Tree Fruit Insect Roundup

Lake George Commercial Fruit Growers' School
Fort William Henry Conference Center, Lake George, NY
February 10, 2014

Peter Jentsch
Senior Extension Associate

CORNELL'S
Hudson Valley
LABORATORY

Overview

Product Updates

Commercial Insect Pest Concerns

Efficacy trials

Insects ‘slipping through the cracks’

CORNELL'S
Hudson Valley
LABORATORY

Product Updates

Guthion: Azinphos-methyl is no longer permitted for use on tree fruit in NYS as of 2014.

Calypso: Bayer Crop Science voluntarily canceled registration with product use through 2016. Ground water concerns.

Thionex: All endosulfan products (3EC & 50W)

- Registered for use in apple
- EPA mandated a stop-use date of March 31, 2016 in apple
- FIFRA 2(ee) for BMSB management

Provado: This original formulation of Imidacloprid has been replaced by AdmirePro and is no longer being sold by Bayer CropScience.

CORNELL'S
Hudson Valley
LABORATORY

Product Updates

Gladiator: FMC pre-mix
Avermectin / zeta-cypermethrin

- Requires penetrating surfactant (oil) for mite management
- Max. 2 consecutive applications @ 19.0 fl.oz/A (high rate)
- Total 38.0 fl.oz/A per season

Portal XLO: Nichino
Fenpyroximate
2.0 pints / A; 1 application / season
Supplemental label in stone fruits, including mite and leafhopper.

Apta 15SC: Nichino (*Experimental*)
Tolfenpyrad; broad spectrum (PC suppression)

CORNELL'S Hudson Valley LABORATORY

Product Updates

Closer: Dow AgroScience

- Sulfoxaflor (Class 4C (neonic's 4A)
- 1.5-5.75 fl. oz./A; 7d PHI in pome fruit
- Aphid complex including wooly apple aphid, leafhopper

Exirel: DuPont

- Cyazypyr (Rynaxypyr (Altacor) Class 28)
- 1.5-5.75 fl. oz./A; 7d PHI in pome fruit
- Lepidoptera (Leafroller, internal Lep. Complex)

Both *Closer* & *Exirel* have federal registrations, no NYS approval

---

Bifenthrin: Section 18 for 2013 has expired, renewal request will be reviewed with possible submission for 2015 for BMSB Mgt.

CORNELL'S Hudson Valley LABORATORY

Lorsban for Pome Fruit Insect Management:

Lorsban: Chlorpyrifos use in apple

- A single application
- Pre-bloom to **canopy** or post-bloom to **trunk below 4'**
- 4d REI, 28d PHI

Lorsban 4E: 45% AI; ½ - 4 pts./A

Lorsban Advanced: 40% AI
Low odor formulation; 1½ - 4 pts./A

Trunk borers, climbing cutworm, plant bugs, rosy apple aphid, **obliquebanded leafroller**, **San Jose scale**
brown marmorated stink bug

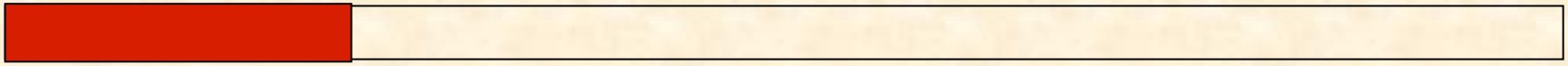
CORNELL'S Hudson Valley LABORATORY

Lorsban for Pome Fruit Production: Apple Timing Options

- Contact activity, complete coverage, single application
- SJS – D-Pink
- OBLR - TC - Pink
- RAA – Pink

canopy / trunk

SJS OBLR / BMSB



GT	TC	P	Bloom	PF	1C	2C	3C	4C	5C	6C	7C	8C
21 March	21 April	27 April	1 May	14 May	28 May	10 June	25 June	5 July	15 July	1 Aug.	15 Aug.	1 Sept.

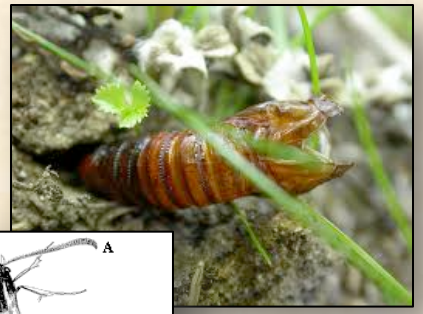
CORNELL'S Hudson Valley LABORATORY

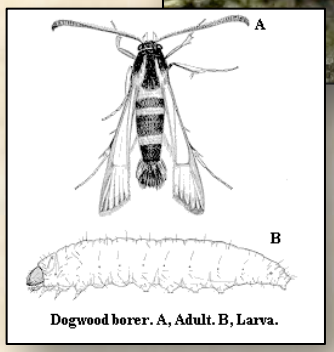
Commercial Pome Fruit Insect Management Concerns:

Trunk borers

Dogwood Borer (Lepidoptera: Sesiidae)
(slender spindle M-9 & M-26 rootstock)

Round and Flatheaded Appletree Borer
(Coleoptera: Buprestidae)
Root Borers
(Coleoptera: Cerambycidae)
Prionus
(Coleoptera: Cerambycidae)





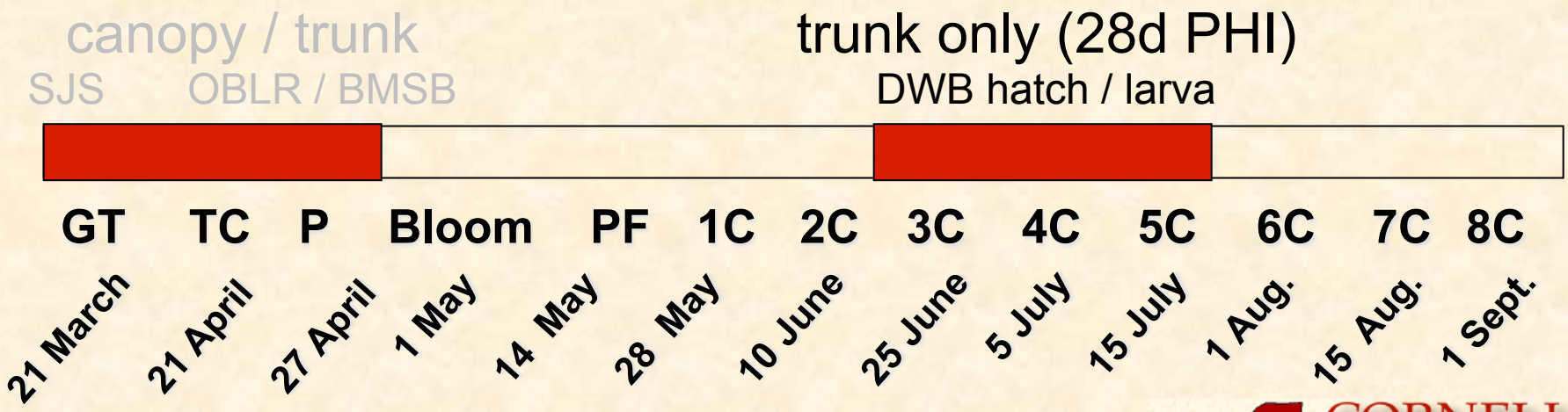
Dogwood borer. A, Adult. B, Larva.

CORNELL'S
Hudson Valley
LABORATORY

Lorsban for Pome Fruit Production: Apple Timing Options

- Contact activity, complete coverage, single application
- SJS – D-Pink
- OBLR - TC - Pink
- RAA – Pink

- DWB – 1st hatch larva (15 June / when convenient)



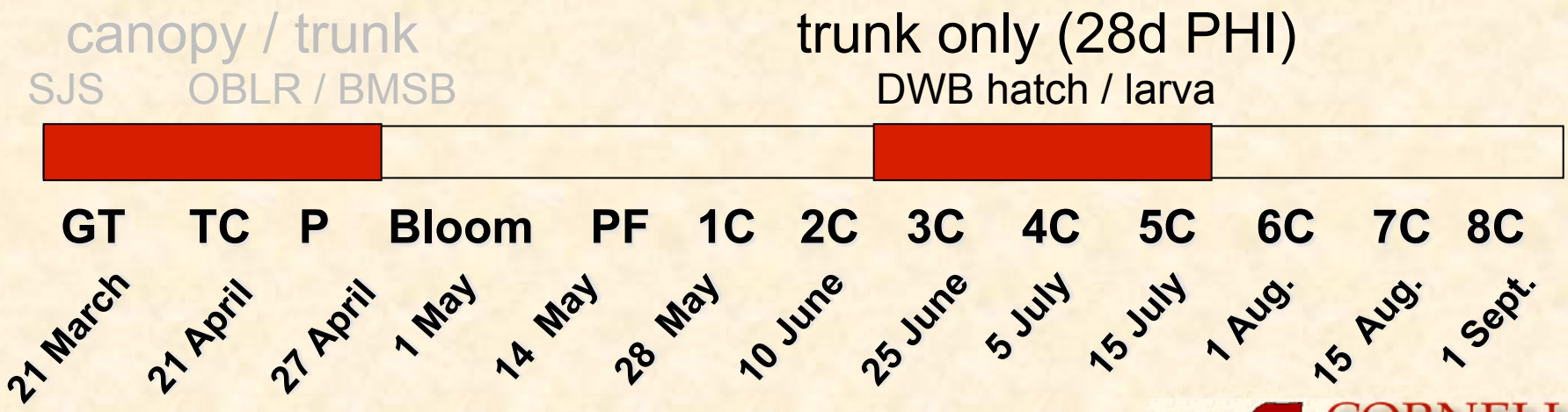
CORNELL'S Hudson Valley LABORATORY

Lorsban for Pome Fruit Production: Apple Timing Options

- Contact activity, complete coverage, single application
- SJS – D-Pink
- OBLR - TC - Pink
- RAA – Pink

- DWB – 1st hatch larva (15 June / when convenient)

- ***Alternate years between foliar and trunk***

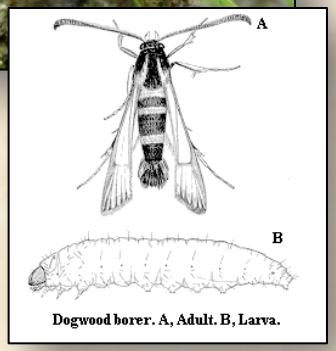


CORNELL'S Hudson Valley LABORATORY

Commercial Pome Fruit Insect Management Concerns:

Dogwood Borer (Lepidoptera: Sesiidae)

Mating disruption for DWB management.



A pheromone antagonist-based dispenser deployed at a rate of 250/ha. effectively disrupted mate-finding by male dogwood borer.

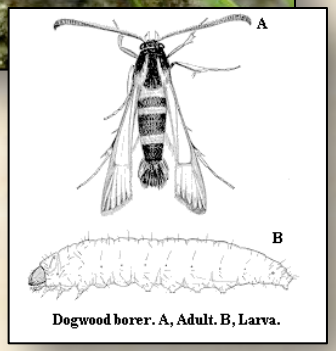
[1]Evaluation of Pheromone-Based Management Strategies for Dogwood Borer (Lepidoptera: Sesiidae) in Commercial Apple Orchards.
J. Econ. Entomol. 102(3): 1085Ð1093 (2009) T. LESKEY, C. BERGH, J. WALGENBACH, A. ZHANG

CORNELL'S
Hudson Valley
LABORATORY

Commercial Pome Fruit Insect Management Concerns:

Dogwood Borer (Lepidoptera: Sesiidae)

Mating disruption for DWB management.



An antagonist-based dispenser deployed at a rate of 250/ha effectively disrupted mate-finding by male dogwood borer.

[1]Evaluation of Pheromone-Based Management Strategies for Dogwood Borer (Lepidoptera: Sesiidae) in Commercial Apple Orchards.
J. Econ. Entomol. 102(3): 1085Ð1093 (2009) T. LESKEY, C. BERGH, J. WALGENBACH, A. ZHANG

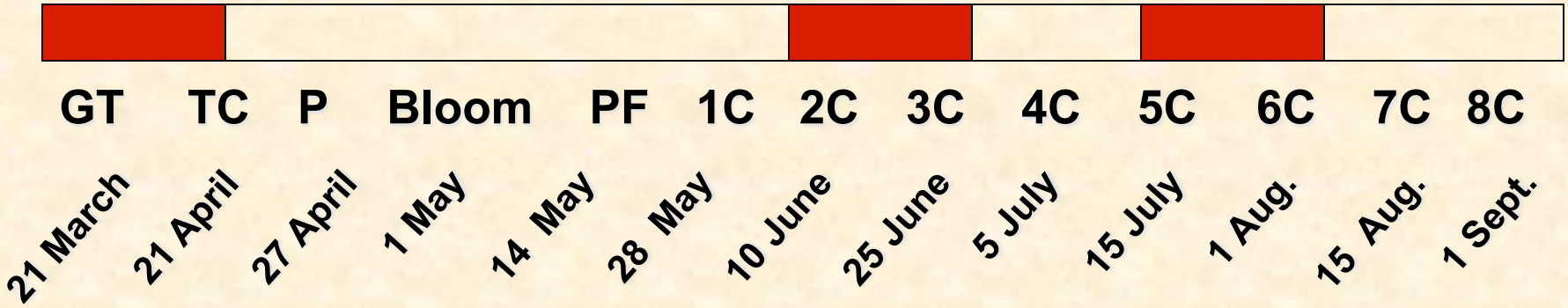
Treatment with Isomate-DWB dispensers at a rate of 150/ A the first season, followed by 100 per acre thereafter, using a plant density of 800 trees per acre, $8 per hour for labor, costs approximately $63.60 /A for the first season and $42.40 /A in subsequent seasons. Lorsban estimated at $25.00 /A .

Dogwood Borer Research, D. Kain and A. Agnello, Cornell University
Great Lakes Fruit Grower News, December 2011

CORNELL'S Hudson Valley LABORATORY

San Jose Scale

- *OW on bark as 'black-cap'*
- *Does not lay eggs - produce live crawlers*
- *Crawler production by OW stage occurs 4-6 wk post bloom*
- *'white cap' → 'black cap' → adult*



San Jose Scale Management

Evaluation of insecticides for controlling San Jose scale on apple, N.Y.S.A.E.S., Hudson Valley Lab., Highland, N.Y.-2005

			% mortality per # of days post application				
Treatment	**Quantity**	**Timing**	**7 d**	**14 d**	**21 d**	**28 d**	**45 d**
1. Damoil	3.0 gal. / 100	GT	100.0 c	100.0 c	100.0 c	100.0 c	100.0 c
2. Damoil	2.0 gal. / 100	HIG	100.0 c	100.0 c	100.0 c	100.0 c	100.0 c
3. Lorsban	1.0 pt. / 100	HIG	100.0 c	100.0 c	100.0 c	100.0 c	100.0 c
4. Esteem	1.25 oz./ 100	HIG	48.5 b	41.3 b	37.5 a	51.4 b	59.4 b
5. Assail	1.25 oz./ 100	HIG	51.6 b	44.6 b	78.4 b	94.1 c	99.9 c
9. Untreated	-	-	2.7 a	23.0 a	37.5 a	36.0 a	34.9 a

Movento 2SC for Pome Fruit Insect Management:

Movento 2SC (Spirotetramat)

- Labeled on pome and stone fruits
- Systemic foliar insecticide: lipid biosynthesis inhibitor.
- Penetration of the leaf cuticle, moves to all areas of the plant, including new shoot, leaf and root tissues.

Requires the use of **a penetrating surfactant**

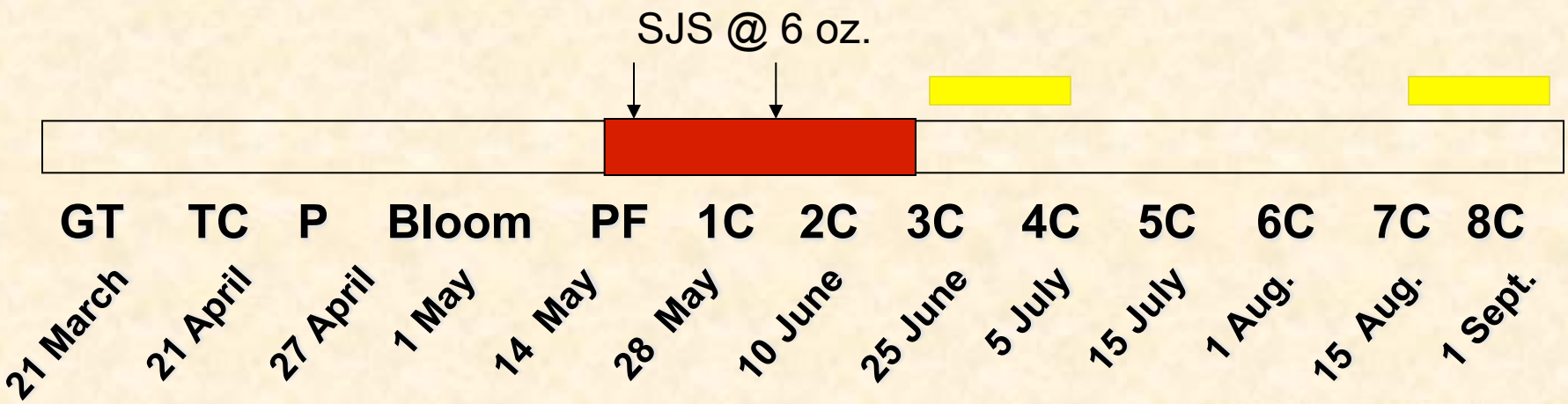
- **Immature stages** of aphids, scale; < fecundity.
- 6-9 fl oz per acre, maximum of 25 fl oz per acre on pome fruits.
- Label states **"Do not apply prior to petal fall.**
- Use of Induce® adjuvant prohibited on pome and stone fruits when fruits are present

CORNELL'S Hudson Valley LABORATORY

Movento 2SC for Pome Fruit Production: Apple Timing Options

The 1st application made 2-3 weeks prior to **nymph emergence**

If 6 oz./A are used 2 applications can be made and the second application should be made @ 14d interval for the 2nd application.

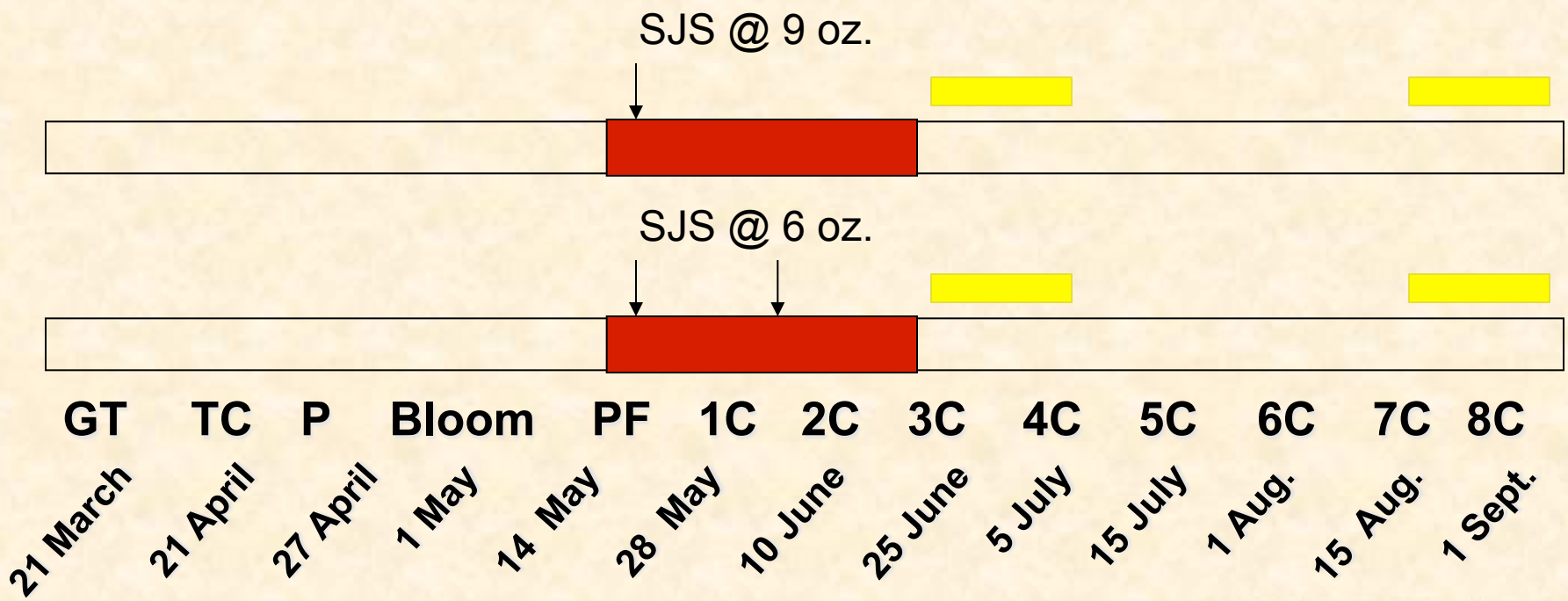


CORNELL'S Hudson Valley LABORATORY

Movento 2SC for Pome Fruit Production: Apple Timing Options

The 1st application made 2-3 weeks prior to **nymph emergence**

If 9 oz./A are used a single application can be made.



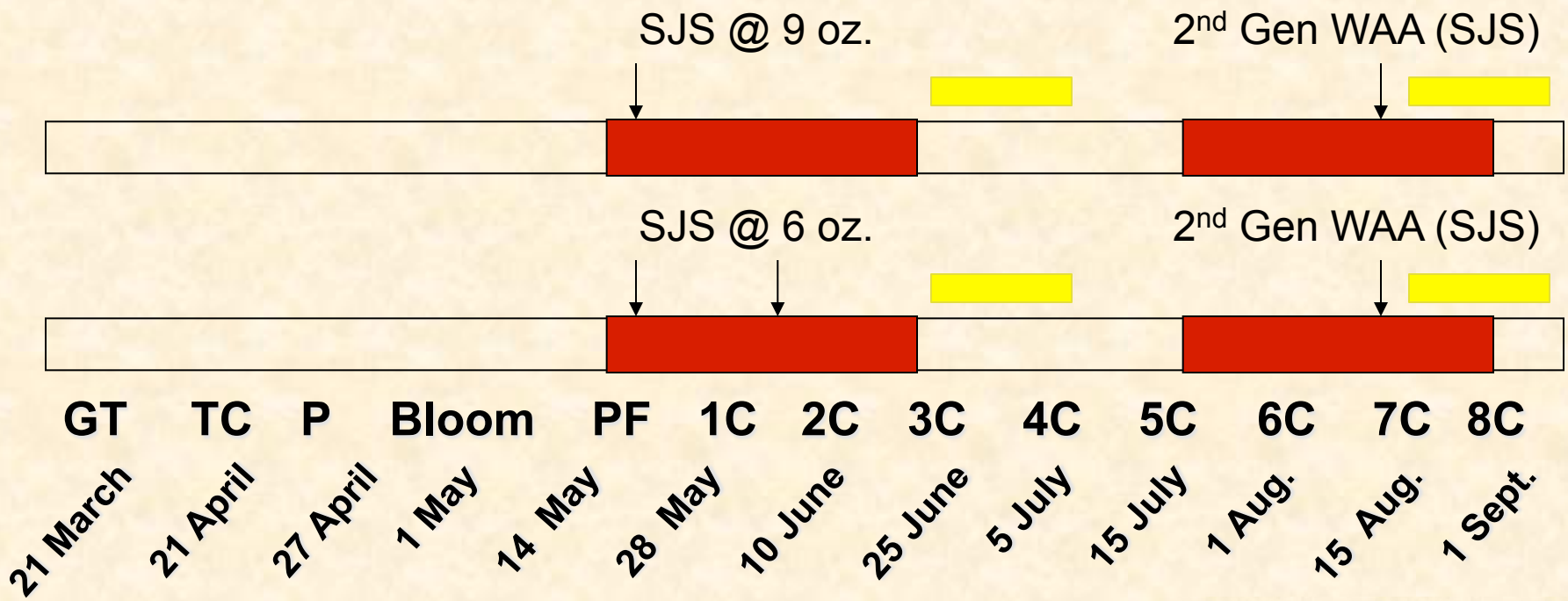
CORNELL'S Hudson Valley LABORATORY

Movento 2SC for Pome Fruit Production: Apple Timing Options

The 1st application made 2-3 weeks prior to **nymph emergence**

Late season applications can be made for the 2nd SJS generation

WAA will also be controlled during this period.



CORNELL'S Hudson Valley LABORATORY

Evaluations Of Insecticide Schedules For Controlling San Jose Scale On Apple [a]. N.Y.S.A.E.S. Hudson Valley Lab. Highland N.Y. - 2013.

			% Damage Rating of SJS Infested Cluster Fruit (0-2)		
Treatment / Formulation	Rate	Timing	0	1	2
1 Calypso	4.0 oz/A	P	98.3	1.3	0.5
Calypso	6.0 oz/A	PF-1C			
Movento + oil	9.0 oz/A	PF			
2 Calypso	4.0 oz/A	P	97.5	0.5	2.0
Calypso	6.0 oz/A	PF-1C			
Movento	6.0 oz/A	PF, 2C			
+ Oil	1.%	PF, 2C			
Belt	5.0 oz/A	3-4C			
6 Esteem	10.0 oz/A	DD	95.5	2.3	2.3
+ Oil	1%	DD			
Imidan 70 WP	5.5 lbs/A	PF-6C			
7 Lorsban 4E	64 oz/A	DD	99.8	0.0	0.3
Perm-Up	10 oz/A	P			
Actara	5.5 oz/A	PF			
Calypso	6.0 oz/A	1, 2, 5C			
Belt	5.0 oz/A	3-4C			
Lannate	3 pts./A	1, 2, 6C			
10 Untreated			26.8	39.8	33.5

[a] Evaluation made on July 2 on of 100 McIntosh fruit per treatment using a SJS rating in which 0 = clean, 1 = ≤ 3 San Jose scale blackcaps; 2 = > 3 SJS blackcap San Jose scale.

Belt SC for Pome Fruit Insect Management:

Belt SC (flubendiamide)

obliquebanded leafroller, internal lep complex, STLM

- Labeled on pome and stone fruits
- **Class 28 (shared with rynaxypyr / chlorantriniprole)**
- 3-5 oz./A
- 15.0 oz./A per season (3 appl. / season)
- 12h REI, 14d PHI

- **Resistance management for OBLR**

  P – Lorsban / pyrethroids Bloom - Bt

  PF – Proclaim / Intrepid

  1st summer – **Delegate** or **Belt / Altacor**

  2nd summer - **Belt / Altacor or Delegate**

Evaluations Of Insecticide Schedules For Controlling Insect Complex On Apple During Harvest[a].
N.Y.S.A.E.S. Hudson Valley Lab. Highland N.Y. - 2013.

Treatment / Formulation	Rate/Timing		Int Lep.	Ext Lep.
1 Calypso	4.0 oz/A	P	2.5 b	0.5 a
Calypso	6.0 oz/A	PF-1C		
Movento	9.0 oz/A	PF		
Belt	5.0 oz/A	2-3C		
Lannate	3 pts./A	4, 6, 8C		
Leverage 360	2.8 oz./A	5, 7, 9C		
2 Calypso	4.0 oz/A	P	1.0 ab	1.5 a
Calypso	6.0 oz/A	PF-1C		
Movento	6.0 oz/A	PF, 2C		
Belt	5.0 oz/A	3-4C		
Leverage 360	2.8 oz./A	5, 7, 9C		
Lannate	3 pts./A	6, 8C		
3 Sivanto	14.0 oz/A	DD	0.5 a	1.5 a
Calypso	4.0 oz/A	P		
Calypso	6.0 oz/A	PF-1C		
Belt	5.0 oz/A	2-3C		
Lannate	3 pts/A	4, 6, 8		
Baythroid XL	2.8 oz/A	5, 7, 9		
10 Untreated			18.5 d	14.0 b

Pre-Mix Formulations for Pome Fruit Insect Management:

Voliam Xpress EC : (*lambda-cyhalothrin + rynaxypyr® (Altacor)

Voliam Flexi: (thiomethoxiam (Actara)+ rynaxypyr® (Altacor)

Endigo ZC : (*lambda-cyhalothrin + thiomethoxiam (Actara)

Agri-Flex (abamectin (AgriMek)+ thiomethoxiam (Actara)

Agri-Mek SC: New concentrate formulation (8% abamectin) vs the Agri-Mek 0.15EC (2% abamectin).

*lambda-cyhalothrin = Warrior

CORNELL'S Hudson Valley LABORATORY

Endigo ZC for Pome Fruit Insect Management:

Endigo ZC : lambda-cyhalothrin (Warrior)+ thiomethoxiam (Actara)

- Pre-mix combination; IRAC class 3 and 4.
- Broad spectrum (**Warrior**) contact activity
- Foliar / PC (**Actara)** foliar / ingestion activity
- 3.5 – 6.0 fl. oz./A (6.0 oz./A = ai/A of 2.56 oz./A Warrior II and 3.6 oz./A of Actara)
- maximum of four applications and 19 fl. oz. per acre (NYS)
- REI of 24 hours; PHI of 21 days on pome fruit

CORNELL'S Hudson Valley LABORATORY

Active Ingredient Use in Pome Fruit Insect Management:

<u>In NYS, the total allowance per season for:</u>

Thiamethoxam = 0.172 lb. a.i./A

Lamda-cyhalothrin = 0.2 lb. a.i./A or
0.16 lb. a.i./A post bloom

Rynaxypyr®* = 0.2 lb. a.i./A

Thiamethoxam = **Actara, Endigo ZC, Voliam Flexi, Agri-Flex**

Lamda-cyhalothrin = **Warrior, Voliam Xpress EC, Endigo ZC**

*Chlorantraniliprole = rynaxypyr = **Altacor, Voliam Xpress**

CORNELL'S Hudson Valley LABORATORY

Leverage for Pome Fruit Insect Management:

Leverage 2.7SE: cyfluthrin (17% Baythoid)+ imidacloprid (Provado)

Leverage 360: beta-cyfluthrin (10.5% Baythoid XL) + imidacloprid (17% Provado)

- Pre-mix combination; IRAC class 3 and 4.
- Broad spectrum (**Baythroid**) contact activity
- Translaminar (**Imidacloprid)** penitrate foliage / ingestion activity
- **2.7SE -** 3.0 – 5.1 fl. oz./A; Max 5.1 fl. oz. per acre
- **360** - 2.4-2.8 fl. oz./A; Max 2.8 fl. oz. per acre
- REI of 12 hours; PHI of 7 days on pome fruit
- AM mgt. requires Nufilm 17

Timing Options for Pome Fruit Production

- no pre-bloom use
- single appl. at the high rate

Leverage 2.7SE / 360:

PC, RAA, EAS, LH, aphid complex
OBLR, CM, OFM, BMSB

PHI 7d

GT	TC	P	Bloom	PF	1C	2C	3C	4C	5C	6C	7C	8C
21 March	21 April	27 April	1 May	14 May	28 May	10 June	25 June	5 July	15 July	1 Aug.	15 Aug.	1 Sept.

CORNELL'S Hudson Valley LABORATORY

Beleaf 50SG for Pome Fruit Insect Management:

Beleaf 50SG (Flonicamid) – aphids and plant bugs (TPB)

NY pome fruit & stone fruit;

Pyridinecarboxamide : IRAC 9C “selective feeding blockers".

Aphid complex including **woolly apple aphid.**

Effective on tarnished plant bug (peaches).

It has a low bee poisoning hazard.

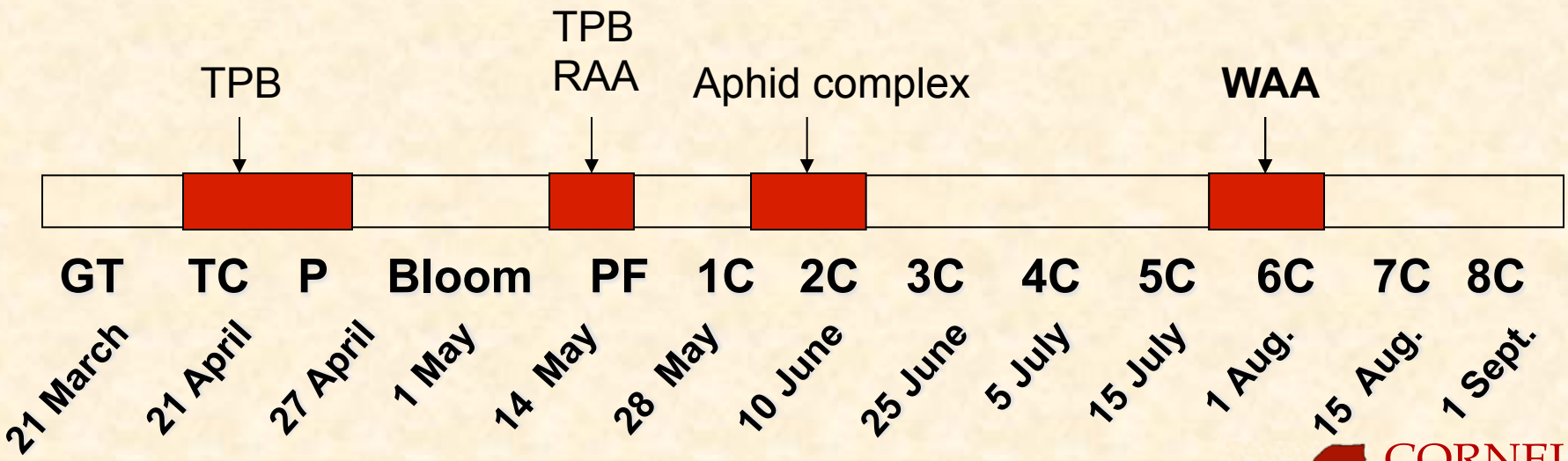
EPA# 71512-10-279.

CORNELL'S Hudson Valley LABORATORY

Beleaf 50SG for Pome Fruit Production:
Apple Timing Options

3 application / year
Rates: 2.0-2.8 oz./A
21 REI, 7 DTH
7d between applications

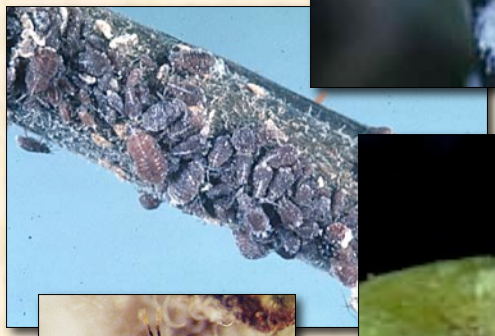
Beleaf 50SG

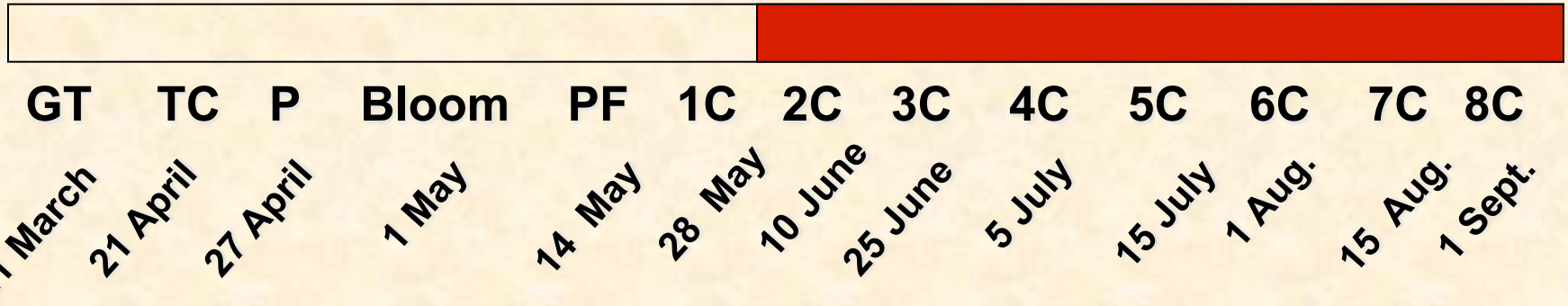


CORNELL'S
Hudson Valley
LABORATORY

Wooly Apple Aphid (WAA)

- Sporadic pest on apple & pear; infesting fruit
- *Wingless females produce live young on apple*
- Nymphs undergo 4 instars, crawlers carried by wind from tree to tree.
- Establish root colonies of susceptible rootstock (M.9, M.26)
- Parasitized by *Aphelinus mali*





Wooly Apple Aphid (WAA)

Beers, E.H.,Talley, R.R, WA State, 2008

WAA colonies/1.5 min search

Treatment	Rate/acre	5-Aug	11-Aug	18-Aug	26-Aug	2-Sep	11-Sep
Pyrifluquinazon 15EC	**27 fl oz**	**37a**	**40abc**	**54b**	**43ab**	**135abc**	**186bc**
Tolfenpyrad 20SC	**3.19 fl oz**	**53a**	**50abc**	**69ab**	**58b**	**93c**	**114cd**
Beleaf 50SG	**5 oz**	**34a**	**29bc**	**59ab**	**62ab**	**117bc**	**147c**
Diazinon 50W	**4 lb**	**37a**	**5d**	**1d**	**4c**	**3d**	**6d**
Check ---		**42a**	**75a**	**98a**	**94a**	**277a**	**324a**

Means within columns not followed by the same letter are significantly different, Waller-Duncan *k*-ratio *t*-test, *k*-ratio=100.
Treatments applied **6 August**;
xData transformed log(x+0.5).
zTreatment included an adjuvant (Silwet, 0.025%).

Wooly Apple Aphid (WAA)

NY: Reissig, H. Combs, D., 2009

Material	Rate/A	Timing	% Term w/WAA colonies 16 July	4 August
Calypso 480SC +	4.0 fl oz	PF	4.0a	10.7b
Movento 240SC[1]	9.0 fl oz			
Movento 240SC[1]	9.0 fl oz	PF + 2C	1.7a	14.7b
Movento 240SC[1]	9.0 fl oz	2C	4.7a	23.3bc
Lorsban 75WG	1.5 lb	TC	6.7a	1.3a
Movento 240SC[1]	9.0 fl oz	4C		
Lorsban 75WG	1.5 lb	TC	12.0ab	13.3b
Esteem 35WP	4.5 oz	4 sprays		
Untreated Check			26.0b	41.3c

1. LI700 @ 0.5% v/v

Means within a column followed by the same letter are not significantly different (Fisher's Protected LSD Test, $P \leq 0.05$). Data were transformed arcsine (sqrt *x*) prior to analysis

Wooly Apple Aphid (WAA)

Wise, J. Mich. State, 2008

Material	Rate/A	Timing	% Survival w/WAA colonies 12 DAT	34 DAT
Movento 240SC Stl-tac	9.0 fl oz 1 % v/v	10 Sept.	3.3 b	0.0 a
Movento 240SC R-11	9.0 fl oz 0.25 % v/v	10 Sept.	6.7 b	0.0 a
Movento 240SC Damoil	9.0 fl oz 1 % v/v	10 Sept.	3.3 b	6.7 a
Provado 1.6F	8.0 fl oz	10 Sept.	6.7 b	3.3a
Thiodan 50WP	4.0 lb	10 Sept.	10.0 b	6.7 a
Untreated Check			80.0a	3.3a

Means within a column followed by the same letter are not significantly different (Fisher's Protected LSD Test, $P \leq 0.05$). Data were transformed arcsine (sqrt *x*) prior to analysis

Pre-Mix Formulations for Pome Fruit Insect Management:

Voliam Xpress EC : (*lambda-cyhalothrin + rynaxypyr® (Altacor)

Voliam Flexi: (thiomethoxiam (Actara)+ rynaxypyr® (Altacor)

Endigo ZC : (*lambda-cyhalothrin + thiomethoxiam (Actara)

Agri-Flex (abamectin (AgriMek)+ thiomethoxiam (Actara)

Agri-Mek SC: New concentrate formulation (8% abamectin) vs the Agri-Mek 0.15EC (2% abamectin).

Leverage 2.7SE: cyfluthrin (17% Baythoid)+ imidacloprid (Provado)

Leverage 360: beta-cyfluthrin (10.5% Baythoid XL) + imidacloprid (17% Provado)

CORNELL'S
Hudson Valley
LABORATORY

Evaluations Of Insecticide Schedules For Controlling Early Season Insect Complex On Apple [a].
N.Y.S.A.E.S. Hudson Valley Lab. Highland N.Y. - 2012.

			Incidence (%) of insect damaged cluster fruit	
Treatment / Formulation	Rate	Timing	PC	EAS
1 Proclaim 5SG	3.84 oz./A	PF	2.5 a	0.5 a
Agri-Flex SC	2.5 fl.oz./A	PF		
Endigo ZCX	5.5 oz./A	PF, 3,7C		
Volium Express	9.0 fl.oz./A	1-2,4-6C		
LI700	0.25% v/v	PF-7C		
2 Proclaim 5SG	3.84 oz./A	PF, 1-2C	6.0 a	0.5 a
Agri-Flex SC	2.5 fl.oz./A	PF		
Endigo ZCX	5.5 oz./A	PF, 3,7C		
Volium Flexi	6.0 fl.oz./A	4-6C		
LI700	0.25% v/v	PF-6C		
3 Lambda-Cy	5.12 oz./A	P, 1C	4.5 a	0.0 a
Assail 30SG	5.0 oz./A	PF		
Vendex	1.5 lb./A	1C		
Assail 30SG	8.0 oz./A	2C		
Assail 30SG	6.0 oz./A	3,7C		
Delegate WG	5.2 oz./A	4-5C		
Imidan 70WP	3.0 lb./A	6C		
6 Perm-Up	10.0 oz./A	P	0.5 a	0.0 a
Leverage 360	2.8 oz./A	PF		
Movento + NIS	9.0 oz./A	PF		
AgriMek+NIS	10.0 oz./A	PF		
Calypso SC	6.0 oz./A	1,5C		
Belt	4.0 oz./A	3-4C		
Calypso SC	4.0 oz./A	2C		
Imidan 70WP	3.0 lb./A	6-7C		
10 Untreated			18.0 b	0.0 a
P value for transformed data			0.035	0.582

[a] Evaluation made on May 24 (2-3C) on Ginger Gold cultivar.

Evaluations Of Insecticide Schedules For Controlling Early Season Insect Complex On Apple [a].
N.Y.S.A.E.S. Hudson Valley Lab. Highland N.Y. - 2012.

			Incidence (%) of insect damaged cluster fruit					
Treatment / Formulation	Rate	Timing	PC	EAS	TPB	MPB	LEP	Clean
1 Proclaim 5SG	3.84 oz./A	PF	2.5 a	0.5 a	1.0 ab	0.5 a	0.5 a	95.5 ab
Agri-Flex SC	2.5 fl.oz./A	PF						
Endigo ZCX	5.5 oz./A	PF, 3,7C						
Volium Express	9.0 fl.oz./A	1-2,4-6C						
LI700	0.25% v/v	PF-7C						
2 Proclaim 5SG	3.84 oz./A	PF, 1-2C	6.0 a	0.5 a	2.0 bc	1.0 a	1.5 ab	94.4 ab
Agri-Flex SC	2.5 fl.oz./A	PF						
Endigo ZCX	5.5 oz./A	PF, 3,7C						
Volium Flexi	6.0 fl.oz./A	4-6C						
LI700	0.25% v/v	PF-6C						
3 Lambda-Cy	5.12 oz./A	P, 1C	4.5 a	0.0 a	0.5 ab	0.5 a	2.0 ab	92.0 b
Assail 30SG	5.0 oz./A	PF						
Vendex	1.5 lb./A	1C						
Assail 30SG	8.0 oz./A	2C						
Assail 30SG	6.0 oz./A	3,7C						
Delegate WG	5.2 oz./A	4-5C						
Imidan 70WP	3.0 lb./A	6C						
6 Perm-Up	10.0 oz./A	P	0.5 a	0.0 a	0.0 a	0.0 a	0.5 a	99.0 a
Leverage 360	2.8 oz./A	PF						
Movento + NIS	9.0 oz./A	PF						
AgriMek+NIS	10.0 oz./A	PF						
Calypso SC	6.0 oz./A	1,5C						
Belt	4.0 oz./A	3-4C						
Calypso SC	4.0 oz./A	2C						
Imidan 70WP	3.0 lb./A	6-7C						
10 Untreated			18.0 b	0.0 a	2.2 bc	2.5 a	4.2 b	73.6 c
P value for transformed data			0.035	0.582	0.110	0.493	0.254	0.001

[a] Evaluation made on May 24 (2-3C) on Ginger Gold cultivar.

Table 2b Evaluations Of Insecticide Schedules For Controlling Early Season Insect Complex On Apple [a]. N.Y.S.A.E.S. Hudson Valley Lab. Highland N.Y. - 2012.

				Incidence (%) of insect damaged cluster fruit	
	Treatment / Formulation	Rate	Timing	PC	EAS
1	Proclaim 5SG	3.84 oz./A	PF	4.0 abc	1.5 a
	AgriFlexi 16.9SC	2.5 fl.oz./A	PF		
	Endigo ZCX	5.5 oz./A	PF, 3,7C		
	Volium Express	9.0fl.oz./A	1-2,4-6C		
	LI700	0.25% v/v	PF-7C		
2	Proclaim 5SG	3.84 oz./A	PF, 1-2C	0.0 a	1.5 a
	AgriFlexi 16.9SC	2.5 fl.oz./A	PF		
	Endigo ZCX	5.5 oz./A	PF, 3,7C		
	Volium Flexi	6.0 fl.oz./A	4-6C		
	LI700	0.25% v/v	PF-6C		
3	Lambda-Cy	5.12 oz./A	P, 1C	5.5 abc	0.5 a
	Assail 30SG	5.0 oz./A	PF		
	Vendex	1.5 lb./A	1C		
	Assail 30SG	8.0 oz./A	2C		
	Assail 30SG	6.0 oz./A	3,7C		
	Delegate WG	5.2 oz./A	4-5C		
	Imidan 70WP	3.0 lb./A	6C		
6	Perm-Up	10.0 oz./A	P	0.5 ab	0.5 a
	Leverage 360	2.8 oz./A	PF		
	Movento + NIS	9.0 oz./A	PF		
	AgriMek+NIS	10.0 oz./A	PF		
	Calypso SC	6.0 oz./A	1,5C		
	Belt	4.0 oz./A	3-4C		
	Calypso SC	4.0 oz./A	2C		
	Imidan 70WP	3.0 lb./A	6-7C		
10	Untreated			30.5 d	0.0 a
P value for transformed data				0.003	0.680

[a] Evaluation made on May 24 on Red Delicious cultivar.

Table 2b Evaluations Of Insecticide Schedules For Controlling Early Season Insect Complex On Apple [a]. N.Y.S.A.E.S. Hudson Valley Lab. Highland N.Y. - 2012.

				Incidence (%) of insect damaged cluster fruit			
	Treatment / Formulation	Rate	Timing	PC	EAS	TPB	MPB
1	Proclaim 5SG	3.84 oz./A	PF	4.0 abc	1.5 a	5.4 bc	1.5 a
	AgriFlexi 16.9SC	2.5 fl.oz./A	PF				
	Endigo ZCX	5.5 oz./A	PF, 3,7C				
	Volium Express	9.0fl.oz./A	1-2,4-6C				
	LI700	0.25% v/v	PF-7C				
2	Proclaim 5SG	3.84 oz./A	PF, 1-2C	0.0 a	1.5 a	1.5 ab	1.0 a
	AgriFlexi 16.9SC	2.5 fl.oz./A	PF				
	Endigo ZCX	5.5 oz./A	PF, 3,7C				
	Volium Flexi	6.0 fl.oz./A	4-6C				
	LI700	0.25% v/v	PF-6C				
3	Lambda-Cy	5.12 oz./A	P, 1C	5.5 abc	0.5 a	2.0 ab	0.0 a
	Assail 30SG	5.0 oz./A	PF				
	Vendex	1.5 lb./A	1C				
	Assail 30SG	8.0 oz./A	2C				
	Assail 30SG	6.0 oz./A	3,7C				
	Delegate WG	5.2 oz./A	4-5C				
	Imidan 70WP	3.0 lb./A	6C				
6	Perm-Up	10.0 oz./A	P	0.5 ab	0.5 a	0.0 a	0.0 a
	Leverage 360	2.8 oz./A	PF				
	Movento + NIS	9.0 oz./A	PF				
	AgriMek+NIS	10.0 oz./A	PF				
	Calypso SC	6.0 oz./A	1,5C				
	Belt	4.0 oz./A	3-4C				
	Calypso SC	4.0 oz./A	2C				
	Imidan 70WP	3.0 lb./A	6-7C				
10	Untreated			30.5 d	0.0 a	3.0 bc	4.0 a
P value for transformed data				0.003	0.680	0.005	0.532

[a] Evaluation made on May 24 on Red Delicious cultivar.

Table 2b Evaluations Of Insecticide Schedules For Controlling Early Season Insect Complex On Apple [a]. N.Y.S.A.E.S. Hudson Valley Lab. Highland N.Y. - 2012.

			Incidence (%) of insect damaged cluster fruit					
Treatment / Formulation	Rate	Timing	PC	EAS	TPB	MPB	LEP	Clean
1 Proclaim 5SG	3.84 oz./A	PF	4.0 abc	1.5 a	5.4 bc	1.5 a	0.5 a	87.1 bcd
AgriFlexi 16.9SC	2.5 fl.oz./A	PF						
Endigo ZCX	5.5 oz./A	PF, 3,7C						
Volium Express	9.0fl.oz./A	1-2,4-6C						
LI700	0.25% v/v	PF-7C						
2 Proclaim 5SG	3.84 oz./A	PF, 1-2C	0.0 a	1.5 a	1.5 ab	1.0 a	0.0 a	96.0 ab
AgriFlexi 16.9SC	2.5 fl.oz./A	PF						
Endigo ZCX	5.5 oz./A	PF, 3,7C						
Volium Flexi	6.0 fl.oz./A	4-6C						
LI700	0.25% v/v	PF-6C						
3 Lambda-Cy	5.12 oz./A	P, 1C	5.5 abc	0.5 a	2.0 ab	0.0 a	1.0 a	91.5 abc
Assail 30SG	5.0 oz./A	PF						
Vendex	1.5 lb./A	1C						
Assail 30SG	8.0 oz./A	2C						
Assail 30SG	6.0 oz./A	3,7C						
Delegate WG	5.2 oz./A	4-5C						
Imidan 70WP	3.0 lb./A	6C						
6 Perm-Up	10.0 oz./A	P	0.5 ab	0.5 a	0.0 a	0.0 a	0.0 a	99.0 a
Leverage 360	2.8 oz./A	PF						
Movento + NIS	9.0 oz./A	PF						
AgriMek+NIS	10.0 oz./A	PF						
Calypso SC	6.0 oz./A	1,5C						
Belt	4.0 oz./A	3-4C						
Calypso SC	4.0 oz./A	2C						
Imidan 70WP	3.0 lb./A	6-7C						
10 Untreated			30.5 d	0.0 a	3.0 bc	4.0 a	6.5 b	61.0 e
P value for transformed data			0.003	0.680	0.005	0.532	0.034	0.001

[a] Evaluation made on May 24 on Red Delicious cultivar.

Table 7a Evaluations Of Insecticide Schedules For Controlling Insect Complex On Apple During Harvest[a]. N.Y.S.A.E.S. Hudson Valley Lab. Highland N.Y. - 2012.

			Incidence (%) of insect damage										
Treatment / Formulation		Rate	TPB	EAS	Early Lep.	Early PC	Late PC	SJS	Internal Lep.	Ext. Lep.	Punct. AM	Tunnel AM	CLEAN
1	Proclaim 5SG	3.84 oz./A	2.1 a	0.0 a	3.6 a	2.6 ab	13.9 a	4.6 a	2.5 a	10.1 a	5.0 a	4.8 b	63.1 ab
	AgriFlexi 16.9SC	2.5 fl. oz./A											
	Endigo ZCX	5.5 oz./A											
	Volium Express	9.0 fl. oz./A											
	LI700	0.25% v/v											
2	Proclaim 5SG	3.84 oz./A	8.3 a	0.8 a	4.8 a	5.0 ab	10.8 a	0.5 a	5.0 a	8.0 a	4.3 a	3.5 ab	65.0 ab
	AgriFlexi 16.9SC	2.5 fl. oz./A											
	Endigo ZCX	5.5 oz./A											
	Volium Flexi	6.0 fl.oz./A											
	LI700	0.25% v/v											
3	Lambda-Cy	5.12 oz./A	9.0 a	1.0 a	3.3 a	6.3 ab	18.8 a	0.8 a	5.8 a	6.5 a	3.3 a	2.3 ab	55.5 ab
	Assail 30SG	5.0 oz./A											
	Vendex	1.5 lb./A											
	Assail 30SG	8.0 oz./A											
	Assail 30SG	6.0 oz./A											
	Delegate WG	5.2 oz./A											
	Imidan 70WP	3.0 lb./A											
6	Perm-Up	10.0 oz./A	6.8 a	1.8 a	1.5 a	1.5 a	4.0 a	1.8 a	3.5 a	10.3 a	3.0 a	2.5 ab	70.8 ab
	Leverage 360	2.8 oz./A											
	Movento + NIS	9.0 oz./A											
	AgriMek+NIS	10.0 oz./A											
	Calypso SC	6.0 oz./A											
	Belt	4.0 oz./A											
	Calypso SC	4.0 oz./A											
	Imidan 70WP	3.0 lb./A											
10	Untreated		11.5 a	1.5 b	13.0 a	27.8 c	27.1 a	0.6 a	15.4 a	17.6 a	16.6 b	15.5 c	27.0 c
P value for transformed data			0.179	0.313	0.057	0.010	0.118	0.664	0.281	0.418	0.011	0.004	0.018

[a] Evaluation made on July 27 on Ginger Gold cultivar.

Overview

Product Update

2012 Insect Pest Overview

Efficacy trials

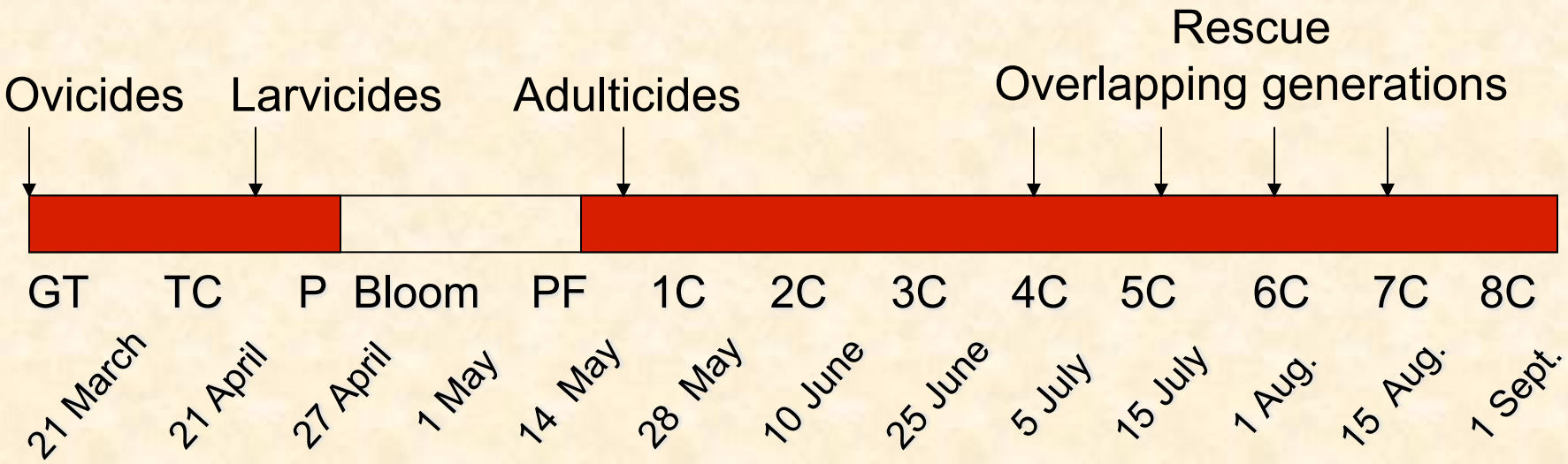
Insects slipping through the cracks??

CORNELL'S
Hudson Valley
LABORATORY

European Red Mite (ERM) *Panonychus ulmi* (Koch)

- OW as fertilized eggs
- Egg hatch >50% complete @ pink; 100% by end of bloom
- Adult feeding reduces photosynthesis, return bloom, fruit size, quality, color, Increase of pre-mature drop of fruit & leaves
- Increasing # of generations with increasing temperatures
- Reproduction both sexual and parthnogeneticly

  Fertilized = both sexes Unfertilized = *males only*

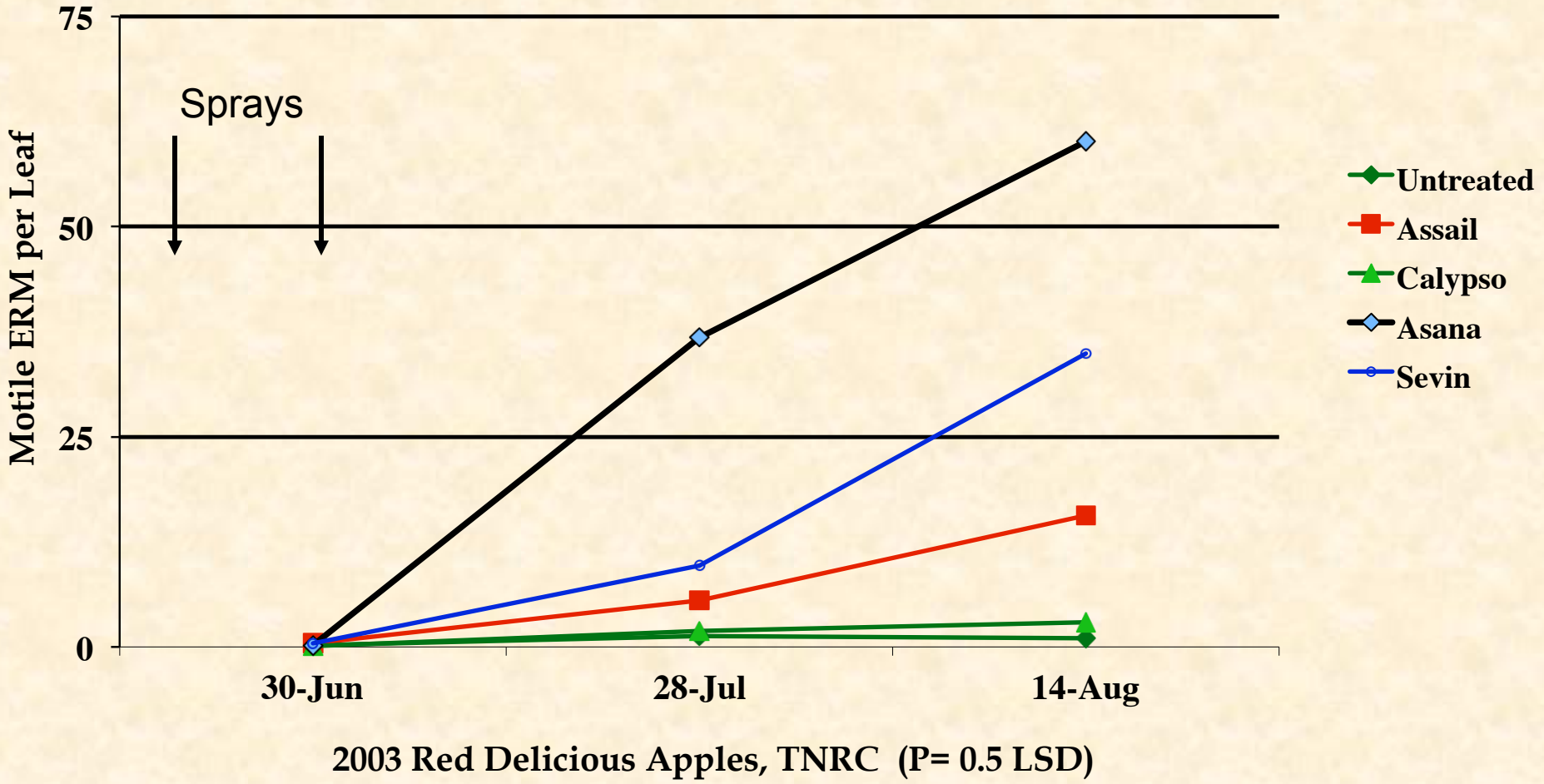


Environmental Effect on Mite Populations

Average Daily Temp. (°F)	Egg Stage (Days)	Hatch to Adult (Days)	Total Time (Days)	# Generations / Season June 1 - September 30 (122 days)
55.4	19	19	40	3.1
59.9	16	14	30	4.1
64.4	11	10	21	5.8
69.8	8	7	15	8.1
75.2	6	4	10	12.2
80.6	4	3	7	17.4

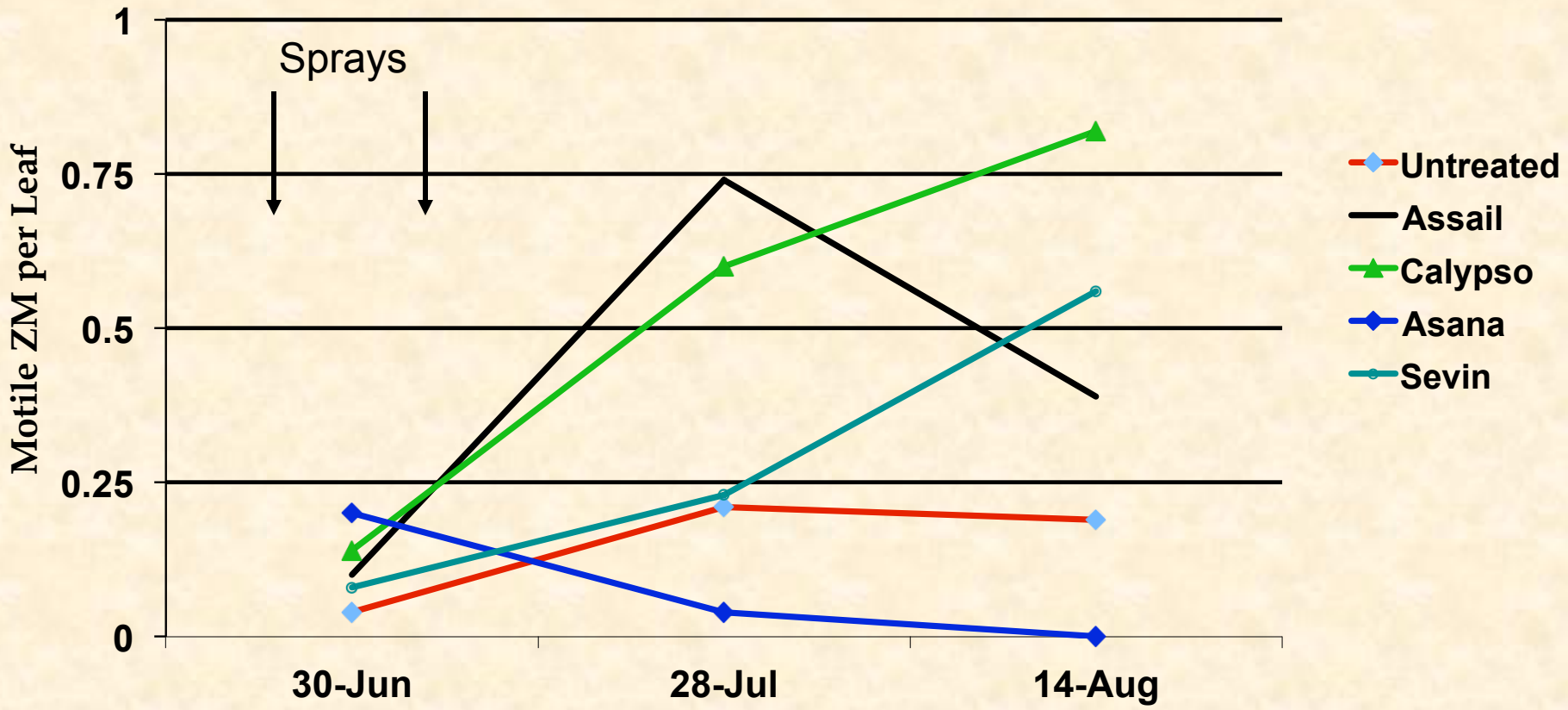
Chart 1. Environmental Effect on Mite Populations

Mite Flaring Potential of Apple Insecticides*
European Red Mite



*John Wise - Michigan State

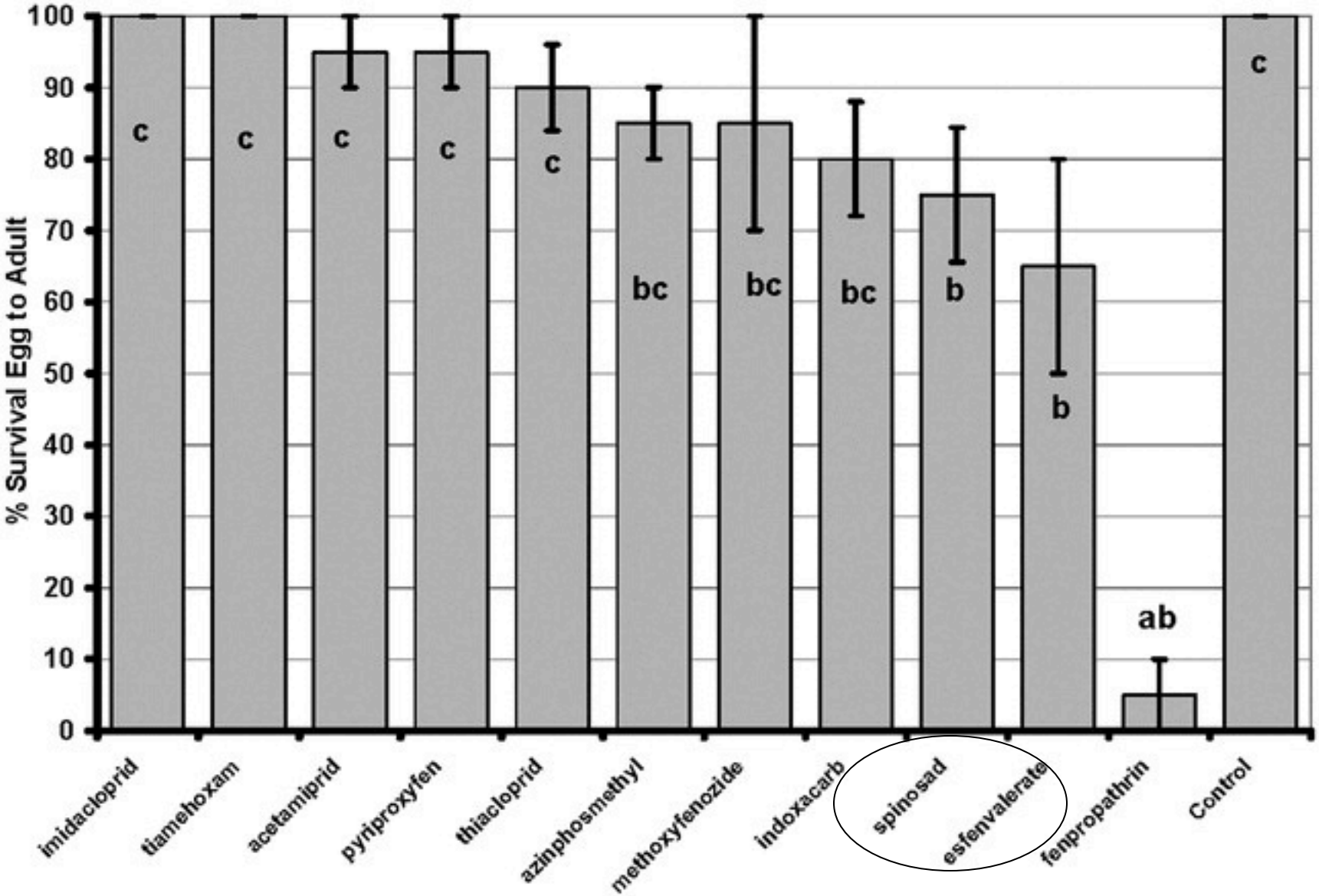
Mite Flaring Potential of Apple Insecticides*
Beneficial Mite



2003 Red Delicious Apples, TNRC (P= 0.5 LSD)

*John Wise - Michigan State

Influence of Insecticides on the Development of *N. fallacis* Mite on Treated Leaf Disks



JEE (98) 6, 2005; Raul T. Villanueva and James F. Walgenbach

Relative Efficacy Table for Insecticides / Miticides on Beneficials.

Insecticide /Miticides	Class	Bees	*A. fallacis*	*T. Pyri*
Oil	0	Low	Low-Moderate [a]	Low-Moderate [b]
Carzol 92SP	1A	Moderate	High	High
AgriMek 0.15EC	6	Low	Moderate	Moderate
Mesa	6	Low	Moderate	Moderate
Proclaim	6	High	No Data	No Data
Apollo 4SC	10A	Moderate	Low	Low
Savey 50DF /Onager 1EC	10A	Low	Low	No Data
Zeal 72WS	10B	Low	High	None
Vendex 50WP	12B	Low	Moderate-High	Moderate
Portal 15SC	20B	Low	Low	No Data
Kanemite 15SC	20B	Low	Low	Low
Nexter 75WS	21	High	Moderate-High [c]	Moderate-High [c]
Envidor 2SC	23	High	Moderate	No Data
Acramite 50WS	25	Moderate	Moderate	Moderate

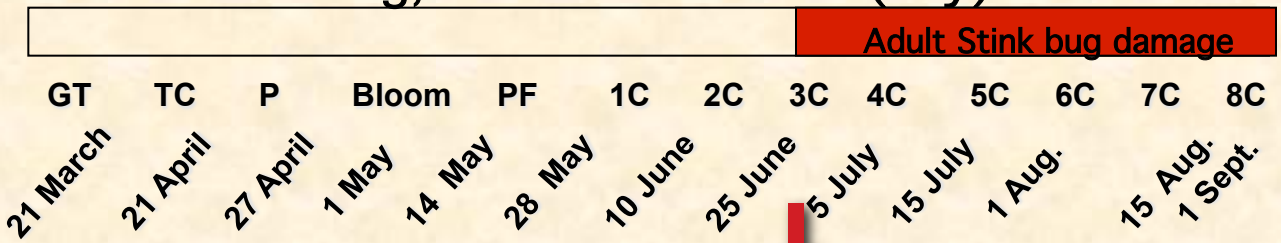
Low = < 30% mortality
moderate= 30-70% mortality
high=>70% mortality
[a] low impact on immatures, moderate impact on eggs.
[b] Low impact on adults, moderate impact on eggs and immatures; population recovery within 7 days.
[c] Rate dependent

Late Season Early-Late Season

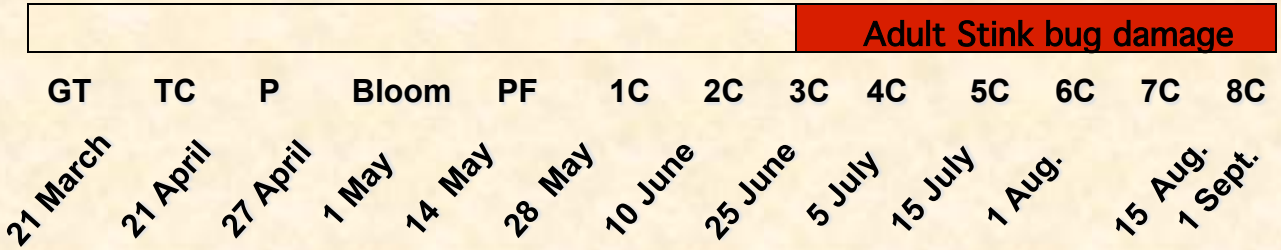
Hudson Valley Complex:

SB species of economic importance

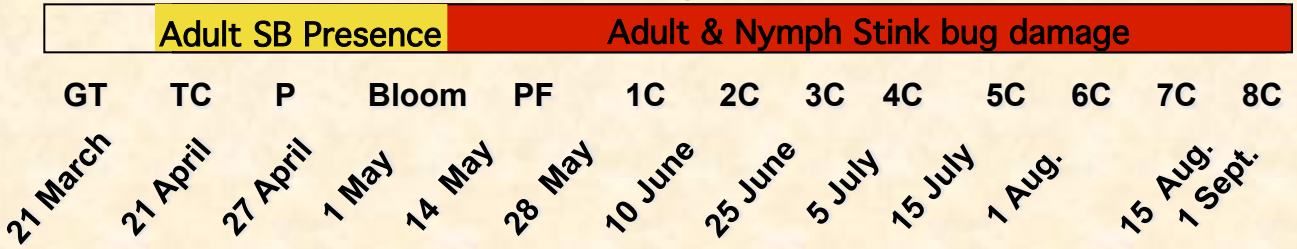
Brown Stink Bug, *Euschistus servus* (Say)



Green Stink Bug, *Acrosternum hilare* (Say).



Brown marmorated stink bug, *Halyomorpha halys* (Stål)

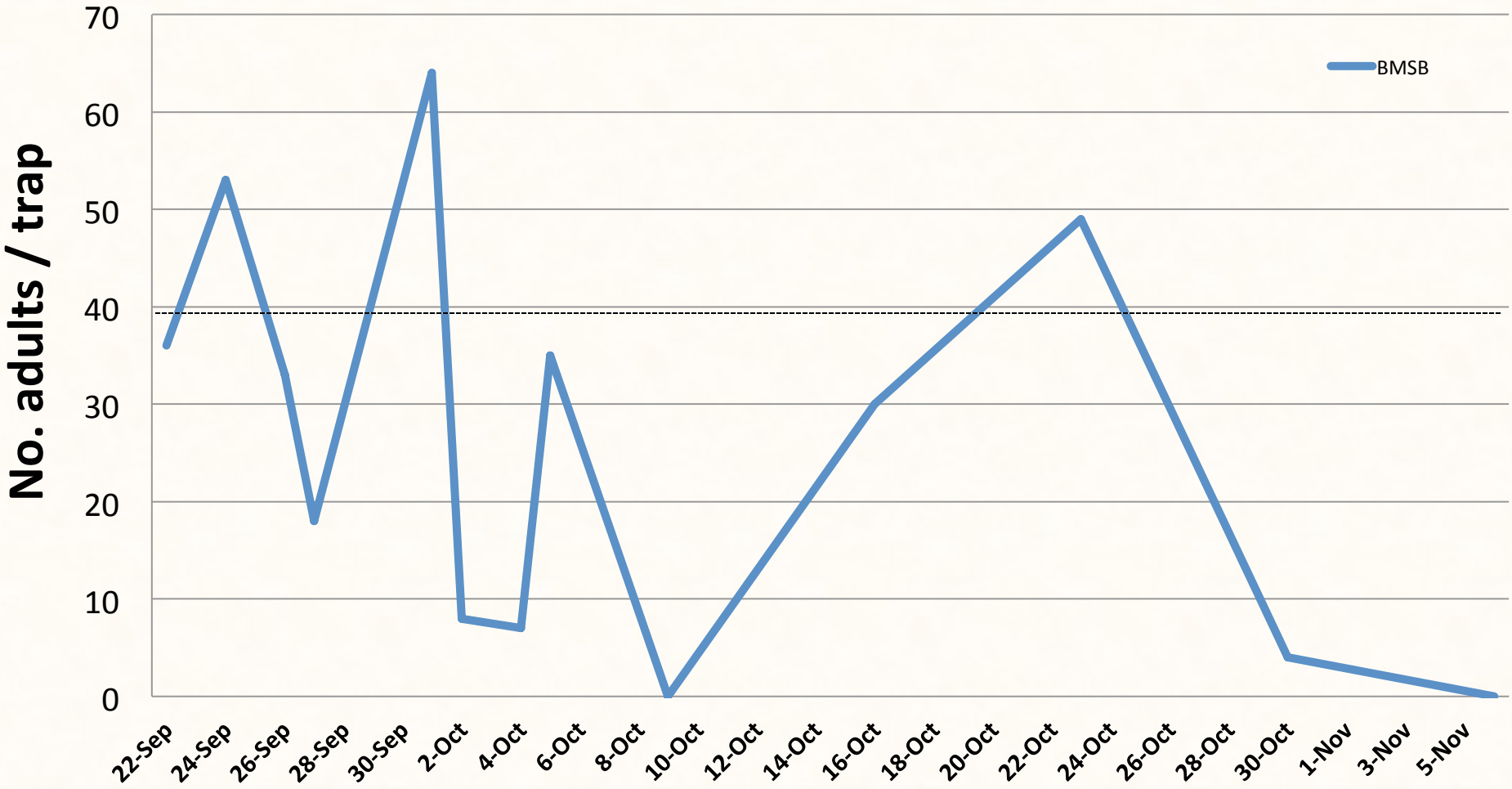


Economic BMSB injury to Pink Lady apple on 4 September, 2012

Pheromone Tedders Trap Captures of BMSB Using MDT & USDA #10 lures

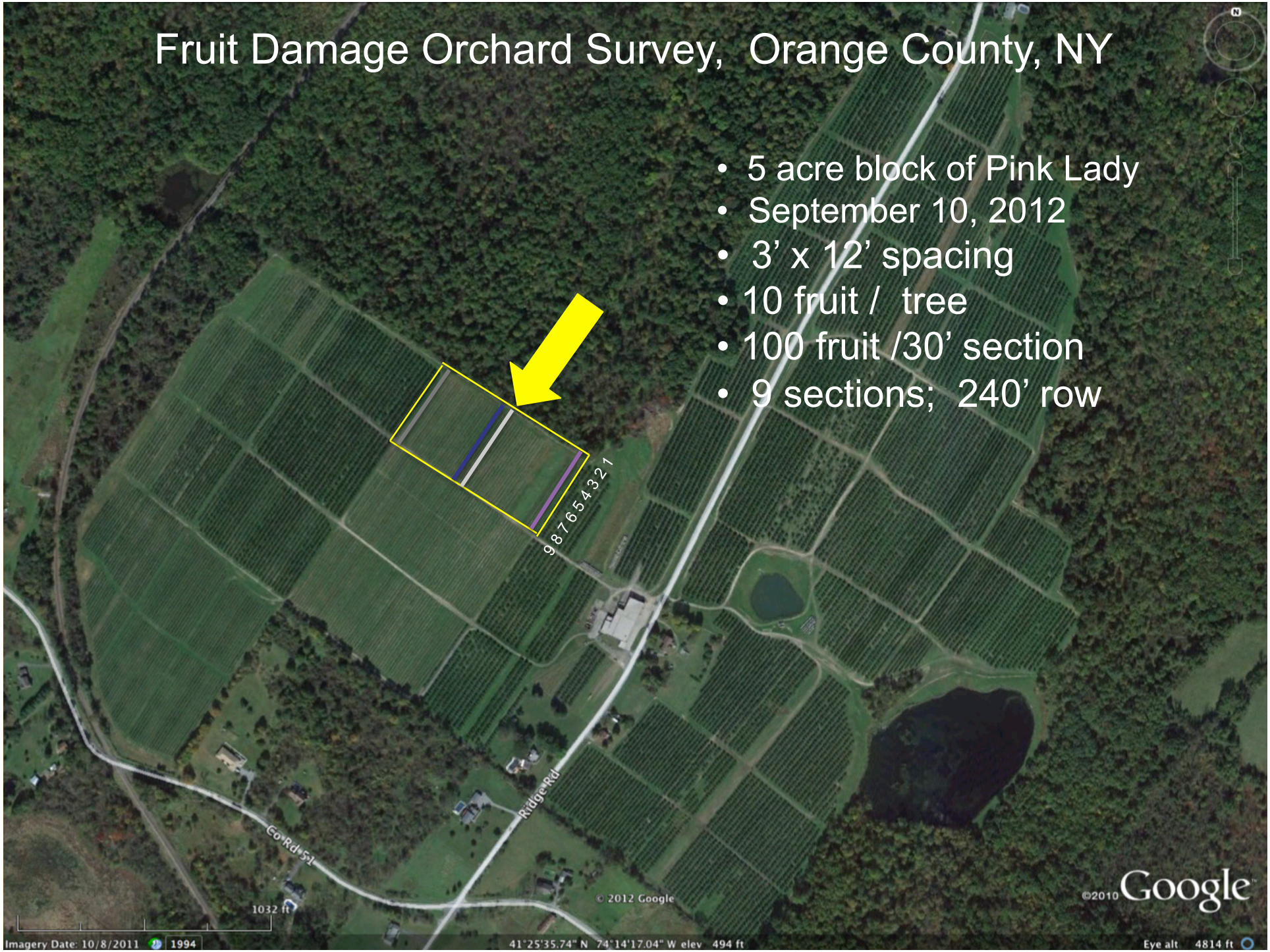
Red Delicious & Rome Apple

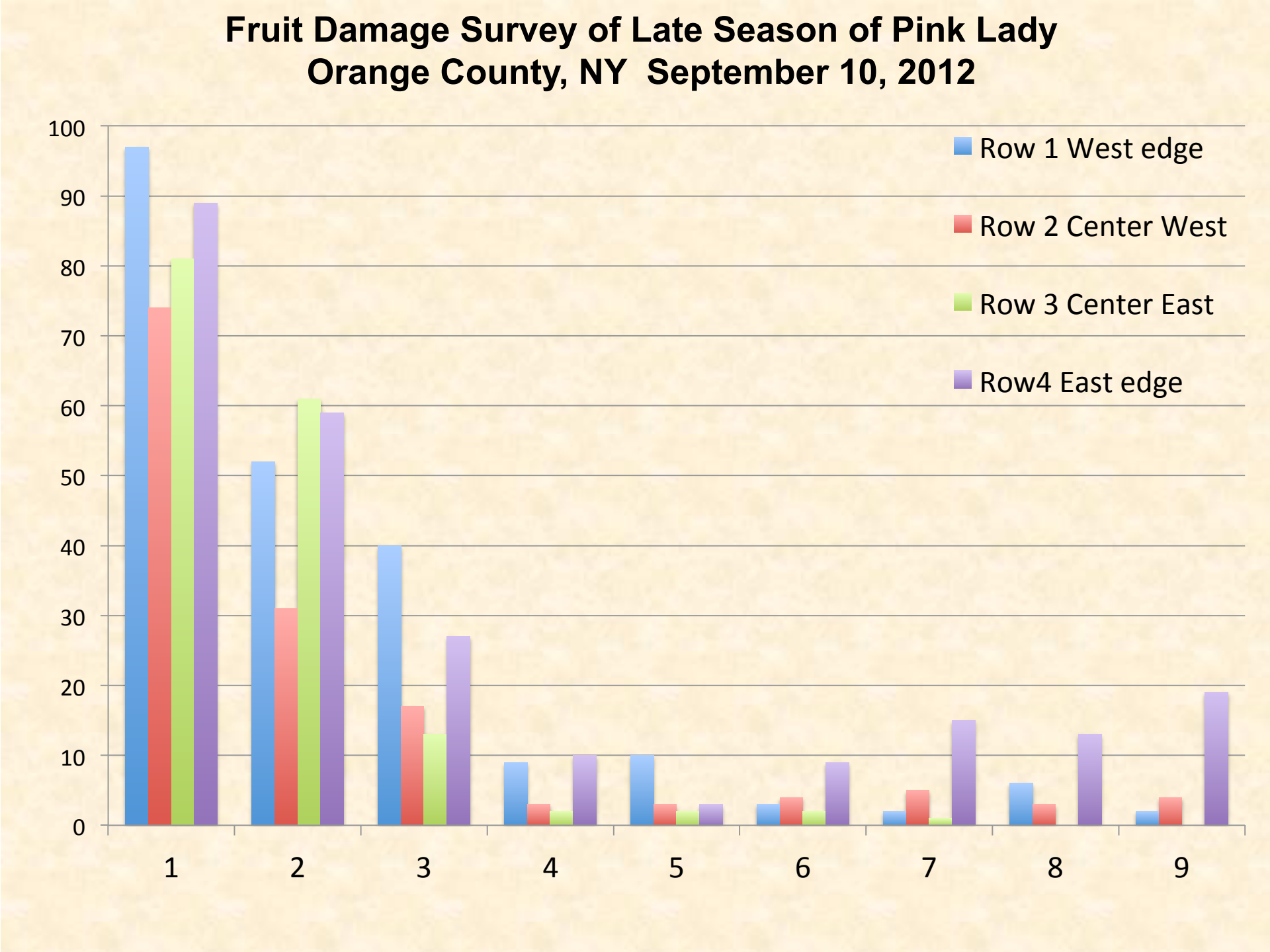
Campbell Hall, NY 2012

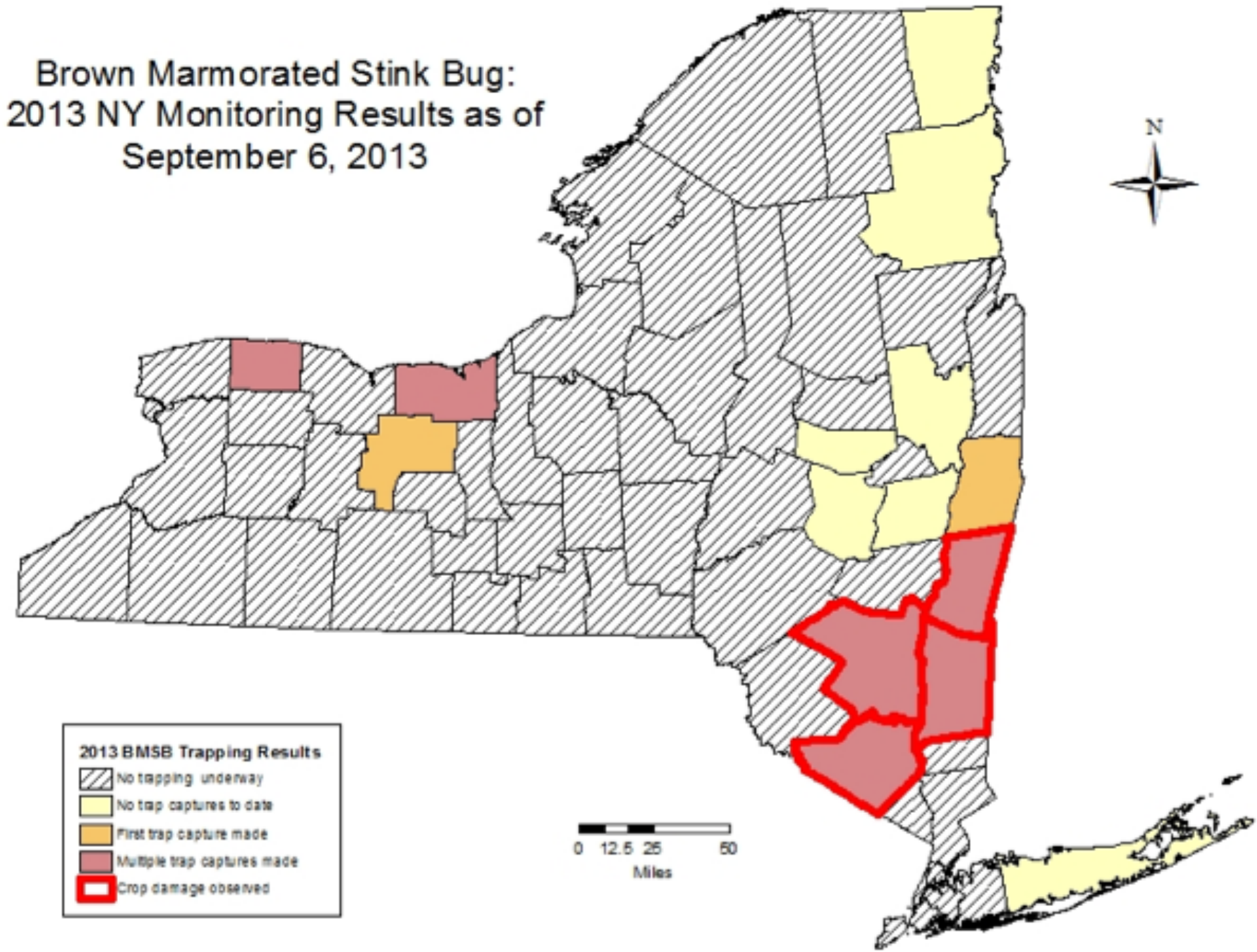


Fruit Damage Orchard Survey, Orange County, NY

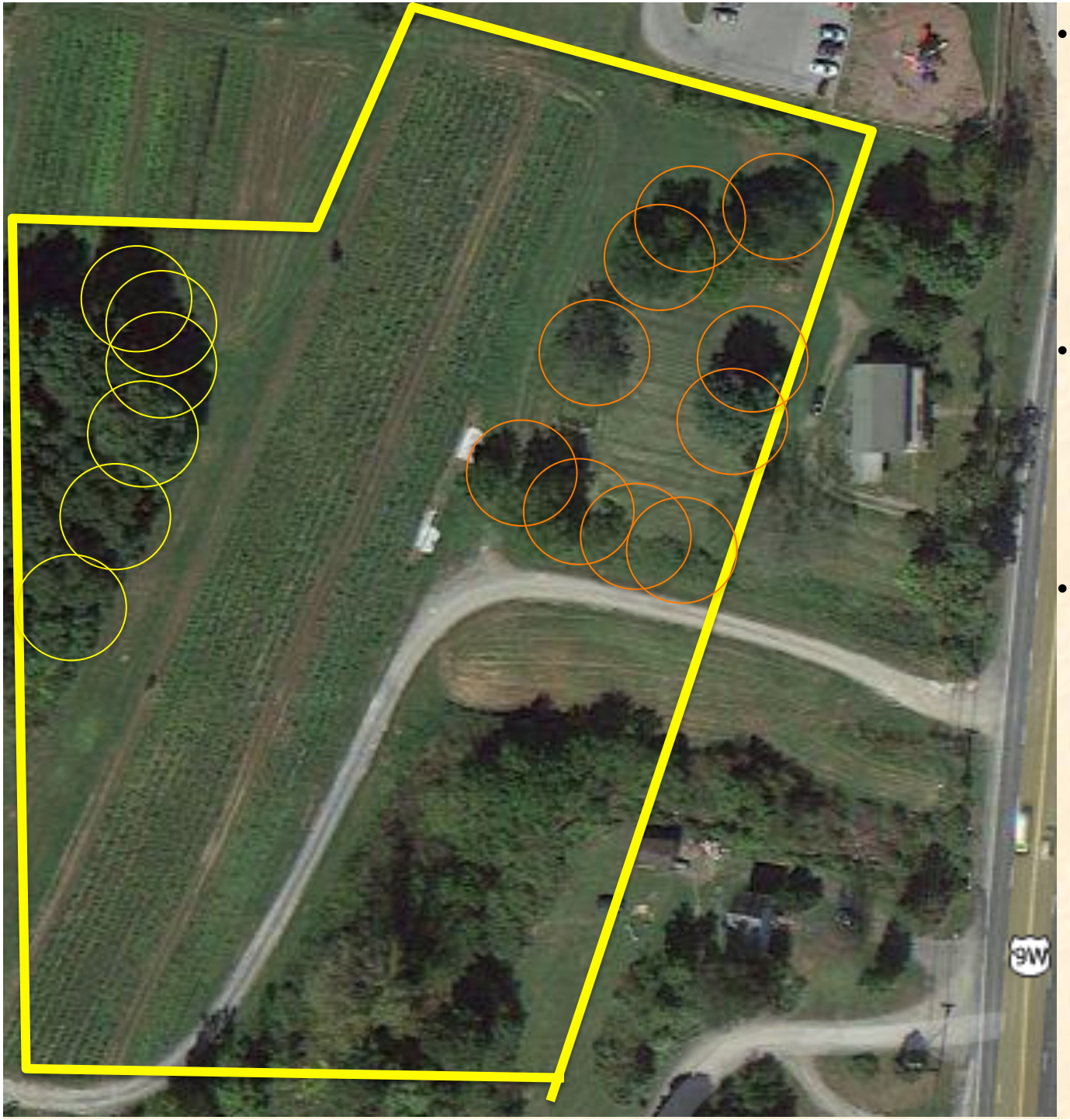
- 5 acre block of Pink Lady
- September 10, 2012
- 3’ x 12’ spacing
- 10 fruit / tree
- 100 fruit /30’ section
- 9 sections; 240’ row




Fruit Damage Survey of Late Season of Pink Lady
Orange County, NY September 10, 2012
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
Row 1 West edge
Row 2 Center West
Row 3 Center East
Row4 East edge


Brown Marmorated Stink Bug:
2013 NY Monitoring Results as of
September 6, 2013
N
2013 BMSB Trapping Results
No trapping underway
No trap captures to date
First trap capture made
Multiple trap captures made
Crop damage observed
0 12.5 25 50
Miles

Infestation Occurrences in Ag. Commodities: >20% Loss in Organic Jalapeno Pepper in 2013



- BMSB populations were observed on Black Walnut and Tree of Heaven, which may have acted as intermediate hosts, fostering migrations to pepper in high numbers.
- BMSB locations on netting traps with pheromone were equally dispersed on the field and forested sides of net.
- Nights when lights were on, BMSB were heavily concentrated on the field side in front of the light with higher numbers observed.

Ailanthus altissima
Juglans nigra

Active Pheromone Baited Trap & Halogen Lighting Insecticide Treated Netting

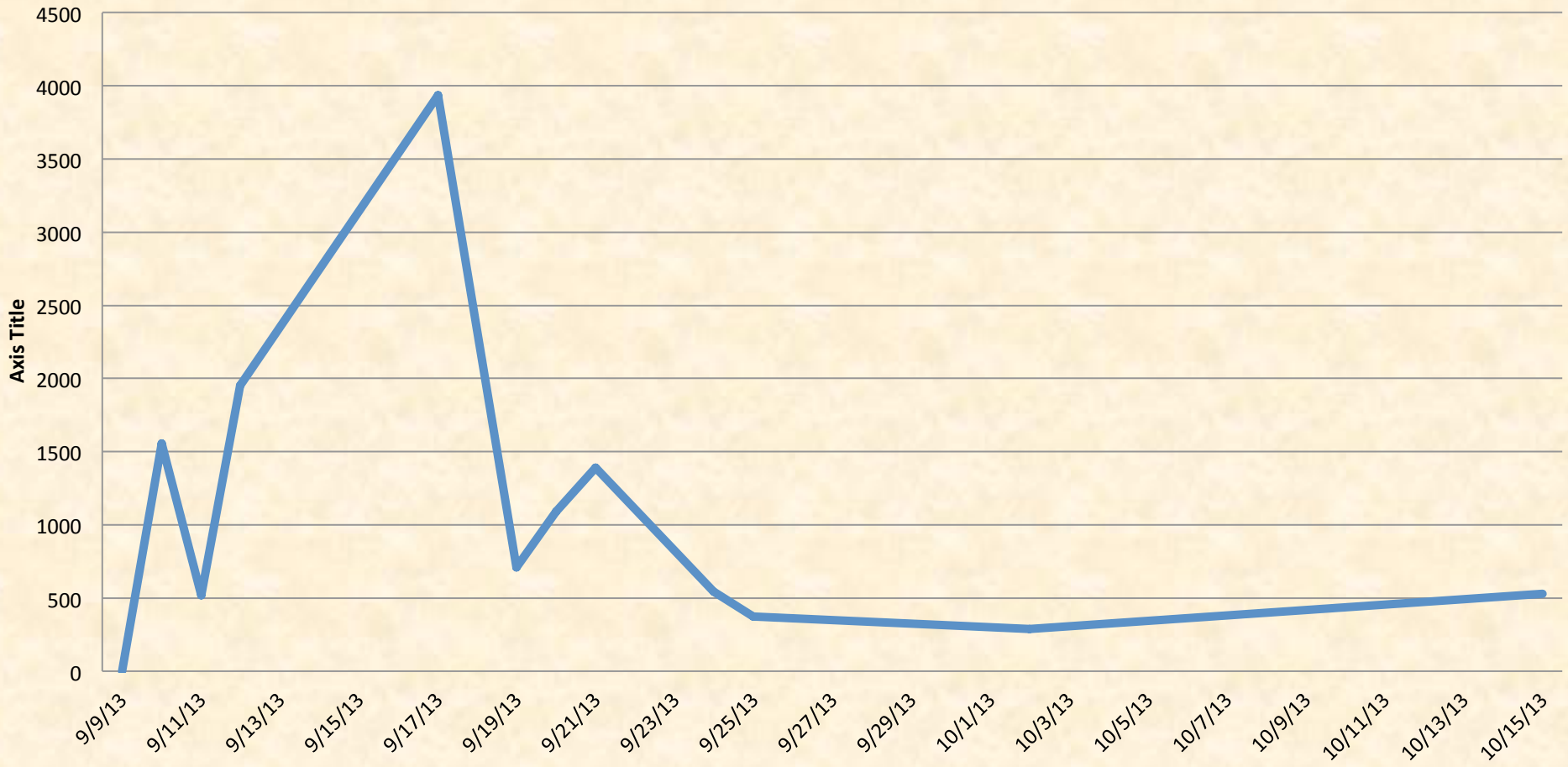
Active Pheromone Baited Trap

Rescue Lure
USDA
MDT

#10

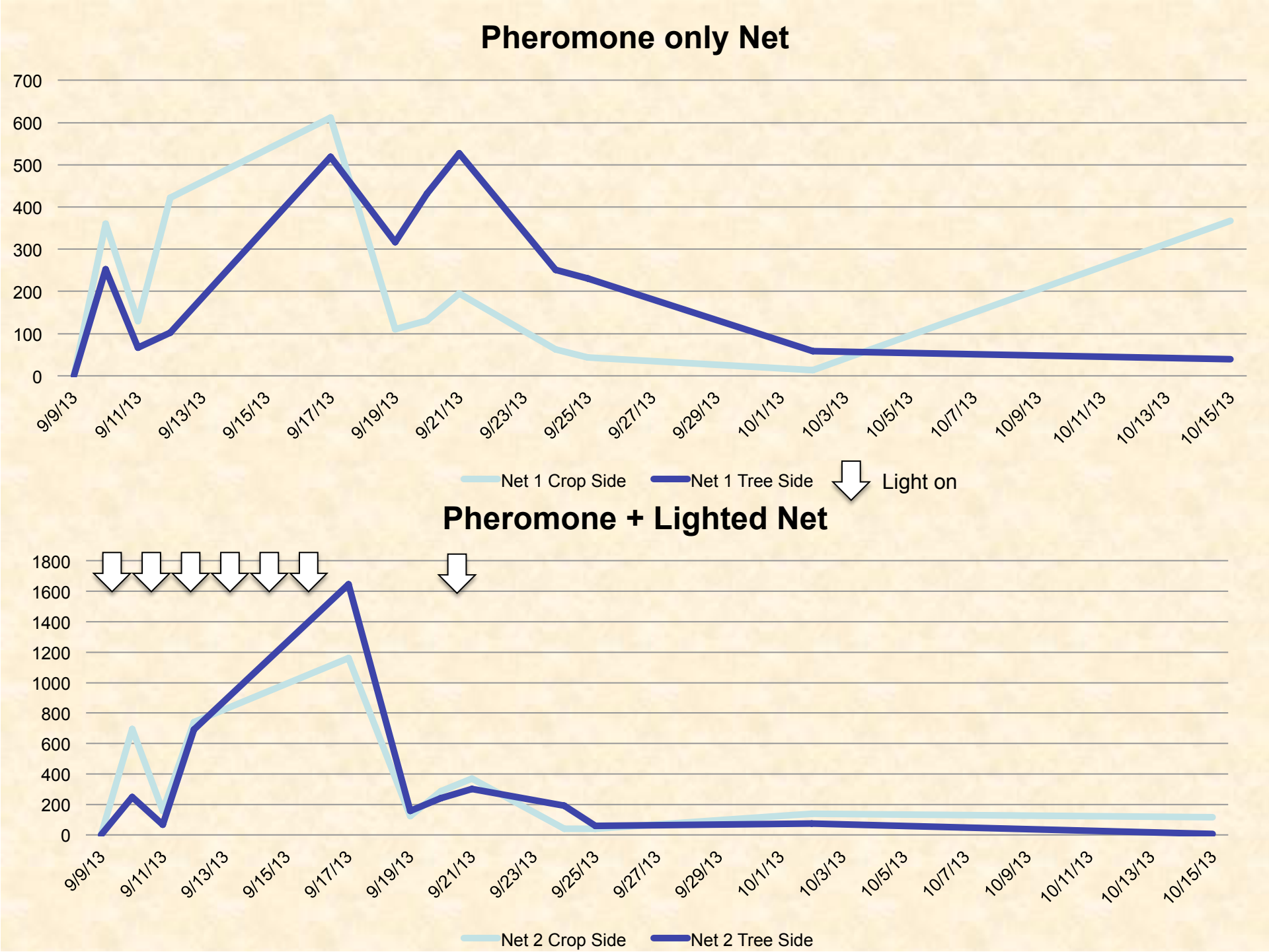
Studies of the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål), in New York State

***Combined Seasonal Trap Captures Using Pheromone and Pheromone + Light**

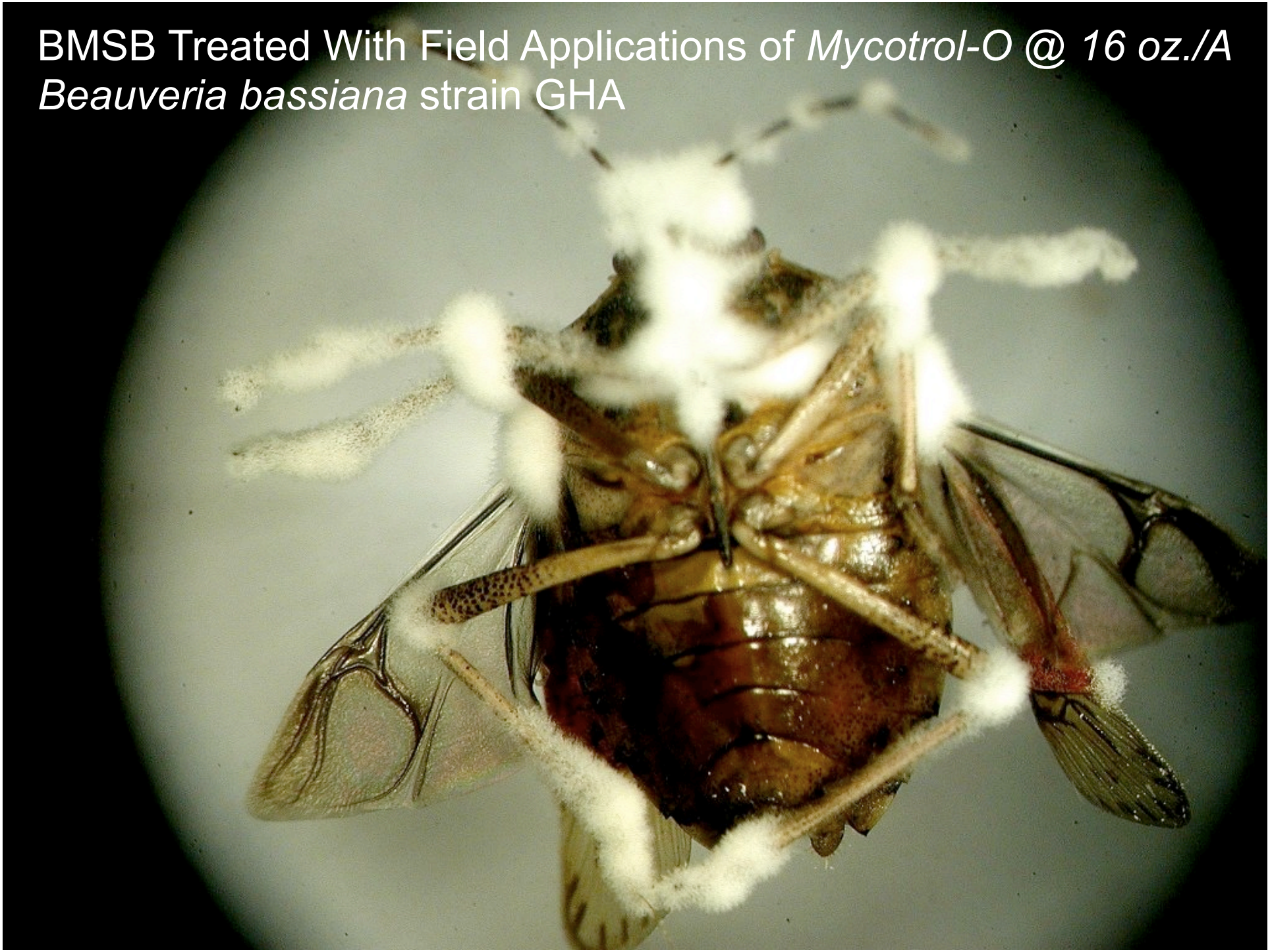


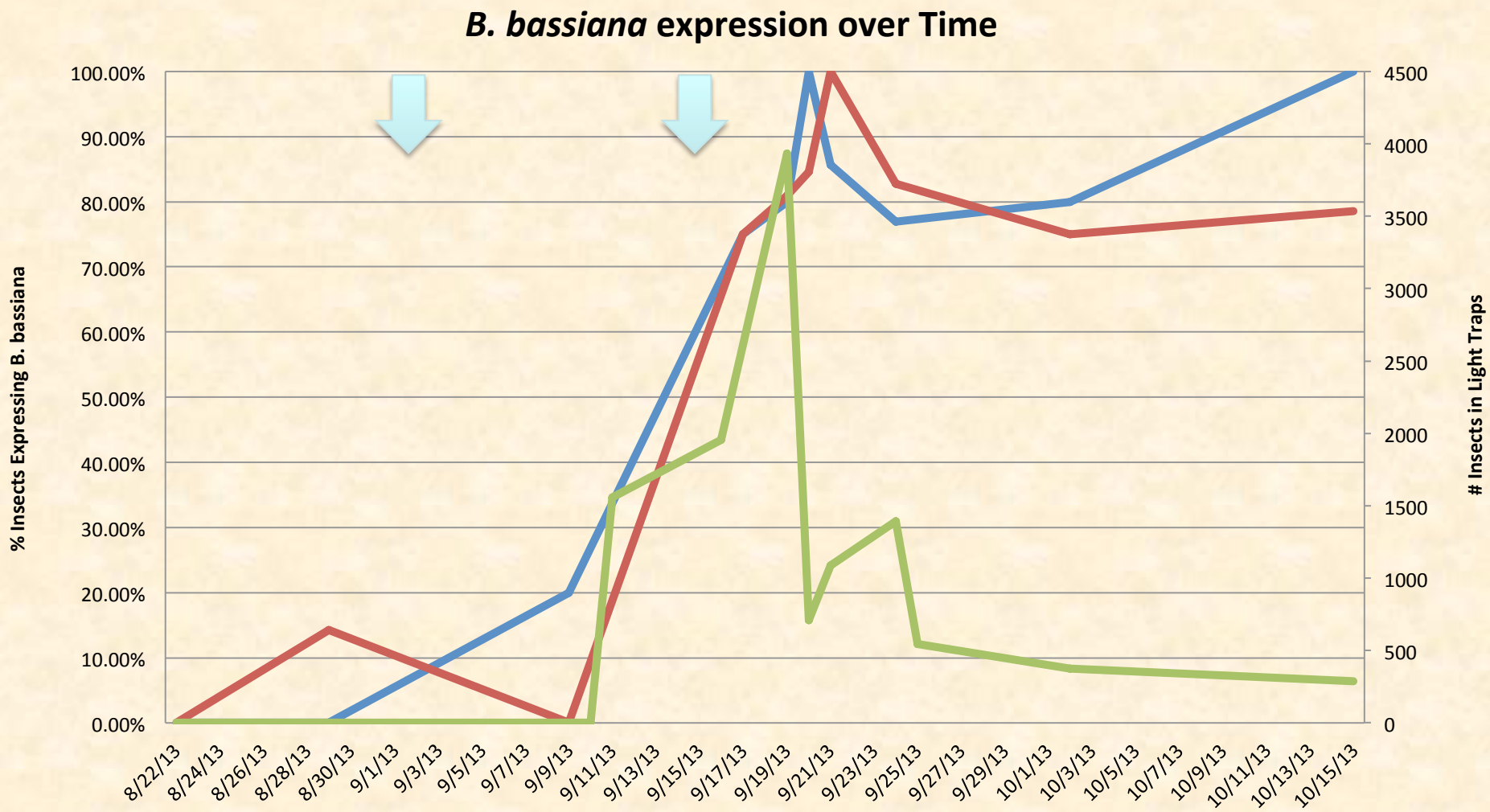
*Over 13,000 BMSB captured

CORNELL'S
Hudson Valley
LABORATORY


Pheromone only Net
700
600
500
400
300
200
100
0
9/9/13
9/11/13
9/13/13
9/15/13
9/17/13
9/19/13
9/21/13
9/23/13
9/25/13
9/27/13
9/29/13
10/1/13
10/3/13
10/5/13
10/7/13
10/9/13
10/11/13
10/13/13
10/15/13
Net 1 Crop Side
Net 1 Tree Side
Light on
Pheromone + Lighted Net
1800
1600
1400
1200
1000
800
600
400
200
0
9/9/13
9/11/13
9/13/13
9/15/13
9/17/13
9/19/13
9/21/13
9/23/13
9/25/13
9/27/13
9/29/13
10/1/13
10/3/13
10/5/13
10/7/13
10/9/13
10/11/13
10/13/13
10/15/13
Net 2 Crop Side
Net 2 Tree Side

BMSB Treated With Field Applications of *Mycotrol-O @ 16 oz./A*
Beauveria bassiana strain GHA





	8/22/13	8/29/13	9/9/13	9/10/13	9/11/13	9/16/13	9/17/13	9/19/13	9/20/13	9/21/13	9/24/13	9/25/13	10/2/13	10/15/13	
Net 1 infection	0.00%	0.00%	20.00%			73.66%		75.00%	80.00%	100.00%	85.71%	76.92%		80.00%	100.00%
Net 2 infection	0.00%	14.29%	0.00%			82.95%		75.00%	80.95%	84.62%	100.00%	82.76%		75.00%	78.57%
Population	0			0	1556	521	1954		3935	708	1090	1392	545	375	287

- *Beauvaria bassiana* strain GHA applications *(Mycotrol-O @ 16 oz./A)*

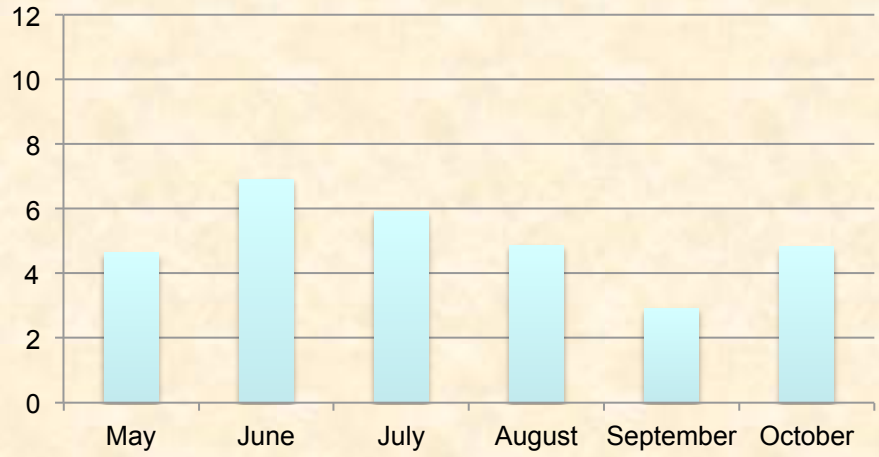
What are the factors influencing the movement of BMSB to Ag Commodities in NYS

- Population density leading to reduced host viability
  - High overwintering and 1st generation BMSB can reduce the viability of seed and foliage for the 2nd generation in deciduous forest trees
- Climatic conditions
  - Under drought conditions
    - Seed and plant tissue becomes stressed with reduced moisture
    - Seed of deciduous trees reduce moisture stores
    - BMSB will move from deciduous trees to crops as seed viability is reduced
- Can we use rainfall & RH as predictors for BMSB movement to crops?

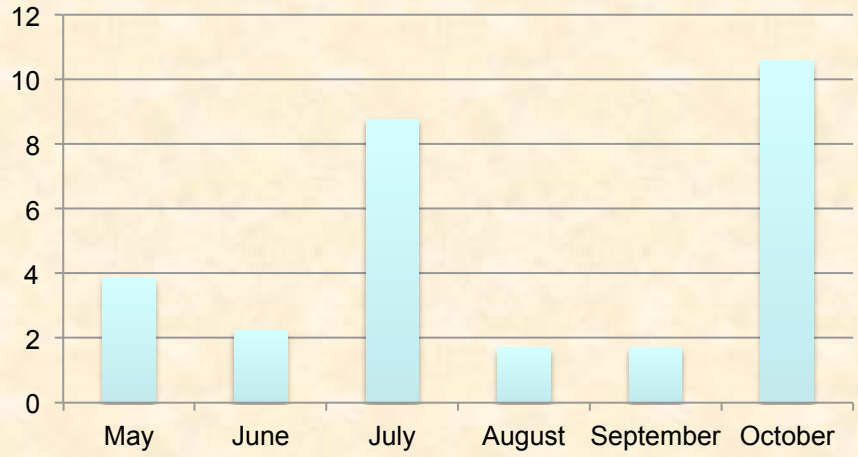
CORNELL'S Hudson Valley LABORATORY

Factors Influencing BMSB Fruit Feeding
Mid-Atlantic, Allentown, PA 2009 & 2010

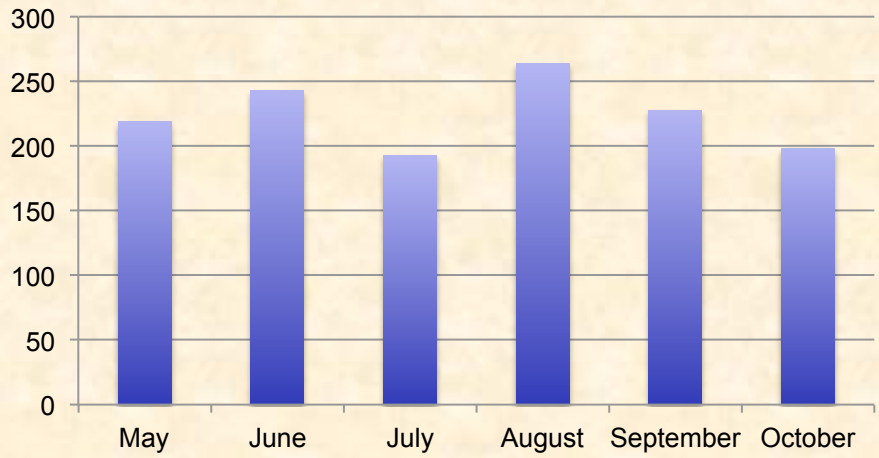
2009 Total Rain (37.88 in.)



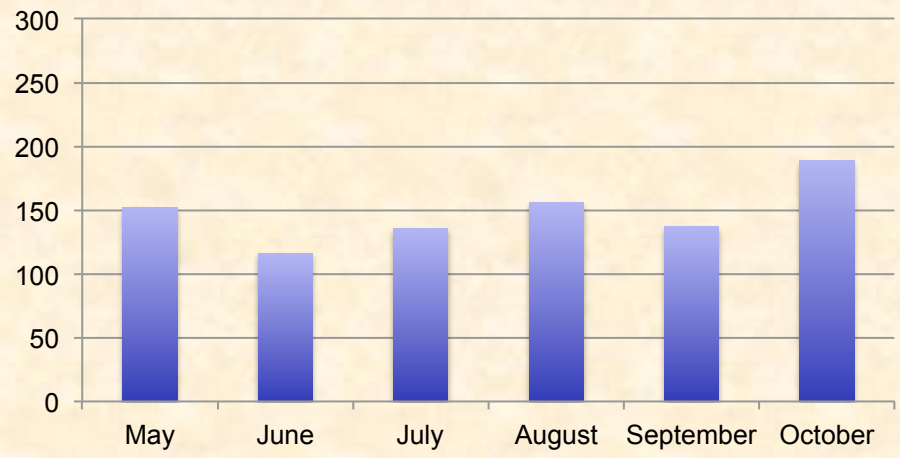
2010 Total Rain (28.85 in.)



RH Hrs >= 90% (1345 hrs.)

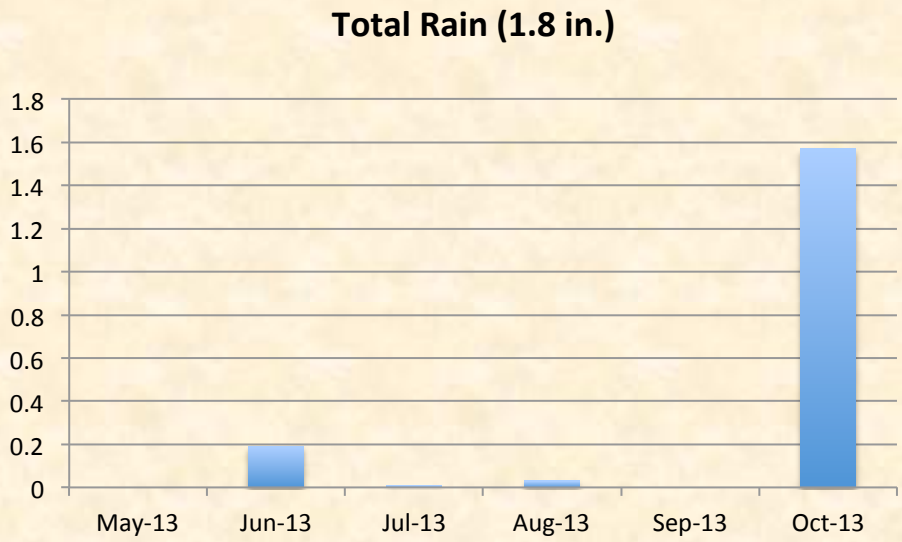


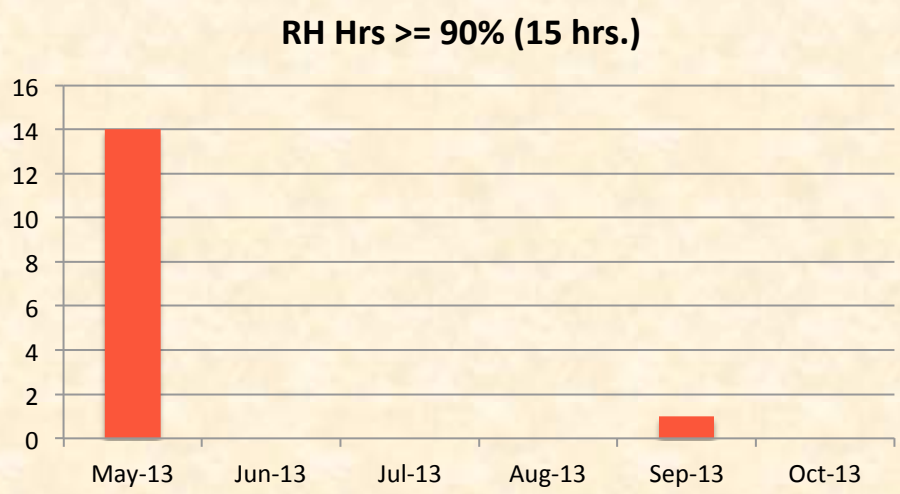
RH Hrs >= 90% (886 hrs.)



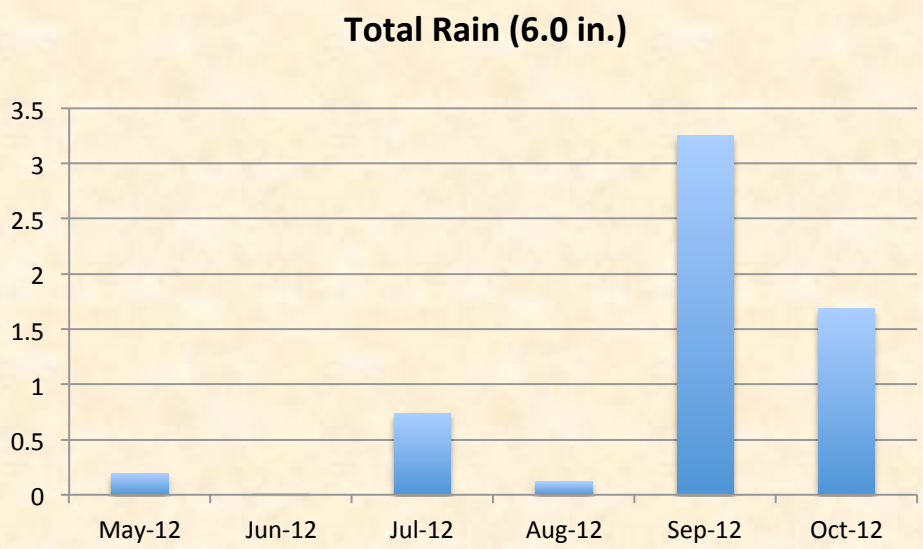
Factors Influencing BMSB Fruit Feeding
Rainfall & RH, Campbell Hall, NY

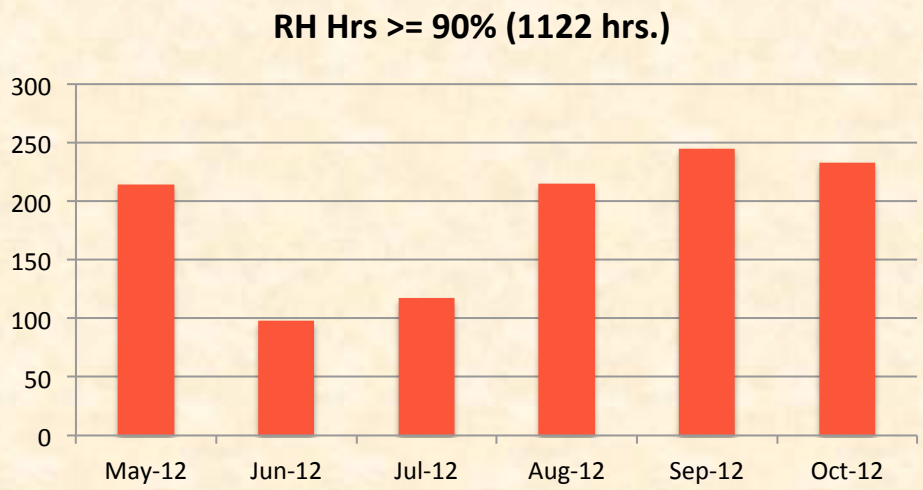
>21% Fruit Injury (N=3600) 2012





0.1% Fruit Injury (N=12,000) 2013





Insecticide Use

Insecticide Group	Product	Active Ingredient	% Adult BMSB Mortality[1]
Pyrethroid	**Bifenture**	bifenthrin	100
	Danitol	fenpropathrin	95
	Warrior II	lambda-cyhalothrin	73
Carbmate	**Lannate**	methomyl	92
	Vydate	oxymyl	68
Neonicotinoid	**Actara**	thiamethoxam	92
	Assail	acetamiprid	87
	Calypso	thiacloprid	58
Pre-mix	**Leverage 360**	imidacloprid and bifenthrin	95
	Endigo	lambda-cyhalothrin and thiamethoxam	98
	Voliam Flexi	chlorantraniliprole and thiamethoxam	98

1. Direct contact activity of insecticides against BMSB adults in a lab setting may be very high, yet the activity of field-aged residue may, over time, quickly becomes ineffective at preventing feeding injury.

Mid-Late Season Management of Stink Bug on Apple

Insecticide	Native SB[L]	**BMSB[L]**	PHI	# Apps/season (Total/yr)
Danitol[L]	***	**	4	2 (NYS 16.0 OZ.42-2/3 oz/yr.)
Warrior[L]	***	***	21	5 (25.6 oz/yr.)
Lannate[L]	***	***	14	5 (15 pints/A/yr.)
Vydate[NL]	***	***	14	4 (8 pints/A/yr.)
Thionex[L]	***	***	21	3 (2 post bloom)
Bifenthrin[1]	?	***	14	2 post bloom (0.5 lb.ai)

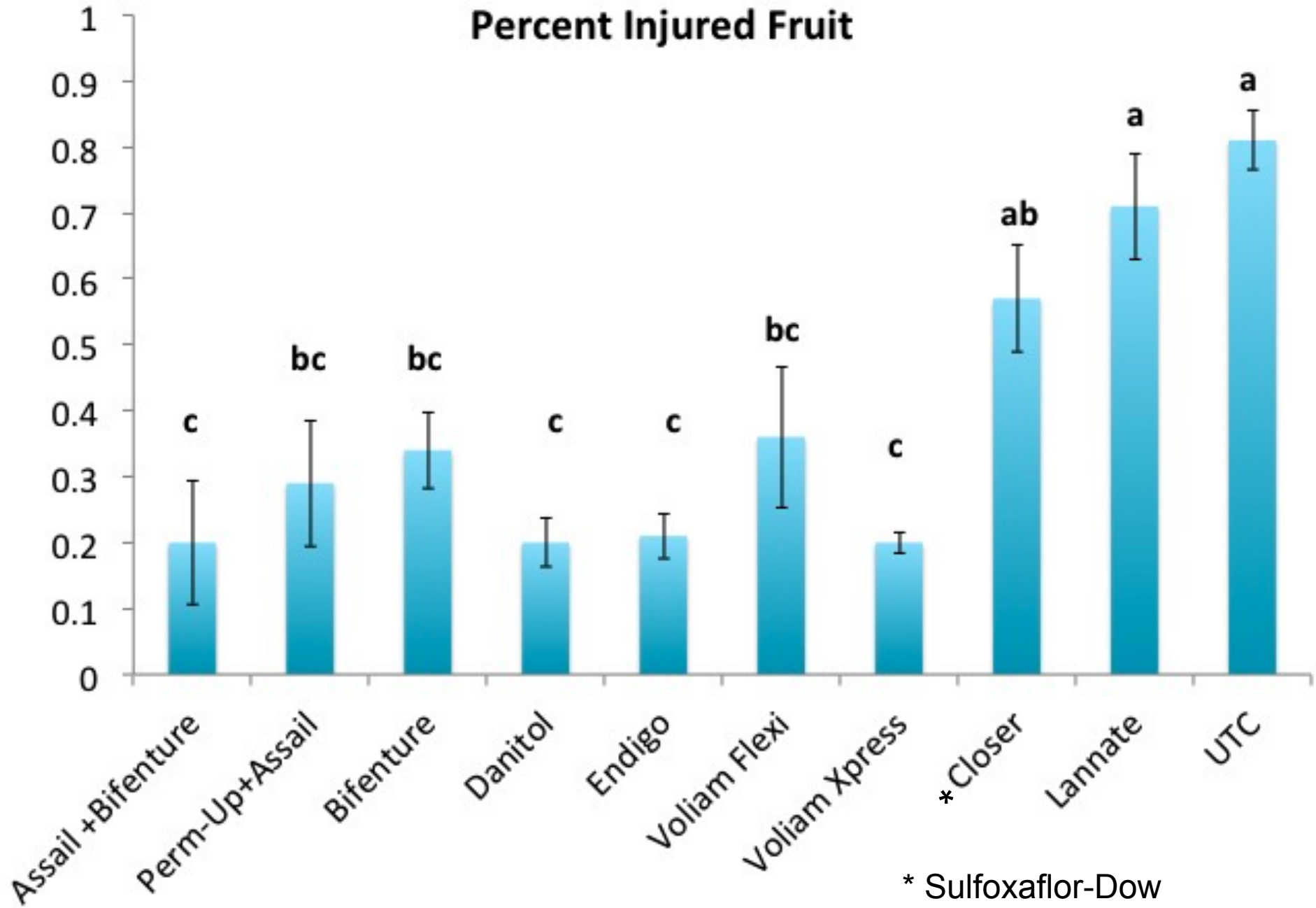
1. (Brigade 2EC or 10WSB) Section 18 in 2013

- untested; 0 – no activity; * - suppression, ** - good; *** - excellent;

L = stink bug on insecticide label;

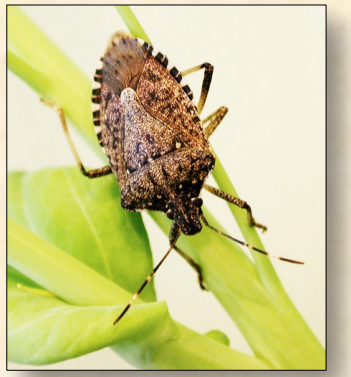
NL – not on the EPA / NY label

BMSB Mgt. in Peaches at 10 d Intervals: Rutgers



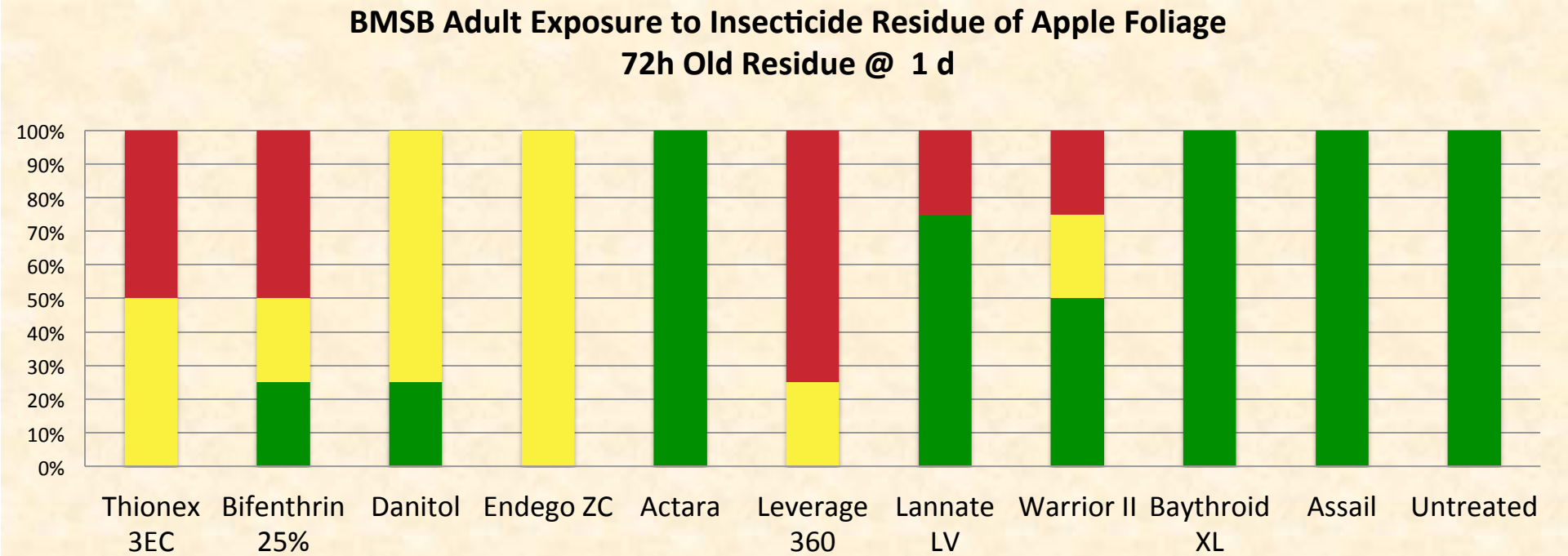
* Sulfoxaflor-Dow

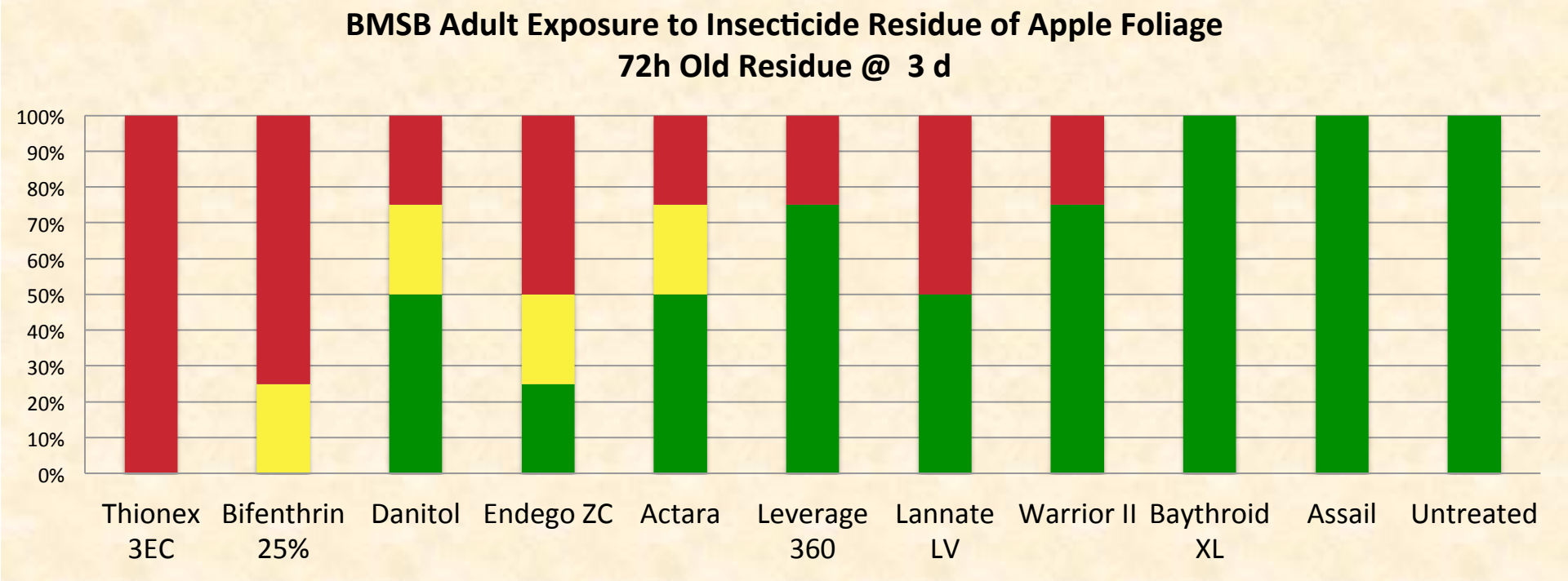
Studies of the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål), in New York State



Residual field bioassay of adult BMSB on treated foliage:

- **Four tree plots, 4 replicates** treated with the highest labeled rate of insecticides using tractor mounted airblast sprayer
- Foliage collected 24, 48 and 72 hours after application.
- 1st generation adults placed on portions of 4 leaves wrapped on the inside of a 1 oz. enclosed container.
- Adults were observed at 1 and 3 day intervals and evaluated as live, morabund or dead, held at 70°F.


BMSB Adult Exposure to Insecticide Residue of Apple Foliage
72h Old Residue @ 1 d
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Thionex 3EC
Bifenthrin 25%
Danitol
Endego ZC
Actara
Leverage 360
Lannate LV
Warrior II
Baythroid XL
Assail
Untreated


BMSB Adult Exposure to Insecticide Residue of Apple Foliage
72h Old Residue @ 3 d
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Thionex 3EC
Bifenthrin 25%
Danitol
Endego ZC
Actara
Leverage 360
Lannate LV
Warrior II
Baythroid XL
Assail
Untreated

Key points to remember

- BMSB is arboreal, forest pest, very mobile to and out of agricultural crops
- Fruit damage takes 2-3 weeks for expression mid-late season.
- Low populations can equate to high feeding injury levels

Strategies for control

1. Early trapping **with Tedders trap + #10 and MDT combo lure**
2. **Scouting** pome and stone fruit **at first trap capture**
3. Border applications at first observation along border
4. Maintain border applications if BMSB presence continues
5. Alternate row applications at 4-7 days as BMSB enter orchard

Insecticide efficacy is critical

- Use materials **with greatest efficacy & longest residual**
- Maintain 'fresh' residue every 4-5 days when needed employing <u>alternate row middle (ARM) applications</u>.

Thanks to the staff at the HVL for all their support:

Technical Assistant.....	Allen Clayton
Summer Research Assistant	Tim Lamposona
Summer Research Assistant	Kellyn Will
PT Summer Research Assistant	Henry Grimsland
Summer Research Intern (CCE BMSB).....	Susan Weibman
PT Summer Intern	Brianna Flonc
Farm Manager …….……...	Albert Woelfersheim
Administrative Assistant ……	Donna Clark
HVL & NEWA Weather Data……...	Anne Rugh,
	Joe Whalon