

Field susceptibility trial of cider apple cultivars to bitter rot and black rot

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Final Technical Report

Objectives

1. Determine in orchard susceptibility of fruit from cider apple cultivars to bitter rot (*Colletotrichum acutatum*)
2. Evaluate efficacy of fungicide programs for bitter rot control in Michigan
3. Determine in orchard susceptibility of fruit from 28 cider apple cultivars to black rot (*Botryosphaeria obtusa*)

These in orchard trials took place at Michigan State University (MSU) Plant Pathology (PLP) Farm in East Lansing during the 2024 growing season. The work will upon previous research funded by Michigan Craft Beverage Council during in FY22 and FY23. Assessment of disease susceptibility of cider apple cultivars to summer fruit rots under Michigan conditions will enable growers to utilize cultivar-specific optimized spray programs for control.

Methods & Accomplishments

During the 2024 growing season, ‘Gala’ apples were purchased from a local Meijer. These apples were used to prepare bitter rot (*Colletotrichum acutatum*) and black rot (*Botryosphaeria obtusa*) field inoculum for in-orchard cider cultivar susceptibility study using wounding method. Apples were wounded with core borer, and wound was filled with mycelial macerate of one of the fungal pathogens. Apples were incubated in humidity chamber for one week, and sporulating apples were hung in cider block at Michigan State University (MSU) Plant Pathology (PLP) Farm using onion bags. The cider block at PLP Farm has 27 cultivars across two sub-blocks each consisting of five rows. The sub-blocks were inoculated with one of the fungal pathogens. After inoculation, the cider block did not receive any additional fungal management for the rest of the growing season, only insect pests were controlled. Up to 100 fruit per tree were rated for respective disease systems and used to calculate disease incidence (Figure 1). A first rating occurred the first week of September for early maturing cultivars, and a second rating occurred the first week of October for late-maturing cultivars. ‘Foxwhelp’ and ‘Nehou’ were highly susceptible to both bitter rot and black rot in field setting.

During 2024 growing season, ‘McIntosh’ apples were purchased from a local Meijer. These apples were used to prepare bitter rot field inoculum for fungicide efficacy trial. Apples were wounded with core borer, and wound was filled with mycelial macerate of *Colletotrichum acutatum*. Apples were incubated in humidity chamber for one week, and sporulating apples were hung in ‘McIntosh’ orchard block at MSU PLP Farm using onion bags. Inoculations were carried out on 23 of July. Fungicide treatments were applied at 300 gallons per acre with a handgun sprayer at 200-250 psi to a block of 45-year-old McIntosh trees at PLP Farm to evaluate bitter rot control. Treatments were replicated four times in single-tree plots. Prior to the commencement of this trial a grower standard program was utilized through fruit set for the

management of apple scab. Spray dates and respective growth stages for the treatments were as follows: A = 1 of July; B = 19 of July; C = 31 of July; D = 13 of August; and E = 23 of August. We did not observe phytotoxicity on leaves or fruit. Fruit on trees was evaluated on 26 of August by examining 100 fruits from each replicate tree for the incidence of bitter rot infection (Table 1). On 26 of August, fifty visually disease-free fruit from each tree were harvested and placed in cold storage at 2.2 °C. Fruits were pulled out of storage and rated for bitter rot on 20 of November (Table 1). Data were analyzed using the analysis of variance and LSD mean comparison function of ARM (version 2024.1; Gylling Data Management Inc., Brookings, SD). Percentage data were subjected to an arcsine square root transformation before analyses.

Communication Activities

The results of the 2024 field experiments were presented to tree fruit growers and stakeholders at Southwest Michigan Horticulture Days in Benton Harbor and Southeast Michigan Tree Fruit Day in Novi.

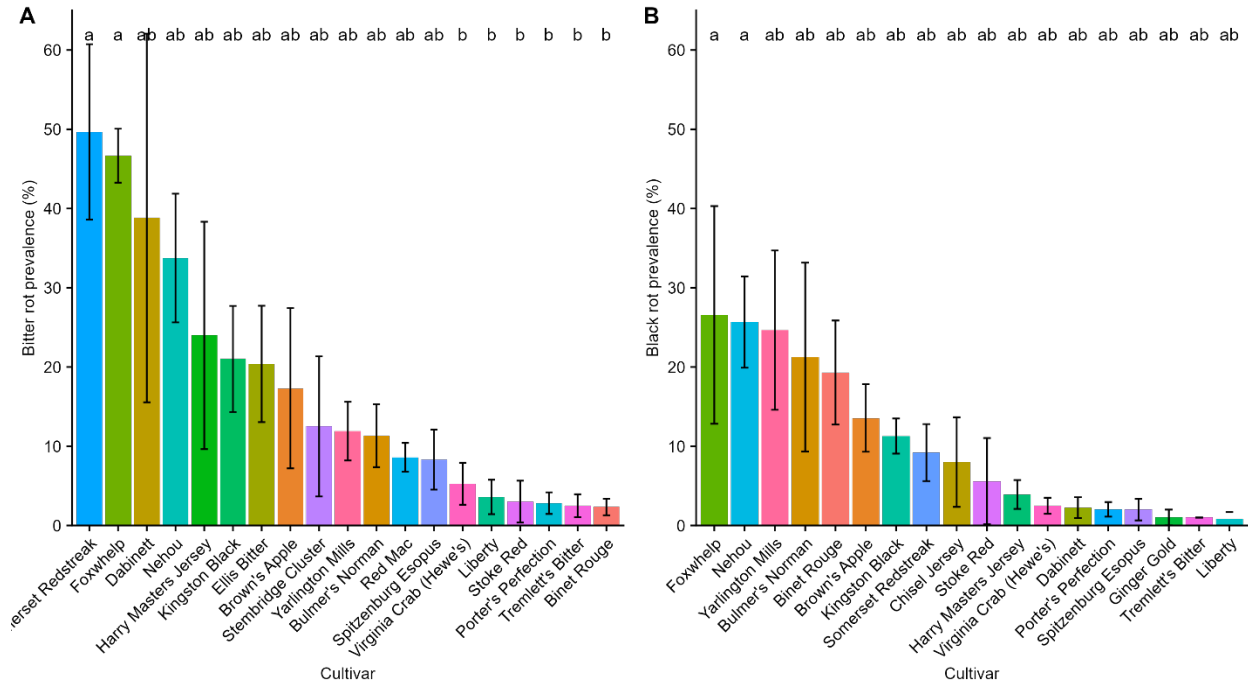


Figure 1. Relative susceptibility of cider apple cultivars after inoculation with bitter rot (A) or black rot (B).

Table 1. Fungicide efficacy trail on 'McIntosh'

2024 MSU Bitter Rot Trial		% Bitter Rot Infection	
Treatment and product per acre	Timing	26 Aug	20 Nov
1–LifeGard 4.5 oz / 100 gal + R-11 0.125% v/v	A		
Merivon 5.5 fl oz	B		
LifeGard 4.5 oz / 100 gal + R-11 0.125% v/v	C		
Merivon 5.5 fl oz	D		
LifeGard 4.5 oz / 100 gal + R-11 0.125% v/v	E	14.3 bc*	8.0 bc
2–Double Nickel 1 qt + Cueva 2 qt	A		
Merivon 5.5 fl oz	B		
Double Nickel 1 qt + Cueva 2 qt	C		
Merivon 5.5 fl oz	D		
Double Nickel 1 qt + Cueva 2 qt	E	11.5 c	7.5 c
3–Double Nickel 1 qt	ABCDE	29.8 a	24.5 ab
4–Double Nickel 2 qt	ABCDE	25.3 ab	30.5 a
5–Merivon 5.5 fl oz	BD	12.3 c	10.5 bc
6–Merivon 5.5 fl oz	ABCDE	12.3 c	5.0 c
8–Untreated control		37.3 a	42.0 a

*Means within a column followed by the same letter are not significantly different according to Fisher's Protected LSD ($P \leq 0.05$).