Managing fire blight in modern orchards planting in the age of antibiotic resistance

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Outline

- Overview of fire blight in Northeastern US
- Updates on chemical management tools
- Streptomycin resistance update
- Managing fire blight
  - Pre & post-season
  - Bloom
  - Post-bloom & Summer
- Using predictive models

Fire blight in NE US

Fire blight in NE US

- Blossom blight
  - Reduces current season's crop
  - Managed forecasted antibiotic applications

- Shoot blight
  - Reduces bearing wood for following season
  - Managed by pruning and treatment with growth regulator prohexadione-calcium (Apogee)

Fire blight in NE US

- Rootstock blight
  - Systemic infection of rootstock from suckers or blossom/shoot blight
  - Managed by resistant rootstocks

- Trauma blight
  - Results from wounds caused by hail, wind, & animals
  - Managed by antibiotics or copper

Fire blight in NE US

- Fire blight increasingly problematic
  - High-density tall/super spindle plantings (>1000/A) = $high-value acreage
  - Resistant rootstocks not always available
  - New popular scion varieties susceptible
  - Young productive trees: protracted bloom & vigorous susceptible shoot tissue
- How do we manage fire blight?

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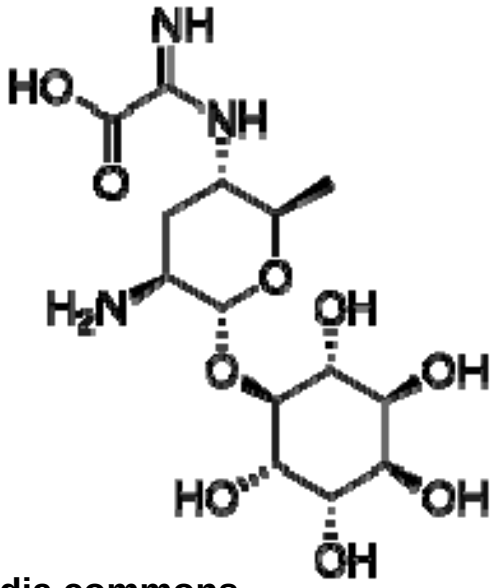
Kasugamycin (Kasumin 2L)

- Aminoglycoside antibiotic developed as rice blast fungicide (protectant)
  - Same class but different MoA: inhibits protein production
- Resistance: mutations in 16S rRNA methyltransferase *ksgA gene*
- No resistance reported in *E. amylovora*
  - Resistance found in other environmental bacteria



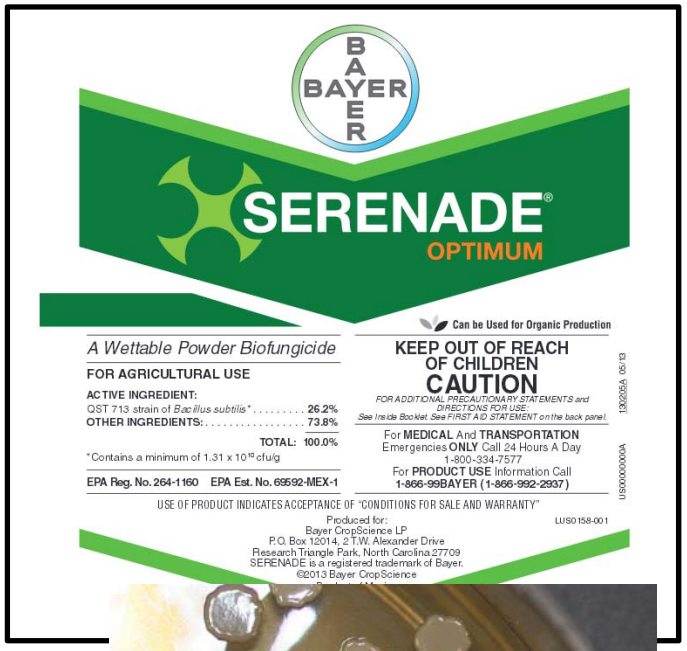
Wikipedia commons

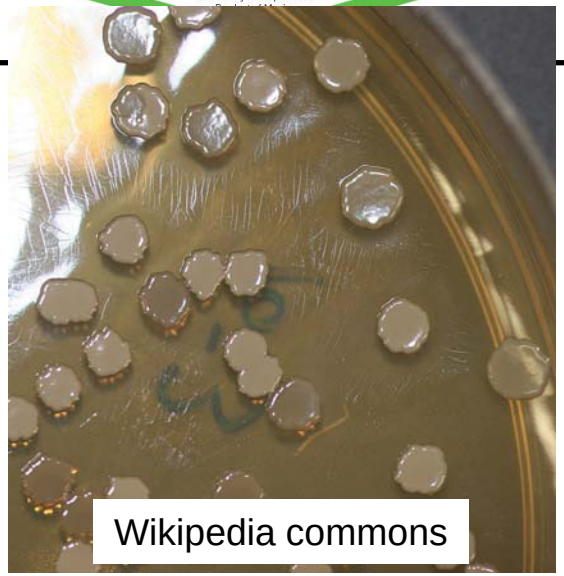
Kasugamycin (Kasumin 2L)

- Evaluated in 1980s for fire blight: testing suspended for phytotoxicity
  - Arysta Lifescience's Kasumin 2L: New formulation – safe for apples
- 2010-2014 seasons: section 18 label for MI
- 2015 season: section 3 label for US

Serenade Optimum

- A.I. & M. O. A.: *Bacillus subtilis*-antibiotic metabolites
- Diseases: Fire blight & anthracnose, botrytis, rusts
- My experiences
  - Fungal diseases: sooty blotch, fly speck, & rusts: moderate
  - Fire blight: >50% control at heavy pressure & 100% control light pressure





DoubleNickel55/LC

- A.I. & M.O.A/: *Bacillus amyloliquefaciens* strain D747-antibiotic metabolites
- Diseases: Fire blight & foliar & fruit diseases
- My experiences
  - Fungal diseases: sooty blotch, fly speck, & rusts: moderate to high
  - Fire blight: >50% control at heavy pressure & 100% control light pressure


DoubleNickel55™

BIOFUNGICIDE

Water Dispersible Granular Biofungicide

FOR ORGANIC PRODUCTION

OMRI™ Listed

Active Ingredient:
Bacillus amyloliquefaciens strain D747* ..... 25.0 %
Other Ingredients: ..... 75.0 %
Total ..... 100.0 %
*Contains a minimum of 5×10^10 colony-forming units (cfu) per gram

Net Contents: 5 Pounds
EPA Reg. No. 70051-108
EPA Est. No. 70051-CA-001
Lot No:

Manufactured by:
Certis USA, L.L.C.
9145 Guilford Rd, Suite 175
Columbia, MD 21046

CERTIS

KEEP OUT OF REACH OF CHILDREN
CAUTION

FIRST AID - Agricultural Use
If in eyes: Hold eyes open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
If on skin: Take off contaminated clothing. Rinse skin with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
If inhaled: Move person to fresh
911 or an ambulance, then giv
mouth-to-mouth if possible. Call
for further treatment advice.
Have the product label with yo
center or doctor.
Hot Line No.: 1-800-255-3924 fo

USER SAFETY RECOMMENDATIONS
Users should:
- Remove clothing/PPE immediately if pesticides get inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

PRECAUTIONARY STATEMENT
HAZARDS TO HUMANS & DOM
CAUTION: Causes moderate ey
repeated skin contact may ca
individuals. Avoid contact with eye
mist. Wash thoroughly with soap a
eating, drinking, chewing gum, us

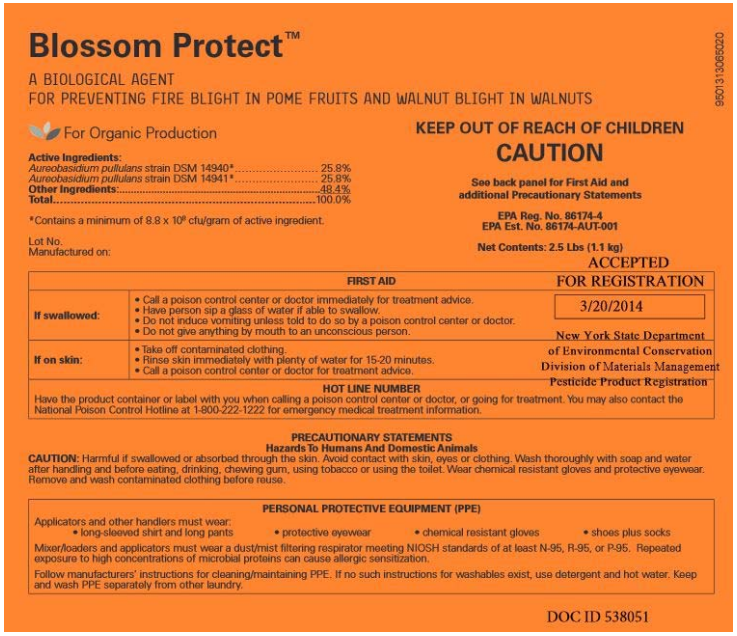
PERSONAL PROTECTIVE EQU
Applicators and other handlers m
- Long-sleeved shirt and long pa
- Waterproof gloves
- Shoes plus socks

Mixer/loaders and applicators
respirator meeting NIOSH standa
Repeated exposure to high conc
cause allergic sensitization. Foll
cleaning and maintaining PPE.
use detergent and hot water for
separately from other laundry.

When handlers use closed syst
a manner that meets requiremen
Standard (WPS) for agricultur
requirements may be reduced or

Wikipedia commons

Blossom Protect



Blossom Protect™

A BIOLOGICAL AGENT
FOR PREVENTING FIRE BLIGHT IN POME FRUITS AND WALNUT BLIGHT IN WALNUTS

For Organic Production

KEEP OUT OF REACH OF CHILDREN
CAUTION

See back panel for First Aid and additional Precautionary Statements

EPA Reg. No. 86174-4
EPA Est. No. 86174-AUT-001

Net Contents: 2.5 Lbs (1.1 kg)

Active Ingredients:
Aureobasidium pullulans strain DSM 14940*..... 25.8%
Aureobasidium pullulans strain DSM 14941*..... 25.8%
Other Ingredients:..... 48.4%
Total..... 100.0%

*Contains a minimum of 8.8 x 10^8 cfu/gram of active ingredient.

Lot No.
Manufactured on:

ACCEPTED
FOR REGISTRATION
3/20/2014
New York State Department of Environmental Conservation
Division of Materials Management
Pesticide Product Registration

FIRST AID	
If swallowed:	• Call a poison control center or doctor immediately for treatment advice. • Have person sip a glass of water if able to swallow. • Do not induce vomiting unless told to do so by a poison control center or doctor. • Do not give anything by mouth to an unconscious person.
If on skin:	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice.

HOT LINE NUMBER
Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact the National Poison Control Hotline at 1-800-222-1222 for emergency medical treatment information.

PRECAUTIONARY STATEMENTS
Hazards To Humans And Domestic Animals
CAUTION: Harmful if swallowed or absorbed through the skin. Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Wear chemical resistant gloves and protective eyewear. Remove and wash contaminated clothing before reuse.

PERSONAL PROTECTIVE EQUIPMENT (PPE)
Applicators and other handlers must wear:
• long-sleeved shirt and long pants • protective eyewear • chemical resistant gloves • shoes plus socks
Mixer/loaders and applicators must wear a dust/mist filtering respirator meeting NIOSH standards of at least N-95, R-95, or P-95. Repeated exposure to high concentrations of microbial proteins can cause allergic sensitization.
Follow manufacturers' instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

DOC ID 538051

950131306020

- A.I. & M.O.A.: *Aureobasidium pullulans* strains x2 = competitive inhibition of stigmatic surface
- Diseases: Fire blight
- Known experiences and concerns
  - 50-80% control of fire blight under high pressure
  - Fruit russeting shouldn't happen – 80% bloom

Copper products

- **MasterCop:** Copper sulfate pentahydrate 5.4% MCE
- Bloom rate + 1-3 lbs./hyrdated lime
- Experiences:
  - Effective on fire blight (50-75% control
  - Mixing issues with strep
  - Phyto./russeting 1 year

MASTERCOP®

Fungicide / Bactericide

FOR USE IN: CITRUS, VEGETABLES, TREE CROPS, SMALL FRUITS, VINES, AND FIELD CROPS.

ACTIVE INGREDIENT:	% BY WT.
Copper sulfate pentahydrate*†	21.46%
INERT INGREDIENTS:	78.54%
TOTAL:	100.00%

*CAS No. 7758-99-8

†Metallic copper content 5.4%

EPA Reg. No. 55272-18-66222 EPA Est. No. 55272-MEX-001

KEEP OUT OF REACH OF CHILDREN

DANGER/PELIGRO

Si usted no entiende la etiqueta, busque al alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

FIRST AID	
If in eyes:	• Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses, if present, after the first 5 minutes, then continue rinsing. • Call a poison control center or doctor for treatment advice.
If swallowed:	• Call a poison control center or doctor immediately for treatment advice. • Have person sip a glass of water if able to swallow. • Do not induce vomiting unless told to by a poison control center or doctor. • Do not give anything to an unconscious person.
If on skin:	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice.
If inhaled:	• Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. • Call a poison control center or doctor for further treatment advice.

Have the product container or label with you when calling a poison control center, doctor, or going for treatment. For emergency information concerning this product, call the National Pesticides Information Center (NPIC) at 1-800-858-7378 seven days a week, 6:30 am to 4:30 pm Pacific Time (NPIC website: www.npic.orst.edu). You may also contact CHEMTREC (800) 424-9300 (24 hours) for emergency medical treatment information.

For additional precautionary, handling, and use statements, see inside of this booklet.

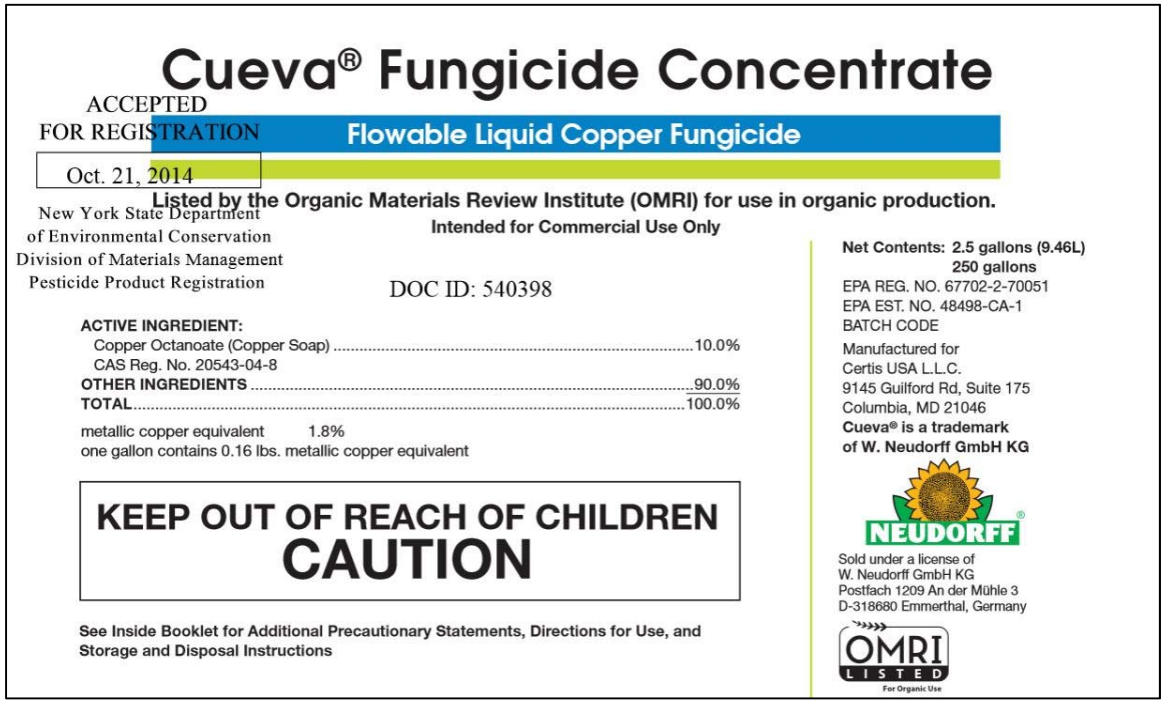
Manufactured for:
Makhteshim Agan of North America, Inc.
4515 Falls of Neuse Road, Suite 300
Raleigh, NC 27609

M A N A

EPA 030110/Notif 101411/ Rev A

Net Contents: 2.5 Gallons

Copper products



Cueva® Fungicide Concentrate

ACCEPTED
FOR REGISTRATION
Oct. 21, 2014
New York State Department
of Environmental Conservation
Division of Materials Management
Pesticide Product Registration

Flowable Liquid Copper Fungicide

Listed by the Organic Materials Review Institute (OMRI) for use in organic production.

Intended for Commercial Use Only

DOC ID: 540398

ACTIVE INGREDIENT:
Copper Octanoate (Copper Soap) 10.0%
CAS Reg. No. 20543-04-8
OTHER INGREDIENTS 90.0%
TOTAL 100.0%

metallic copper equivalent 1.8%
one gallon contains 0.16 lbs. metallic copper equivalent

KEEP OUT OF REACH OF CHILDREN
CAUTION

See Inside Booklet for Additional Precautionary Statements, Directions for Use, and Storage and Disposal Instructions

Net Contents: 2.5 gallons (9.46L)
250 gallons
EPA REG. NO. 67702-2-70051
EPA EST. NO. 48498-CA-1
BATCH CODE
Manufactured for
Certis USA L.L.C.
9145 Guilford Rd, Suite 175
Columbia, MD 21046
Cueva® is a trademark
of W. Neudorff GmbH KG

NEUDORFF

Sold under a license of
W. Neudorff GmbH KG
Postfach 1209 An der Mühle 3
D-318680 Emmerthal, Germany

OMRI LISTED For Organic Use

- **Cueva:** Copper Octanoate (Copper Soap) 1.8%MCE, OMRI
- Bloom rate, but issues with label text
- Experiences:
  - effective on sooty blotch flyspeck late season, no phyto issues

Copper products

- **Badge X2 (OMRI):** Copper Oxychloride & Hydroxide 28% MCE
- Bloom rate + 1-3 lbs./hydrated lime
- Experiences:
  - Effective on fire blight (75% control) and fly speck sooty blotch late season
  - No mixing or phyto. issues
  - Enhanced strep

OCT 06 2014

Doc ID: 540222

New York State Department
of Environmental Conservation
Division of Materials Management
Pesticide Product Registration

Badge® X2

B2880855

DRY FLOWABLE

FUNGICIDE/BACTERICIDE FOR AGRICULTURAL USE

ACTIVE INGREDIENT:	
Copper Oxychloride (CAS No. 1332-40-7)*	23.82%
Copper Hydroxide (CAS No. 20427-59-2)*	21.49%
OTHER INGREDIENTS:	54.69%
TOTAL:	100.00%

*Metallic Copper (Cu) Equivalent is 28% by weight

OMRI LISTED

KEEP OUT OF REACH OF CHILDREN

WARNING - AVISO

See Attached Label (back) for Additional Precautions and Directions For Use

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand the label find someone to explain it to you in detail.)

FIRST AID	
IF SWALLOWED	• Call a poison control center or doctor immediately for treatment advice. • Have person sip a glass of water if unable to swallow. • Do not induce vomiting unless told to do so by a poison control center or doctor. • Do not give anything by mouth to an unconscious person.
IF IN EYES	• Hold eye open and rinse slowly and gently with water for 15 to 20 minutes. • Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice.
IF ON SKIN	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15 to 20 minutes. • Call a poison control center or doctor for treatment advice.
IF INHALED	• Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. • Call a poison control center or doctor for further treatment advice.
NOTE TO PHYSICIAN: Possible mucosal damage may contraindicate use of gastric lavage.	
Have the product container or label with you when calling a poison control center or doctor, or going for treatment. You may also contact 1-800-222-1222 for emergency medical treatment information. For Chemical Emergency Spill Leak Fire Exposure or Accident Call CHEMTREC Day or Night Domestic North America 800-424-9300 International 703-527-3883 (collect calls accepted)	

EPA Registration No.: 80289-12

EPA Establishment No.: 79558-ITA-1

FOR ORGANIC PRODUCTION

Managing FB: Product efficacy

- Orchard site
  - 4-5 year old ‘Idared’ trees on B.9
- Artificial inoculum (Ea 273 at $1x10^{7-8}$ $CFUml^{-1}$)
  - Spray for BB or Scissor dip for SB

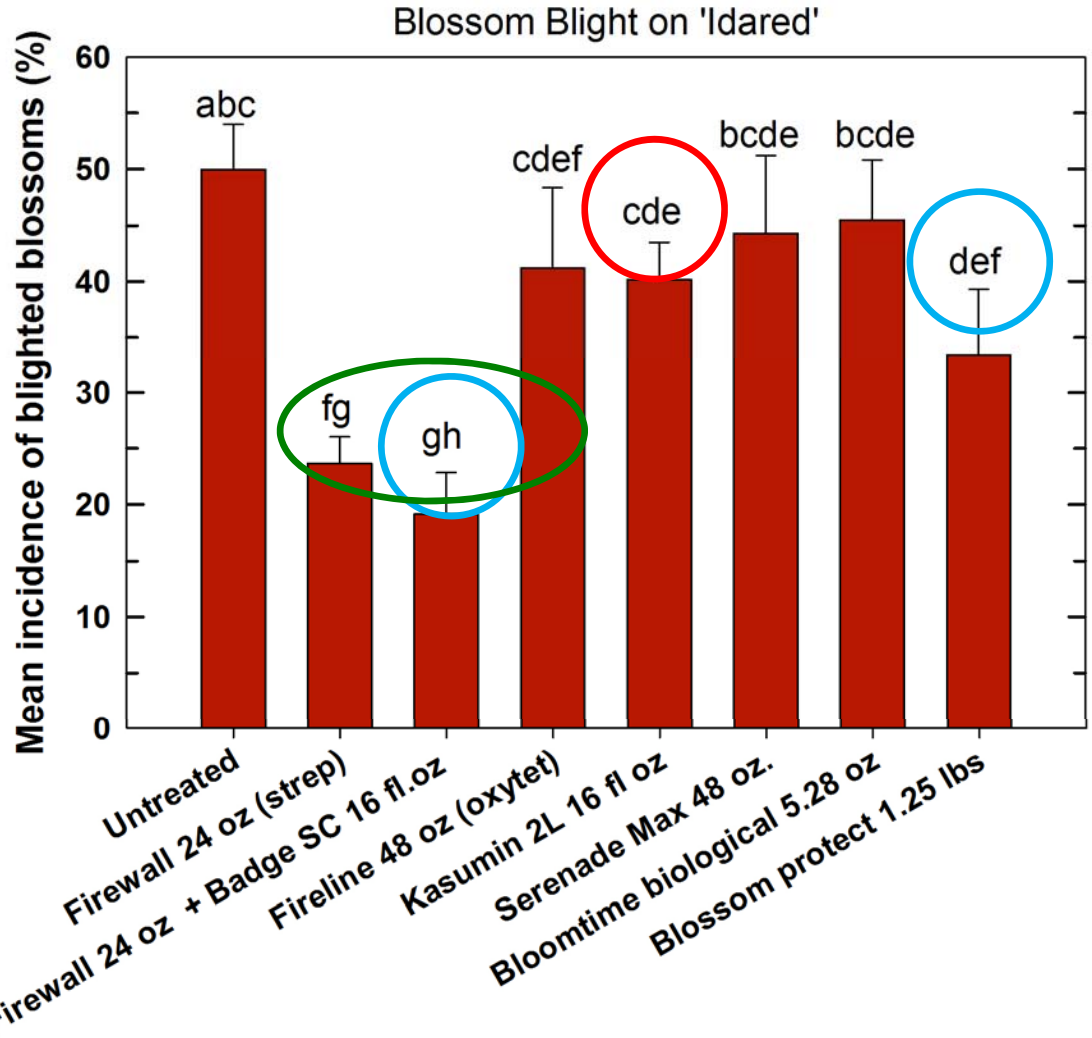
Managing FB: Product efficacy

- Blossom blight application timing
  - Pre-bloom timings for biopesticides
  - All antibiotics & biopesticides @ 80% bloom
- Blossom blight incidence: percentage of blighted blossoms (5 reps)

Managing FB: Product efficacy

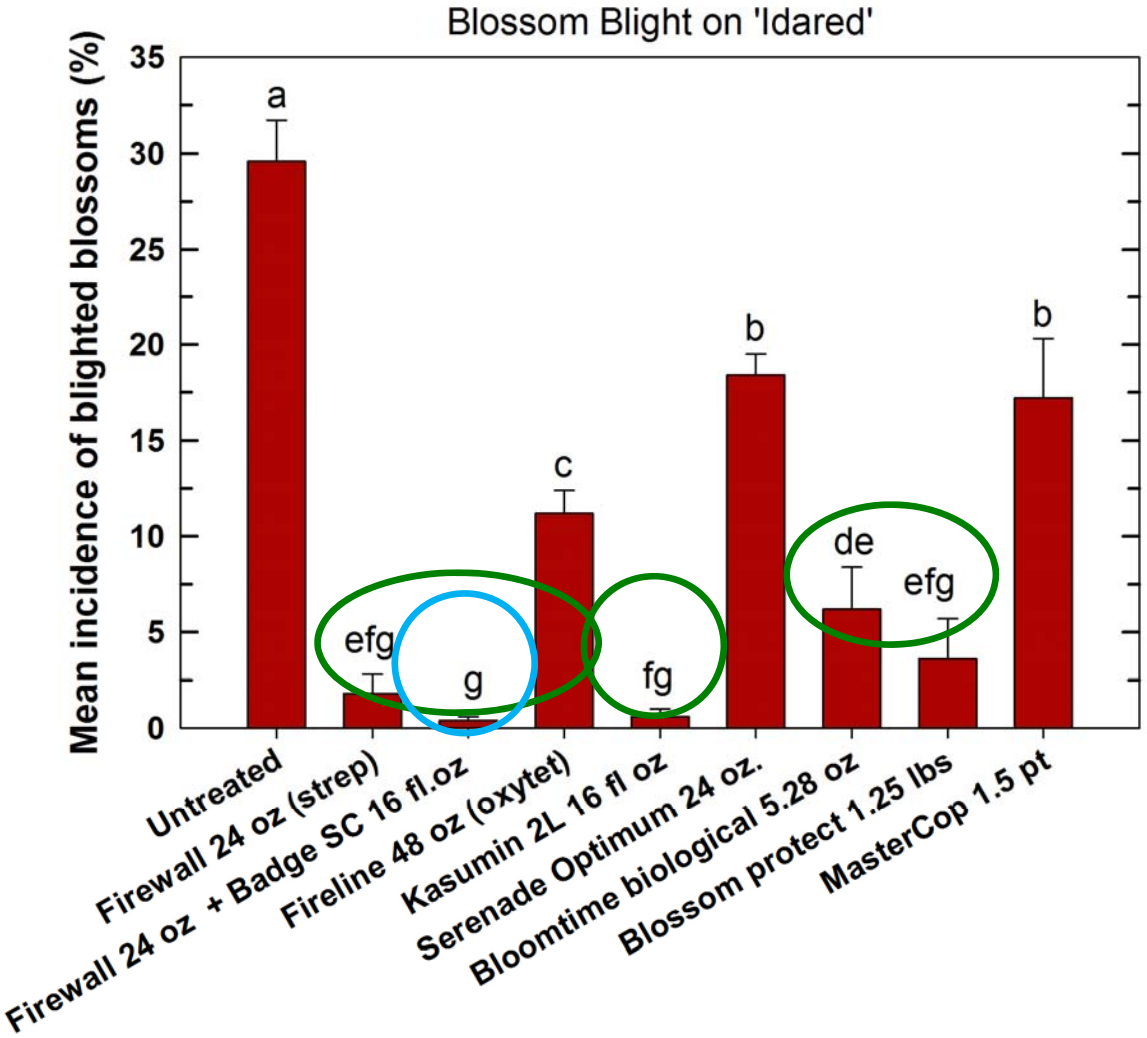
- Shoot blight application timing
  - Active terminal growth (5-7”): 24 hours after inoculation (trauma)
  - Apogee (PF/1-2”) or 5-days prior: Actigard
- Shoot blight: progression of canker of 20 shoots (5 reps)

2012 Blossom Blight Trial



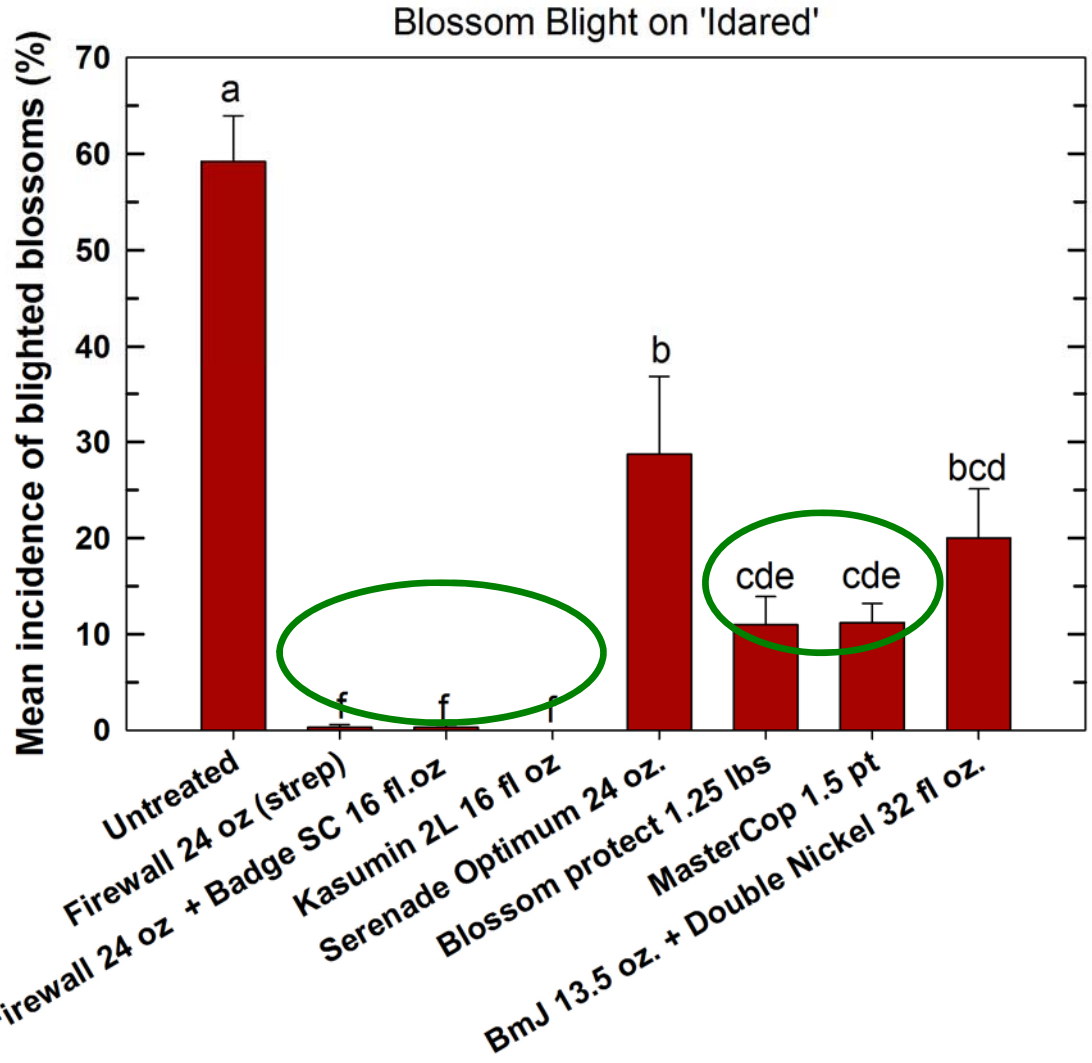
- **High pressure year:** Streptomycin programs, Strep + low copper, Kasumin 2L, Blossom Protect

2013 Blossom Blight Trial



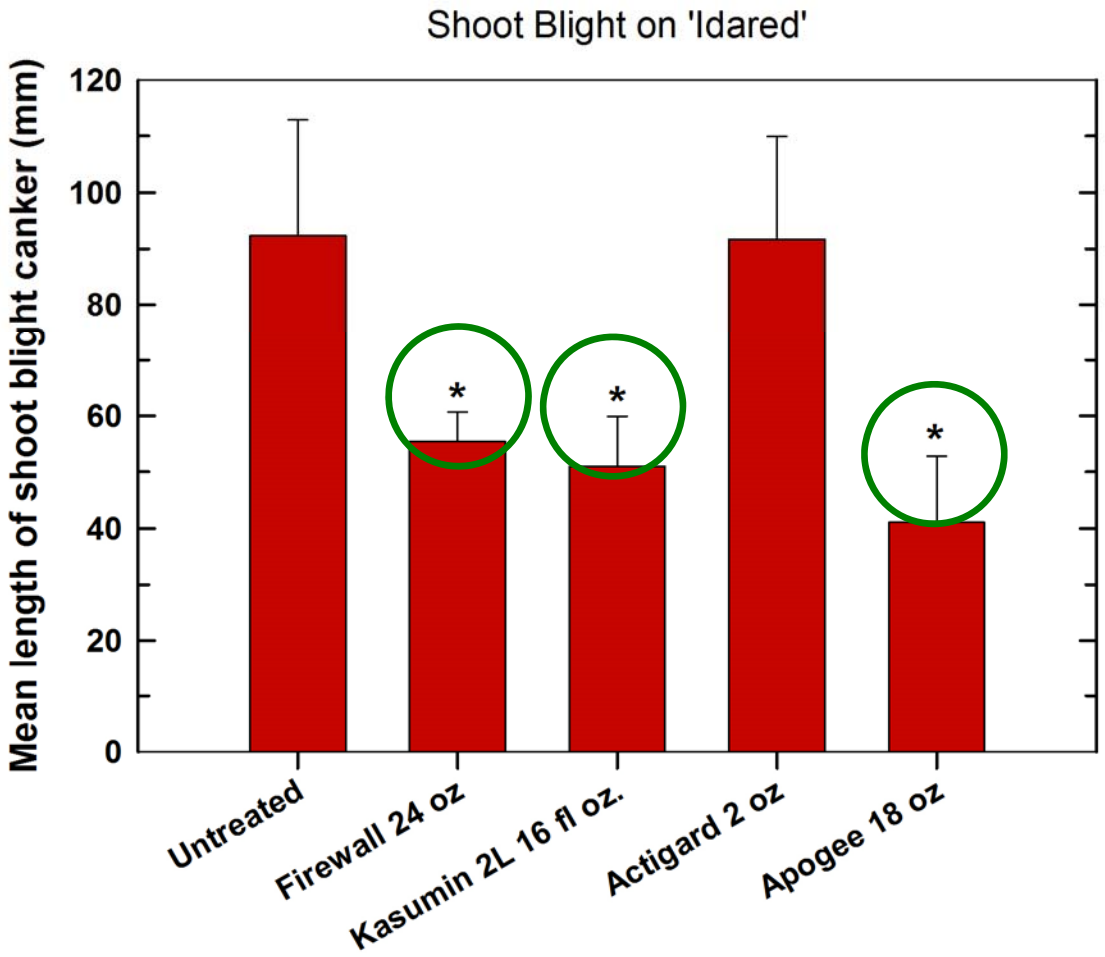
- **Low pressure year:** Streptomycin programs, Strep + low copper, Kasumin, Blossom Protect, Bloomtime Biological

2014 Blossom Blight Trial



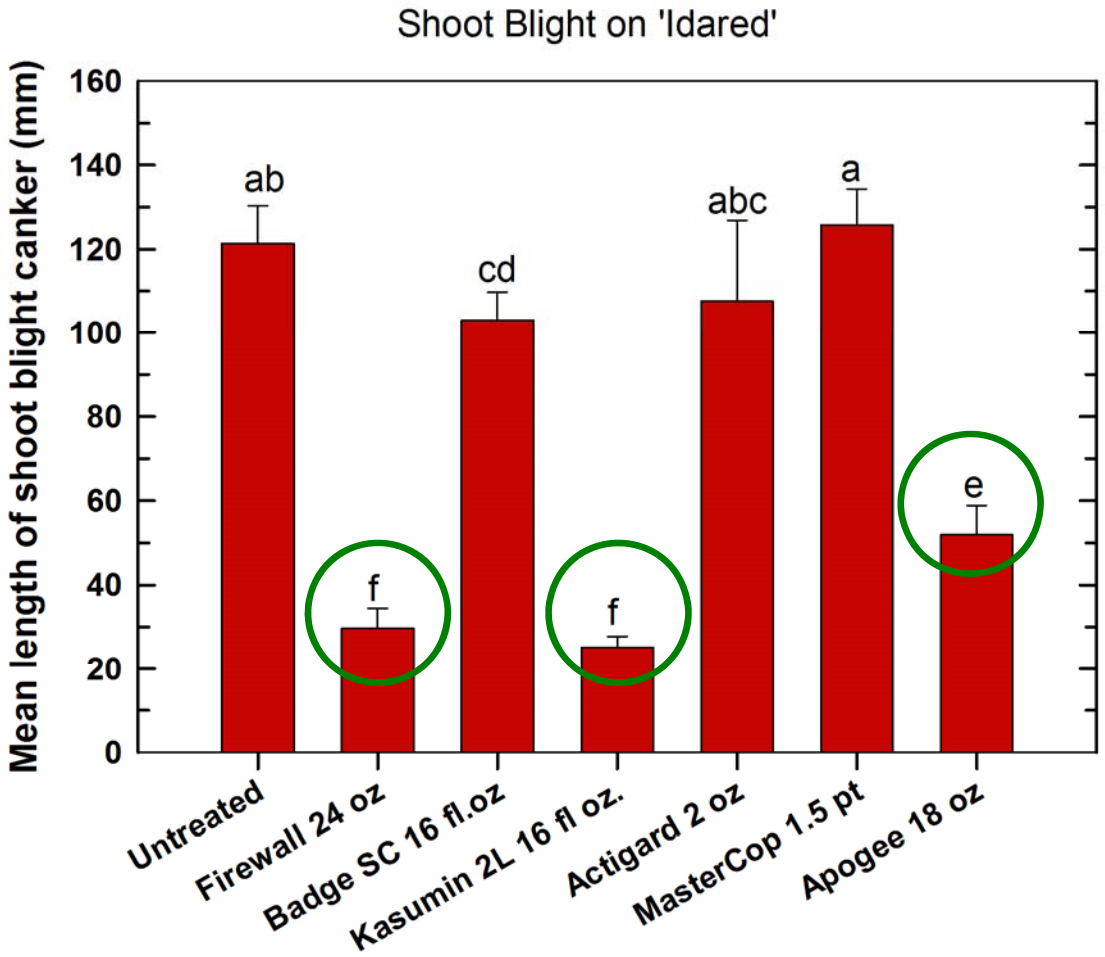
- **Moderate pressure year:** Antibiotic programs, Blossom Protect, MasterCop, BmJ & Double Nickel

2012 Shoot Blight



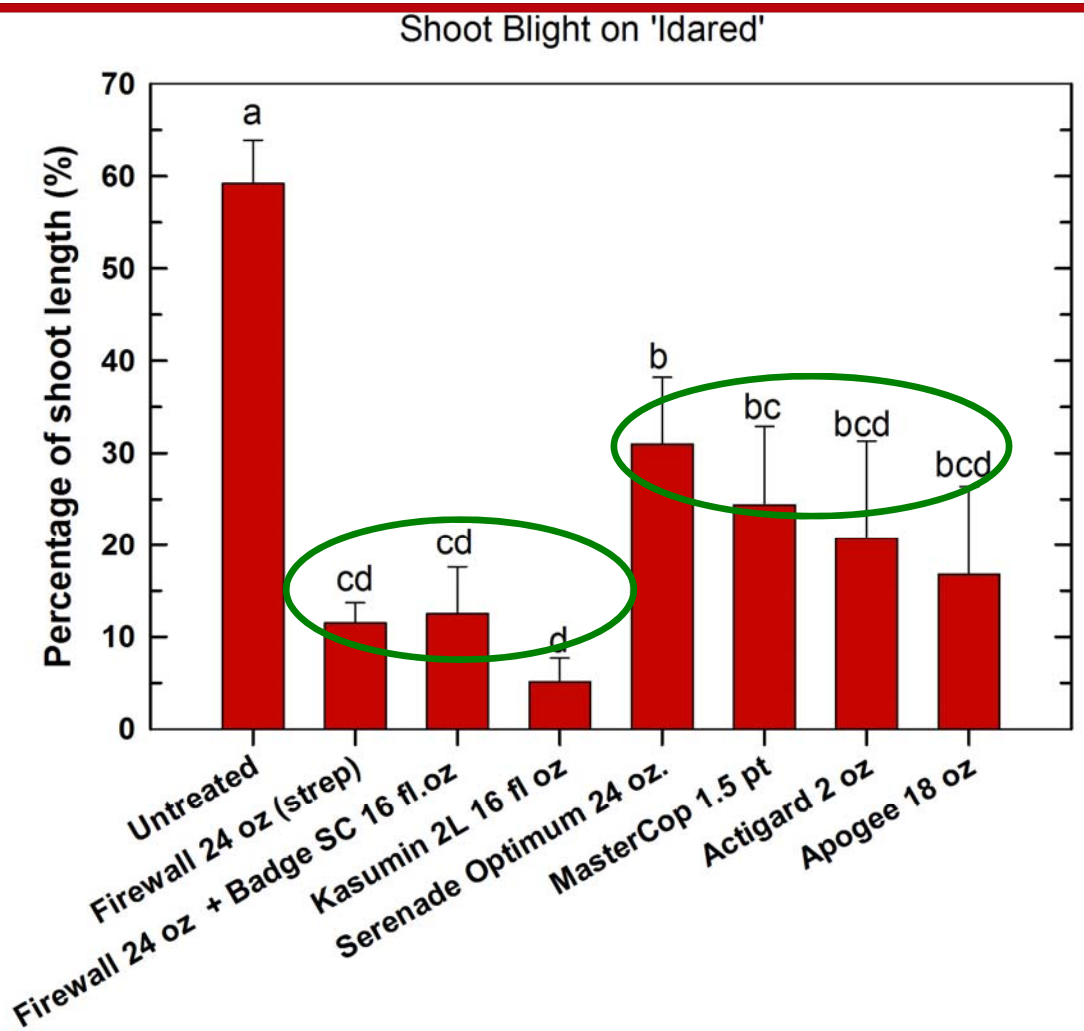
• 2012: Only Apogee and the **two antibiotics** provided a significant reduction of shoot blight progression

2013 Shoot Blight



• 2013: Only Apogee and the **two antibiotics** provided a significant reduction of shoot blight progression

2014 Shoot Blight



- 2014: **Antibiotics** provided strongest reduction of shoot blight progression; biologicals, Apogee, and Actigard > good effect

Blossom Blight Summary

- Streptomycin greatest activity against BB
  - Improved by bloom rate of buffered copper: No phyto!
- Kasumin 2L (protectant): as effective as strep
  - Resistant management: not necessary in region where SmR Ea not conformed or suspected
- Biologicals & low MCE coppers
  - They work, but more effective against lower inoculum levels & variable in performance
  - Often equivalent to oxytet **(does not kill)**

Shoot Blight Summary

- Antibiotics greatest effect on trauma shoot blight
  - Don’t use antibiotics for shoot blight outside trauma events
- Apogee
  - Even single application provides considerable control: important for high vigor varieties
- Copper & Actigard
  - Variable in performance, and strongest effect against realistic inoculum levels

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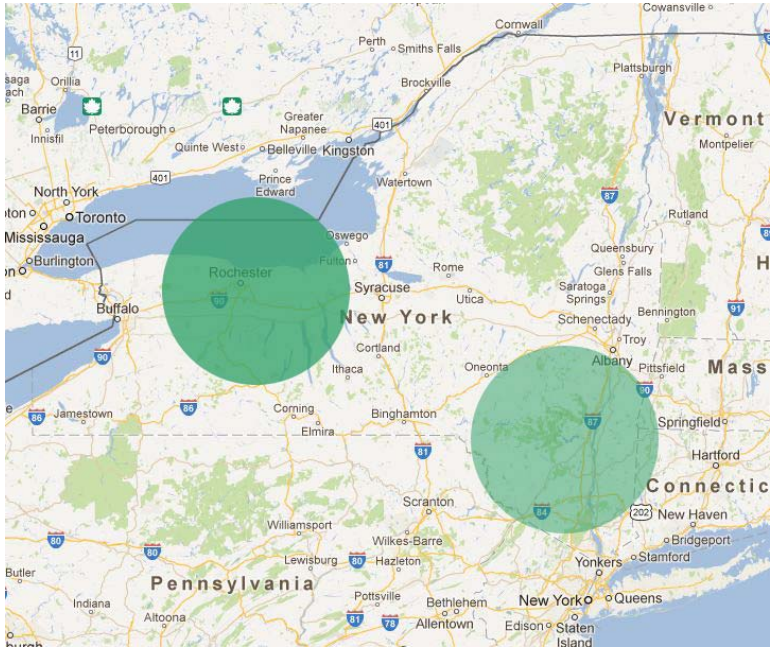
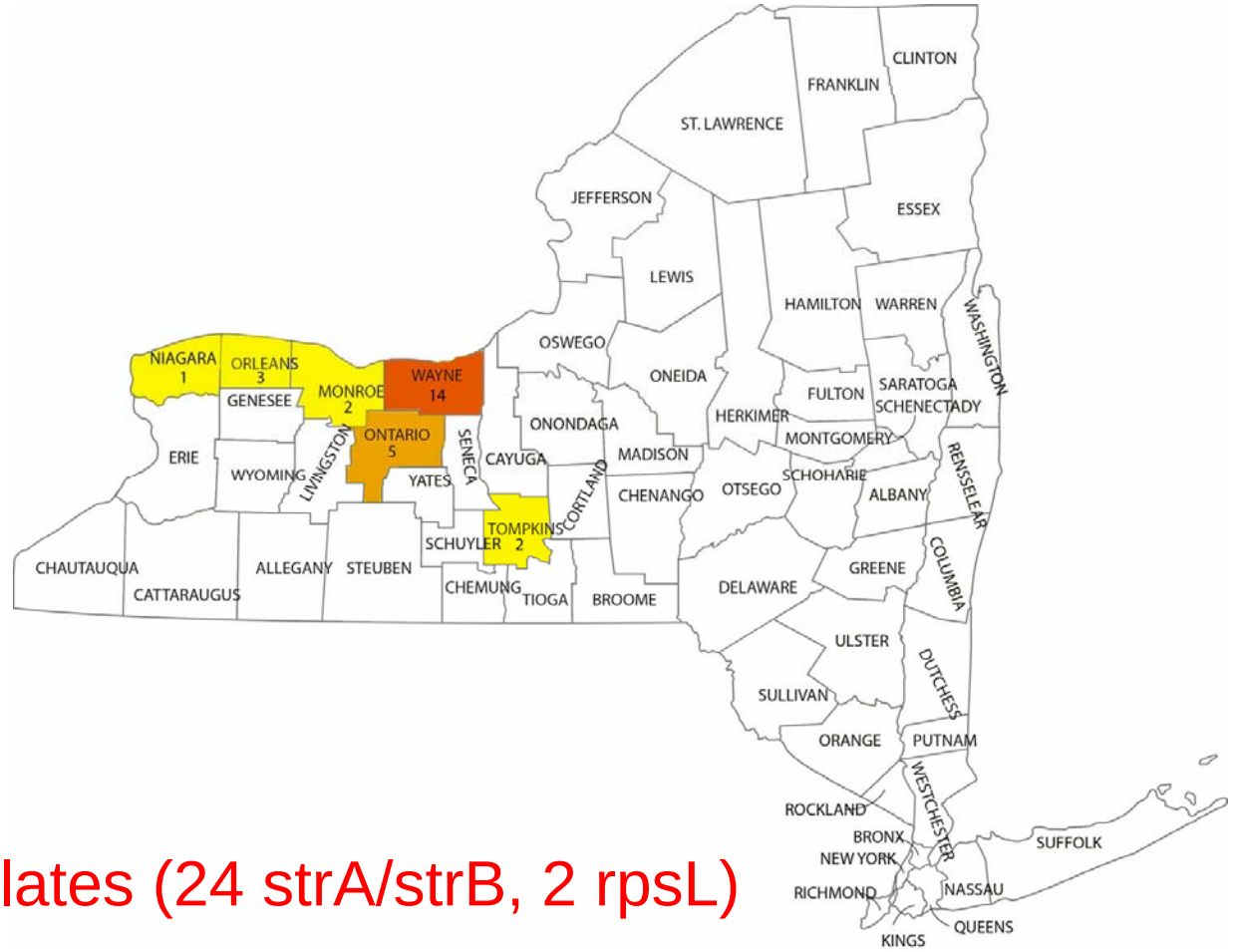
Status of streptomycin resistance

- 2012: 175 isolates from 43 commercial sites
- 2013: 320 isolates from 32 commercial sites
- 2014: 800 isolates from 32 commercial sites
  - Majority of sampling: Lake Ontario & Hudson Valley



Status of streptomycin resistance

- 2012-2013: 16 apple production operations had SmR Ea



26 Sm^R Isolates (24 strA/strB, 2 rpsL)

Trends & implications

- 2014: Lots of Ea, but no SmR Ea
  - Other tree declines present (1/3 samples > BSB, winter injury, & fungal decay blights)
- SmR Ea seems to be restricted to western NY
  - Closest to regions of previous outbreaks
  - Eastern NY appears to be SmR Ea free
- 16 apple production operations had SmR Ea
  - Disproportionate ratio of SmS to SmR strains
  - Most strains have plasmid-borne resistance

Trends & implications

- All samples from shoot blight: no catastrophic strep failures w/ widespread losses
  - Numerous reports of FB in RubyFrost, Honeycrisp, & Gala
- In “high risk” areas for strep resistance
  - Streptomycin and oxytet mixes: seemed to improve overall control of FB in Western NY
  - High risk operations with SmR Ea in 2012 had only SmS in 2013 & 2014

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Managing fire blight

- Post season: Clean up inoculum to reduce spread within and between trees
  - Prune out strikes and small cankers:

Managing fire blight

- Pre season: Clean up inoculum to reduce spread within and between trees
  - Scout and prune out oozing cankers:
    - Large - depressed discolored cracked bark: main scaffolds can’t prune
    - Small – blossom & shoot infections, summer pruning cuts: numerous & hard to see/find


Courtesy of Debbie Breth

Managing fire blight

- Pre season
  - Apply full rate of copper at silver/green tip
    - Warm weather causes cankers to ooze > fire flight inoculum increases greatly
- Bloom (had or have history of fire blight)
  - Watch for CCE alerts and disease model forecasts for fire blight infection periods (NEWA & MaryBlyt 7.1)
  - Since **SmR Ea** has **not** been confirmed in eastern NY, use highest rate of strep for each forecast infection

Managing fire blight

- Bloom
  - Concerned about effectiveness of strep, use highest rate of Kasumin 2L at the 2nd or 3rd forecast infection
- Bloom (Organic with susceptible varieties)
  - No antibiotics (Oct 20, 2014), Highest rate of Double Nickel with Cueva, Badge X2 with hydrated lime, Serenade Optimum, or Blossom Protect
  - Run MaryBlyt 7.1 with 60-75% efficiency with forecast data to plan spray interval – use local data

Managing fire blight

- Additional bactericide considerations
  - Streptomycin: locally systemic & Oxytetracycline & Kasugamycin protectants
- Post-Bloom & Summer: Copper (protectant)
  - Can cause fruit russet: not a concern in nursery or during establishment - survival
  - Apply with adequate drying time
  - Protectant: reduces surface bacteria
  - Terminals can outgrow protective residues of copper
  - Low rate fixed copper program: 7-10 day schedule until terminal bud set

Managing fire blight

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

Managing fire blight

- Post-Bloom & Summer: Pruning newly developed strikes
  - Remove as soon as noticed
  - Prune on a cool dry day
  - Cut into last season's growth - At least 12” into healthy tissue
  - Young trees: if 12” is into the main scaffold – remove/replant

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Managing fire blight: Using models

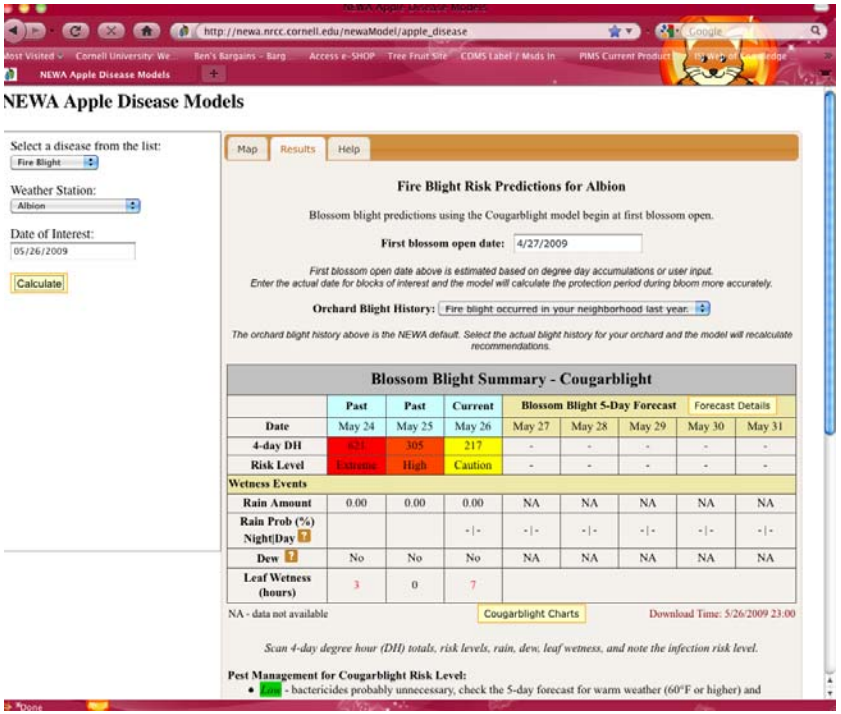
- Web-based intuitive pest/disease forecasting systems
- Promoted and used for apples in WA, Canada, and Europe: cost-effective pest management & pesticide stewardship
- Web versions of time-tested relationships with integrated weather data
- Prevents unnecessary pesticide applications, saves growers money, prevents losses due to disease

Managing fire blight: Using models

- Fire blight forecasting:
  - Predicts blossom blight infection periods
  - Essential for cost-effective management of fire blight and avoiding antibiotic resistance
  - NEWA system & Marybylt 7.1: heat units & presence of moisture

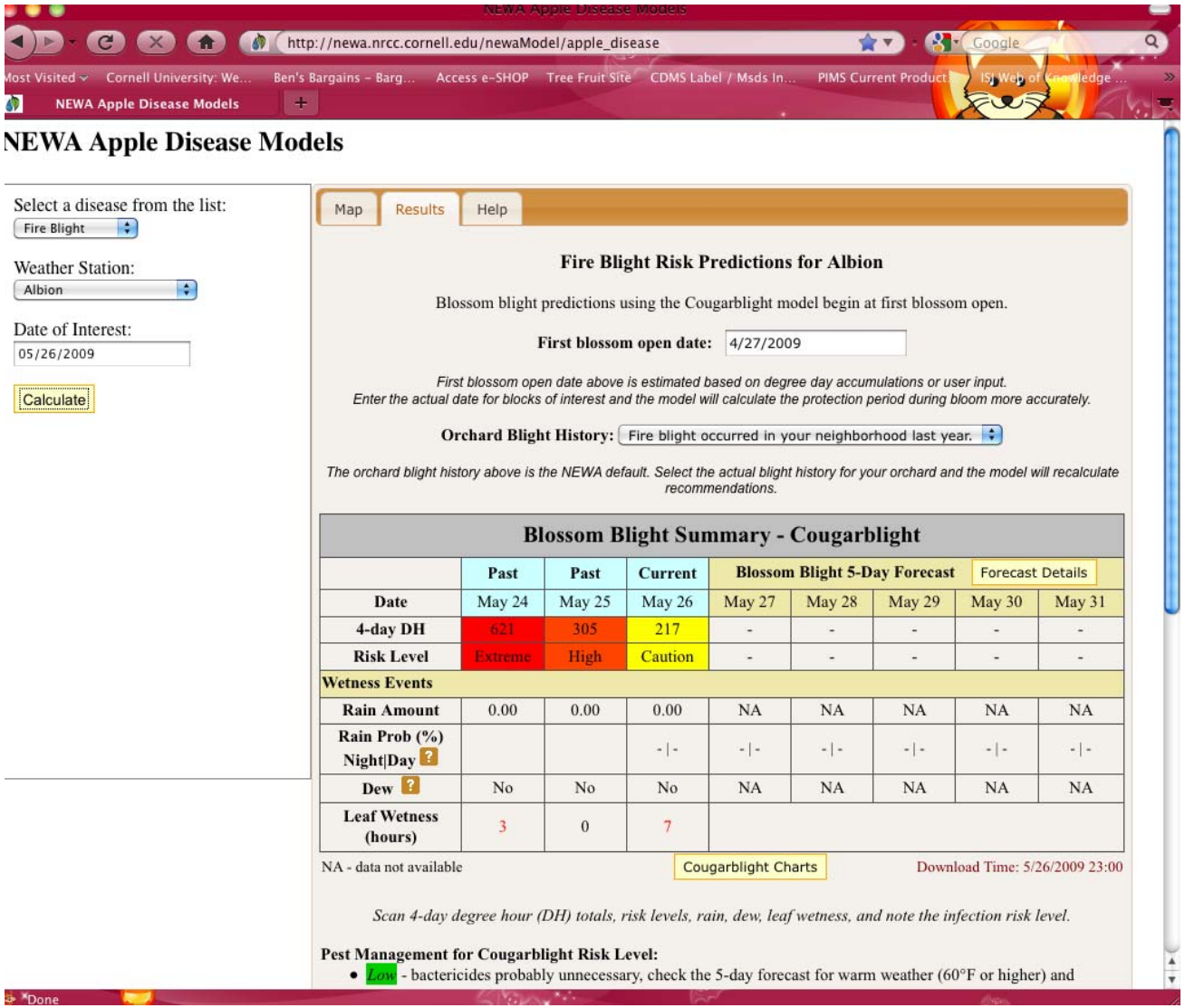
Managing fire blight: Using models

- NEWA system:
  - Based on CougarBlight logic
    - Tim Smith WSU
    - Model works well on east coast apples
  - Integrated with NEWA/NRCC data
  - Fully Automated: w/ limited user input



http://newa.nrcc.cornell.edu/newaModel/apple_disease

Managing fire blight: Using models



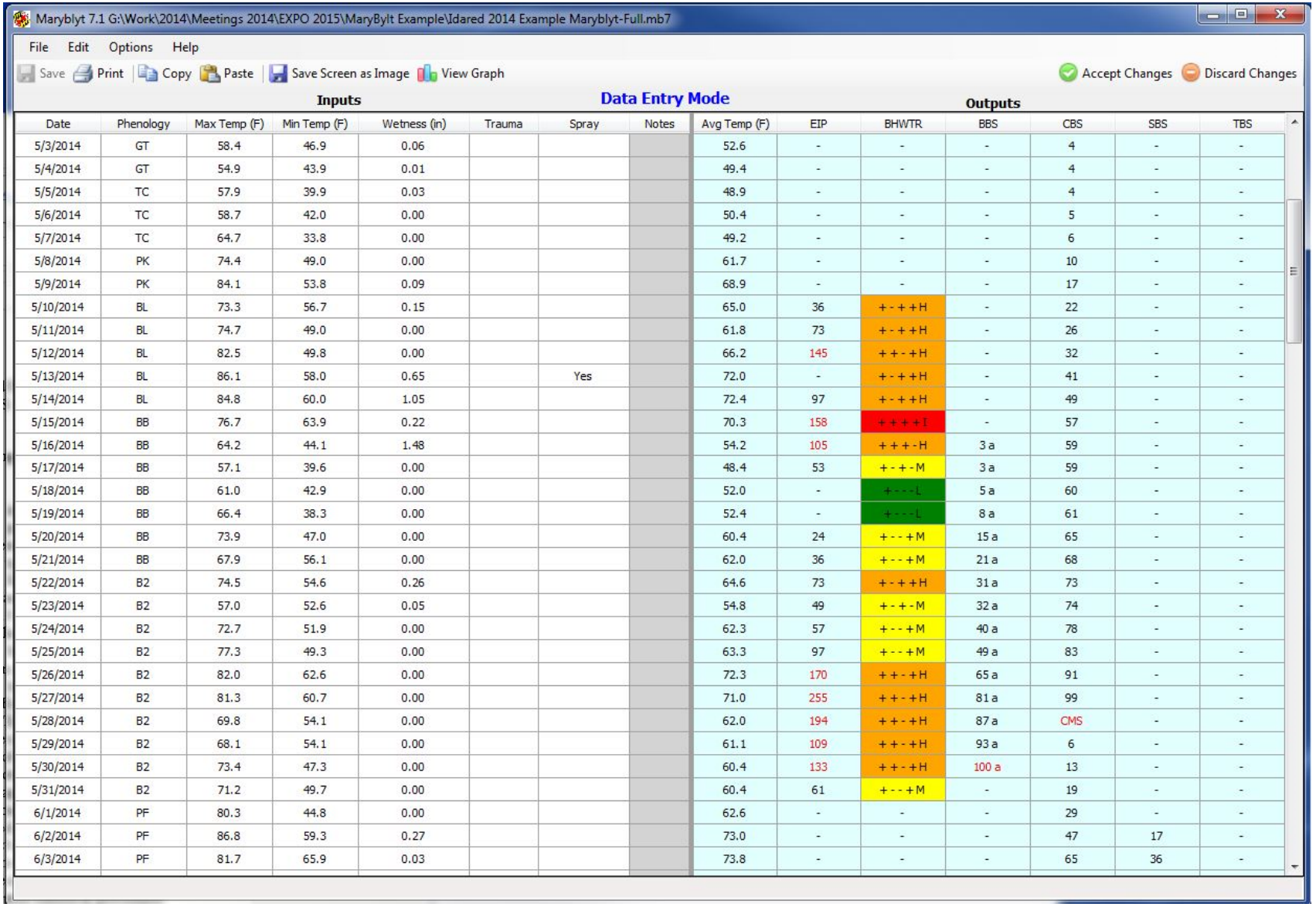
http://newa.nrcc.cornell.edu/newaModel/apple_disease

Managing fire blight: Using models

- MaryBlyt 7.1:
  - Based on east coast research and validation
    - Paul Steiner UMD
  - Standalone program
  - Requires more user input/data, but higher level of specificity
  - Season long predictions
  - Can import NEWA data

http://www.caf.wvu.edu/kearneysville/Maryblyt/

Managing fire blight: Using models



Maryblyt 7.1 G:\Work\2014\Meetings 2014\EXPO 2015\MaryBylt Example\Idared 2014 Example Maryblyt-Full.mb7

File Edit Options Help

Save Print Copy Paste Save Screen as Image View Graph Accept Changes Discard Changes

Data Entry Mode

Inputs								Outputs						
Date	Phenology	Max Temp (F)	Min Temp (F)	Wetness (in)	Trauma	Spray	Notes	Avg Temp (F)	EIP	BHWTR	BBS	CBS	SBS	TBS
5/3/2014	GT	58.4	46.9	0.06				52.6	-	-	-	4	-	-
5/4/2014	GT	54.9	43.9	0.01				49.4	-	-	-	4	-	-
5/5/2014	TC	57.9	39.9	0.03				48.9	-	-	-	4	-	-
5/6/2014	TC	58.7	42.0	0.00				50.4	-	-	-	5	-	-
5/7/2014	TC	64.7	33.8	0.00				49.2	-	-	-	6	-	-
5/8/2014	PK	74.4	49.0	0.00				61.7	-	-	-	10	-	-
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		Yes		72.0	-	+ - + + H	-	41	-	-
5/14/2014	BL	84.8	60.0	1.05				72.4	97	+ - + + H	-	49	-	-
5/15/2014	BB	76.7	63.9	0.22				70.3	158	+ + + + I	-	57	-	-
5/16/2014	BB	64.2	44.1	1.48				54.2	105	+ + + - H	3 a	59	-	-
5/17/2014	BB	57.1	39.6	0.00				48.4	53	+ - + - M	3 a	59	-	-
5/18/2014	BB	61.0	42.9	0.00				52.0	-	+ - - - L	5 a	60	-	-
5/19/2014	BB	66.4	38.3	0.00				52.4	-	+ - - - L	8 a	61	-	-
5/20/2014	BB	73.9	47.0	0.00				60.4	24	+ - - + M	15 a	65	-	-
5/21/2014	BB	67.9	56.1	0.00				62.0	36	+ - - + M	21 a	68	-	-
5/22/2014	B2	74.5	54.6	0.26				64.6	73	+ - + + H	31 a	73	-	-
5/23/2014	B2	57.0	52.6	0.05				54.8	49	+ - + - M	32 a	74	-	-
5/24/2014	B2	72.7	51.9	0.00				62.3	57	+ - - + M	40 a	78	-	-
5/25/2014	B2	77.3	49.3	0.00				63.3	97	+ - - + M	49 a	83	-	-
5/26/2014	B2	82.0	62.6	0.00				72.3	170	+ + - + H	65 a	91	-	-
5/27/2014	B2	81.3	60.7	0.00				71.0	255	+ + - + H	81 a	99	-	-
5/28/2014	B2	69.8	54.1	0.00				62.0	194	+ + - + H	87 a	CMS	-	-
5/29/2014	B2	68.1	54.1	0.00				61.1	109	+ + - + H	93 a	6	-	-
5/30/2014	B2	73.4	47.3	0.00				60.4	133	+ + - + H	100 a	13	-	-
5/31/2014	B2	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	-

Acknowledgments

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Questions?