Ministry of Agriculture, Food and Fisheries

Blueberry Anthracnose

March 2021

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 fioriniae* (previously *Colletotrichum acutatum*). Anthracnose occurs in all blueberry producing regions in B.C. The primary concern with anthracnose fruit rot is the impact of reduced shelf-life and poor fruit quality on the fresh market.

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 1A). Within a few days, bright salmon-orange coloured, wet spore masses can be seen on the shrunken areas (Figure 1B). These sticky spore masses often spread to other berries by rain, irrigation, splashing water and contact during harvest, resulting in substantial pre- and postharvest 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 stems. New shoots and leaves may become blighted in the spring. On twigs, infections originate from the 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

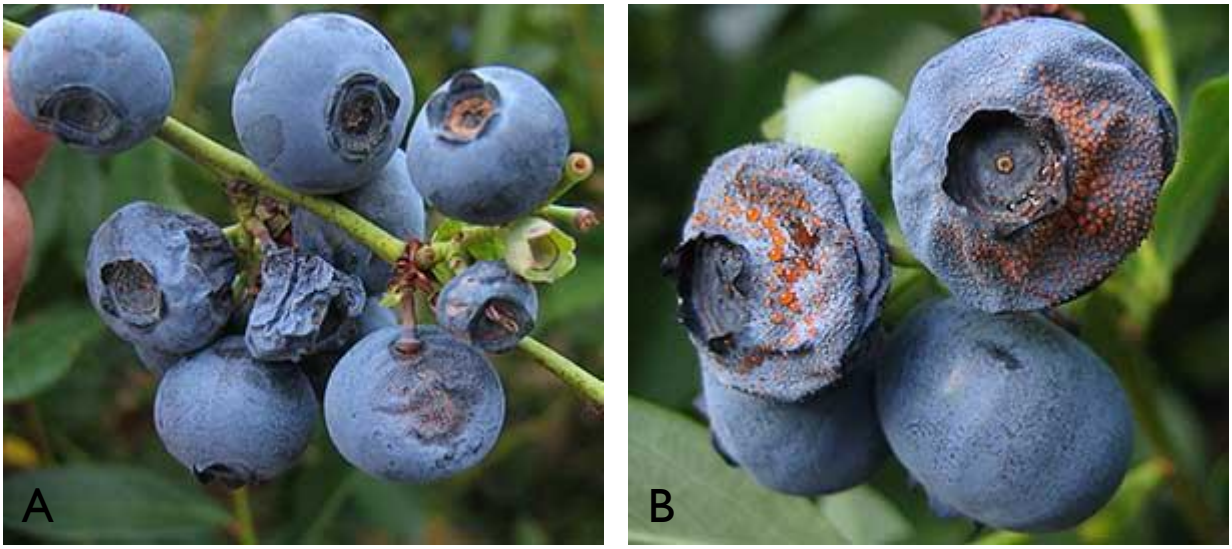

Figure 1. Fruit infected with anthracnose showing (A) sunken areas and shrivelling near blossom-end and (B) masses of salmon-orange coloured wet spores on ripe berries.

Disease Cycle

The fungus over winters on live twigs and flower buds and 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 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. 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, irrigate 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 enough 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. 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.

Submit suspected plant samples to the Ministry of Agriculture, Food and Fisheries - Plant Health Laboratory or to a qualified laboratory for disease confirmation.

Control

Follow a scheduled fungicide spay 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).

Fungicides that have been registered for anthracnose management is depicted in Table 1. 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, and do not apply the same fungicide repeatedly or not more than 2 consecutive sprays. Rotate fungicides belonging to different chemical.

Post-harvest fruit handling

Post-harvest handling of fruit 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. Protect harvest berries left in the field from heat as much 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.

Table 1. A summary of registered aphicides and label information. Please refer to Health Canada's Pest Management Regulatory Agency website for labels and information on registered fungicides.

Product	Active ingredient	Chemical or biological group	Mode of Action	REI[1] hrs	PHI[2] days	Application Guidelines
Bravo 500, Bravo 720, Echo 720	chlorothalonil	M5	preventative, non-systemic	48	54	Apply preventatively at green tip, pink bud, and petal fall. Apply at 10 to14 days intervals. Do not exceed 3 applications per season.
Quash, Quash SC	metconazole	3	curative, systemic	72	7	Apply preventatively at bloom and, thereafter, 7-day intervals. Do not exceed 3 applications per season.
Quilt	azoxystrobin & propiconazole	3 & 11	preventative & curative, locally systemic	12	30	Apply preventatively at bloom and, thereafter, 7 to 10 days intervals. Do not exceed 4 applications per season.
Inspire Super	difenoconazole & cyprodinil	3 & 9	preventative & curative, locally systemic	12	1	Appy preventatively at early bloom, thereafter, at 7 to 10 days intervals. Do not exceed 2 consecutive applications.
Pristine WG	boscalid & pyraclostrobin	7 & 11	preventative & curative, locally systemic	24 (until dry)	0	Appy preventatively at 7 to 14 days intervals. Do not exceed 4 applications per season. Do not apply as a tank mix.
Miravis Neo	propiconazole, pydiflumetofen & azoxystrobin	3, 7 & 11	preventative & curative, locally systemic	12	30	Apply preventatively at 10 days intervals. Do not exceed 2 applications per season.
Switch WG	cyprodinil & fludioxonil	9 & 12	preventative, non-systemic	12	1	Apply preventatively at early bloom, thereafter, at 7 to 10 days intervals. Do not exceed 3 applications per season.

Cabrio EC	pyraclostrobin	11	preventative & curative, locally systemic	24	1	Apply preventatively at early bloom, thereafter, 10 to 14 days intervals. Do not exceed 4 applications per season.
Allegro 500	fluazinam	29	preventative & curative, locally systemic	24	30	use preventatively at early bloom, thereafter, at 7 to 10 days intervals. Do not exceed 4 applications per season.
Aliette WDG	fosetyl-Al	33	protectant & curative (systemic)	24	1	Apply preventatively at pink bud, thereafter, at 14 to 21 days intervals. Do not exceed 4 applications per season.
Confine Extra	phosphorous acid	33	protectant & curative (systemic)	48	1	Apply preventatively at 7 to 21 days intervals.

[1]REI - re-entry interval

[2]PHI - pre-harvest interval

Useful References

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.

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-Uribeondo, J. (2004). The biology of *Colletotrichum acutatum*. Anales del Jardín Botánico de Madrid 61(1):3-22.

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