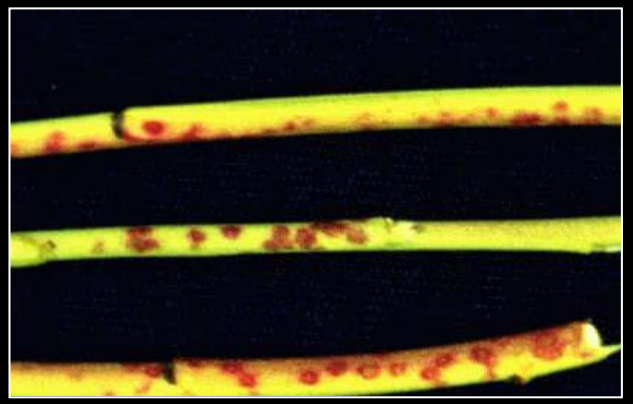
Peach Scab Trial Results from Three States

Phil Brannen and Leigh Ann Fall, University of Georgia
Clive Bock and Michael Hotchkiss, USDA
Guido Schnabel, Clemson University
Ed Sikora and Jim Pitts, Auburn University

When using the current USDA grading system (United States Standards for Grades of Peaches; effective 21 May 2004), peach fruit is downgraded from #1 to #2 grade when scab damage occurs (defined as "cracked, or when aggregating more than 3/8 inch in diameter" – roughly 4-6 well-developed lesions on a fruit). When 10% or more of the fruit in a shipment has scab damage, as defined above, the whole shipment can be downgraded.

Scab – *Fusicladium carpophilum*

- Spores, conidia, are produced from overwintered stem lesions formed the previous year.
- Conidial production starts about two weeks before shuck split, and it continues in earnest till 3-4 weeks after shuck split.
- The time of onset, peak, and tapering-off of spore production potential is critical for management decisions.

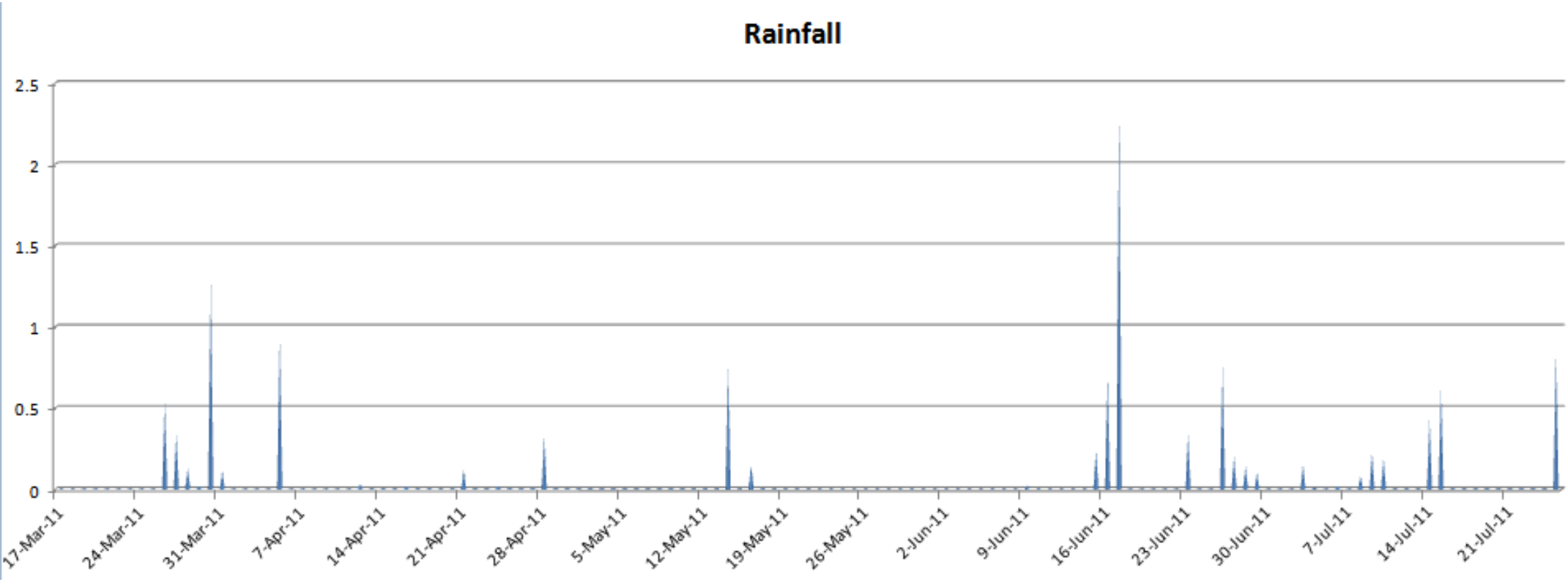


For scab management, we have generally recommended the use of chlorothalonil (Bravo) applications at petal fall and shuck split, followed by sulfur and/or Captan applications for the remainder of the season – mainly as a resistance management plan for brown rot.

“Petal fall scab sprays are sometimes of little value. However, if conditions are particularly favorable for scab development, no strategy can undo infections that develop because of a missed spray.”


100% petal fall; 30% shuck split; 5% shuck off
Utah State University
Utah State University
University of Massachusetts

Byron, GA (USDA Station) Rainfall 2011



Shuck split

Petal fall

2011 Peach Scab Data – Byron, GA (Flameprince)

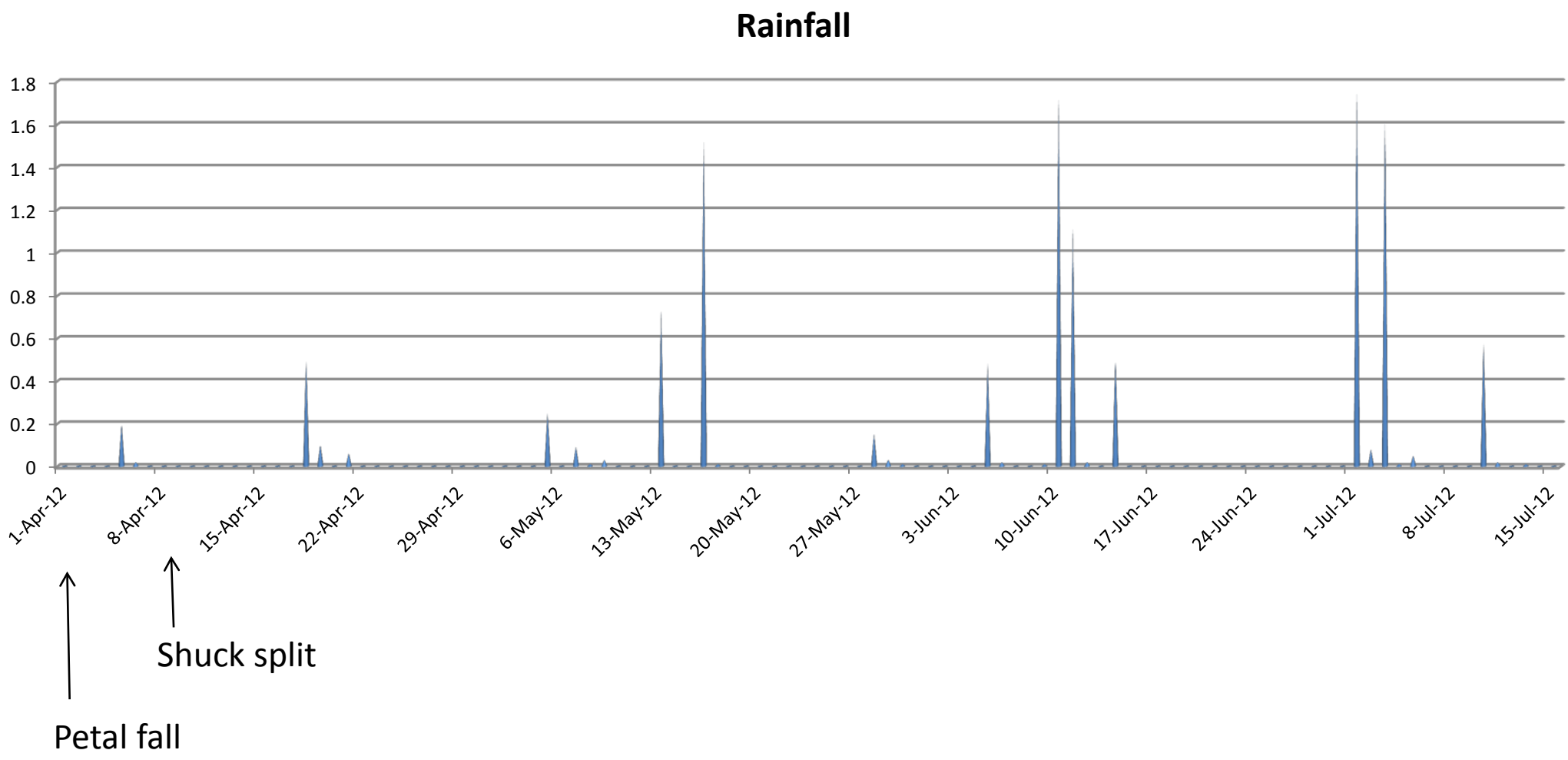
Treatment and rate/A	Application timing[z]	Scab incidence[y]	Scab severity[x]
1. Untreated Control	---	96.9 a	130.8 a
2. Bravo Weather Stik 6F 4.125 pt	PF	96.9 a	98.7 ab
3. Bravo Weather Stik 6F 4.125 pt	SS	88.8 ab	91.1 bc
4. Bravo Weather Stik 6F 4.125 pt	PF, SS	70.6 b	62.4 cd
5. Abound 15 fl oz	PF	81.3 ab	33.5 de
6. Abound 15 fl oz	SS	45.0 c	28.4 e
7. Abound 15 fl oz	PF, SS	20.6 d	3.2 e
8. Bravo Weather Stik 6F 4.125 pt ..... Yellow Jacket Sulfur 90W 9 lb	PF, SS 1-10 C	34.4 cd	8.3 e
9. Abound 15 fl oz ..... Yellow Jacket Sulfur 90W 9 lb	PF, SS 1-10 C	18.8 d	4.2 e
10. Yellow Jacket Sulfur 90W 9 lb	PF, SS, 1-10C	31.9 cd	8.4 e
LSD (P = 0.05)		20.0	33.6

[z] PF = petal fall to 1% shuck split application, SS = shuck split to 10% shuck off application, and C = cover spray application.

[y] Scab incidence (percent infected fruit) was recorded for 40 randomly selected mature fruit from each plot. Means followed by the same letter are not significantly different when using Fisher's protected LSD test.

[x] Scab severity was determined by counting the number of scab lesions observed on each of 40 fruit. Means followed by the same letter are not significantly different when using Fisher's protected LSD test.

Byron, GA (USDA Station) Rainfall 2012



2012 Peach Scab Data – Byron, GA (Flameprince)

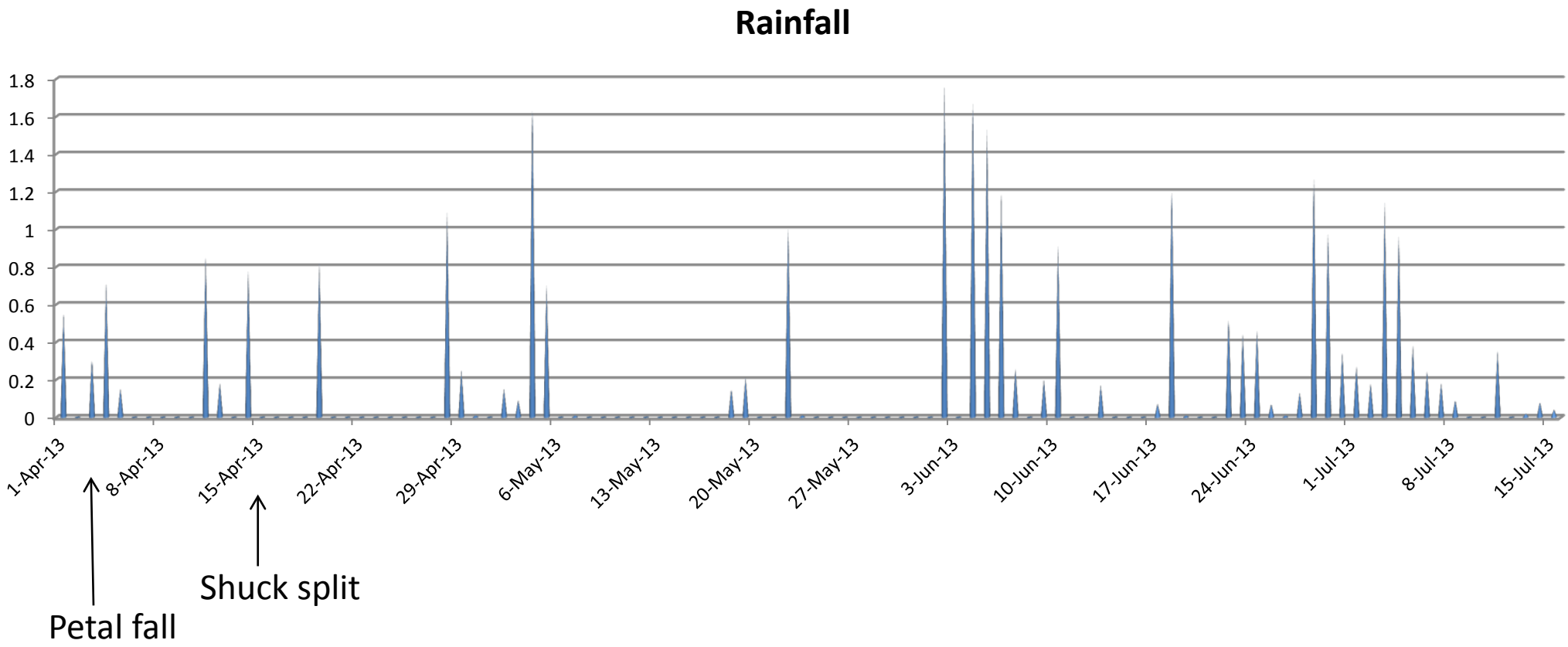
Treatment and rate/A	Application timing[z]	Scab incidence[y]	Scab severity[x]
1. Untreated Control	---	73.8 a	35.4 a
2. Bravo Weather Stik 6F 4.125 pt	PF	77.5 a	32.3 a
3. Bravo Weather Stik 6F 4.125 pt	SS	40.6 b	5.0 b
4. Bravo Weather Stik 6F 4.125 pt	PF, SS	20.0 bc	2.0 b
5. Abound 15 fl oz	PF	20.0 bc	0.9 b
6. Abound 15 fl oz	SS	28.1 bc	2.2 b
7. Abound 15 fl oz	PF, SS	16.3 c	1.0 b
8. Bravo Weather Stik 6F 4.125 pt ..... Yellow Jacket Sulfur 90W 9 lb	PF, SS 1-8 C	13.1 c	1.0 b
9. Abound 15 fl oz ..... Yellow Jacket Sulfur 90W 9 lb	PF, SS 1-8 C	9.4 c	0.3 b
10. Yellow Jacket Sulfur 90W 9 lb	PF, SS, 1-8C	27.5 bc	4.0 b
LSD (P = 0.05)		21.2	12.3

[z] PF = petal fall to 1% shuck split application, SS = shuck split to 10% shuck off application, and C = cover spray application.

[y] Scab incidence (percent infected fruit) was recorded for 40 randomly selected mature fruit from each plot. Means followed by the same letter are not significantly different when using Fisher's protected LSD test.

[x] Scab severity was determined by counting the number of scab lesions observed on each of 40 fruit. Means followed by the same letter are not significantly different when using Fisher's protected LSD test.

Byron, GA (USDA Station) Rainfall 2013



2013 Peach Scab Data – Byron, GA (Flameprince)

Treatment and rate/A	Application timing [z]	Scab incidence [y]	Scab severity [x]
1. Non-treated Control	---	92.5 a	101.3 a
2. Bravo Weather Stik 6F 4.125 pt	PF, SS	73.1 bcd	30.5 c
3 Abound 15 fl oz.....	PF, SS	64.4 cd	15.9 cd
4. Yellow Jacket Sulfur 90W 9 lb	PF, SS	81.3 abc	63.9 b
5. Abound 15 fl oz	PF		
Bravo Weather Stik 6F 4.125 pt	SS	68.1 cd	24.6 cd
6. Bravo Weather Stik 6F 4.125 pt	PF		
Abound 15 fl oz.....	SS	61.3 d	23.7 cd
7. Abound 15 fl oz	PF		
Yellow Jacket Sulfur 90W 9 lb	SS	88.1 ab	32.9 c
8. Yellow Jacket Sulfur 90W 9 lb	PF		
Abound 15 fl oz.....	SS	80.6 abc	35.9 c
9. Bravo Weather Stik 6F 4.125 pt	PF, SS,		
Yellow Jacket Sulfur 90W 9 lb	1-11 C	16.9 e	1.0 d
10. Abound 15 fl oz	PF, SS,		
Yellow Jacket Sulfur 90W 9 lb	1-11C	14.4 e	1.9 d
LSD (P = 0.05)		17.6	27.5

[z] PF = petal fall to 1% shuck split application, SS = shuck split to 10% shuck off application, and C = cover spray application.

[y] Scab incidence (percent infected fruit) was recorded for 40 randomly selected mature fruit from each plot. Means followed by the same letter are not significantly different when using Fisher's protected LSD test.

[x] Scab severity was determined by counting the number of scab lesions observed on each of 40 fruit. Means followed by the same letter are not significantly different when using Fisher's protected LSD test.

Conclusions

- Petal fall sprays can have value for reduction of scab, particularly when using Abound.
- Though efficacious, sulfur is not the best choice for petal fall or shuck split applications.
- Abound and Bravo provide similar efficacy when followed by sulfur cover sprays, but Abound is moderately better.
- When applied alone at petal fall and shuck split, Abound can provide surprising and exceptional scab control, but this is not a sufficient program, nor would it provide good resistance management.

QoI Resistance in *Fusicladium carpophilum* Populations from Almond in California and Evaluation of Molecular Resistance Mechanisms

Y. Luo, L. Hou, H. Förster, and **J. E. Adaskaveg,** Department of Plant Pathology and Microbiology, University of California, Riverside 92521

Abstract

Luo, Y., Hou, L., Förster, H., and Adaskaveg, J. E. 2013. QoI resistance in *Fusicladium carpophilum* populations from almond in California and evaluation of molecular resistance mechanisms. Plant Dis. 97:1322-1330.

Disease management failures have been reported in California for almond scab caused by *Fusicladium carpophilum* following quinone outside inhibitor (QoI) applications. Resistance in the pathogen populations was found to be common and at high incidence in the major almond-growing regions beginning in 2003, 4 years after registration of azoxystrobin on this crop. Two levels of azoxystrobin resistance, moderate and high, were identified with 50% effective concentration (EC_{50}) values between 0.15 and 10 µg/ml or >40 µg/ml, respectively. Reference isolates collected before resistance was detected had EC_{50} values <0.05 µg/ml. High-resistance was associated with a G143A mutation in the mitochondrial *cytochrome b* gene. For the less commonly found moderately resistant isolates, no mutations in the gene were detected between codons 122 and 212. Using primers targeting the G143A mutation or the *cytochrome b* gene of all *F. carpophilum* isolates in quantitative polymerase chain reaction (qPCR) analyses, the frequency of highly resistant isolates was accurately determined in mixtures of conidia with selected ratios of sensitive and resistant isolates. The frequency of high resistance in bulked samples of scab lesions, however, was generally underestimated compared with in vitro testing of fungicide sensitivity of fungal isolates from the same lesions. Competition experiments using conidial suspensions demonstrated stability of the highly resistant genotype in the presence of different amounts of sensitive and moderately resistant genotypes. Analysis of covariance of linear regressions of cycle threshold values on DNA concentrations derived from qPCR amplifications using two primer pairs for cytochrome b alleles with and without the G143 mutation showed that several isolates differed in their slopes and midpoints. Thus, heteroplasmy of mitochondrial-inherited QoI resistance is suggested as a likely cause for incongruence in estimating resistance frequencies using the two methods.

Treatment and rate/A	Application timing	Scab incidence (GA)	Scab incidence (GA)	Scab incidence (SC)	Average
1. Non-treated Control	---	92.5	77.5	100.0	90
2. Chlorothalonil.....	PF, SS	73.1	49.4	43.8	55.4
3. Azoxystrobin	PF, SS	64.4	48.1	67.5	60.0
4. Azoxystrobin	PF				
Chlorothalonil	SS	68.1	34.4	38.1	46.9
5. Chlorothalonil	PF				
Azoxystrobin.....	SS	61.3	53.1	74.4	62.9

Treatment and rate/A	Application timing	Scab severity (GA)	Scab severity (GA)	Scab severity (SC)	Average
1. Non-treated Control	---	101.3	52.2	124.8	92.8
2. Chlorothalonil.....	PF, SS	30.5	13.7	13.2	19.1
3. Azoxystrobin	PF, SS	15.9	8.0	12.6	12.2
4. Azoxystrobin	PF				
Chlorothalonil	SS	24.6	7.1	6.4	12.7
5. Chlorothalonil	PF				
Azoxystrobin.....	SS	23.7	10.0	10.3	14.7

Conclusion

If using Abound, Abound at petal fall followed by Bravo at shuck split is the preferred order of alternation for resistance management and efficacy.