Southern Region Small Fruit Consortium
Extension Progress Report
2024 E-03

Title: An examination of *Botrytis cinerea* fungicide resistance in strawberries in the Southeast

Name, Mailing and Email Address of Principal Investigator(s):

- **Rebecca A. Melanson**, Co-PI, Plant Pathologist, Central MS Research & Extension Center, 1320 Seven Springs Road, Raymond, MS, 39154, rebecca.melanson@msstate.edu
- **Alejandra Maria Jimenez-Madrid**, Co-PI, Director – Plant Molecular Diagnostic Lab, University of Georgia, Tifton, CAES Campus, 2360 Rainwater Rd, Tifton, GA 31793, a.jimenez@uga.edu
- **Guido Schnabel**, Co-PI, Plant Pathologist, College of Agriculture, Forestry and Life Sciences, 105 Collings St. 220 BRC, Clemson, SC 29634, schnabe@clemson.edu

Public Abstract:
The disease gray mold is one of the most important diseases of strawberry in the Southeast. This fungal disease is largely managed with fungicides, but fungicide resistance to the pathogen that cause this disease, *Botrytis cinerea*, is well-documented, complicating disease management for producers. Fungicide resistance testing to the fungicides boscalid, fenhexamid, fludioxonil, fluopyram, iprodione, penthiopyrad, pyraclostrobin, and thiophanate methyl was conducted by the University of Georgia Molecular Diagnostic Laboratory on *Colletotrichum* spp. isolates collected from anthracnose-infected samples from strawberry fields in several of the Southern Region Small Fruit Consortium states (e.g., Alabama, Arkansas, Georgia, Louisiana, Mississippi). In total, 65 isolates were tested for fungicide resistance. Most isolates were resistant or had reduced sensitivity to fenhexamind (70.8%), penthiopyrad (93.8%), pyraclostrobin (92.3%), and thiophanate-methyl (80.0%). All tested isolates were resistant or had reduced sensitivity to boscalid and flyopyram. At least half of the isolates remained sensitive to fludioxonil (50.8%) and iprodione (66.2%). This study is expected to carry over into the 2025 season, which will allow for a better representation of isolates from across the Southeast.

Introduction:
Strawberries are a valuable small fruit crop in the United States, including in the Southeast, where they are produced commercially in both conventional and organic production systems. Production of a successful strawberry crop requires, among other factors, successful management of pests, including plant pathogens (diseases), arthropods (e.g., insects and mites), and weeds. Across the Southeast, one of the most important diseases of strawberries is gray mold, caused by the fungus *Botrytis cinerea*, that causes rots on berries. This disease is largely managed with fungicides, but fungicide resistance to *Botrytis cinerea* is well-documented in the Southeast, complicating disease management for producers. Several plant diagnostic and research laboratories in the Southeast, including the University of Georgia Plant Molecular Diagnostic Lab (UGA MDL), offer resistance

profile testing for *Botrytis*, which enable strawberry producers to manage gray mold more effectively and economically in their fields by allowing them to make informed decisions when choosing fungicides. The Southeast Regional Strawberry Integrated Pest Management Guide Focused on Plasticulture Production (henceforth called the Strawberry IPM Guide) includes a Fungicide Decision Management Table, which recommends various options for a fungicide spray program based on the known fungicide resistance profiles for *Botrytis* and *Colletotrichum* within a field. The determination of *Botrytis* fungicide resistance throughout the Southeast will enable the authors of the Strawberry IPM Guide the ability to update this table, as necessary, to better assist strawberry producers in the Southeast in developing spray programs for these two diseases when resistance test results are provided and will give producers, scientists, and Extension educators a better idea of the level of resistance present in the Southeast.

Description of Outreach Activity:

Objectives:

1. To determine the fungicide resistance profiles for *Botrytis cinerea* (gray mold) in strawberries in the southeastern U.S., particularly in states for which resistance profile testing has not been conducted or has not been conducted in recent years
2. To update the Fungicide Decision Management Table in the Southeast Regional Strawberry Integrated Pest Management Guide Focused on Plasticulture Production to be more applicable to all strawberry producers in the Southeast

Collaborators from each state in the Southern Region Small Fruit Consortium will assist in the collection and/or submission of gray mold samples from up to five representative farms in their states. Samples will be submitted to the UGA MDL for resistance testing to eight fungicides, e.g., boscalid (FRAC 7), fenhexamid (FRAC 17), fludioxonil (FRAC 12), fluopyram (FRAC 7), iprodione (FRAC 2), penthiopyrad (FRAC 7), pyraclostrobin (FRAC 11), and thiophanate-methyl (FRAC 1). Isolates will be rated as being resistant, having reduced sensitivity, or sensitive. Results will be used to update the next edition of the Fungicide Decision Management Table in the Southeast Regional Strawberry Integrated Pest Management Guide Focused on Plasticulture Production.

Results or Outcome:

This is a progress report as the project has not reached its end date (February 28, 2025) and a no-cost extension will be requested. Thirteen samples from Alabama (1), Arkansas (4), Georgia (2), Louisiana (1), and Mississippi (5) were collected and submitted to the UGA Molecular Plant Diagnostic Laboratory for *Colletotrichum* resistance testing. During the 2024 season, every state in the Southern Region Small Fruit Consortium was not able to submit samples or reach the sample submission goal. *Botrytis* isolates from submitted samples were tested to determine their sensitivity or resistance to three fungicides, e.g., boscalid, fenhexamid, fludioxonil, fluopyram, iprodione, penthiopyrad, pyraclostrobin, and thiophanate-methyl, and were rated as being resistant, having reduced sensitivity, or sensitive. In total, 65 isolates were tested for fungicide resistance. Most isolates were resistant or had reduced sensitivity to fenhexamind (70.8%), penthiopyrad (93.8%), pyraclostrobin (92.3%), and thiophanate-methyl (80.0%). All tested isolates were resistant

or had reduced sensitivity to boscalid and flyopyram. At least half of the isolates remained sensitive to fludioxonil (50.8%) and iprodione (66.2%).

Since the samples collected are not representative of all of the Southern Region Small Fruit Consortium states and the full set of samples were not able to be collected from each state, we are requesting a continuation into the 2025 season; the full set of results will be used to update the Fungicide Decision Management Table in the Southeast Regional Strawberry Integrated Pest Management Guide Focused on Plasticulture Production for 2026.