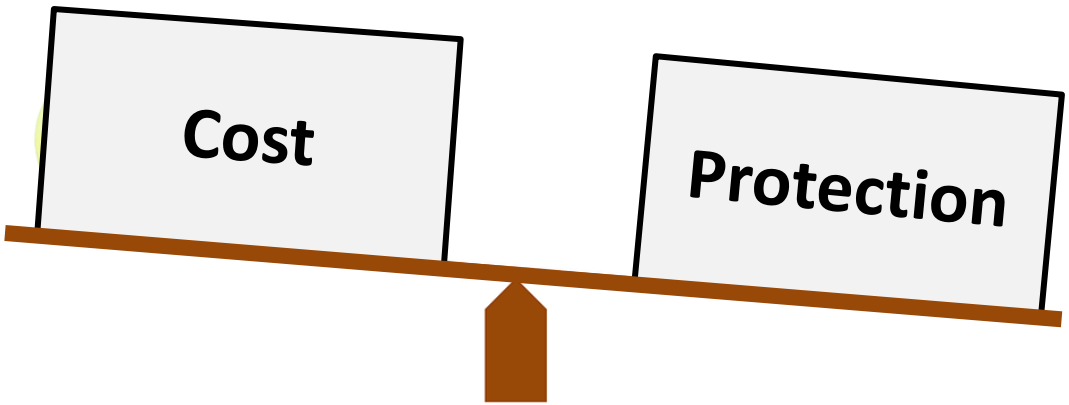
2021 Pecan Pathology Update

Jason Brock & Tim Brenneman

UGA Dept. of Plant Pathology

Presentation Overview

- Fungicides by mode-of-action
  - Products
    - Stand alone
    - Pre-mixes
  - Updates
  - Best fit
- General programs



Early 1990s

- Super Tin
- Orbit (propiconazole)
- Benlate (same MOA as Topsin)

Early 1990s

- Super Tin
- Orbit (propiconazole)
- Benlate (same MOA as Topsin)

Late 1990s/early 2000s

- Abound (azoxystrobin)
- Elast (dodine)

Early 1990s

- Super Tin
- Orbit (propiconazole)
- Benlate (same MOA as Topsin)

Late 1990s/early 2000s

- Abound (azoxystrobin)
- Elast (dodine)

More Recent

- phosphites
- Miravis Top

FRAC Code	common name	Trade Names
1	thiophanate-methyl	Topsin; T-methyl
3	fenbuconazole	Enable
3	metconazole	Quash
3	propiconazole	Orbit, Bumper, Propimax, Tilt
3	tebuconazole	Folicur, Monsoon, Orius, Tebuzol, Toledo
3	tetraconazole	Andiamo, Domark
3	mefentrifluconazole	Cevya
11	azoxystrobin	Abound, Azaka
11	kresoxim-methyl	Sovran, Narvos
11	pyraclostrobin	Headline
11	picoxystrobin	Aproach
30	triphenyltin hydroxide (TPTH)	Super Tin; Agri Tin
P7	phosphite	Fosphite, FungiPhite, K-Phite, Phiticide, Phostrol, ProPhyt, Rampart, Reliant, Topaz
U12	dodine	Elast
M	ziram	Ziram
3 + 1	tebuconazole + thiophanate-methyl	Topsin XTR
3 + 7	pydiflumetofen + difenoconazole	Miravis Top
3 + 11	difenoconazole + azoxystrobin	Quadris Top, Amistar Top
3 + 11	flutriafol + azoxystrobin	Topguard
3 + 11	propiconazole + azoxystrobin	Quilt
3 + 11	tebuconazole + trifloxystrobin	Absolute
3 + 11	tebuconazole + azoxystrobin	Custodia, Helmstar
3 + 11	tetraconazole + azoxystrobin	Brixen
3 + 30	tetraconazole + TPTH	Minerva Duo
3 + P7	tebuconazole + phosphite	Viathon
3 + 46	difenoconazole + tea tree oil	Regev

FRAC Code	common name	Trade Names
1	thiophanate-methyl	Topsin; T-methyl
3	fenbuconazole	Enable
3	metconazole	Quash
3	propiconazole	Orbit, Bumper, Propimax, Tilt
3	tebuconazole	Folicur, Monsoon, Orius, Tebuzol, Toledo
3	tetraconazole	Andiamo, Domark
3	mefentrifluconazole	Cevya
11		Abound, Azaka
11		Sovran, Narvos
11		Headline
11		Aproach
30		Super Tin; Agri Tin
P7		K-Phite, Phiticide, Phostrol, ProPhyt, Rampart, Reliant, Topaz
U12		Elast
M		Ziram
3 + 1		Topsin XTR
3 + 7		Miravis Top
3 + 11		Quadris Top, Amistar Top
3 + 11		Topguard
3 + 11	propiconazole + azoxystrobin	Quilt
3 + 11	tebuconazole + trifloxystrobin	Absolute
3 + 11	tebuconazole + azoxystrobin	Custodia, Helmstar
3 + 11	tetraconazole + azoxystrobin	Brixen
3 + 30	tetraconazole + TPTH	Minerva Duo
3 + P7	tebuconazole + phosphite	Viathon
3 + 46	difenoconazole + tea tree oil	Regev

Importance of FRAC Code

- **Fungicide resistance management**
- **Best fit in spray program**

1	topsin	no update
30	TPTH (tin)	no update
U12	dodine	no update
11	strobilurins	no update
3	DMIs	New active ingredients
P7	phosphites	new recommendation
7	SDHIs	new chemistry

Group 1

1	**thiophanate-methyl**	**Topsin; T-methyl**
3 + 1	**tebuconazole + thiophanate-methyl**	**Topsin XTR**

Resistance risk: high

Do not apply more than 1 to 2 applications per year.
Always use in a tank mix.

Best use: in periods with high disease potential

Group 30 and Group U12

30	triphenyltin hydroxide (TPTH)	SuperTin; Agri Tin
U12	dodine	Elast
3 + 30	tetraconazole + TPTH	Minerva Duo

Resistance risk: low to moderate

Limits on amount of active ingredients per year

Best use: nut scab

Group 11

11	azoxystrobin	Abound, Azaka
11	kresoxim-methyl	Sovran, Narvos
11	pyraclostrobin	Headline
11	picoxystrobin	Aproach

3 + 11	difenoconazole	+	azoxystrobin	Quadris Top, Amistar Top
3 + 11	flutriafol	+	azoxystrobin	Topguard
3 + 11	propiconazole	+	azoxystrobin	Quilt
3 + 11	tebuconazole	+	trifloxystrobin	Absolute
3 + 11	tebuconazole	+	azoxystrobin	Custodia, Helmstar
3 + 11	tetraconazole	+	azoxystrobin	Brixen

		d, Azaka
		, Narvos
		dline
		roach

Resistance risk: moderate

Best suited for foliar diseases; anthracnose

Good mixing partner.

3 + 11	dife		op
3 + 11	fluth	+ azoxystrobin	Topguard
3 + 11	propiconazole	+ azoxystrobin	Quilt
3 + 11	tebu		
3 + 11	tebu		
3 + 11	tetr		

Solo QoI products: no more than 1/3 of the total number of fungicide applications

Solo QoI's and/or mixes: no more than 1/2 of the total number of fungicide applications

Group 3

3	fenbuconazole	Enable
3	metconazole	Quash
3	propiconazole	Orbit, Bumper, Propimax, Tilt
3	tebuconazole	Folicur, Monsoon, Orius, Tebuzol, Toledo
3	tetraconazole	Andiamo, Domark
3	mefentrifluconazole	Cevya

3 + 1	tebuconazole + thiophanate-methyl	Topsin XTR
3 + 7	difenoconazole + pydiflumetofen	Miravis Top
3 + 11	difenoconazole + azoxystrobin	Quadris Top, Amistar Top
3 + 11	flutriafol + azoxystrobin	Topguard
3 + 11	propiconazole + azoxystrobin	Quilt
3 + 11	tebuconazole + trifloxystrobin	Absolute
3 + 11	tebuconazole + azoxystrobin	Custodia, Helmstar
3 + 11	tetraconazole + azoxystrobin	Brixen
3 + 30	tetraconazole + TPTH	Minerva Duo
3 + 33	tebuconazole + phosphite	Viathon
3 + 46	difenoconazole + tea tree oil	Regev

3	fenbuconazole	Enable
3	metconazole	Quash
3	propiconazole	Orbit, Bumper, Propimax, Tilt
3	tebuconazole	Folicur, Monsoon, Orius, Tebuzol, Toledo
		iamo, Domark
		Cevya

Resistance risk: moderate

Best suited for leaf scab, powdery mildew, zonate leaf spot.

Good mixing partner.

3 + 1		
3 + 7		
3 + 11		ar Top
3 + 11		
3 + 11		
3 + 11		
3 + 11		tar
3 + 11		
3 + 30	tetraconazole + TPTH	Minerva Duo
3 + 33	tebuconazole + phosphite	Viathon
3 + 46	difenoconazole + tea tree oil	Regev

3	fenbuconazole	Enable
3	metconazole	Quash
3	propiconazole	Orbit, Bumper, Propimax, Tilt
3	tebuconazole	Folicur, Monsoon, Orius, Tebuzol, Toledo
		iamo, Domark
		Cevya

Cross resistance: when a pathogen is also resistant to other fungicides within the same chemical class

3 + 1		
3 + 7		
3 + 11		ar Top
3 + 11		
3 + 11	propiconazole + azoxystrobin	Quilt
3 + 11	tebuconazole + trifloxystrobin	Absolute
3 + 11	tebuconazole + azoxystrobin	Custodia, Helmstar
3 + 11	tetraconazole + azoxystrobin	Brixen
3 + 30	tetraconazole + TPTH	Minerva Duo
3 + 33	tebuconazole + phosphite	Viathon
3 + 46	difenoconazole + tea tree oil	Regev

3	fenbuconazole	Enable
3	metconazole	Quash
3	propiconazole	Orbit, Bumper, Propimax, Tilt
3	tebuconazole	Folicur, Monsoon, Orius, Tebuzol, Toledo
3	tetraconazole	Andiamo, Domark
3	mefentrifluconazole	Cevya

3 + 1	tebuconazole	+	thiophanate-methyl	Topsin XTR
3 + 7	difenoconazole	+	pydiflumetofen	Miravis Top
3 + 11	difenoconazole	+	azoxystrobin	Quadris Top, Amistar Top
3 + 11	flutriafol	+	azoxystrobin	Topguard
3 + 11	propiconazole	+	azoxystrobin	Quilt
3 + 11	tebuconazole	+	trifloxystrobin	Absolute
3 + 11	tebuconazole	+	azoxystrobin	Custodia, Helmstar
3 + 11	tetraconazole	+	azoxystrobin	Brixen
3 + 30	tetraconazole	+	TPTH	Minerva Duo
3 + 33	tebuconazole	+	phosphite	Viathon
3 + 46	difenoconazole	+	tea tree oil	Regev

Groups 3 & 11

- Both fit best for foliar diseases
- Efficacy varies between locations.

- Use highest labeled rate.
- Use together in a mix, or with other class.

Group P7

P7	**phosphite**	**Fosphite, FungiPhite, K-Phite, Phiticide, Phostrol, ProPhyt, Rampart, Reliant, Topaz**
3 + P7	**tebuconazole + phosphite**	**Viathon**

Resistance risk: low

Best suited for leaf scab and anthracnose; late-season growth flushes.

Phosphite Use Recommendations

- Stand-alone use
  - Excellent control of leaf scab
  - Nut scab control is cultivar-dependent
- Rates: as recommended by UGA
  - Pre-pollination: min. of 4 pints (2 quarts)
  - Post-pollination: min. of 6 pints (3 quarts)

Group 7

7 + 3	**pydiflumetofen + difenoconazole**	**Miravis Top**

Group 7 - new chemistry recommendation
Received label in 2019.

Resistance risk: medium to high

Best use: nut scab (Jun – Aug)

Miravis Top

- Use as a protectant.
- Rotate modes of action (away from 3 and 7)
- Apply no more than 2 sequential applications
- No more than 4 applications per year
- Minimum application interval of 14 days

Spray Program Considerations

Non-bearing Trees

- Probably no "right" answer
- From a cost, efficacy and safety standpoint, use a phosphite
  - excellent on leaf scab
  - most systemic material to move into the new growth
  - equivalent of 1-2 quarts per 100 gal
  - higher rates might have leaf burn
  - repeated every few weeks as dictated by weather
- Back pack sprayers applied to runoff, use 1 quart rate.
- Use higher rate with air blast sprayers
- Group 3 and Group 11 fungicides are suitable options .

AU Pecan: weather-based advisory

- based on recorded rain events and the 5-day average rain forecast
- For the 2021 crop season, the service will only be available as part of regular Ag Weather Subscription Service.
- www.awis.com

Pre-pollination Recommendations

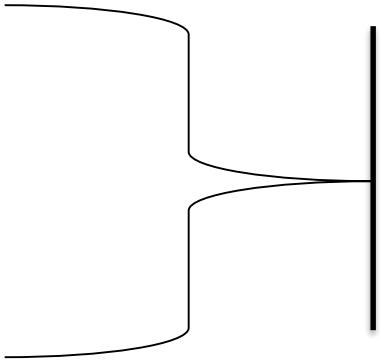
- Group 3 + Group 11
- Phosphite

Post-pollination Recommendations

- Tin (TPTH)
- Elast
- Tin + Elast mix

Post-pollination Recommendations

- Tin (TPTH)
- Elast
- Tin + Elast mix



Can mix with

- Phosphite
- Group 3 (DMI)
- Group 11 (strobilurin)

Post-pollination Recommendations

- Tin (TPTH)
- Elast
- Tin + Elast mix

- Miravis Top (Group 3 + 7)
- Group 3 + Group 11 (conditional use)
- Phosphite (conditional use)

Sample Fungicide Programs

- New approach
- Limited data
- Goals
  - framework for scab management
  - built in fungicide resistance management
  - economically effective
- Based on cultivar scab potential

Scab Susceptibility Groups

Low	Moderate	Mod/High	High
Avalon	Creek	Caddo	Byrd
Elliott	Kiowa	Cape Fear	Carroll
Excel	Oconee	Hoffman	Desirable
Kanza	Sumner	Schley	Morrill
Lakota	Zinner	Stuart	Pawnee
McMillan		Tanner	Treadwell
		Tom	
		Whiddon	

Scab Susceptibility Groups

Low	Moderate	Mod/High	High
		Caddo	
		Cape Fear	
		Hoffman	
		Schley	
Lakota	Zinner	Stuart	Pawnee
McMillan		Tanner	Treadwell
		Tom	
		Whiddon	

0 – 3 sprays

5 – 7 sprays

≥ 8 sprays

Low Scab Potential (0-3)

1) Phosphite ~ mid-April

2) Phosphite ~ mid-to-late May

3) 11 + 3 mix ~ early-June

Moderate Scab Potential (5-7)

1)	Phosphite	~ mid April
2)	Phosphite OR 11+3	~ mid May
3)	Miravis Top	~ mid June
4)	Elast+Tin OR phosphite	~ late June
5)	Miravis Top	~ mid July
6)	Tin OR Elast+Tin	~ late July

High Scab Potential (≥ 8)

1) phosphite
2) phosphite
3) 11 + 3 mix — Pre-pollination

---

4) Miravis Top + phosphite — Post-pollination
5) Elast + Tin
6) Miravis Top
7) Elast + Tin
8) Miravis Top

- A lot of flexibility in **product selection** and **timing.**
- Make sure to pay attention to 1) proper timing of use and 2) resistance management.
- Other diseases (e.g. downy spot, powdery mildew) might become an issue with reduced scab programs.
- With mixed plantings, manage the most scab susceptible cultivar.
- Nothing beats personal knowledge of your orchard.

	common name	Trade Names
1	thiophanate-methyl	Topsin; T-methyl
3	fenbuconazole	Enable
3	metconazole	Quash
3	propiconazole	Orbit, Bumper, Propimax, Tilt
3	tebuconazole	Folicur, Monsoon, Orius, Tebuzol, Toledo
3	tetraconazole	Andiamo, Domark
3	mefentrifluconazole	Cevya
11	azoxystrobin	Abound, Azaka
11	kresoxim-methyl	Sovran, Narvos
11	pyraclostrobin	Headline
11	picoxystrobin	Aproach
30	triphenyltin hydroxide (TPTH)	Super Tin; Agri Tin
P7	phosphite	Fosphite, FungiPhite, K-Phite, Phiticide, Phostrol, ProPhyt, Rampart, Reliant, Topaz
U12	dodine	Elast
M	ziram	Ziram
3 + 1	tebuconazole + thiophanate-methyl	Topsin XTR
3 + 7	pydiflumetofen + difenoconazole	Miravis Top
3 + 11	difenoconazole + azoxystrobin	Quadris Top, Amistar Top
3 + 11	flutriafol + azoxystrobin	Topguard
3 + 11	propiconazole + azoxystrobin	Quilt
3 + 11	tebuconazole + trifloxystrobin	Absolute
3 + 11	tebuconazole + azoxystrobin	Custodia, Helmstar
3 + 11	tetraconazole + azoxystrobin	Brixen
3 + 30	tetraconazole + TPTH	Minerva Duo
3 + P7	tebuconazole + phosphite	Viathon
3 + 46	difenoconazole + tea tree oil	Regev

Good luck in 2021!

If any questions along the way, please reach out to your local Extension office.