

Stone fruit disease update

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Topics

- Understanding problems with brown rot control
- Management of bacterial spot of peaches and plums
- Copper
- Phytophthora collar rot
- Cherry leaf post

Why does brown rot (*Monilinia fruticola*) became a noticeable problem in some peach orchards some years?

Peach bloom Berrien Co. 2009

Date	Hr wet	Ave temp (C)	Ave temp (F)	Rain (in.)
4/25	15	9.4	49	0.13
4/27	29	11.1	52	1.26 *
4/30	33	11.7	53	0.30 *

* = sufficient for infection

Long wet periods during bloom are sufficient for blossom infection even when cool



Blossom remnants in tree provides enough spore production to start the epidemic



Why does brown rot (*Monilinia fruticola*) became a noticeable problem in some peach orchards some years?

Repeated use of same class of fungicide results in buildup of resistant strains of the brown rot fungus.



Michigan populations of brown rot (*M. fructicola*) are shifting toward SI resistance

- 2008 Cherry isolates – all sensitive to SI fungicides
- A single resistant isolate from peach 2009 and cherry 2010
- Detected two orchards shifting toward resistance (cherry 2010 & peach 2010)



American brown rot sterol inhibitor fungicide studies - Sundin

- Sundin's lab has surveyed approximately 1,500 isolates of American brown rot fungus (2009-2013) for sensitivity to SI fungicides
- 24.6% Sensitive
- 70.6% Somewhat resistant
- 4.8% Resistant
- For resistant strains even 12 fl oz Indar / A rate not effective.
- Most of ABR population is shifted toward resistance

Use of SI in view of increased resistance



Working subclasses of SI

1st generation

Myclobutanil (Nova)

Fulsilazole (Nustar)

Propiconazole (Topaz, Mission, Orbit)

2nd generation

Fenbuconazole (Indar)

Difenoconazole (Inspire Super – includes Vanguard)

- *less systemic*

American brown rot control strategies, 2014 and beyond

- **When using Indar, high rates are important, *spray window must be shortened***
 - 4-5 days depending on weather conditions
 - Protective applications are essential
 - Great coverage is essential
- **Add Captan for resistance management**
 - 2.5 lbs/A Captan 80 WDG



Expect that Indar 2F at the label rate of 6 fl. oz. per acre (= 2 oz Indar 75 WSP) should provide excellent control of American brown rot in most orchards.

Use of 8 fl. oz. per acre for control of fruit infections may be used as a hedge against further shifting of the brown rot population in most orchards

Growers whose American brown rot orchard populations are closer to the resistance threshold should consider using a 9-10 fl. oz. per acre rate.

The Michigan 24(c) registration allows as high a rate as 12 fl. oz. per acre. A maximum of 48 fl. oz. per acre is allowed per season, i.e., no more than eight applications at 6 fl. oz. per acre or four applications at 12 fl. oz. per acre.

4 oz Indar 2 F = 2 oz Indar 75

Brown Rot Resistance Against 5 Classes of Fungicides

Fungicide Class	Product examples	Resistance appearance	Brown rot resistance
Dodine	Syllit	Gradual, will revert back	Not used for this
Dicarboximide	Iprodione, Nevado, Rovral	Sudden	Not reported, not for use after petal fall
Sterol biosynthesis inhibitors	Bayleton, Elite, Rubigan, Indar, Orbit, Procure, Quash	Gradual	Becoming a real problem in some orchards
Strobilurins	Flint = Gem, Sovran, Cabrio, Abound	Sudden	Starting to appear in SE US
Anilo-pyrimidine	Scala, Vangard	Sudden	Reported in California, moderately effective

American brown rot control strategies, 2014 and beyond

- Mix in the new SDHIs Luna Sensation or Merivon or Pristine
- Alternate SDHIs with Indar, examples:
 - SDHI, Indar, Indar, SDHI or
 - Indar, SDHI, Indar, SDHI
- Add Captan for resistance management
 - 2.5 lbs/A Captan 80 WDG

SDHI labels for brown rot control

- Pristine – 10.5 - 14.5 oz/A, 5 appl max, 0 day PHI
- Merivon – 4 - 6.7 fl oz/A, 3 appl max,) day PHI
- Fontelis – 14 - 20 fl oz/A, 3 appl max, 0 day PHI

- Luna Sensation – not labeled for peaches (sweet and tart cherry only)
 - 5 - 5.6 fl oz/A, 2 appl max, 1 day PHI

Fruit Fungicide Summary - MSU Fruit Team – March 13, 2014

BRBlos = brown rot blossom, BRfruit = brown rot fruit, PM = powdery mildew, LS = leafspot, SBFS = sooty blotch fly speck, Numbers are preharvest interval (days) for A=apple, Pr=pear, Ch=cherry, Pch=peach, and Pl=plums; Efficacy ratings are P=poor, F=fair, G=good, E=excellent

<u>DMI</u>	<u>Frac</u>	<u>Active ingred.</u>	<u>2nd Active I.</u>	<u>BRBlos</u>	<u>BRfruit</u>	<u>PM</u>	<u>LS</u>	<u>SBFS</u>	<u>Scab</u>	<u>A</u>	<u>Pr</u>	<u>Ch</u>	<u>Pch</u>	<u>Pl</u>
Procure	3	<u>triflumizole</u>				G -r			F	14	14	1		
Rally	3	<u>myclobutanil</u>		E	P -r	FG -r	F	G	G	14		1	1	1
Elite	3	<u>tebuconazole</u>		E	GE -r	FG -r	F					0	0	0
Indar	3	<u>fenbuconazole</u>		E	E -r	E -r	F	F	E	14		0	0	0
Orbit	3	<u>propiconazole</u>		E	E -r		PF					0	0	0
Topguard	3	<u>flutriafol</u>				E		?	G	14				
Inspire Super	3/9	<u>difenoconazole</u>	<u>cyprodinil</u>			v		G	v	14	14	2^	2	2
<u>Qols (stroby)</u>														
Flint	11	<u>trifloxystrobin</u>				G		GE	R	14	14			
Sovran	11	<u>kresoxim-methyl</u>				G		GE	R	30	30			
<u>Cabrio</u>	11	<u>pyraclostrobin</u>		P	P	G	FG					0		
Gem	11	<u>trifloxystrobin</u>			G	E	E					1*	1	1
<u>Adament</u>	11/3	<u>tebuconazole</u>	<u>trifloxystrobin</u>		G	E	E			75	75	1	1	1
Pristine	11/7	<u>pyraclostrobin</u>	<u>boscalid</u>		G	E	E	G	E	0	0	0	0	0

Frac = Fungicide resistance action committee classes, * post petal fall cherry; # not past bloom; ^ not on sweets, ?R may have resistant scab in some locations, -r rumors of some resistance, v effective but not rated

Fruit Fungicide Summary

SDHI	Frac	Active ingred.	2 nd Active I.	BRBlos	BRfruit	PM	LS	SBFS	Scab	A	Pr	Ch	Pch	PI
Fontelis	7	penthiopyrad			G	GE			G	28	28	0	0	0
Luna Sensation	7/11	fluopyram	trifloxystrobin		G	E	E			14		1		
Luna Tranquility	7/9	fluopyram	pyrimethanil			GE			GE	72				
Merivon	7/11	fluxapyroxad	pyraclostrobin		G	GE	E		GE	0	0	0	0	0
Anilinopyrimide														
Scala	9	pyrimethanil				-			G	72	72		2	2
Vanguard	9	cyprodinil		G		-	P		G	72	72	^	#	#
Benzimidazole														
Topsin M	1	Thiophanate methyl				G		FG	R	0	1	1	1	1
Protectants														
Syllit	U12	dodine			P		E		?R	7		0	15	
Bravo	M5	chlorothalonil		G			E					X	X	X
Captan	M4	captan		F	F			FG	FG	X	X	X	X	X
Copper	M1	copper					G		G	X	X	X	X	X
Mancozeb	M3	EDBC							G	77	77			
Ziram	M3	ziram					PF		G	X	X	X	X	
Rovral	2	iprodione		E			F					#	#	#
Sulfur	M2	sulfur		PF	F	G	P		G	X	X	X	X	X

Frac = Fungicide resistance action committee classes, * post petal fall cherry; # not past bloom; ^ not on sweets, ?R may have resistant scab in some locations, -r hints of resistance

Bacterial Spot

- Peaches, nectarine, plums





Bacterial spot on
Castleton leaves

Bacterial Spot Notes

- **Warm temps, moisture (frequent rain, heavy dew, high humidity), high winds, driving rains favor epidemics**
- **Critical time for infection is from petal fall through pit hardening.**
- **Disease can be severe especially where peach is grown on sandy sites**
- **Vigorously-growing trees are less susceptible to disease than weaker trees**

Bacterial spot of peaches and nectarines



Hide” more susceptible varieties on the inside of orchard blocks with the most resistant varieties on the exposed orchard edges.

Use sod strips between trees and to use gravel or other dust-suppressing methods on nearby dirt roads.

Use of low rates of copper for suppression of bacterial spot of peaches and nectarines

Copper as an alternative to:

Mycoshield - more effective than copper for bacterial spot control but is more expensive and perhaps prone to resistance problems. Not labeled in Canada.

Syllit FI 1.5 to 2.3 pt + Captan 80 at 2.5 lb/acre has potential for phytotoxicity like copper. Bacterial spot is not on the Syllit label.



General program for in-season use of copper for bacterial spot suppression on peaches and nectarines

Stage	Formulated 53% copper (lb/acre)*	Metallic copper (lb/acre)
Delayed dormant	4 to 5	2
7 – 10 day interval	2	1
1 – 5% bloom	1	0.5
Petal fall	0.5	0.25
Shuck split	0.25	0.125
<i>Other coppers can be used—see label. After shuck split switch to Mycoshield or Syllit + captan</i>		

If you have not had a rain since the last copper, hold off or skip the next application. Apply no sooner than weekly.

Look for signs of copper injury and the amount of copper residue before each application. If copper is obvious on the foliage, hold off. If the amount of copper damage is becoming significant, hold off. Lime alone can be applied to help safen the existing copper on the foliage.

modified from summary by David Ritchie, North Carolina State University

Cautionary note for in-season use of copper for bacterial spot
suppression on peaches and nectarines
(modified from summary by David Ritchie, North Carolina State University)

Growers who opt for use of copper need to be aware that the safety margin is relatively small.

Copper is toxic when the dissolved form penetrates into plant tissue.

In general, growers should avoid the use of spray additives such as spray oils, foliar nutrients, and surfactants such as organosilicants with penetrating characteristics when applying coppers.

Careful calibration and adjustment of spray equipment is needed to make sure applications do not result in excessively high deposits of copper in some areas of the trees.



Additional notes/suggestions for use of copper

Solubility of fixed coppers increases under acidic conditions. Don't use acidifiers such as LI-700 and non-buffered phosphite fungicides with coppers.

Copper sprays generally cause more phytotoxicity to the sprayed foliage when applied under slow-drying conditions.

Finely ground coppers will stick better than more coarsely ground formulations.

For summer sprays, focus on minimizing phytotoxicity, perhaps with higher quality formulations



Prebloom pruning



Postbloom pruning

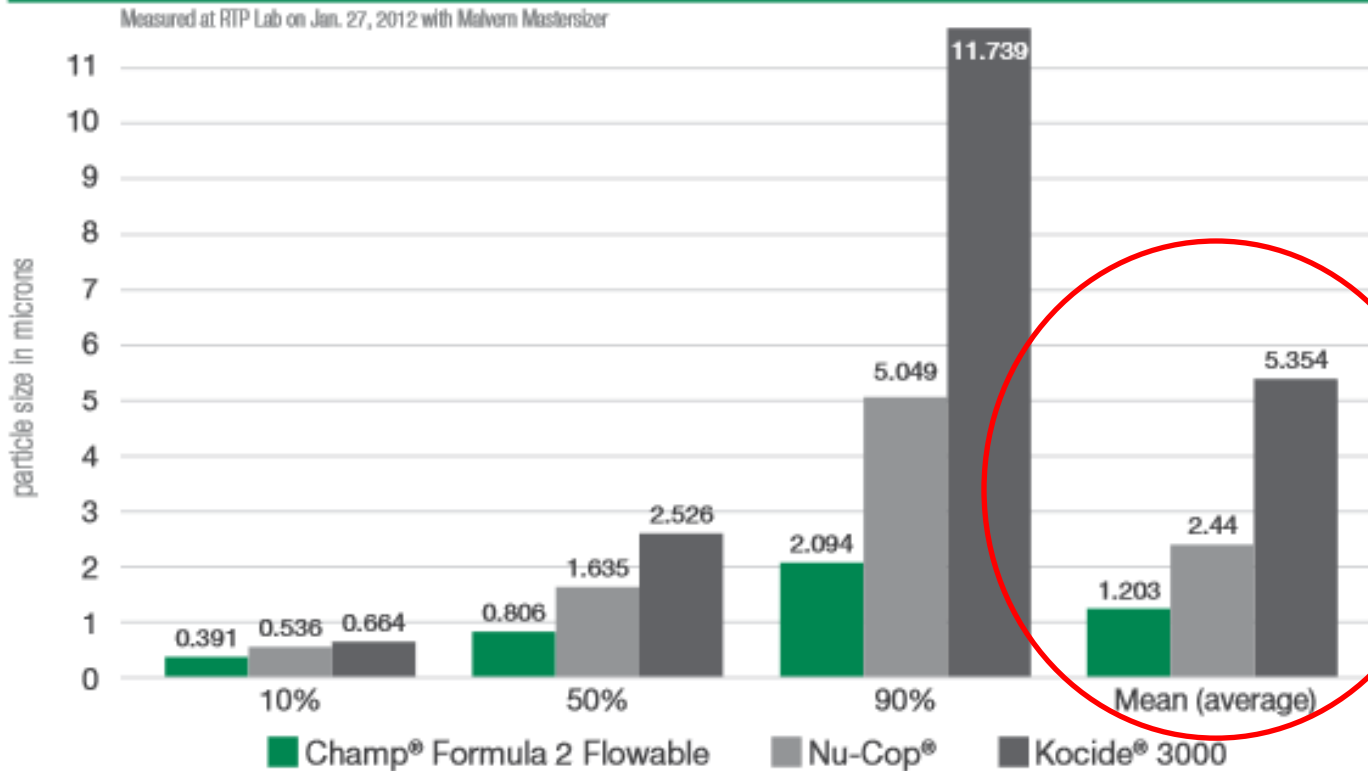
Leaf phytotoxicity and drop following copper treatment when peaches were stressed by late pruning

Copper damage to peach leaves



Copper damage to peach leaves and fruit

Particle Size Comparison



Particle size comparison of new Champ Formula 2 Flowable and Kocide® 3000 over a percentage range of particles. Champ 2F contains smaller, more uniformly-sized particles, with 90 percent of particles less than 2.094 microns in size, and a mean particle size of 1.203 microns, compared to 5.354 microns for Kocide 3000.

Other micronized types: Badge SC, Kocide Blue Xtra



***Phytophthora* crown and collar rot** of fruit trees

The disease frequently kills trees 5-7 years in age, about the time they begin to bear fruit.

Trees with collar rot are poorly anchored, have brown/red cambium tissue in the lower trunk, crown, and feeder roots.

Pathogen is more active in wet soils and at soil temperatures of 55-70°F.

Key factors

- Heavier soils, susceptible rootstock, cool & wet weather, trees planted too deep

Crown and collar rot

Ridomil Gold SL 0.5 pt/100 gal water

Rates are based on tree size. Need rain or irrigation to move material into root zone.

Ridomil Gold 480 EC is very soluble in water and moves systemically up from roots into stems and then leaves with the transpiration stream of plants. There is very little downward movement in plants and therefore it is important to apply this fungicide as a soil drench for best results against *Phytophthora* root diseases. Target when soil temperatures are in range 55-70°F.

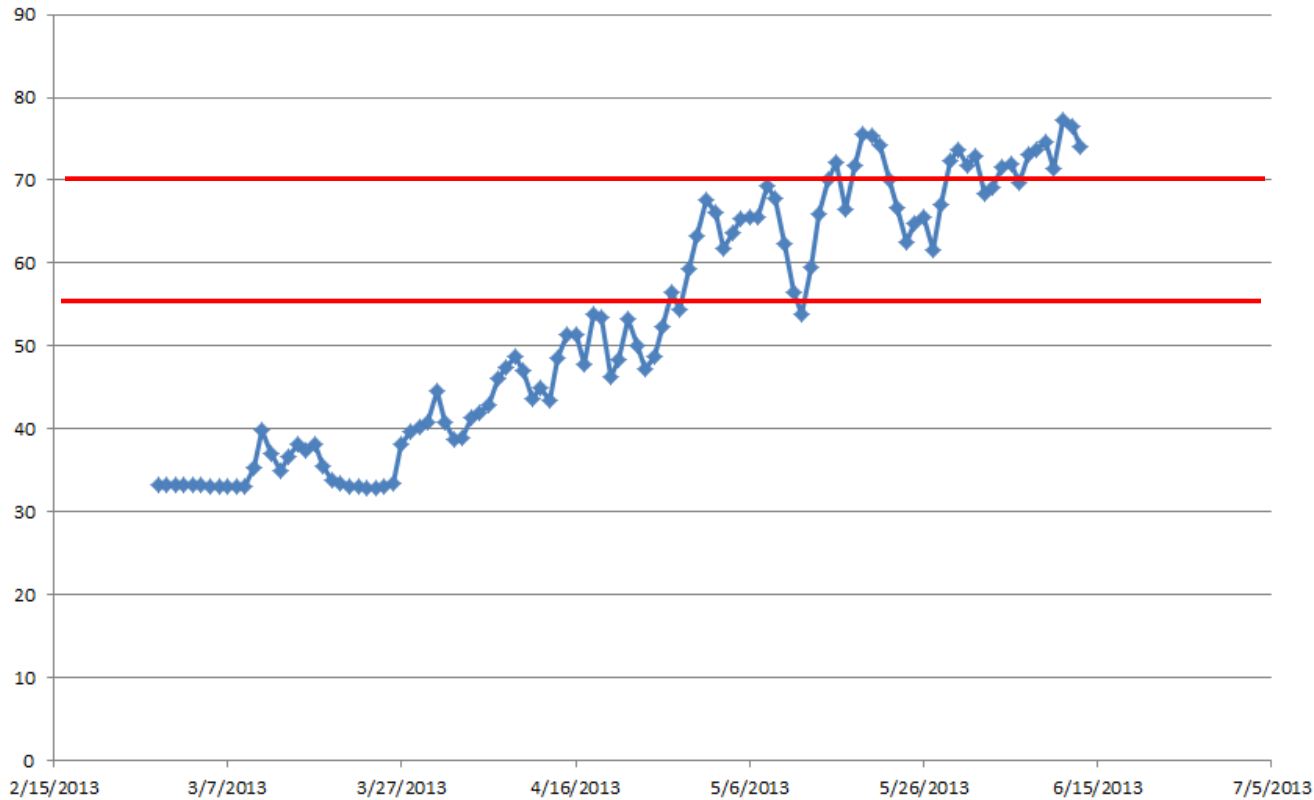
Note: Aliette, Agri-Fos, Fosphite, and Phostrol also registered but may be more useful in the fall (foliar application)



Crown and collar rot

Target when soil temperatures are in range 55-70°F.

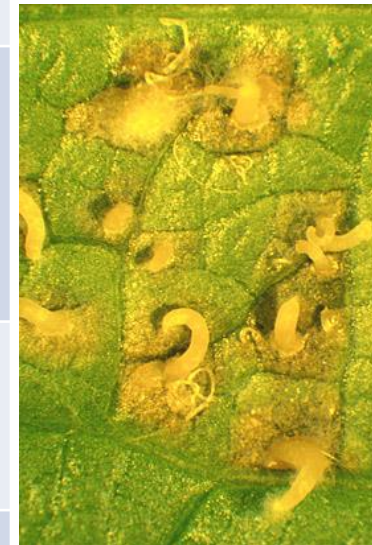
Max Soil Temp at 4 inches (degrees F)



Bainbridge
 Enviroweather
 Station Data - 2013

Cherry Leafspot Resistance Against 5 Classes of Fungicides

Fungicide Class	Product examples	Resistance appearance	Cherry leaf spot resistance
Dodine	Syllit	Gradual, will revert back	Not reported
Dicarboximide	Iprodione, Nevado, Rovral	Sudden	Not reported but not very effective
Sterol biosynthesis inhibitors	Bayleton, Elite, Rubigan, Indar, Orbit, Procure, Quash	Gradual	Widespread
Strobilurins	Flint = Gem, Sovran, Cabrio, Abound	Sudden	Not reported but likely
Anilo-pyrimidine	Scala, Vangard	Sudden	Not effective



Leaf spot management fungicides

- Bravo – chlorothalonil (petal fall, shuck split)
- Cover spray options:
 - Pristine (*Resistance to Pristine has been detected in NW and WC Michigan*).
 - Strobilurins (Gem)
 - Syllit + Captan
 - Copper
- Bravo postharvest
- Special 24c label for Bravo Weatherstik up to 21 days before harvest. See E-154.
- *Pristine, Gem, Adament, Syllit are all at risk of resistance.*
- *Copper has potential phytotoxicity issues*

Questions?

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