

# Newly discovered pathogen in NY apples causes bitter rot disease

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Apple with bitter rot disease, caused by a *Colletotrichum* fungus. Credit: image provided by Srdjan Goran Acimovic

In a study of New York state apple orchards, Cornell plant pathologists have identified a new fungal pathogen that causes bitter rot disease in apples. Also, a second related fungus known to cause rot disease in other fruits was found for the first time in apples.

The study, "Identification and Characterization of Colletotrichum Species Causing Apple Bitter Rot in New York and Description of *C. noveboracense* sp. nov.," was published July 6 in the journal *Scientific Reports*.

"We were shocked by what we found, just dumbfounded," said Srdjan Acimovic, a senior extension associate at the Hudson Valley Research Laboratory (part of Cornell AgriTech) and the paper's senior author.

"We found these two [species](#), one that has never been described before and one that has been described before but never on this host."

Both pathogens belong to the genus *Colletotrichum*, which contains 189 [species of fungi](#) that cause devastating rot diseases in a wide variety of fruit crops, including banana, strawberry, citrus, avocado, papaya, mango and [apple](#).

If protective practices are not applied in a timely manner, apple losses from bitter rot in New York state can average up to 25% per year, with reports of some organic farms losing up to 100% of their crop. Bitter rot also accounts for up to 5% additional loss of marketable fruit in storage post-harvest.

This damage is costly for farmers; the farm gate value for New York apples was roughly \$260 million in 2018, according to U.S. Department of Agriculture statistics.

"The main purpose of the study was to identify all the *Colletotrichum* species in apple orchards in New York, and especially in the Hudson Valley area," said study first author Fatemeh Khodadadi, a postdoctoral researcher in Acimovic's lab.

The [dominant species](#) found in the apples was *C. fioriniae*, followed by *C. chrysophilum*, which is found in other fruits but not apples until now,

and the newly discovered *C. noveboracense*, named after New York state in Latin.

In the study, the researchers isolated *Colletotrichum* fungi in 400 separate cultures from samples collected in commercial and private apple orchards from eight New York counties—Ulster, Dutchess, Orange, Albany, Westchester, Greene, Columbia and Suffolk—in 2017 and 2018.

Samples came from Honeycrisp, Idared, McIntosh, Gala, Fuji, Red Delicious, Golden Delicious, Empire, Snap Dragon, Cortland, Rambo, Granny Smith, Crimson Crisp and Winesap apple cultivars that displayed typical symptoms of bitter rot disease.

In collaboration with researchers at Pennsylvania State University, Khodadadi and Acimovic also received and examined samples from apple orchards in Pennsylvania, where they found all three of the prevalent New York species, along with others not yet detected in New York.

*Colletotrichum* fungi that infect apple [fruit](#) can largely be divided in two main groups. One group called the *C. gloeosporioides* complex thrives in warmer growing regions than the other group, the *C. acutatum* complex, which is more frequently reported in cooler apple growing regions. And based on the group they belong to, species can react differently to fungicides, which the researchers also tested. For this reason, identifying and characterizing the fungi is important for bitter rot management.

"When we know which species are dominant in our area, we know how [environmental conditions](#) will affect them and which control method is best in an orchard," Khodadadi said.

"We think that the range of these pathogens is expanding because of

global warming, however, more work needs to be done to demonstrate this" Acimovic said.

In the future, the researchers plan to work with other plant pathologists and apple breeders to identify possible genes that confer natural resistance to *Colletotrichum* fungi that may be bred into apple cultivars.

**More information:** Fatemeh Khodadadi et al, Identification and characterization of *Colletotrichum* species causing apple bitter rot in New York and description of *C. noveboracense* sp. nov., *Scientific Reports* (2020). [DOI: 10.1038/s41598-020-66761-9](https://doi.org/10.1038/s41598-020-66761-9)

Provided by Cornell University

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