

# Blueberry Anthracnose (Ripe Rot)

March, 2018

Anthracnose or ripe rot is a common pre- and post-harvest fruit rot of highbush blueberry in British Columbia (B.C.). It is caused primarily by the fungus *Colletotrichum acutatum*. Anthracnose occurs in all blueberry producing areas in B.C. The primary concern with anthracnose fruit rot is the impact of reduced shelf-life and poor quality fruit on the fresh market.



Figure 1. Fruit infected with anthracnose showing sunken areas near blossom-end and shrivelling.



Figure 2. Masses of salmon-orange coloured wet spores are produced on infected ripe berries.

## Symptoms

The fruit is the most susceptible to anthracnose. Berries do not develop symptoms until they are mature or ripe. The initial symptoms usually appear near the calyx (blossom)-end on ripe fruit as dark, sunken areas and the infected areas may shrivel with time (Figure 1). Within a few days, bright salmon-orange coloured, wet spore masses can be seen on the shrunken areas (Figure 2). These sticky spore masses often spread to other berries by rain, irrigation, splashing water and contact during harvest, resulting in substantial pre- and post-harvest losses.

Spent fruit trusses appear to be the main site where the fungus overwinters. When trusses are infected during the growing season they do not show visible symptoms. However, in the spring it is possible to observe salmon-orange coloured spore masses produced on infected trusses. The fungus also infects leaves, buds, twigs and canes. New shoots and leaves may become blighted by the anthracnose fungus in the spring. On twigs, infections usually originate from the infected buds and may kill portions of the twig. Dark brown, canker-like lesions with fruiting bodies (spore producing structures) may develop on young canes. Anthracnose on leaves, twigs and canes has not commonly been observed in B.C.

## Disease Cycle

The fungus over winters on live twigs and flower buds and also on dead twigs, spurs and trusses. In the spring, the fungus produces spores that spread by rain, over-head irrigation and water-splashes. A minimum of 12 hours of continuous leaf/fruit surface wetness and temperatures between 12 and 27°C are required for the infection to occur. Although the fungal infection on berry is only obvious when fruit is mature, the fruit can be infected anytime from flowering to harvest. After the fungus enters the developing berry it remains dormant until the berry starts to ripen. At this point, the fungus begins to colonize the infected area and produce hydrolytic enzymes which destroy plant cell walls. Damaged cells lose their cell contents and integrity, thus the infected area becomes sunken and shrivelled. Spent fruit trusses can be infected after harvest. Recent studies also suggest that some infection may occur even at cooler temperatures.

## Disease Management

### Prevention

- Plant resistant blueberry varieties. Cultivars 'Berkeley', 'Bluecrop', 'Blueray', 'Coville' and 'Jersey' are more susceptible to anthracnose.
- Rainy weather and over-head irrigation during bud-break and fruit development provide an environment conducive for anthracnose infection. There is nothing that one can do to avoid wet weather in B.C. However, the following cultural practices will help reduce leaf/fruit surface wetness and excess moisture in the environment.
  - Prune to improve air movement where bushes have dense foliage and are planted close together. A less dense canopy encourages faster drying of foliage and fruit surfaces.
  - Where over-head irrigation is needed, it should be started early in the morning so that plants can dry off during the day. Schedule pesticide spray events in the morning or early afternoon hours; this will allow ample time for excess moisture to dry off. The objective is to keep the duration of plant wetness well under 12 hours to avoid new infections.
- Since the fungus overwinters on infected twigs and trusses, removal of all dead twigs and trusses is recommended. Trials in Washington State found that pruning and removal of dead twig and truss from bushes can reduce anthracnose infection by 50%.
- Spores can also be spread around on flats, totes, tools and machine harvesters. Make sure such items are disinfected before and after using them in fields.

### Eradication & Management

- Follow a scheduled fungicide spray program, particularly for fields that have a history of anthracnose. Even with a fungicide spray program, expected results may not be achieved if the disease pressure is very high. Therefore, try to prevent/minimize the amount of inoculum (spores) and sources of infection in the field (see above under *Prevention*).
- Refer to Table 1 for information on fungicides that have been registered for anthracnose management. Strictly adhere to product label instructions when using each chemical. Use of fungicides should be based on an IPM program.
- To prevent resistance development in the pathogen to a fungicide,
  - Never apply a fungicide below the recommended rate.
  - Use fungicide at the highest recommended rate when disease pressure is high.
  - Do not apply the same fungicide repeatedly or not more than 2 consecutive sprays. Rotate fungicides belonging to different chemical groups.

**Table 1.** A summary of registered fungicides and label information. Please refer to Health Canada's [Pest Management Regulatory Agency](#) website for fungicide label information.

Product name	Active ingredient	Chemical or biological group	Mode of Action	REI <sup>1</sup> hrs	PHI <sup>2</sup> days	Application guidelines
Bravo	chlorothalonil	M	protectant (non-systemic)	48	54	Apply preventatively during green tip, pink bud and petal fall at 10- to 14-day interval. Do not exceed 3 applications per season.
Quash	metconazole	3	curative (systemic)	3	7	Apply preventatively during bloom and thereafter, at 10- to 14-day interval. Do not exceed 3 applications per season.
Quilt	azoxystrobin & propiconazole	3 + 11	protectant & curative (locally systemic)	12	30	Apply preventatively during bloom and thereafter, at 7- to 10-day interval. Do not exceed 4 applications per season.
Pristine	boscalid & pyraclostrobin	7 & 11	protectant & curative (locally systemic)	24 or until dry	0	Apply preventatively during bloom and thereafter, at 7- to 10-day interval. Do not exceed 4 applications per season. Do not apply as a tank mix.
Switch	cyprodinil & fludioxonil	9 & 12	protectant (non-systemic)	12	1	Apply preventatively from early bloom and thereafter, at 7- to 10-day interval. Do not exceed 3 applications per season.
Cabrio	pyraclostrobin	11	protectant & curative (locally systemic)	24	1	Apply preventatively from early bloom and thereafter, at 10- to 14-day interval. Do not exceed 4 applications per season.
Allegro	fluazinam	29	protectant	24	30	Apply preventatively from early bloom and thereafter, at 10- to 14-day interval. Do not exceed 4 applications per season.
Aliette	fosetyl-Al	33	protectant & curative (systemic)	24	1	Apply preventatively from pink bud and thereafter, at 14- to 21-day interval. Do not exceed 4 applications per season.
Confine	phosphorous acid	33	protectant & curative (systemic)	48	1	Apply preventatively at 7- to 21-day interval.
Bravo	chlorothalonil	M	protectant (non-systemic)	48	54	Apply preventatively during green tip, pink bud and petal fall at 10- to 14-day interval. Do not exceed 3 applications per season.

<sup>1</sup>REI - re-entry interval indicated on label

<sup>2</sup>PHI - pre-harvest interval

NC - not classified

## Post-harvest handling of fruit

Post-harvest handling of berries is one of the most important components in preventing anthracnose on harvested berries during storage and in fresh market. Anthracnose will not develop on fruit that are promptly cooled after harvest.

Remove/screen/avoid field heat from harvest berries as soon as possible. Bring flats into the packing shed as quickly as possible after picking. Store the flats with berries in the shade if they cannot be transported to a cooler place right away. It has been demonstrated that, where berries are cooled immediately to 2°C within 2 hours of harvest, there is less rot than if berries are brought to 2°C over 48 hours.

## For Further Information

- Integrated Pest Management for Blueberries, Washington State University, Washington, USA
- Blueberry Disease Facts: Anthracnose (Ripe Rot), Cornell University, New York, USA
- Pacific Northwest Plant Disease Management Handbook: Blueberry Ripe Rot, Oregon State University
- Polashock, J.J., Ehlenfeldt, M.K., Stretch, A.W. and Kramer, M. (2005). Anthracnose fruit rot resistance in blueberry cultivars. *Plant Disease* 89:33-38.
- Wharton, P.S. and Diéguez-Urbeondo, J. (2004). The biology of *Colletotrichum acutatum*. *Anales del Jardín Botánico de Madrid* 61(1):3-22.
- Wharton, P.S. and Schilder, A.C. (2008). Novel infection strategies of *Colletotrichum acutatum* on ripe blueberry fruit. *Plant pathology* 57:122-134.
- Polashock, J.J., Caruso, F.L., Averill, A.L. and Schilder A.C. Eds. (Revised 2007). *Compendium of blueberry, cranberry and lingonberry diseases and pests*. APS press.

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