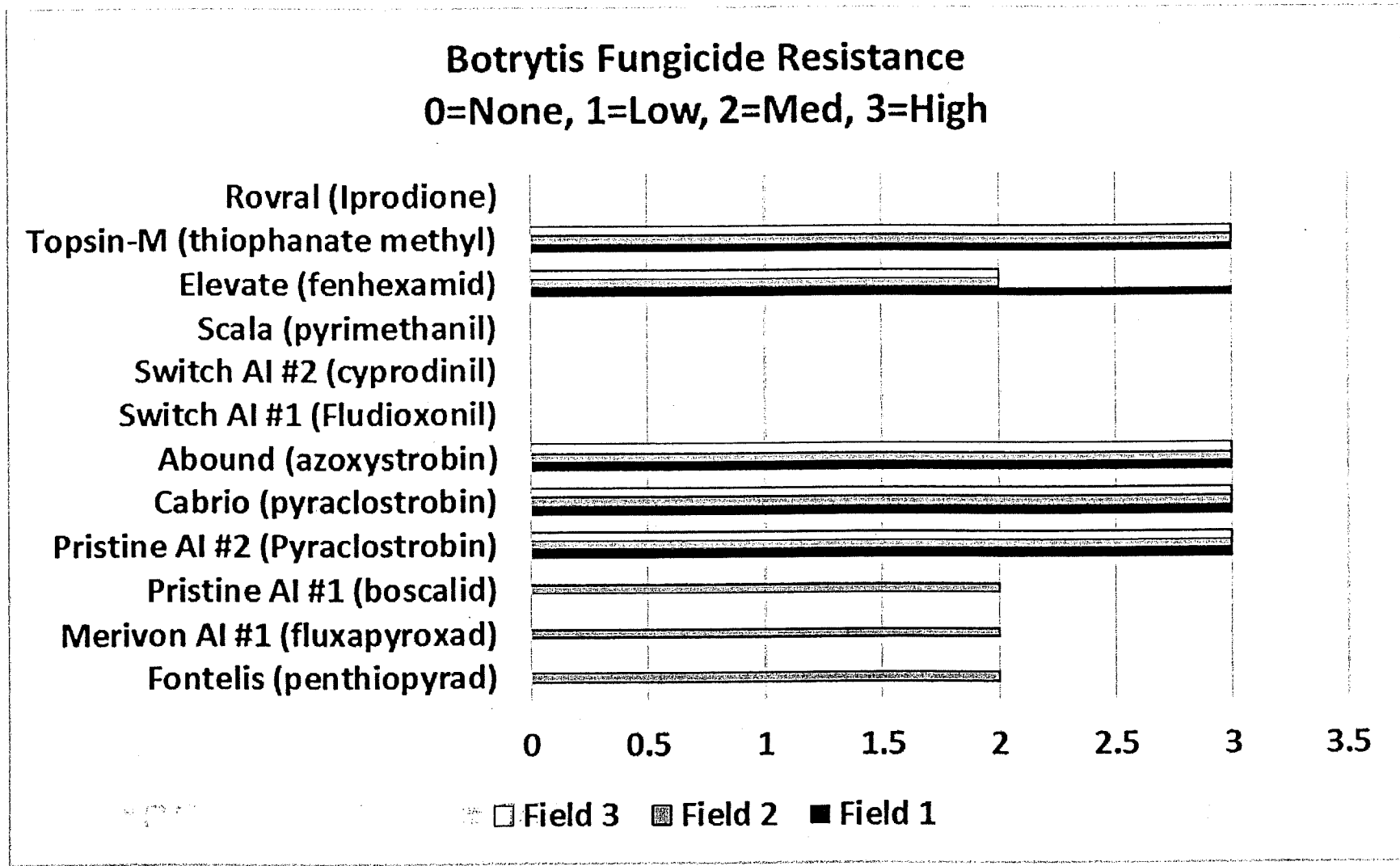


Fungicide resistant populations of Botrytis in Maryland, based on 2015 testing (Guido Schanbel)



Pre-harvest—Early Bloom (10%) and into Harvest: Disease Management

The primary diseases of concern at early bloom and into harvest are **Botrytis fruit rot** and **anthracnose fruit rot (AFR)**. Most growers rarely experience anthracnose problems and may not need an anthracnose management program. Several **key principles** should be kept in mind:

1. Abound, Azaka, Cabrio, Merivon and Pristine belong to the same family of chemicals (QoI; Group 11 chemistry). Pyraclostrobin (Cabrio, Merivon, and Pristine) has offered better control of AFR in recent research efforts. No more than 2 sequential applications of a Group 11 fungicide should be made before alternating with fungicides that have a different mode of action. Pristine and Merivon also has a second chemical that has good broad spectrum activity against a number of diseases, especially those caused by Botrytis. Newly labeled pre-mix products include Quadris Top that has a broader range of activity (See Efficacy Table below on pages 28-29).
2. Captan, Thiram, and Switch offer a broad spectrum of disease control. Switch has not performed well against AFR in NC research.
3. Polyoxin D (PhD; OSO 5%SC; Tavano 5%SC) is as effective as captan for Botrytis and can help reduce the number the number of captan sprays. Consider substituting Polyoxin D up to 3 times for captan or thiram. Polyoxin D has low activity against AFR.
4. Elevate may not be used in more than 2 consecutive sprays. It is very effective against Botrytis but no other fungal pathogens. Resistance is known in many fields.
5. High risk fungicides of the same chemical class should not be applied in consecutive applications.
6. CaptEstate is a premix of captan and Elevate which has good broad-spectrum activity.
7. Bloom sprays are the most important for managing Botrytis, because 90% of fruit infection occurs through the flower at bloom. Recent research suggests bloom sprays are also critical for anthracnose fruit rot control.
8. Fruit rot diseases develop rapidly during wet periods or in poorly ventilated locations. Control is easier when initiated before the problem develops. Spray coverage is important and dependent on nozzle condition, tractor speed, pressure, and plant density. Spray coverage can be checked with water sensitive cards.
9. Botrytis has acquired resistance to several fungicides. Tests can be secured through Clemson University to help determine farm-specific recommendations. In the absence of such tests, growers should rely primarily on captan for gray mold control. For instructions on sampling see: <http://strawberries.ces.ncsu.edu/wp-content/uploads/2014/02/2014-collection-instructions-11.pdf>

For growers who **have** received a resistance profile report, follow the recommendations in that report.

For growers who do **not have** a report and who adopt a conservative (low risk) fungicide program, apply sprays every 7 to 10 days according to **ONE** of the following suggested schedules.

SCHEDULE 1. For cases when there is no risk of anthracnose and growers need to focus on gray mold control (most fields):

Rotate two or more of the following: polyoxin D; captan; CaptEstate; Switch; captan + Fontelis,

Options: For a reduced fungicide program, initiate applications at FIRST bloom as above but apply subsequent sprays before predicted wet weather that favors Botrytis; end applications about 26 to 30 days before expected final harvests. Increase the time between spray applications when dry weather persists. Research trials have documented that 4 sprays during bloom are sufficient to offer season-long Botrytis fruit rot control.

SCHEDULE 2. For cases where anthracnose fruit rot risk is high and gray mold control is also needed:

Application 1: At FIRST bloom apply captan or thiram tank mixed with Cabrio.

Application 2: Apply ONE of these alternatives: CaptEstate OR captan.

Application 3: Same as Application 1.

Application 4 and weekly: Rotate two or more of the following: captan; captan+ Cabrio.

In other words, there should be continuous coverage with Captan, a FRAC 11 or FRAC 3 products, or the combination. Follow **key principle 1** above. During periods of cool wet weather and during bloom, incorporate Switch for better Botrytis control. Pristine, Merivon, or Cabrio show the best efficacy under high anthracnose (AFR) pressure in research studies.

Pre-harvest—Early Bloom (10%) and into Harvest: Disease Management						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Botrytis gray mold	Captan 50W or Captan 80WDG	3 to 6 lb (50W) or 1.9-3.8 lb (80W)	+++	24 hr	1 day	See suggested schedule above on page 20. Do not apply more than 24 lb of captan active ingredient per acre per year. FRAC-M4
	Captec 4L	2.5 qt	+++	24 hr	1 day	
	Switch 62.5WG	11 to 14 oz	+++++	12 hr	0 days	Begin application at or before bloom and continue on a 7-10 day interval. Do not exceed 56 ounces of product per acre per year. Follow the label concerning rotational crop waiting periods. See resistance management notes on page 8 and 20. FRAC-12, FRAC-9
	Ph-D WDG	6.2 oz	+++	4 hr	0 days	No more than 3 applications per season. Rotate or mix with other FRAC groups. FRAC-19
	OSO 5%SC Tavano 5%SC	6.5 – 13 fl oz	+++	4 hr	0 days	Use high rate when used alone and disease pressure is high. No more than 6 applications per season at max. rate. Rotate or mix with other FRAC groups. FRAC-19
	Thiram 75 WDG Thiram 24/7	4.4 lb (WDG) 2.6 qt (24/7)	+++	24 hr	3 days	Make 3 to 5 applications at 10-day intervals. Thiram is a broad spectrum fungicide similar to captan. FRAC-M3
	Elevate 50WDG	1.5 lb	+++++	4 hr	0 days	Do not apply more than 6 pounds of Elevate per season per acre. Avoid making more than 2 consecutive applications. After the second application, use an alternative Botrytis material for 2 consecutive applications before reapplying Elevate. Under light pressure, reduced rates plus captan may be used (see label). FRAC-17
	Fontelis	16 to 24 fl oz	+++++	12 hr	0 days	Do not make more than 2 consecutive applications before switching to a fungicide with a different mode of action. Some matted row cultivars may show phytotoxicity (see label). FRAC-7
	CaptEstate 68 WDG	3.5 to 5.25 lb	+++++	24 hr	0 days	CaptEstate is a combination product of captan plus Elevate. Do not make more than 2 consecutive applications before switching to a fungicide with a different mode of action. Do not apply more than 21.0 lb/acre/season. With plastic mulch, do not apply within 16 feet of naturally vegetated or aquatic areas. FRAC-M4, FRAC-17

Pre-harvest – Early Bloom (10%) and into Harvest: Disease Management						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Botrytis gray mold (continued)	Scala	18 fl oz 9 fl oz	+++	12 hr	1 day	Use lower rate only in a tank mix with another fungicide active against gray mold (e.g. captan or Thiram). FRAC-12
	Fracture	24.4 – 36.6 fl oz	+	4 hr	1 day	Active ingredient is a protein extract of sweet white Lupin seeds. Some efficacy can be expected at the highest rate.
Botrytis blight and Anthracnose (acutatum)	Pristine WG	18.5 to 23 oz	+++++	12 hr	0 days	No more than 2 sequential applications of Pristine should be made before alternating with fungicides that have a different mode of action. Do not apply more than 5 applications per acre per crop year. See page 20. FRAC-11, FRAC-7
	Merivon	8 to 11 fl oz	+++++	12 hr	0 days	No more than 2 sequential applications of Merivon should be made before alternating with fungicides that have a different mode of action. Do not apply more than 5 applications per acre per crop year. See page 20. FRAC-11, FRAC-7
	Captan 50W Captan 80 WDG	3 to 6 lb (50W) 1.9-3.8 lb (80WDG)	+++	24 hr	1 day	For better control and resistance management, use captan applications plus Topsin-M (see label). See suggested schedule above. Do not apply more than 24 lb of captan active ingredient per acre per year. FRAC-M4
Anthracnose (acutatum)	Abound 2.08 F Azaka	6.2 to 15.4 fl oz	+++ (failure found in some fields)	4 hr	4 hr	See notes on page 20 to manage risk of developing fungicide resistance. In recent research, Abound and similar products has performed less well than Cabrio/Pristine. FRAC-11
	Merivon	5.5 to 8 fl oz	++++	12 hr	0 days	See notes on page 20 to manage risk of developing fungicide resistance. FRAC-11, FRAC-7
	Pristine WG	18.5 to 23 oz	++++	12 hr	0 days	See notes on page 20 to manage risk of developing fungicide resistance. FRAC-11, FRAC-7
	Cabrio EG	12 to 14 oz	++++	12 hr	0 days	See notes on page 20 to manage risk of developing fungicide resistance. FRAC-11
	Tilt and multiple generics	4 fl oz	++?	12 hr	0 days	Registered for Anthracnose Fruit Rot only. No more than 2 sequential applications should be made before alternating with fungicides that have a different mode of action. Not registered for Anthracnose crown rot control. FRAC-3

Pre-harvest—Early Bloom (10%) and into Harvest: Disease Management						
Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Anthracnose (acutatum) (continued)	Quadris Top	12 to 14 fl oz	+++	12 hr	0 days	Premix of two active ingredients, azoxystrobin (FRAC-11) and difenoconazole (FRAC-3). No more than 2 sequential applications should be made before alternating with fungicides that have a different mode of action.
	Protocol	1.33 pt	+++	24 hr	1 day	Premix of two active ingredients, thiophanate-methyl (FRAC-1) and propiconazole (FRAC-3). No more than 2 sequential applications should be made before alternating with fungicides that have a different mode of action.
Anthracnose ('gloeosporioides' crown rot)	Captan 50W	3 to 6 lb (50W)	++	24 hr	1 day	In plantings known to be infected with the anthracnose crown rot pathogen, consider applying captan plus Topsin-M at 10- to 14-day intervals, for a total of 2 to 3 applications in the fall. FRAC-M4
	Captan 80WDG	1.9-3.8 lb (80W)				
	Captec 4L	2.5 qt	++	24 hr	1 day	FRAC-M4
	Topsin-M 70WP	1 lb	++	12 hr	1 day	See note (page 20) on resistance management. FRAC-1
	Quadris Top	12 to 14 fl oz	+++	12 hr	0 days	Same as above. FRAC-3, FRAC-11
Powdery mildew (only)	Procure 50WS	4 to 8 oz	+++++	12 hr	1 day	Check label for prohibited rotational crops. Do not plant leafy or fruiting vegetables within 30 days after application. Do not plant bulb or root vegetables within 60 days after application. Do not plant cotton, small cereal grains and all other crops not registered within one year application. FRAC-3
	Procure 480SC	4 to 8 fl oz				
	Rally 40WSP	2.5 to 5 oz	+++++	24 hr	0 days	Rally is registered for control of leaf spot, leaf blight, and powdery mildew. Do not apply more than 30 oz per year. FRAC-3
	Quintec	4 to 6 fl oz	+++++	24 hr	1 day	Do not use more than 4 times per crop and no more than 2 times in a row. Rotate with other mildewcides. Rotation to all other crops within 1 year after application, unless Quintec is registered for use on those crops, is prohibited. FRAC-13
Powdery mildew and Anthracnose (acutatum)	Abound 2.08 F Azaka	6.2 to 15.4 fl oz	++++	4 hr	4 hr	See notes on page 20 to manage risk of developing fungicide resistance. FRAC-11

Pre-harvest—Early Bloom (10%) and into Harvest, Disease Management

Pest/Problem	Management Options	Amount of Formulation per Acre	Effectiveness (+) or Importance (*)	REI	PHI	Comments (FRAC/IRAC Code)
Powdery mildew and Anthracnose (acutatum) (continued)	Pristine WG	18.5 to 23 oz	++++	12 hr	0 days	See notes on page 20 to manage risk of developing fungicide resistance. FRAC -11, FRAC-7
	Cabrio EG	12 to 14 oz	++++	12 hr	0 days	See notes on page 20 to manage risk of developing fungicide resistance. DO NOT EXCEED 1.5 QT/YEAR. FRAC-11
	Tilt and multiple generics	4 fl oz	+++	12 hr	0 days	Registered for Anthracnose Fruit Rot only. No more than 2 sequential applications should be made before alternating with fungicides that have a different mode of action. Not registered for Anthracnose crown rot control. FRAC-3
	Quadris Top	12 to 14 fl oz	+++	12 hr	0 days	Premix of two active ingredients, azoxystrobin (FRAC-11) and difenoconazole (FRAC-3). No more than 2 sequential applications should be made before alternating with fungicides that have a different mode of action.