

The Northwest Center for Small Fruits

Title: Identification of the fungal pathogen causing dry-berry and development of tools for rapid identification

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In this Factsheet

- An exploration of the fungus which causes dry-berry disease is refined and determined to be caused by a new species of *Monilinia*, closely related to *Rhizoctonia rubi* which was misidentified to cause the disease in 1959.
- The newly identified fungus went through processes to determine accurate ways to isolate and confirm it in plant disease laboratories.
- Fungicide sensitivity testing was conducted to determine the best mode of action to limit the growth of this newly identified pathogen in field conditions.

Identification of the fungal pathogen causing dry-berry and development of tools for rapid identification

Abstract

Dry-berry, a disease of raspberry and blackberry, whereby immature green berries are killed, was first described in British Columbia, Canada in the 1950's. The pathogen was named *Rhizoctonia rubi*, and we have made significant progress in reexamining the identity of the pathogen with molecular methods and determining its fungicide sensitivity. We characterized DNA sequences of 14 dry-berry fungal isolates and determined that the fungal pathogen causing dry-berry disease is a novel species of *Monilinia*, not a *Rhizoctonia* species as previously thought. This has major implications on the types of fungicides that will best manage the disease. Using these DNA sequences, we are now developing PCR-based tools to rapidly confirm dry-berry disease in less than a day. In the longer term, we are preparing high-quality DNA extractions of 4 dry-berry isolates for full genome sequencing, which is ongoing. We also have tested the effectiveness of DMI (FRAC 3), SDHI (FRAC 7), and QoI (FRAC 11) fungicides to limit the growth of the dry-berry pathogen. We also deployed a set of spore traps in 2021 with the goals of obtaining environmental spore samples to determine when dry-berry spores are dispersing in fields and as a resource to test the accuracy of new PCR assays to detect the dry-berry pathogen. Analysis of spore trap data is underway. All together, the information generated with this project may be used to better align the application of the most effective fungicides for dry-berry management during the periods of greatest risk for infection.



Changes to standard production practices and new grower recommendations:

- Identification is key to determining proper management. Watch for diseased green fruit with brown immature berry, dead sepals and necrosis spreading down the pedicle. It is common for other berries on the laterals to appear perfectly normal. The killed berries persist through the season on the dead pedicle.
- The pathogen *Monilinia rubi* (proposed name) has a history of destruction (up to 50% crop loss) in the pre-synthetic fungicide era. The isolates that we tested were sensitive to chemistries from three fungicide resistance groups (FRAC 3 fungicides (DMI) propiconazole, tebuconazole, and myclobutanil; FRAC 7 fungicide (SDHI) boscalid; and FRAC 11 fungicides (QoI) azoxystrobin and pyraclostrobin). The study suggests that dry-berry is managed inadvertently by early season fungicide applications to manage yellow rust and *Botrytis*. Dry-berry should be monitored especially in fields where fungicide programs have changed substantially.
- Scout for dry-berry in organically-managed fields and in no-spray fields. A high incidence of dry-berry was observed in blackberry test plots in northern Washington that were not treated with fungicides.

Production Tips

- The territory of *Monilinia rubi* is undetermined. The pathogen is endemic in British Columbia and northern Washington. Its spread into new regions should be monitored and noted.
- If a suspected dry-berry infection is found in the field and sent in for diagnosis, a rapid molecular diagnostic tool will allow for quick and robust confirmation of dry-berry disease once PCR primers are validated.

Economic Impact

- Reclassification of the dry-berry fungus from a *Rhizoctonia* sp. to a *Monilinia* sp. This changes the classification of the fungus from a basidiomycete to an ascomycete fungus, which impacts the fungicides selected to control the disease. Helping hone in on proper management will save resources.
- Evaluated sensitivity of the pathogen to fungicides. Fungicides were selected from groups that are rated as moderate to high-risk for development of resistance. All six fungicides were effective at reducing dry-berry pathogen hyphal growth, indicating, at present, there are numerous fungicides growers can utilize and rotate to manage this disease.
- The rapid identification PCR assay will be useful to plant disease clinics to diagnose the disease. The PCR assay also will be instrumental for epidemiological studies to understand the disease dynamics, the influence of weather on spore dispersal, pathogen refuges, and when growers should intervene with fungicide applications to manage the disease.

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Related Research

-  Weldon, W. A., McGhee, G., Shaffer, B., and Stockwell, V.O. Taxonomic reclassification of the fungal pathogen causing dry berry disease of caneberries into the division Ascomycota as *Monilinia rubi*. *Plant Disease* 2022.

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-  Weldon, W. A., McGhee, G., Shaffer, B., and Stockwell, V.O. 2021. Optimizing media and temperature conditions for culturing of the dry berry fungal pathogen of *Rubus* spp. *Plant Health* 2021, Annual meeting of the American Phytopathological Society. Abstract.

