and again during dormancy before spring. Serenade may be applied up to and including the day of harvest.

Note: Serenade is a bacterial-based biofungicide. It is approved for organic production.

Serenade Max: no longer produced

Botrytis Cane Wilt (*Botrytis cinerea*)

Damage

Botrytis cane wilt can be very destructive during wet seasons and in plantings where the growth is lush and dense.

Symptoms

Infections first appear as brown blotches on the new green canes. The blotches, which may include one or more nodes, become tan coloured as infected canes mature. A typical concentric ring pattern appears in late winter.

Disease Cycle

The fungus overwinters in dead leaves, mummified fruit and as black fungal bodies called sclerotia. Numerous sclerotia form on diseased canes during the late fall and winter. It also overwinters on weeds. In the early spring under humid conditions, sclerotia produce spores which infect succulent new growth. Infected new canes wilt and die. Dead canes are pithy and may be covered with grey mould. Botrytis also causes blossom blight and fruit rot.

Monitoring

Examine canes in the spring to determine the level of overwintering fungus and plan a control program accordingly.

Management

Cultural control

Improve air circulation by controlling weeds.

Remove surplus new shoots as they develop to prevent the rows from becoming too dense.

Prune out the old canes immediately after harvest to increase air circulation.

Prune out diseased new canes as soon as observed, and destroy to reduce inoculum.

Meeker and Willamette show resistance to Botrytis cane wilt. Chemainus and Cascade Bounty are highly susceptible.

Biological control

None.

Chemical control

Fruit rot sprays help control this disease.

Cane Blight (*Leptosphaeria coniothyrium*)

Damage

Cane blight can weaken fruiting canes but this fungal disease is usually of minor importance. It enters new canes through wounds so there is greater potential for damage where mechanical harvesters are used.

Symptoms

Early cane blight infections may resemble spur blight. However, cane blight usually covers the whole stem and is not confined to the leaf node areas as with spur blight. During the late summer, infected canes turn greyish and may be confused with winter injury or anthracnose. The infected areas on the cane become flattened and may crack open. During the next season, laterals on infected canes wilt and die in warm weather.

Disease Cycle

The cane blight fungus overwinters on cane stubs. The old, dead canes can produce spores for several years. Rain and overhead irrigation will spread spores in splashing water. Infection may occur at any time during the growing season, but often occurs at harvest when canes are wounded. Moist conditions are required for infection.

Monitoring

Monitor new canes after harvest. Scrape away the bark above or below wounds and look for reddish streaking. During the dormant season, examine old cane stubs for grey, flattened, cracked areas, especially at catch plate height.

Management

Cultural control

Cut out and destroy infected canes.

Adjust the tension of the catch plates of mechanical harvesters to reduce wounding.

Top canes during dry weather, if possible.

Avoid high nitrogen levels as tall, succulent cane growth is more susceptible to injury.

Biological control

None.

Chemical control

Lime-sulphur (23% calcium polysulphide) at 35 L in 1000 L of water. Apply in sufficient water for thorough coverage of all plant parts. Apply at the delayed dormant (bud-bursting) stage if a spray program is necessary. If leaves are out, spray only when they are dry to avoid damage.

Crown Gall (*Agrobacterium tumefaciens*)

Damage

Crown gall poses a serious threat to the production of susceptible raspberry varieties. If infected planting stock is used, yield can be significantly reduced.

Symptoms

The first symptoms are usually woody swellings or galls on the crowns or canes at ground level. These galls range from the size of a pea to the size of a tennis ball. Root infections may go undetected until galls are so numerous that the vigour of the plant is affected. In some plantings where the disease has become established, the fruiting canes produce short, weak laterals. The leaves turn yellow and dry at the edges and curl up with the onset of warm weather. Root systems from these dying plants resemble a string of beads because of the frequency of galls.

Disease Cycle

The crown gall bacterium is present in some fields. It can also be introduced on infected planting stock. Once introduced into the field, the bacteria survive almost indefinitely in decaying root galls or in alternate hosts. Wounds resulting from insect injury and cultivation or mechanical harvester damage encourage new infections.

Monitoring

Carefully check planting stock for the presence of galls. In existing plantings, look near the crown, for evidence of galls or dig plants up to examine roots for galls.

Management

Cultural control

Use certified raspberry plants. Never use plants from sources where crown gall has been reported. Do not use plants containing visible galls.

Where only a few plants in a field are infected, entire plants (including the complete root system) should be removed carefully and burned.

Take care when removing canes and pruning because the bacteria can be spread on the pruning shears.

Disinfect pruning shears by dipping in 5% Virkon, Chemprocide or CleanGrow, or a 1:10 dilution of household bleach. Caution: bleach is corrosive to metal blades.

Minimize root and cane injury by controlling root weevils and nematodes, avoiding close cultivation and making sure that catch plates on mechanical harvesters are working properly.

Field experience has shown that Meeker does not develop galls. Saanich and Chemainus are susceptible.

Biological control

Dyggall is a formulation of a naturally occurring bacterium that is antagonistic (i.e. kills) to the crown gall bacterium. It is applied to cuttings or plant roots before planting in infested soils. It is to be used by trained nursery personnel only.

Chemical control

None

Fruit Rot (*Botrytis cinerea*)

Damage

The fungus *Botrytis* causes rot and yield loss. Losses will likely occur each year if fungicides are not applied to protect the blossoms and developing fruits. Losses are most severe when weather is wet through harvest.

Symptoms

Infected flowers turn brown and shrivel when they dry. Under moist conditions, grey tufts of fungus can be seen on blighted blossoms. *Botrytis*-infected berries become shrivelled and covered with the grey tufts when the fruit matures. Fruit can appear healthy at harvest but develop rot soon after. This is the postharvest rot phase.

Disease Cycle

The fungus primarily enters through the blossom and develops slowly until the fruit ripens. Then rot develops rapidly. Healthy fruit next to infected berries can develop rot on the bush or after harvest.

Monitoring

Watch for cane infections in the spring. They may be an important source of spores for flower infection.

Management

Cultural control

Train canes for an open canopy to promote good air circulation.

Avoid excessive nitrogen fertilization.

Time overhead irrigation so plants dry out as quickly as possible.

Keep fruit cool after harvest and deliver to the processor or packer as quickly as possible.

Biological control

None.

Chemical control

At least three sprays are recommended. Start when the blossoms first open and repeat at 7 to 10 day intervals.

To delay the development of resistance, alternate sprays from the different chemical groups.

Apply:**Group M**

Captan 80 WDG (80% captan) at 1.2 kg in 1000 L of water/ha (0.5 kg in 400 L/acre) depending on the label. Do not apply more often than every 7 days. Do not re-enter treated fields within 72 hours of application. Do not apply within 2 days of harvest; or

Maestro 80DF (80% captan) at 2.5 kg/ha (1.0 kg/acre). Do not apply more often than every 7 days. Do not re-enter treated fields within 72 hours of application unless protective clothing is worn. For hand harvesting, do not apply within 3 days of harvest. For machine harvest, do not apply within 2 days of harvest; or

Note: Leaf injury to the variety, Malahat, can occur with Maestro or Captan particularly when sprays are applied on a warm day following a period of wet weather; or

Group 1

Senator 70WP (70% thiophanate-methyl) at 1.1 kg/ha (0.44 kg/acre) during flowering and every 7-10 days as needed. Senator also provides powdery mildew control. Do not apply within 1 day of harvest; or

Group 2

Rovral (500 g/kg iprodione) at 2 kg/ha in 1000 L of water per ha (0.8 kg/acre in 400 L/acre of water). To reduce the possibility of disease resistance to Rovral, alternate applications with Captan. Do not apply within 1 day of harvest; or

Group 7

Cantus WDG (70% boscalid) at 560 g/ha (224 g/acre) in enough water to obtain good coverage. Apply beginning at early bloom. Spray in rotation with other fungicides on a 7 to 14 day schedule. Use the shorter interval when disease pressure is high. Do not apply more than 4 times per crop per season. Do not apply Lance, Cantus or other Group 7 fungicides more than twice in succession. Lance or Cantus can be applied up to the day of harvest; or

Sercadis (300 g/L fluxapyroxad) at 250-666 mL/ha (100-266 mL/acre) in enough water to obtain good coverage. Apply beginning at early bloom, prior to onset of disease development. Spray in rotation with fungicides from other groups on a 7 to 14 day schedule. Use the shorter spray interval when disease

pressure is high. Do not apply more than 3 times per crop season. Can be applied up until the day of harvest; or

Note: Sercadis will only provide suppression of Botrytis

Group 7/9

Luna Tranquility (125 g/L fluopyram, 375 g/L pyrimethanil) at 1200 ml/ha (486 ml/acre) in a minimum of 500 L/ha (202 L/acre) of water. Begin applications in early bloom or when conditions are conducive to Botrytis and repeat as required at 7 to 10 day intervals. Do not apply more than twice per crop per season for Botrytis. Can be applied up until the day of harvest; or

Group 7/11

Pristine WG (25.2 % boscalid, 12.8 % pyraclostrobin) at 1.3 to 1.6 kg/ha (0.52 to 0.64 kg/acre) in enough water to obtain good coverage. Apply beginning at early bloom. Spray in rotation with other fungicides on a 7 to 14 day schedule. Use the shorter interval when disease pressure is high. Do not apply more than 4 times per crop per season. Do not apply Pristine or other products containing Group 7 or 11 fungicides more than twice in succession. Do not re-enter treated fields for hand harvesting or hand pruning within 24 hours of application. If mechanical harvesting, application can be made up to the day of harvest; or

Group 9

Scala (400g/L pyrimethanil) at 2.0 l/ha (0.78 l/acre) in a minimum spray volume of 1000 l/ha (393 l/acre). Make the first application at early flowering and repeat applications as required at 7-10 day intervals. Do not apply more than 2 times per crop per season. Application can be made up to the day of harvest; or

Group 9/12

Switch 62.5 WG (37.5% cyprodinil and 25% fludioxinil) at 775 to 975 g/ha (310 to 390 g/acre) in enough water to obtain good coverage (500 to 1000 L/ha (200 to 400 L/acre)). Apply when conditions are favourable for disease development. Do not apply Switch more than twice in succession. Alternate with fungicides from other groups. Do not apply within 1 day of harvest; or

Group 11/27

Tanos 50 DF (25% famoxadone, 25% cymoxanil) at 840 g/ha (335 g/acre) in sufficient water volume to ensure thorough coverage of the crop. Do not apply more than 3 times per year. At least 12 days must pass between the first and second applications. At least 24 days must pass between the second and third applications. Do not re-enter fields within 9 days of application. Do not apply within 9 days of harvest;

Group 17

Elevate 50 WDG (50% fenhexamid) at 1.7 kg/ha (0.7 kg/acre) in enough water (up to 1000 L/ha) to obtain good coverage. Apply up to 4 times per season beginning at early bloom. Do not make more than two consecutive applications of Elevate. It should be alternated with fungicides from other groups to prevent development of resistance. Do not apply within 1 day of harvest; or

BioFungicides

Serenade Opti (QST 713 strain-Bacillus subtilis) at 1.7 to 3.3 kg/ha (0.68 to 1.32 kg/acre). Begin applications at the first sign of disease or when conditions favour disease development. Repeat as necessary on a 7-10 day interval. Serenade may be applied up to and including the day of harvest; or

Note: Serenade is a bacterial-based biofungicide. It is approved for organic production.

Serenade Max: no longer produced.

Timorex Gold (23.8% tea tree oil) at 1.5 to 2.0 L/ha (0.6 to 0.8 L/acre) in 400 to 1200 L/ha (160 to 480 L/acre) of water. For preventative treatments, apply at 7 to 14 day intervals. Avoid spraying in the heat of the day or when temperatures are above 35°C. Do not apply within 2 days of harvest.

Nematodes

Damage



Nematodes are microscopic worms that live in the soil. When plant parasitic nematodes are present in large numbers, they cause stunting and reduce vigour of raspberries by feeding on the roots. Some nematodes (dagger) are capable of transmitting viruses such as tomato ringspot. Damage usually occurs in patches in fields.

Monitoring

Test fields for nematodes before planting and fumigate if necessary. Nematodes tend to be very spotty in their distribution in a field. Thus it is very difficult to collect a representative soil sample. For this reason, careful sampling is of extreme importance if harmful nematodes are to be detected. Refer to “Nematodes” in “General Berry Pests” of this guide, for more information on sampling.

Management

1. New Plantings

Raspberry plants are most susceptible to nematode damage during the year of planting. If high populations are present, control with pre-plant fumigation is necessary to allow good establishment in the first year.

New fields are best sampled for nematodes in the spring or summer before the year of planting. This allows adequate time to prepare the land for fumigation in late August or September, if necessary. Organic matter reduces effectiveness of most fumigants. Therefore, if manures are to be used, apply in spring prior to planting.

Details of soil sampling, field preparation, and fumigant application timing and method are given in the section “General Berry Pests” in this guide. Refer to this section when planning for nematode [control](#).

If nematode damage is noticed in the year of planting, apply Vydate as recommended for established plantings.

2. Established Plantings

Cultural control

Good weed control practices will help prevent nematodes from building up in established plantings.

Chemical control

Apply:

 **Vydate L** (24% oxamyl) at 9.35 L/ha (3.8 L/acre) as a soil drench in a 1m wide band centred on the row. The drench should only be applied to moist soils and should be followed with about 2 cm of irrigation to ensure that the Vydate is washed into the root zone. The drench may be applied any time between the end of harvest and the end of the growing season. Do not apply after October 31. Do not apply in the spring. Do not re-enter treated fields within 3 days of application. Apply only once per year.

Root Rot (*Phytophthora fragariae* var. *rubi* and other fungi)

Damage

Damage can be severe, especially when susceptible varieties are grown, nematode populations are high, or where soils are wet for long periods.

Symptoms

Fruiting canes may suddenly wilt and die with the onset of warm weather. Plants may also be stunted and low yielding. Infected roots appear rotted and brown. The outer tissue can be sloughed off and few fibrous roots are present. Black or purplish lesions may develop up the new canes from the ground level. Frequently, new shoots develop from the healthier portions of the crown.

Disease Cycle

Root rot is caused by fungi and fungi-like organisms that act alone or as a complex. Some only infect plants that have been previously weakened by stress. They all survive in the soil for years, and begin new infections by invading fine roots. They grow through the root tissue and may grow into the plant crown and damage it.

Monitoring

During the winter, note poorly drained areas. Watch these areas for symptoms of root rot when the weather starts to warm up. After hot, dry periods, watch for wilting of fruiting canes.

Management

Cultural control

Use root rot-free, certified plants and set them out in fertile, well-drained soils.

Plant on raised beds to provide a better-drained root zone.

Control nematodes as they can increase root rot losses.

Avoid applying high levels of nitrogen to plants infected with root rot.

Subsoil between the rows in October to improve drainage.

There are no completely resistant varieties. Cascade Bounty and Cascade Delight have shown good field tolerance. Malahat and Tulameen are particularly susceptible.

Research has shown that high levels of soil calcium can reduce infection and damage caused by *Phytophthora* root rot. This can be achieved by applying gypsum before planting, but more research is necessary to determine the reliability and feasibility of this technique.

Biological control

None.

Chemical control

Where control is necessary, apply:

Foliar application.

Aliette (80% fosetyl-AI) at 5.5 kg/ha in a minimum of 200 to 1000 L/ha of water (2.2 kg/acre in 80 to 400 L/acre of water). For spring applications, apply the first spray when there is 7 cm of new growth and again 3 to 4 weeks later. For fall applications apply when conditions favour disease development (high soil moisture and cool temperatures) and then repeat if necessary 3 to 4 weeks later. Make the last fall application at least 30 days before leaf drop. Do not make more than 4 applications per year - 2 in the spring and 2 in the fall. Aliette is systemic – the product will move down from the leaves to the roots. Do not apply within 60 days of harvest; or

Phostrol (53.6% mono and dibasic sodium, potassium and ammonium phosphites) at 5.2 L/ha in a minimum of 400 L/ha of water (2.1 L/acre in 160 L/acre of water). For spring applications, apply the first spray when there is 7 cm of new growth and again 45 to 60 days later. For fall applications apply when conditions favour disease development (high soil moisture and cool temperatures) and then repeat if necessary 21 to 28 days later. Make the last fall application at least 30 days before leaf drop. Do not make more than 4 applications per year - 2 in the spring and 2 in the fall. Phostrol is systemic – the product will move down from the leaves to the roots. May be applied up to the day of harvest.

Soil drench.

New plantings.

Ridomil Gold 480SL or 480EC (480 g/L metalaxyl-M) at 37 mL per 100 m of row as a post-plant soil drench in a 1 m wide band centered over the row (If the row spacing is 10 feet use 0.5 L/acre). Apply again in the fall before November 30; or

Orondis (100 g/L Oxathiopiprolin) at 1.3 to 2.8 L/ha (0.5 to 1.1 L/acre). Directly apply to soil with a banded drench application at a minimum of 200 L/ha, continue on a 7-14 days interval. Follow by sprinkler or drip irrigation within 24 hours to adequately distribute the product to the root zone. Use 1-2 applications at 7-14 days apart in spring and 1-2 applications at 7-14 days apart during fall. Do not make more than 4 applications per year. Do not apply within 1 day of harvest, or

Torrent 400SC (400 g/L cyazofamid) at 0.25 L/ha in 1000 L/ha of water (101 ml/acre in 405 L/acre of water) as a soil drench. One application can be made in the fall and one application can be made in the spring. Do not use a surfactant with this drench.

Established Plantings.

Ridomil Gold 480SL or 480EC (480 g/L metalaxyl-M) at 37 mL per 100 m of row as a soil drench in a 1 m wide band centered over the row (If the row spacing is 10 feet use 0.5 L/acre). Apply in late-October to cool, moist soils just prior to rains. Rain or irrigation are essential to wash Ridomil into the root zone as soon as possible after application. Do not apply to dry soils. Do not apply after November 30. Ridomil will control root rots caused by *Phytophthora* and *Pythium* but will have no effect on other root rot-causing fungi. Since there are frequently several root rot-causing fungi in the same field, control may not be complete; or

Orondis (100 g/L Oxathiopiprolin) at 1.3 to 2.8L/ha (0.5 to 1.1 L/acre). Directly apply to soil with a banded drench application at a minimum of 200L/ha, continue on a 7-14 day interval. Follow by sprinkler or drip irrigation within 24 hours to adequately distribute the product to the root zone. Use 1-2 applications at 7-14 days apart in spring and 1-2 applications at 7-14 days apart during fall. Do not make more than 4 applications per year. Do not apply within 1 day of harvest.

Torrent 400SC (400 g/L cyazofamid) at 0.25 L/ha in 1000 L/ha of water (101 ml/acre in 405 L/acre of water) as a soil drench. One application can be made in the fall and one application can be made in the spring. Do not use a surfactant with this drench. Do not apply within 90 days of harvest.

Spur Blight (*Didymella applanata*)

Damage

The fungus causing this disease can infect leaves, petioles (leaf stems) and canes. Fruiting laterals may be stunted and less vigorous.

Symptoms

Infections on leaves are wedge-shaped with a brown central area surrounded by a yellow band. Infections on the petioles are not noticeable, but they grow into the new canes in mid-summer forming dark brown spots surrounding buds. The infection (brown areas) can spread up and down so that large sections of the cane are totally infected. The buds surrounded by the brown areas are not infected directly, but are greatly weakened by toxins produced by the fungus. These weakened buds may die or, if they do leaf out in the spring, may produce weak fruiting laterals with small, yellow leaves which dry up early in the season.

Disease Cycle

The infected areas on the canes remain dark brown until early winter when they become silvery-grey in colour. Over winter, small black bodies containing spores develop under the bark. The spores are released by rain in the spring to start the cycle again. New canes can be infected when they are 20 to 25 cm tall.

Monitoring

From May to early July, monitor for wedge-shaped brown patches on leaves to obtain an indication of spur blight levels. In the summer, watch for brown lesions around buds on the canes. During the dormant season and early spring, check overwintering levels of the spur blight fungus by looking for cracked grey areas on the canes around buds.

Management

Cultural control

Avoid excessive nitrogen fertilization.

After harvest, remove and destroy the old fruiting canes.

Biological control

None.

Chemical control

Lime-sulphur (23% calcium polysulphide) at 35 L in 1000 L of water. Apply in sufficient water for thorough coverage of all plant parts. Apply at the delayed dormant (green-tip) stage if a spray program becomes necessary. If leaves are out, spray only when they are dry to avoid damage; or

Tanos 50 DF (25% famoxadone, 25% cymoxanil) at 840 g/ha (335 g/acre) in sufficient water volume to ensure thorough coverage of the crop. Do not apply more than 3 times per year. At least 12 days must pass between the first and second applications. At least 24 days must pass between the second and third applications. Do not re-enter fields within 9 days of application. Do not apply within 9 days of harvest;

Note: Tanos 50 DF contains a Group 11 and a Group 27 fungicide. To delay fungicide resistance do not apply Tanos or other Group 11 or Group 27 fungicides more than twice in succession. Alternate with fungicides from other groups.

Captan 80 WDG (80% captan) at 1.2 kg in 1000 L of water/ha (0.5 kg in 400 L/acre) depending on the label. Do not apply more often than every 7 days. Do not re-enter treated fields within 72 hours of application. Do not apply within 2 days of harvest. Other fruit rot sprays will also help to control spur blight.

Ferbam 76 WDG. Refer to “Anthracnose” for application information.

Note: Ferbam is not acceptable for all markets. Check with your packer before using.

Yellow Rust (*Phragmidium rubi-idaei*)

Damage

Yellow rust can be a problem in wet growing seasons. This fungus can infect all succulent, above ground parts of the plant causing reduced vigour and yields.

Symptoms

Symptoms first appear as distinct yellow spots on the leaves. Later the lower leaves turn yellow and drop off. Infected canes develop lesions that become deep cankers and may break off during pruning. By autumn, black pustules form on the underside of infected leaves.

Disease Cycle

The fungus overwinters on old infected leaves and old cane stubs.

Monitoring

By late April, start watching the oldest leaves on developing laterals near the wire. Look for yellow pustules on the upper and lower leaf surface. Watch to determine when the pustules will begin to release spores and apply a fungicide to protect new growth.

Management

Cultural control

Good sanitation is the most important control method for yellow rust. Prune out the old fruiting canes as soon as possible after harvest. Postpone tying canes until after the leaves drop. Rotovate to incorporate all infected leaves and canes in the early spring before the new leaves develop.

Biological control

None.

Chemical control

Lime-sulphur (23% calcium polysulphide) at 35 L in 1000 L of water. Apply in sufficient water for thorough coverage of all plant parts. Apply at the delayed dormant (green-tip) stage if a spray program becomes necessary. If leaves are out, spray only when they are dry to avoid damage; or

Nova 40W (40% myclobutanil) at 175 g/ha (70 g/acre) in enough water to obtain good coverage. Begin application in the spring at the first sign of yellow rust pustules. Apply at 10 to 14 day intervals. Do not apply more than 3 times per season. Do not enter or allow worker entry into treated areas for 6 days for hand harvesting, training and tying or for 12 hours for all other activities. Do not apply within 6 days of harvest for hand harvested crops. Do not apply within 1 day of mechanical harvesting; or

Topas 250E or **Jade** or **Tilt** (250 g/L propiconazole) at 500 mL/ha (200 mL/acre) or **Mission 418 EC** (418 g/L propiconazole) at 300 mL/ha (120 mL/acre) in enough water to obtain good coverage. Apply in the spring when the first yellow rust pustules are detected. Repeat 14 days later. Do not apply more than twice per season. Do not re-enter treated areas within 3 days of application. Do not apply within 30 days of harvest. This product has caused some stunting of fruiting laterals when applied in the spring. Meeker is particularly susceptible; or

Ferbam 76 WDG. Refer to “Anthracnose” for application information.

Note: Ferbam is not acceptable to some markets. Check with your packer before using.