# Annual report (funded in 2019)

**Title:** Species Identification and Fungicide Resistance Profiling of *Botrytis* Isolates Affecting Raspberries and Blackberries in the Mid-Atlantic.

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**Program Area:** Production Research

Approved funding: $3,500

Specific objectives in the grant:

*Obj. 1. Identify Botrytis species from raspberry and blackberry fields in the Mid-Atlantic.*

In total, 82 *Botrytis* isolates were collected from blackberries (n=13), black raspberries (n=33), red raspberries (n=36), from 5 farms in Maryland during 2018 to 2019 seasons. All isolates were phenotypically and genotypically identified as *Botrytis cinerea*. No other *Botrytis* species were identified.

*Obj. 2. Determine fungicide sensitivity of Botrytis isolates to multiple chemical classes of fungicides.*

All the 82 isolates from brambles and additional 167 isolates collected from grapes (n=92) and strawberries (n=75) in the region were tested for fungicide resistance to commonly used fungicides. Overall frequencies of resistance were found to be: 92% to pyraclostrobin (one component in Pristine), 86% to cyprodinil (one component in Switch), 71% to thiophanate-methyl (Topsin M), 48% to fenhexamid (Elevate), 47% to iprodione (Rovral), 26% to boscalid (one component in Pristine), 11% to fludioxonil (one component in Switch), 8% to penthiopyrad (Fontelis), 7% to benzovindiflupyr (Aprovia), 4% to adepidyn (Miravis Prime), and 4% to isofetamid (Kenja).

The fungicides used for the resistance detection represented seven distinct chemical classes, and the isolates were summarized according to the number of chemical classes to which they were resistant (Fig. 2). Eight isolates were S to every chemical class (0CCR), and 19 isolates were R to one (1CCR), 37 isolates were R to two (2CCR), 54 were R to three (3CCR), 60 were R to four

(4CCR), 47 were R to five (5CCR), 33 were R to six (6CCR), and 7 were R to all seven (7CCR) chemical classes of fungicides tested. The 7CCR isolates were from three strawberry and red two raspberry farms. 0CCR isolates were collected from blackberry, black raspberry, red raspberry, and strawberry, but not from grapes. CCR values of isolates from blackberry (5.31), red raspberry (4.67), and strawberry (4.34) had statistically higher (α = 0.05) mean CCR values than grape (3.32) and black raspberry (2.76).
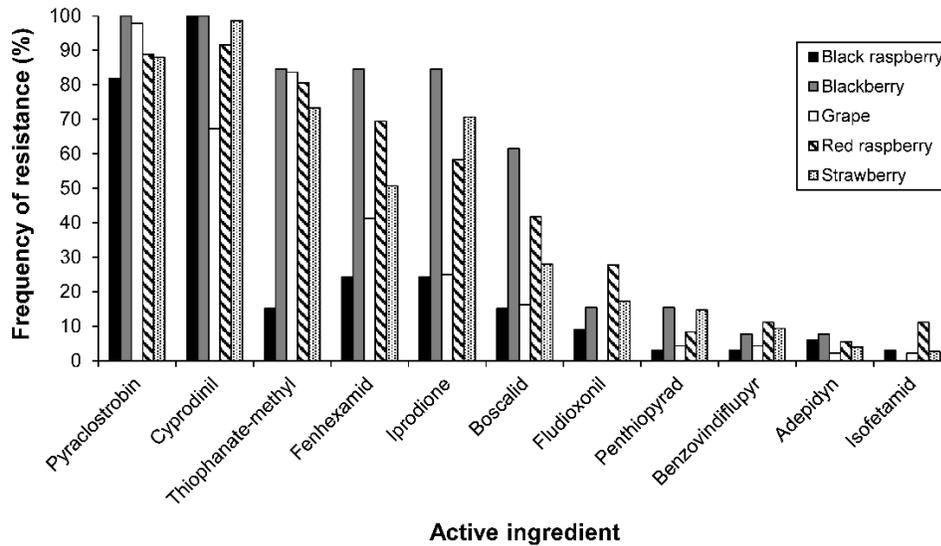


**Fig. 1.** Frequencies of resistance to eleven active ingredients in *Botrytis cinerea* isolates collected from black raspberry (n=33), blackberry (n=13), grape (n=92), red raspberry (n=36), and strawberry (n=75).
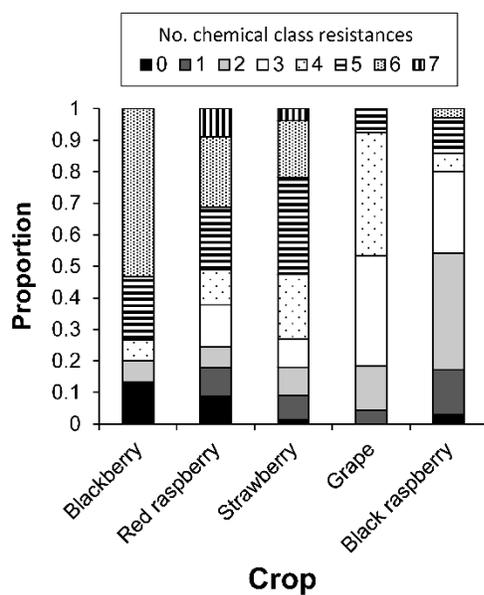


**Fig. 2.** Proportion of *Botrytis cinerea* isolates from blackberry (n=13), red raspberry (n=36), strawberry (n=75), grape (n=92), and black raspberry (n=33), resistant to 0, 1, 2, 3, 4, 5, 6, or 7 distinct chemical classes.

*Obj. 3. Compare species and resistance profiles of Botrytis isolates between raspberries, blackberries and other small fruit.*

Please refer to figs. 1 and 2.