

Fungicide Selection for Botrytis and Anthracnose Fruit Rot Management 2018
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This is a supplement to the Strawberry IPM Guide. <http://www.smallfruits.org/assets/documents/ipm-guides/StrawberryIPMGuide.pdf>. Carefully read pages related to fungicide resistance and selection in the IPM guide.

Management of Botrytis fruit rot (gray mold; **BFR**) and anthracnose fruit rot (**AFR**) caused by “*Colletotrichum acutatum*” has become more complex. Growers need to use products that work against resistant strains of BFR and manage AFR. We developed a new table to help with the decision process (see below).

The Table (right) shows our current understanding of the efficacy (+++ = high efficacy) of fungicides for the Southeastern US (north of Florida). A large number of farms are experiencing problems with Botrytis strains that are resistant to one or more fungicide. (Color codes are similar to the codes in the MyIPM app).

BOTRYTIS CONTROL: *Botrytis cinerea* historically has a high potential to develop resistance. Therefore, it is important to give these recommendations serious consideration:

1. If a Botrytis spray is needed before bloom (e.g. to control Botrytis Crown Rot) use Rovral (FRAC 2).
2. Use members of any FRAC code (except M3 or M4) no more than twice per season (For example, if you used Fontelis once and Merivon once you maxed out the 2 applications for FRAC 7 fungicides).
3. Resistance profiles vary from farm-to-farm. Sample gray mold populations for their resistance profile through Clemson University (<http://www.clemson.edu/extension/peach/commercial/diseases/index.html>). Based on samples submitted to Clemson, the **Fungicide Decision Management Table** below shows a decision guide to manage Botrytis fruit rot. If you do not know your profile, it is best to avoid over-reliance on products where resistance is prevalent.
4. Specific plant sources may be identified as having AFR infestations. In that case growers need to manage both BFR and AFR.

AFR CONTROL: Resistance to FRAC 11 fungicides (Pristine, Cabrio, Merivon, Abound, Azaka, Luna Sensation) has been found in Florida, North Carolina and California; problems tend to be plant-source associated. Therefore, it is a good idea to use the FRAC 11 fungicides only in mixture at the lower label rate with the higher labeled rate of captan products (Captan or Captec) alternated with captan alone. If you know the resistance profile, see the **Fungicide Decision Management Table** below. Also, recently, we have documented reduced activity with azoxystrobin (Abound, Azaka) with certain strains of the anthracnose fruit rot (AFR) pathogen. Cabrio and FRAC 7+11 products have offered better control of AFR in recent research efforts and if the strains are not resistant to FRAC 11 fungicides.

FRAC 7+11 products can be used if your resistance profile shows the FRAC 7 component is still effective against BFR. If FRAC 7 resistance is diagnosed or you don't know, we recommend using Cabrio (plus captan). Like BFR, our data shows early bloom sprays are also critically important for AFR management.

	FRAC	BFR	Botrytis Resistance	AFR
Captan or Captec	M4	++	None	++
Captevate	M4+17	+++	Prevalent for 'Elevate'	++
Thiram	M3	++	None	+
Fracture	M12	+	No Data	No Data
Topsin M	1	Not effective	Widespread	Not effective
Rovral	2	++	Prevalent	Not effective
Tilt and generics	3	Not Effective	Not applicable	+
Fontelis	7	+++	Prevalent	+
Kenja	7	+++	Not Prevalent	Not effective
Scala	9	++	Prevalent	Not effective
Pristine	7+11	++	Prevalent	+++*
Merivon	7+11	+++	Prevalent	+++*
Luna Sensation	7+11	+++	Not Prevalent	+++*
Cabrio	11	Not effective	Widespread	+++*
Abound or Azaka	11	Not effective	Widespread	+*
Switch	12+9	+++	Not Prevalent	++
Elevate	17	+++	Prevalent	Not effective
Ph-D, OSO, Tavano	19	++	Not Prevalent	No Data

*Resistance issues to FRAC 11 fungicides have been reported in FL, CA and NC in the last 3 yrs. Problems tend to be plant source related.

For cases when there is no anthracnose and growers need to focus on gray mold control (most fields) follow Decision Code A below.

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 often are sufficient to offer season-long Botrytis fruit rot control. Also, consult available forecasting models linked through the Strawberry IPM guide.

For cases when anthracnose is present and there is no known resistance within the Botrytis population follow Decision Code B-1.

Before predicted periods of cool and wet weather during bloom, use Switch (12+9) for better Botrytis control. Use Switch with captan if Botrytis pressure is expected to be heavy. Switch also has decent anthracnose control. FRAC 7+11 products or Cabrio show the best efficacy against AFR under high anthracnose pressure in research studies and either can be used if there is no resistance to FRAC 7 (an active ingredient in FRAC 7+11 products). Also, if weather conditions (warm & wet) favor AFR, or you start to approach the upper limit of FRAC 11 fungicides allowed (4-5 applications), consider rotating to a tank mix of captan + Tilt.

See the Strawberry IPM Guide (<http://www.smallfruits.org/assets/documents/ipm-guides/StrawberryIPMGuide.pdf>) for more detailed Information on total IPM Programs and download the MyIPM-SED app to learn more about disease/pest management and FRAC codes. Also see: Diagnosis tool: <https://diagnosis.ces.ncsu.edu/strawberry/>
Strawberry Disease Factsheets: <https://strawberries.ces.ncsu.edu/strawberries-diseases/>

Fungicide Decision Management Table								
Decision	Fungicide Resistance issue		Sprays during bloom and fruit ripening					
Code	Botrytis	Anthracnose	1	2	3	4	5	6
A	No resistance	No Disease	12+9	7	thiram+17	thiram+19	captan	Goto 1
B-1	No resistance	No resistance	captan+17	11+7	12+9	captan+19	11+7	Goto 1
C-1	FRAC 7	No resistance	captan+17	captan+11	12+9	captan+11	captan+19	Goto 1
D-1	FRAC 17	No resistance	thiram+11	captan	12+9	11+7	captan+19	Goto 1
E-1	FRAC 7+17	No resistance	thiram+11	12+9	captan	captan+11	12+9	Goto 1
F-1	FRAC 12+9	No resistance	captan+17	11+7	thiram	11+7	captan+19	Goto 1
G-1	FRAC 12+9+17	No resistance	thiram+11	captan	thiram	captan+11	captan+19	Goto 1
H-1	FRAC 12+9+7	No resistance	captan+17	captan+11	thiram	captan+11	captan+19	Goto 1
I-1	FRAC 12+9+7+17	No resistance	thiram+11	captan	thiram	captan+11	captan+19	Goto 1
B-2	No resistance	FRAC 11	captan+17	captan+7	12+9	captan+19	captan+7	Goto 1
C-2	FRAC 7	FRAC 11	captan+17	captan	12+9	captan+17	12+9	Goto 1
D-2	FRAC 17	FRAC 11	captan+7	12+9	captan+7	12+9	captan+19	Goto 1
E-2	FRAC 7+17	FRAC 11	12+9	captan	captan+19	12+9	captan	Goto 1
F-2	FRAC 12+9	FRAC 11	captan+17	captan+7	thiram	captan+19	captan	Goto 1
G-2	FRAC 12+9+17	FRAC 11	thiram+7	captan	captan+7	captan	captan+19	Goto 1
H-2	FRAC 12+9+7	FRAC 11	captan+17	captan	thiram	captan+17	captan+19	Goto 1
I-2	FRAC 12+9+7+17	FRAC 11	thiram	captan	captan+19	captan	captan+19	Goto 1

Decision Management Code Guidelines:

A: Botrytis is expected with no resistance and plants are verified to be anthracnose free.

B-1 to I-1: The Anthracnose pathogen is known to be sensitive to FRAC 11 products

B-2 to I-2: The Anthracnose pathogen is known to be resistant to FRAC 11 products

NOTE: For B-1 to I-1: If anthracnose is known to be absent, then the FRAC 11 products are **NOT** needed.

B-1: Botrytis is expected; no resistance is documented and plants are verified to harbor the anthracnose pathogen

C-1: Botrytis is resistant to FRAC 7 products and plants are verified to harbor the anthracnose pathogen; Etc.,