

Extinguishing the Fire (Blight): Management Considerations for 2016



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North Carolina State University***



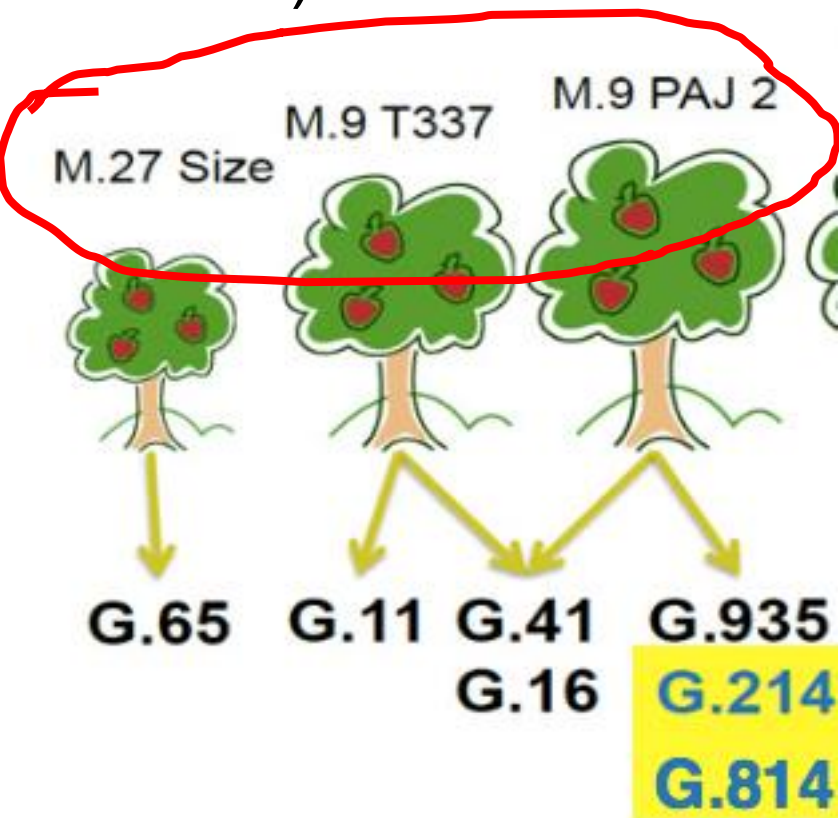
Fire Blight Concerns in NC

- Increasing #s of high density plantings: greater \$\$\$ investment



Fire Blight Concerns in NC

- High Demand for fire blight resistant rootstocks (G-series)



D. Breth



Tim Smith

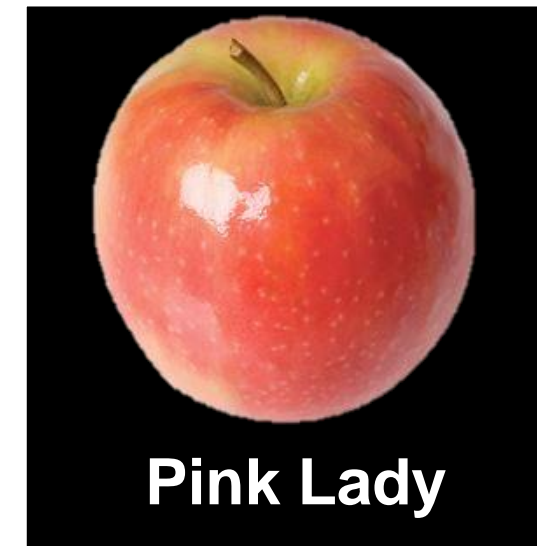
Fire Blight Concerns in NC

- Increased planting of popular scion varieties with greater fire blight susceptibility

**Res/
Mod S.**



**Sus/
Very
Sus**



Fire Blight Concerns in NC

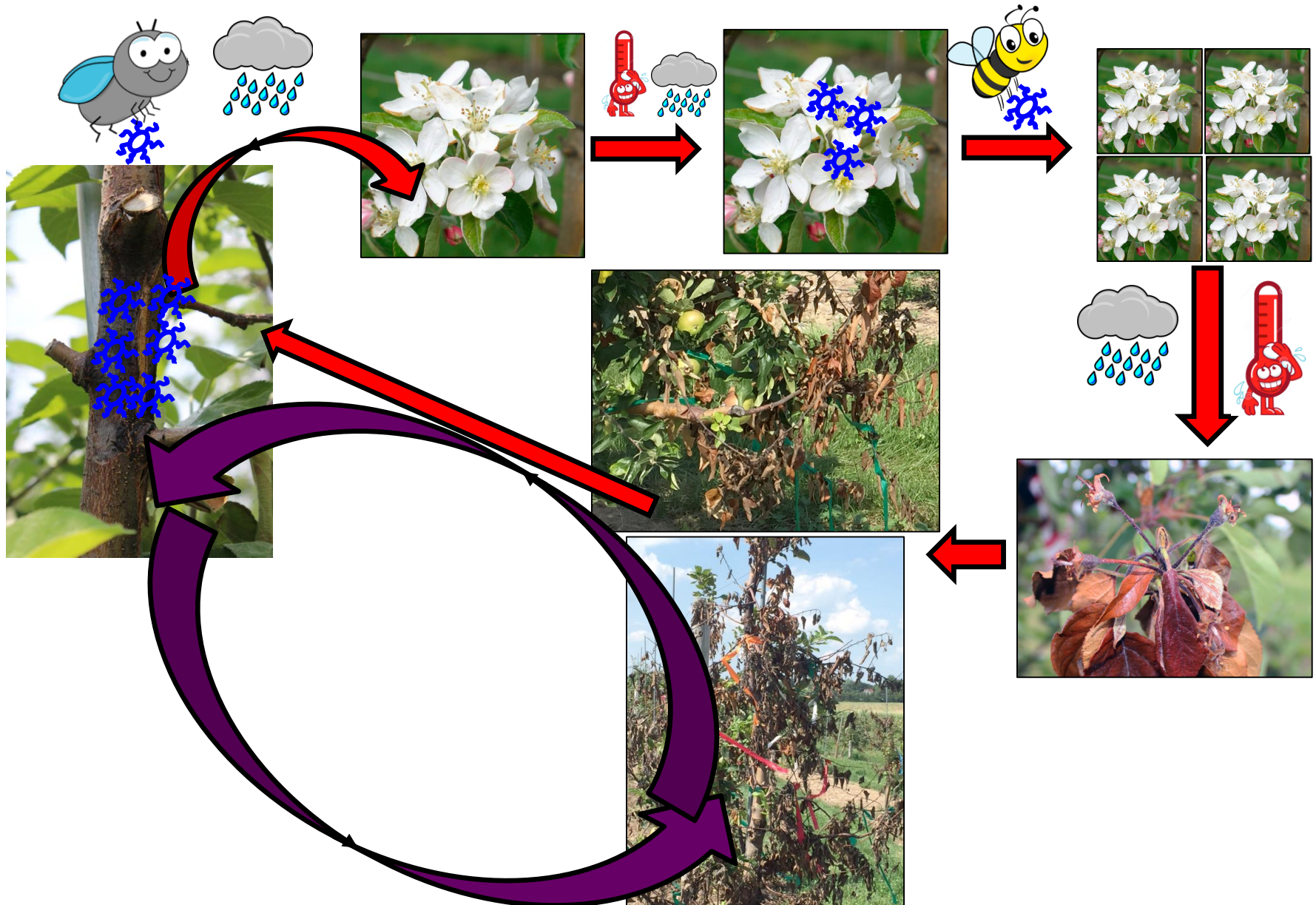
- Young, new plantings: extended bloom period, susceptible tissue (esp. during “filling out” period)



Richard Lehnert, Good Fruit Grower

Bacteria in the Wood: Fire Blight

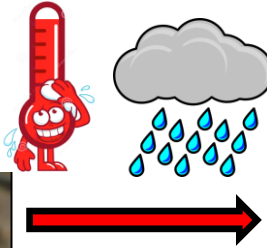
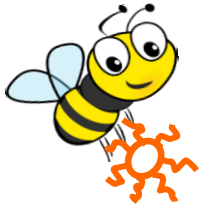
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Many Manifestations of Fire Blight

- Blossom blight

- Petal Fall: Darkening of petiole or base of flower, ooze (orange, amber, white)



- Mummy or blight?



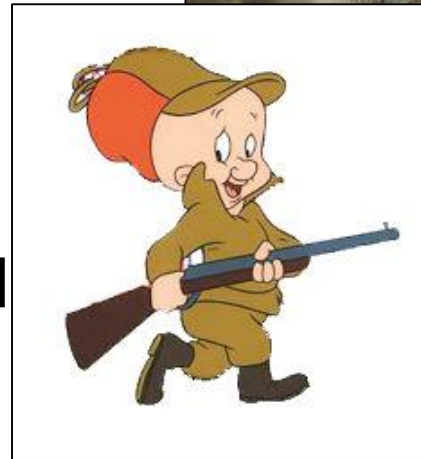
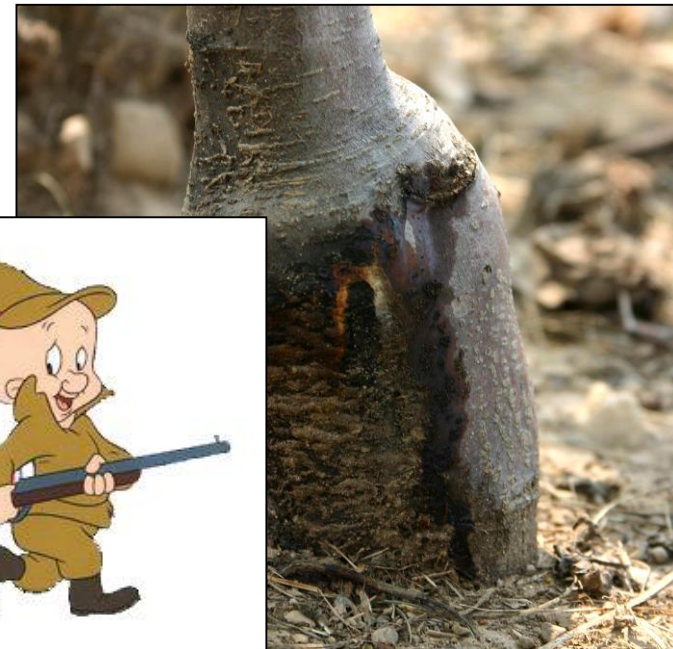
Many Manifestations of Fire Blight

- Shoot blight
 - Symptoms: Shepherd's crook, blackening/necrosis of leaf mid-vein and pedicel



Many Manifestations of Fire Blight

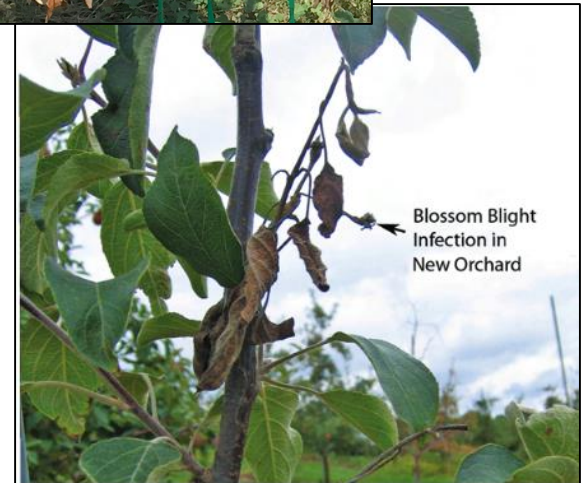
- Canker Blight
 - Narrow, water soaked-zone in healthy tissue bordering cankers, ooze droplets ~~in spring~~
 - Managed by copper applications and pruning
- Rootstock Blight
 - Systemic infection of rootstock from blossom or shoot blight
 - Managed with resistant rootstocks
- Trauma Blight
 - Results from wounds caused by hail, wind, animals (deer)



Fire Blight Management: Cankers

10

- Prune out fire blight cankers
 - Large cankers in main scaffold/trunk: can't prune
 - Small cankers:
 - Prune 6-12" from canker margin into 2+ year old wood
 - Prune during winter and remove all cuttings
 - In season: cut back to internode ("pruning canker" management); 4-inch "ugly stub"
- Young tree? Remove?



Fire Blight Management: Cankers

- Chemical Management
 - Apply full rate of copper at silver/green tip
 - Warm weather causes cankers to ooze
 - Only works if bacteria are present-won't get “inside” cankers



- Manage shoot blight: Apogee
 - Retards vigorous shoot growth in young trees and is best protection against shoot blight
 - Make 2 applications: 6-12 oz/100 gal (3-6 oz/100 gal for trees <5 years) beginning at 1-3” shoot growth and 14-21 days later

Blossom Blight Management: Predictive Models

- Blossom blight management: Models
 - Predictive Models: Maryblyt 7.1 or CougarBlight
 - Both use weather and phenology to generate FB predictions; both work for NC
 - Maryblyt: Infection events and symptom development for canker blight, blossom blight, shoot blight, trauma blight
 - More refined prediction (user entry)
 - CougarBlight (NEWA-for 2016 only?): Infection events for blossom blight only
 - High value on orchard FB history

Blossom Blight: Predictive Models

- CougarBlight (NEWA-Cornell)

Orchard FB history

Heat Units: Bacterial
multiplication: 4 days

Washing of bacteria from
stigma to nectarhodes


Estimate based on RH
and temperature

Fire Blight Risk Predictions for Hendersonville (Klimstra)

Blossom blight predictions using the Cougarblight model begin at first blossom open.

First blossom open date:

First blossom open date above is estimated based on degree day accumulations. Infection cannot occur without open blossoms. If the predicted bloom date is incorrect, enter the actual date for blocks of interest and the model will calculate the protection period during bloom more accurately. If bloom in your orchard has not yet occurred, continue to check Cougarblight daily and monitor your bloom. If bloom in your orchard has not yet occurred, enter a future bloom date, up to five days into the future, to gauge fire blight risk potential.

Orchard Blight History: 

The orchard blight history above is the NEWA default. Select the actual blight history for your orchard and the model will recalculate recommendations.

Blossom Blight Summary - Cougarblight								
	Past	Past	Current	Blossom Blight 5-Day Forecast				
				Forecast Details				
Date	Apr 7	Apr 8	Apr 9	Apr 10	Apr 11	Apr 12	Apr 13	Apr 14
4-day DH	36	241	534	675	685	523	288	228
Risk Level	Low	Caution	Extreme	Extreme	Extreme	Extreme	Caution	Caution
Wetness Events								
Rain Amount	1.15	0.00	0.00	0.24	0.00	NA	NA	NA
Rain Prob (%) Night Day ?			- -	- -	- -	- -	- -	- -
Dew ?	Yes	Yes	Yes	Yes	Yes	No	No	No
Leaf Wetness (hours)	19	12	0					

NA - data not available

[Cougarblight Charts](#)

Download Time: 4/9/2015 23:00

Blossom Blight: Predictive Models

- CougarBlight (NEWA-Cornell)

FB risk ↓ if no history

Fire Blight Risk Predictions for Hendersonville (Klimstra)

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First blossom open date: 3/15/2015

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Orchard Blight History: Fire blight occurred in your neighborhood last year.

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Rain Prob (%) Night Day ?			- -	- -	- -	- -	- -	- -
Dew ?	Yes	Yes	Yes	Yes	Yes	No	No	No
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Cougarblight Charts

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Orchard Blight History: No fire blight in your neighborhood last year.

Select the actual blight history for your orchard and the model will recalculate recommendations.

Blossom Blight Summary - Cougarblight

	Past	Past	Current	Blossom Blight 5-Day Forecast				
				Forecast Details				
Date	Apr 7	Apr 8	Apr 9	Apr 10	Apr 11	Apr 12	Apr 13	Apr 14
4-day DH	36	241	534	675	685	523	288	228
Risk Level	Low	Low	High	High	High	High	Low	Low
Wetness Events								
Rain Amount	1.15	0.00	0.00	0.24	0.00	NA	NA	NA
Rain Prob (%) Night Day ?			- -	- -	- -	- -	- -	- -
Dew ?	Yes	Yes	Yes	Yes	Yes	No	No	No
Leaf Wetness (hours)	19	12	0					

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Cougarblight Charts

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Blossom Blight: Predictive Models

- CougarBlight (NEWA-Cornell)

No Strep

Strep

Strep

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4-day DH	36	241	534	675	685	523	288	228
Risk Level	Low	Caution	Extreme	Extreme	Extreme	Extreme	Caution	Caution

Wetness Events

Rain Amount	1.15	0.00	0.00	0.24	0.00	NA	NA	NA
Rain Prob (%)								
Night/Day			- -	- -	- -	- -	- -	- -
Dew	Yes	Yes	Yes	Yes	Yes	No	No	No
Leaf Wetness (hours)	19	12	0					

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Cougarblight Charts

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Blossom Blight Summary - Cougarblight

	Past	Past	Current	Blossom Blight 5-Day Forecast				
				Forecast Details				
Date	Apr 7	Apr 8	Apr 9	Apr 10	Apr 11	Apr 12	Apr 13	Apr 14
4-day DH	36	-	292*	440*	480*	523	288	228
Risk Level	Low	-	Caution*	High*	High*	Extreme	Caution	Caution

Wetness Events

Rain Amount	1.15	0.00	0.00	0.24	0.00	NA	NA	NA
Rain Prob (%)								
Night/Day			- -	- -	- -	- -	- -	- -
Dew	Yes	Yes	Yes	Yes	Yes	No	No	No
Leaf Wetness (hours)	19	12	0					

NA - data not available

Cougarblight Charts

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	Past	Past	Current	Blossom Blight 5-Day Forecast				
				Forecast Details				
Date	Apr 7	Apr 8	Apr 9	Apr 10	Apr 11	Apr 12	Apr 13	Apr 14
4-day DH	36	241	-	147*	187*	230*	288	228
Risk Level	Low	Caution	-	Low*	Caution*	Caution*	Caution	Caution

Wetness Events

Rain Amount	1.15	0.00	0.00	0.24	0.00	NA	NA	NA
Rain Prob (%)								
Night/Day			- -	- -	- -	- -	- -	- -
Dew	Yes	Yes	Yes	Yes	Yes	No	No	No
Leaf Wetness (hours)	19	12	0					

NA - data not available

Cougarblight Charts

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Don't "jump the gun" with antibiotic sprays

Blossom Blight: Predictive Models

- Maryblyt: University of Maryland, West Virginia
 - Left: “data entry”: phenology, temps, sprays, rain or dew
 - Right: “number crunching”: Analysis and prediction

Inputs								Outputs						
Date	Phenology	Max Temp (F)	Min Temp (F)	Wetness (in)	Trauma	Spray	Notes	Avg Temp (F)	EIP	BHWTR	BBS	CBS	SBS	TBS
5/9/2014	PK	84.1	53.8	0.09				68.9	-	-	-	17	-	-
5/10/2014	BL	73.3	56.7	0.15				65.0	36	+++H	-	22	-	-
5/11/2014	BL	74.7	49.0	0.00				61.8	73	+++H	-	26	-	-
5/12/2014	BL	82.5	49.8	0.00				66.2	145	+++H	-	32	-	-
5/13/2014	BL	86.1	58.0	0.65				72.0	255	++++I	-	41	-	-
5/14/2014	BL	84.8	60.0	1.05				72.4	279	++++I	17 a	49	-	-
5/15/2014	BL	76.7	63.9	0.22				70.3	267	++++I	31 a	57	-	-
5/16/2014	BL	64.2	44.1	1.48				54.2	105	+++H	34 a	59	-	-
5/17/2014	BL	57.1	39.6	0.00				48.4	53	+++M	34 a	59	-	-
5/18/2014	BL	61.0	42.9	0.00				52.0	-	+++L	36 a	60	-	-
5/19/2014	BL	66.4	38.3	0.00				52.4	-	+++L	39 a	61	-	-
5/20/2014	BL	73.9	47.0	0.00				60.4	24	+++M	46 a	65	-	-
5/21/2014	BL	67.9	56.1	0.00				62.0	36	+++M	52 a	68	-	-
5/22/2014	BL	74.5	54.6	0.26				64.6	73	+++H	62 a	73	-	-
5/23/2014	BL	57.0	52.6	0.05				54.8	49	+++M	63 a	74	-	-
5/24/2014	BL	72.7	51.9	0.00				62.3	57	+++M	71 a	78	-	-
5/25/2014	BL	77.3	49.3	0.00				63.3	97	+++M	80 a	83	-	-
5/26/2014	BL	82.0	62.6	0.00				72.3	170	+++H	96 a	91	-	-
5/27/2014	BL	81.3	60.7	0.00				71.0	255	+++H	112 a	99	-	-
5/28/2014	BL	69.8	54.1	0.00				62.0	194	+++H	102 b	CMS	-	-
5/29/2014	BL	68.1	54.1	0.00				61.1	109	+++H	93 c	6	-	-
5/30/2014	BL	73.4	47.3	0.00				60.4	133	+++H	100 c	13	-	-
5/31/2014	BL	71.2	49.7	0.00				60.4	61	+++M	-	19	-	-
6/1/2014	PF	80.3	44.8	0.00				62.6	-	-	-	29	-	-
6/2/2014	PF	86.8	59.3	0.27				73.0	-	-	-	47	17	-
6/3/2014	PF	81.7	65.9	0.03				73.8	-	-	-	65	36	-
6/4/2014	PF	71.8	53.4	0.00				62.6	-	-	-	73	44	-

Blossom Blight: Predictive Models

- MaryBlyt: University of Maryland, West Virginia

- **EIP (epiphytic inoculum potential):** measure of heat units and bacterial colonization of blossom

- **BHWTR**

B= open flowers

H= EIP>100

W= wetting from rain, dew, pesticide app. (current day)

T= mean temp >60F

R= Risk level: based on “+ #)

- **BBS: >100: symptoms visible**

Avg Temp (F)	Outputs					
	EIP	BHWTR	BBS	CBS	SBS	TBS
68.9	-	-	-	17	-	-
65.0	36	+ - + + H	-	22	-	-
61.8	73	+ - + + H	-	26	-	-
66.2	145	+ + - + H	-	32	-	-
72.0	255	+ + + + I	-	41	-	-
72.4	279	+ + + + I	17 a	49	-	-
70.3	267	+ + + + I	31 a	57	-	-
54.2	105	+ + + - H	34 a	59	-	-
48.4	53	+ - - - M	34 a	59	-	-
52.0	-	+ - - - L	36 a	60	-	-
52.4	-	+ - - - L	39 a	61	-	-
60.4	24	+ - - + M	46 a	65	-	-
62.0	36	+ - - + M	52 a	68	-	-
64.6	73	+ - + + H	62 a	73	-	-
54.8	49	+ - - - M	63 a	74	-	-
62.3	57	+ - - + M	71 a	78	-	-
63.3	97	+ - - + M	80 a	83	-	-
72.3	170	+ + - + H	96 a	91	-	-
71.0	255	+ + - + H	112 a	99	-	-
62.0	194	+ + - + H	102 b	CMS	-	-
61.1	109	+ + - + H	93 c	6	-	-
60.4	133	+ + - + H	100 c	13	-	-
60.4	61	+ - - + M	-	19	-	-
62.6	-	-	-	29	-	-
73.0	-	-	-	47	17	-

Blossom Blight: Predictive Models

Inputs								Data Entry Mode								Outputs							
Date	Phenology	Max Temp (F)	Min Temp (F)	Wetness (in)	Trauma	Spray	Notes	Avg Temp (F)	EIP	BHW/TR	BBS	CBS	SBS	TBS									
5/9/2014	PK	84.1	53.8	0.09				68.9	-	-	-	17	-	-									
5/10/2014	BL	73.3	56.7	0.15				65.0	36	++ ++ H	-	22	-	-									
5/11/2014	BL	74.7	49.0	0.00				61.8	73	++ ++ H	-	26	-	-									
5/12/2014	BL	82.5	49.8	0.00				66.2	145	++ ++ H	-	32	-	-									
5/13/2014	BL	86.1	58.0	0.65				72.0	255	+++ ++ I	-	41	-	-									
5/14/2014	BL	84.8	60.0	1.05				72.4	279	+++ ++ I	17 a	49	-	-									
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5/19/2014	BL	66.4	38.3	0.00				52.4	-	++ ++ L	39 a	61	-	-									
5/20/2014	BL	73.9	47.0	0.00				60.4	24	++ ++ M	46 a	65	-	-									
5/21/2014	BL	67.9	56.1	0.00				62.0	36	++ ++ M	52 a	68	-	-									
5/22/2014	BL	74.5	54.6	0.26				64.6	73	++ ++ H	62 a	73	-	-									
5/23/2014	BL	57.0	52.6	0.05				54.8	49	++ ++ M	63 a	74	-	-									
5/24/2014	BL	72.7	51.9	0.00				62.3	57	++ ++ M	71 a	78	-	-									
5/25/2014	BL	77.3	49.3	0.00				63.3	97	++ ++ M	80 a	83	-	-									
5/26/2014	BL	82.0	62.6	0.00				72.3	170	+++ ++ H	96 a	91	-	-									
5/27/2014	BL	81.3	60.7	0.00				71.0	255	+++ ++ H	112 a	99	-	-									
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5/19/2014	BL	66.4	38.3	0.00				52.4	-	++ ++ L	8 a	61	-	-									
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5/23/2014	BL	57.0	52.6	0.05				54.8	49	++ ++ M	32 a	74	-	-									
5/24/2014	BL	72.7	51.9	0.00				62.3	57	++ ++ M	40 a	78	-	-									
5/25/2014	BL	77.3	49.3	0.00				63.3	97	++ ++ M	49 a	83	-	-									
5/26/2014	BL	82.0	62.6	0.00				72.3	170	+++ ++ H	65 a	91	-	-									
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5/30/2014	BL	73.4	47.3	0.00				60.4	133	+++ ++ H	100 a	13	-	-									
5/31/2014	BL	71.2	49.7	0.00				60.4	61	++ ++ M	-	19	-	-									
6/1/2014	PF	80.3	44.8	0.00				62.6	-	-	-	29	-	-									
6/2/2014	PF	86.8	59.3	0.27				73.0	-	-	-	47	17	-									
6/3/2014	PF	81.7	65.9	0.03				73.8	-	-	-	65	36	-									
6/4/2014	PF	71.8	53.4	0.00				62.6	-	-	-	73	44	-									

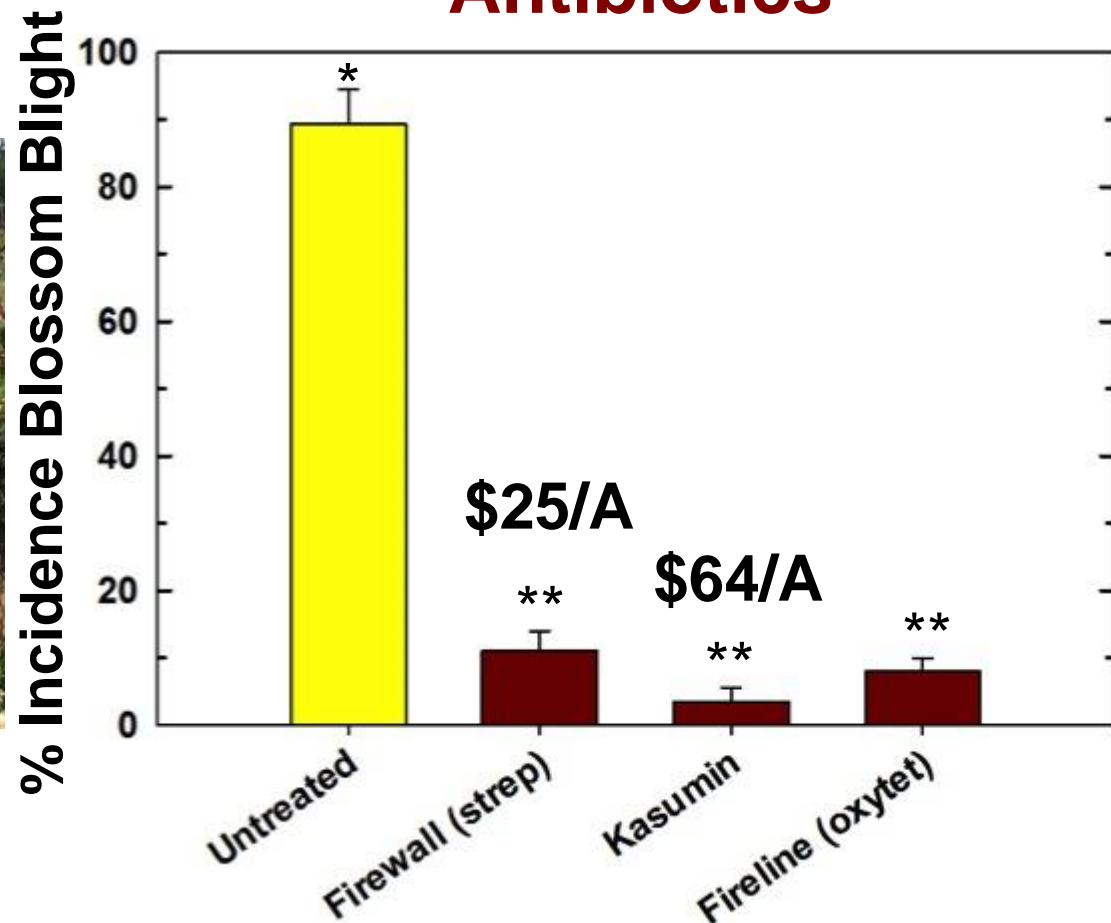
Blossom Blight Management

- Blossom blight application timing
 - Pre-bloom timings for biopesticides
 - All antibiotics & biopesticides @ 80% bloom
- Inoculation with *E. amylovora* after 80% BL application
- Blossom blight incidence: percentage of blighted blossoms (5 reps)



Blossom Blight: Management

Antibiotics

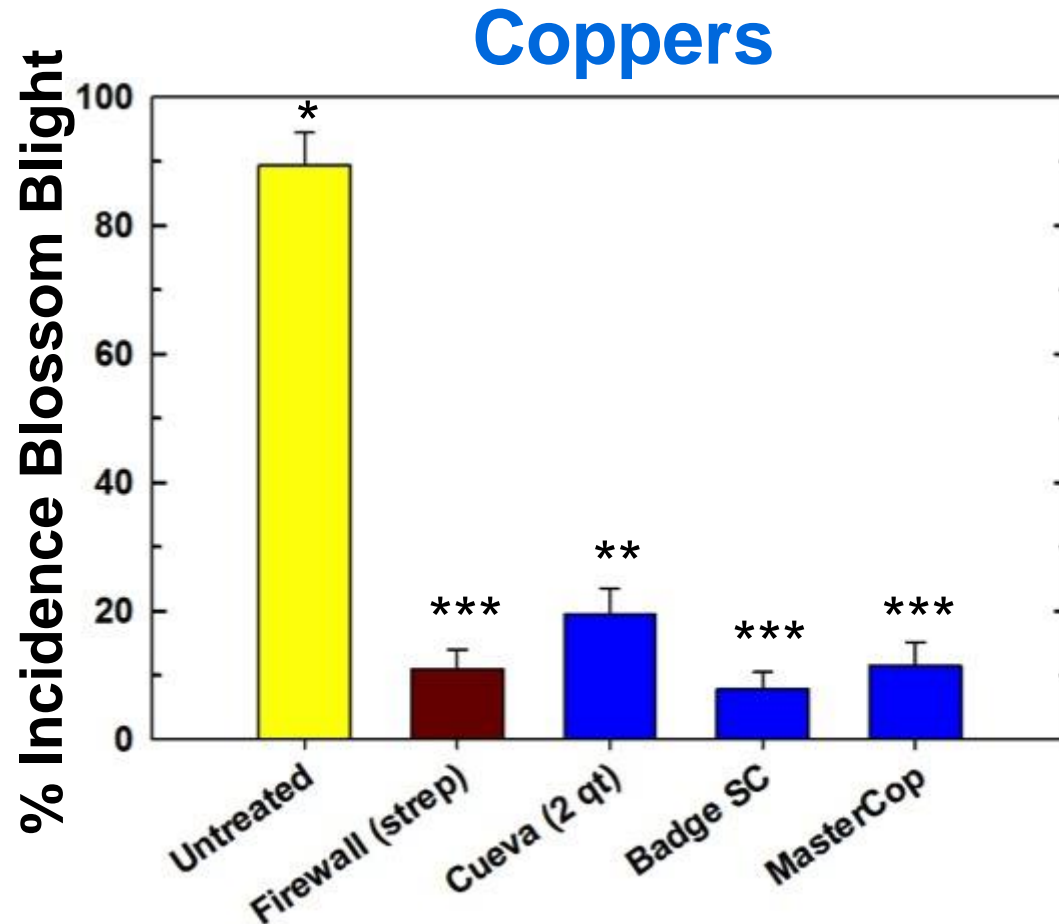


% Incidence Blossom Blight



- Inoculum pressure higher than commercial orchards
- Preserve streptomycin efficacy!

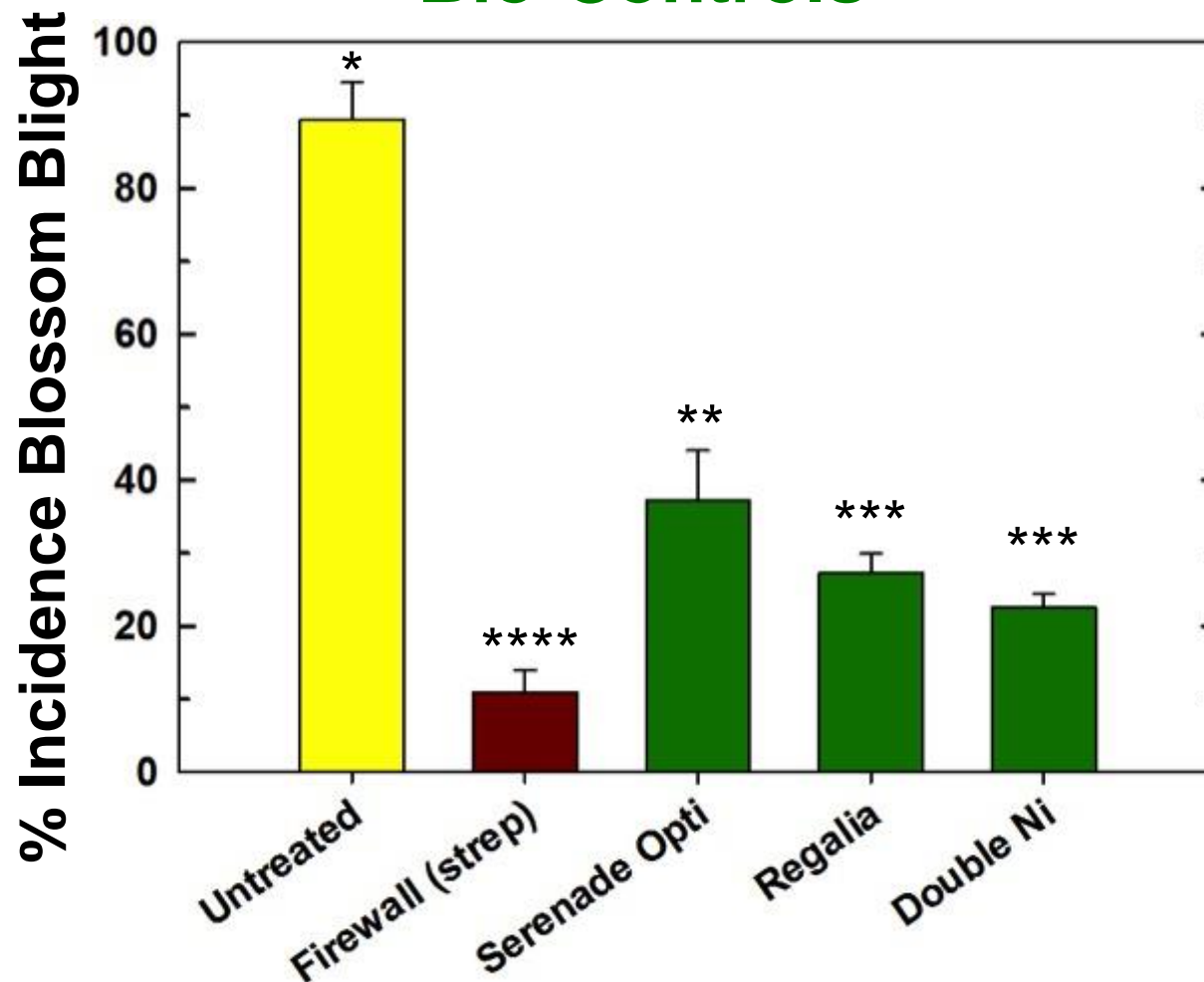
Blossom Blight Management



- Badge SC, Mastercop similar to strep (2015 only)
- Injury when applied during early shoot development

Blossom Blight Management

Bio-Controls



- Bio-controls significantly lowered blossom blight incidence-low pressure orchards? Risk?

Fire Blight Management

- Bloom
 - Strep still works in SC and is relatively inexpensive: no need for Kasumin?
 - “Protracted Bloom” Cultivars?: Consider tank mixture of strep + oxytet (Fireline) or a Kasumin application for resistance management
 - Rotation or tank mixture with biological?
- Post-Bloom
 - Make 2 Apogee applications: 6-12 oz/100gal (3-6 oz/100gal for tree <5 years) beginning at 1-3” shoot growth & 14-21 days later

Acknowledgements/Questions?

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