Insecticide Efficacy for Insect Management of Eastern NY Tree Fruit

Pest Management Efficacy Workshop

March 5, 2021 8AM

Hudson Valley Research Laboratory

Conference Room

3357 Route 9W, Highland, NY

Peter Jentsch

Senior Extension Associate – Entomology

THE JENTSCH LAB

INSECT BIOLOGY, ECOLOGY, AND MANAGEMENT IN HUDSON VALLEY AGRICULTURAL COMMODITIES

WELCOME ENTOMOLOGY BROWN MARMORATED STINK BUG INVASIVES ORGANIC AG. RESEARCH TREE FRUIT THE HEIRLOOM ORCHARD

VEGETABLE SWEET CORN SMALL FRUIT GRAPE IN THE NEW

- INSECTICIDE AND ACARICIDE STUDIES
- SCOUTING REPORT
- HISTORICAL TREE PHENOLOGY & HUDSON VALLEY FRUIT PRODUCTION

Tree Fruit

2019 Seasonal Overview

RESULTS OF INSECTICIDE AND ACARICIDE STUDIES IN EASTERN NEW YORK

Pome fruit insecticide screening has been a vital component of the Hudson Valley Laboratory's department of Entomology since its inception. Listed below are the yearly publications pertaining to pear and apple insecticide screening for the yearly pest complex of newly developed and standard materials on schedules fitting to the region. BMSB studies are included in reports beginning in 2011.

Search

RECENT BLOG PAGES

- Last Call.....Webinar: HVRL Research Updates for NYS Commercial Apple Pest Management.

Weekly Scouting observations, tree phenology, IPM predictive modeling events

Observations made at the Hudson Valley Research Laboratory orchards in untreated research plots representing relatively high insect pest pressure. Predictive Modeling information is taken from the Highland Station NEWA web site.

Date	Baskerville-Emin (BE) DD Accumulations (previous day NEWA) 43 F	50 F	# / trap / day (pheromone trap)	Field Observations / Trap Catches / Models
5/26	645.6	316.6		Degree day accumulations beginning 1 January, 2020
			6.5	Black Stem Borer (BSB) (54/39)
			2.5	Codling Moth (CM) (26/9)
			0.0	Grape Fruitworm (0/0)
			1.1	Lesser Apple Worm (LAW) (6/9)
			1.7	Oriental Fruitmoth (OFM) (6/18)
			1.0	Pear Psylla 25 Nymphs/25 leaves
			3.7	Redbanded Leafroller (RBLR) (26)
			1.0	San Jose Scale (SJS) (0/14) FIRST CATCH
			0.2	Pear Psylla 6 Eggs/25 leaves
			0.0	Speckled Green Fruitworm (SGFW) (0/0)
			3.3	Spotted Tentiform Leafminer (28/18)
			1.4	Tufted Apple Budmoth (14/5) FIRST CATCH
				Fruit Injury
			4%	Lepidopteran feeding in Untreated (UT) Ginger Gold (GG) fruitlets
			8%	Plum Curculio (PC) feeding in UT GG fruitlets
			20%	Tarnished Plant Bug (TPB) feeding in UT GG fruitlets
			4%	European Apple Sawfly (EAS) feeding in UT GG fruitlets
			24%	PC on UT cherry, multiple varieties
				Degree Day Modeling
			487	STLM (biofix 3/30) eggs hatching, sap feeding mines appear
			454	OFM (biofix 4/6) End of hatch at $646DD_{43BE}$. 2nd flight at 700-$1100DD_{43BE}$.
			134	CM (biofix 5/15) Moths flying and first eggs laid. Eggs hatch at 220 DD. Action threshold at $220DD_{50BE}$, predicted on May 30. SJS (biofix 5/26)
			0.2	Weekly Rainfall
			1.73	Monthly Rainfall
			8.79	Total Rainfall (Since 1 March, 2020)

Date	Baskerville-Emin (BE) DD Accumulations (previous day NEWA) 43 F	50 F	# / trap / day (pheromone trap)	Field Observations / Trap Catches / Models
5/31	801.5	430.9		Degree day accumulations beginning 1 January, 2020
			6.5	Black Stem Borer (BSB) (19/72)
				Brown Marmorated Stink Bug (6 adults/trap)
			3.7	Codling Moth (CM) (45/7)
			0.9	Dogwood Borer (DWB) (5/7) 1st CATCH
			0.1	Fruit Tree Leafroller (FTLR) (1) 1st CATCH
			12.4	Grape Berry Moth (GBM) (87)
			2.2	Lesser Apple Worm (LAW) (26/5)
			0.6	Oriental Fruitmoth (OFM) (1/7)
			1.2	Pear Psylla 61 Nymphs/50 leaves
			0.8	Redbanded Leafroller (RBLR) (4/7)
			0.0	San Jose Scale (SJS) (0/0)
			0.1	Sparganothis (SPAR) 1st CATCH
			0.4	Pear Psylla 19 Eggs/ 50 leaves
			0.0	Speckled Green Fruitworm (SGFW) (0/0)
			0.8	Spotted Tentiform Leafminer (2/9)
			1.1	Tufted Apple Budmoth (14/5) 1st SUSTAINED CATCH
			0.3	Variegated Leafroller (VLR) (2/2) 1st CATCH
				Fruit Injury
			1.3%	Lepidopteran feeding in Untreated (UT) Ginger Gold (GG) fruitlets
			41.3%	Plum Curculio (PC) feeding in UT GG fruitlets
			9.3%	Tarnished Plant Bug (TPB) feeding in UT GG fruitlets
			0%	European Apple Sawfly (EAS) feeding in UT GG fruitlets
			32%	PC on UT cherry, multiple varieties
				Degree Day Modeling
			$209DD_{50}$	Plum Curculio migration model. Residue needed to $308DD_{50}$
			643	STLM (biofix 3/30) Sap feeding and tissue mines are present.
			610	OFM (biofix 4/6) 1st moth flight and egg hatch over. 2nd flight at 700-$1100DD_{43BE}$.
			249	CM (biofix 5/15) Moths capture increasing, eggs hatching. Application for CM larval 10% hatch at 250 DD after first adult SC.
			114	SJS (biofix 5/26) 1st generation crawlers developing.
			0.31	Weekly Rainfall
			2.04	Monthly Rainfall (May 2020)
			9.1	Total Rainfall (Since 1 March, 2020)

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Historical Weather Data

Data represents historical McIntosh tree phenological observations from the Hudson Valley Laboratory Research Laboratory Orchard.

Departments of Entomology and Plant Pathology
Hudson Valley Research Laboratory

Cornell University
College of Agriculture and Life Sciences

McIntosh Phenology

Year	GT	HIG	T.C.	Pink	Bloom	P.F.	PF DD_{43}	PF DD_{50}
2019	4/10	4/15	4/19	4/22	5/8	5/15	533.1	257.2
2018	4/18	4/28	4/30	5/4	5/9	5/14	514.5	274.6
2017	4/2	4/11	4/17	4/24	4/27	5/8	603.0	312.0
2016	3/17	4/04	4/11	4/18	4/25	5/12	597.8	186.0
2015	4/13	4/20	4/27	5/4	5/6	5/12	527.8	304.5
2014	4/14	4/18	4/28	5/6	5/12	5/19	594.9	321.5
2013	4/13	4/18	4/24	4/30	5/7	5/13	510.6	262.2
2012	3/16	3/18	3/25	4/8	4/16	4/21	506.5	267.5
2011	4/4	4/11	4/25	5/1	5/9	5/16	526.0	268.3
2010	3/20	4/2	4/6	4/10	4/20	4/28	305.0	168.5
2009	4/6	4/13	4/20	4/24	4/29	5/7	452.0	219.6
2008	4/10	4/14	4/21	4/24	4/29	5/7	404.5	207.4
2007	4/2	4/21	4/24	5/2	5/7	5/14	397.0	228.3
2006	4/3	4/10	4/17	4/22	4/26	5/8	419.2	220.0
2005	4/7	4/11	4/18	4/26	5/8	5/16	493.7	258.6
2004	4/12	4/19	4/22	4/27	5/3	5/13	558.5	304.7
2003	4/7	4/16	4/24	4/28	5/1	5/19	595.0	324.7
2002	3/25	4/10	4/14	4/15	4/16	5/7	498.0	283.2
2001	4/11	4/17	4/25	4/28	5/2	5/10	481.3	288.0
2000	3/27	4/2	4/14	4/24	5/1	5/8	488.3	346.0
1999	4/2	4/7	4/12	4/26	5/2	5/13	530.1	174.4
1998	3/27	3/29	4/1	4/10	4/23	5/4	498.1	382.0
1997	4/4	4/11	4/21	4/28	5/1	5/14	422.7	250.0
1996	4/15	4/19	4/22	4/29	5/6	5/20		
1995	4/11	4/19	4/24	4/29	5/8	5/19		
1994	4/11	4/14	4/20	4/29	5/5	5/12		
1993	4/12	4/19	4/24	5/1	5/3	5/10		
1992	4/13	4/21	5/4	5/7	5/12	5/18		
1991	4/5	4/8	4/11	4/17	4/27	5/7		
1990	3/21	4/16	4/23	4/26	4/29	5/11		
1989	3/29	4/17	4/28	5/3	5/9	5/19		
1988	4/4	4/9	4/28	5/5	5/8	5/19		
1987	3/29	4/10	4/18	4/22	4/29	5/16		
1986	3/31	4/7	4/19	4/27	5/3	5/8		
1985	3/30	4/12	4/15	4/22	5/4	5/12		
1984	4/10	4/26	4/30	5/6	5/16	5/24		
1983	4/12	4/27	4/30	5/2	5/5	5/18		
1982	4/15	4/22	4/30	5/4	5/13	5/17		
1981		4/8	4/16	4/22	5/5	5/14		
1980	4/15		4/24	5/2	5/5	5/10		
Earliest day	**3/16**	**3/18**	**3/25**	**4/8**	**4/16**	**4/21**	305.0	168.5 **Low**
Latest day	**4/18**	**4/28**	**5/4**	**5/7**	**5/16**	**5/24**	603.0	382.0 **High**

Midrange: 3/31 (+/-14D) Mean days in bloom 9.4 days

4/7 (+/-20.5D)

4/14 (+/-20D)

4/22 (+/-14D)

5/1 (+/-15D)

5/7 (+/-16.5D)

Mid-Range Tree Phenology Dates
McIntosh

- **Green Tip:** 31 March
- **!/2" Green:** 7 April
- **Tight Cluster:** 14 April
- **Pink:** 22 April
- **Bloom:** 1 May
- **Petal Fall:** 7 May

Mean Days Bloom: 9.4 days

Degree Day Range	Low	High
PF DD 43°F	305.0	168.5
PF DD 50°F	603.0	382.0

RESULTS OF 2020 INSECTICIDE AND ACARICIDE STUDIES IN EASTERN NEW YORK

Pub. # HV2020

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HRVL & NEWA Weather Data	Lydia Brown

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Acknowledgements

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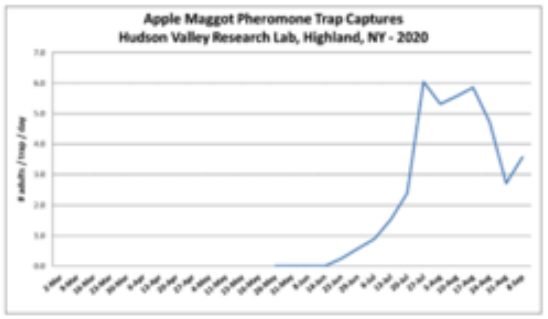
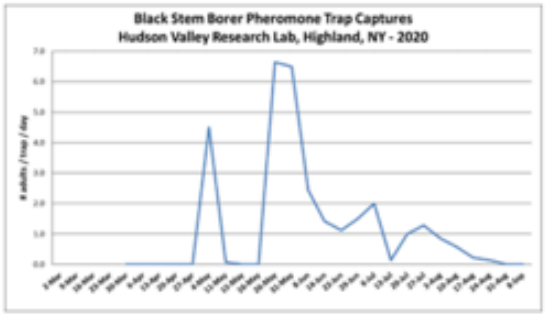
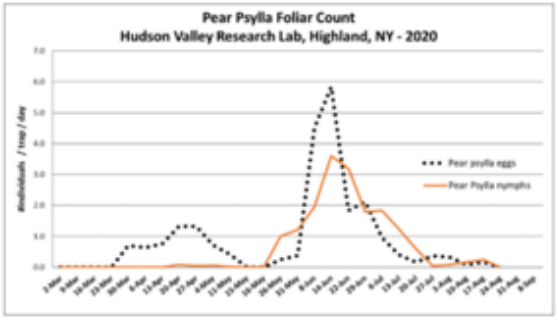
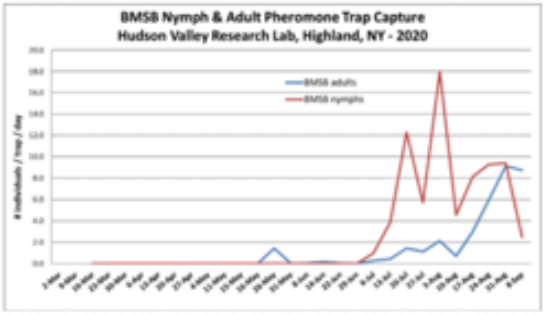
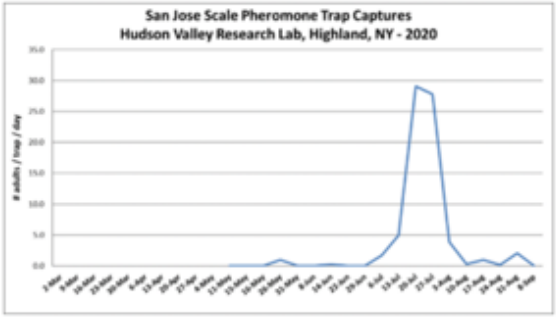

Apple Maggot Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020

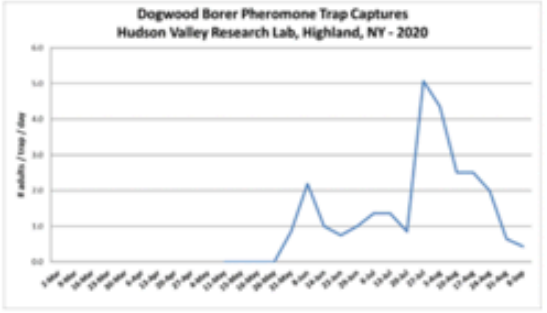

Black Stem Borer Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020

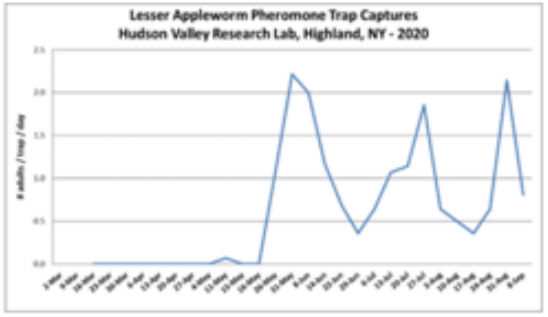

Pear Psylla Foliar Count
Hudson Valley Research Lab, Highland, NY - 2020
Pear psylla eggs
Pear Psylla nymphs


BMSB Nymph & Adult Pheromone Trap Capture
Hudson Valley Research Lab, Highland, NY - 2020
BMSB adults
BMSB nymphs


Codling Moth Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020


San Jose Scale Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020


Dogwood Borer Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020


Lesser Appleworm Pheromone Trap Captures
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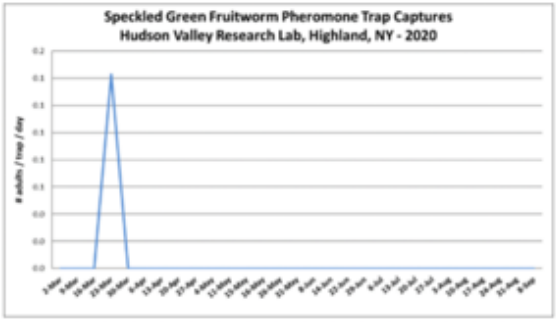

Speckled Green Fruitworm Pheromone Trap Captures
Hudson Valley Research Lab, Highland, NY - 2020

Table 20 **Evaluation of Drape Net for Controlling Insect Complex on Apple**
Hudson Valley Research Laboratory, Highland, NY - 2020

		Incidence (%) of insect damaged fruit					
Trmt.	Net App. Date	PC	EAS	TPB	MPB	Ext. Lep	Clean
1. Drape Net	29 April	4.0	0.0	0.0	0.0	1.3	94.7
2. Drape Net	21 May	5.8	0.3	0.3	0.0	1.0	92.8
3. Unnetted		2.5	0.0	0.0	0.0	2.5	95.0
P value		0.5273	0.5283	0.5283	NA	0.4924	0.6175

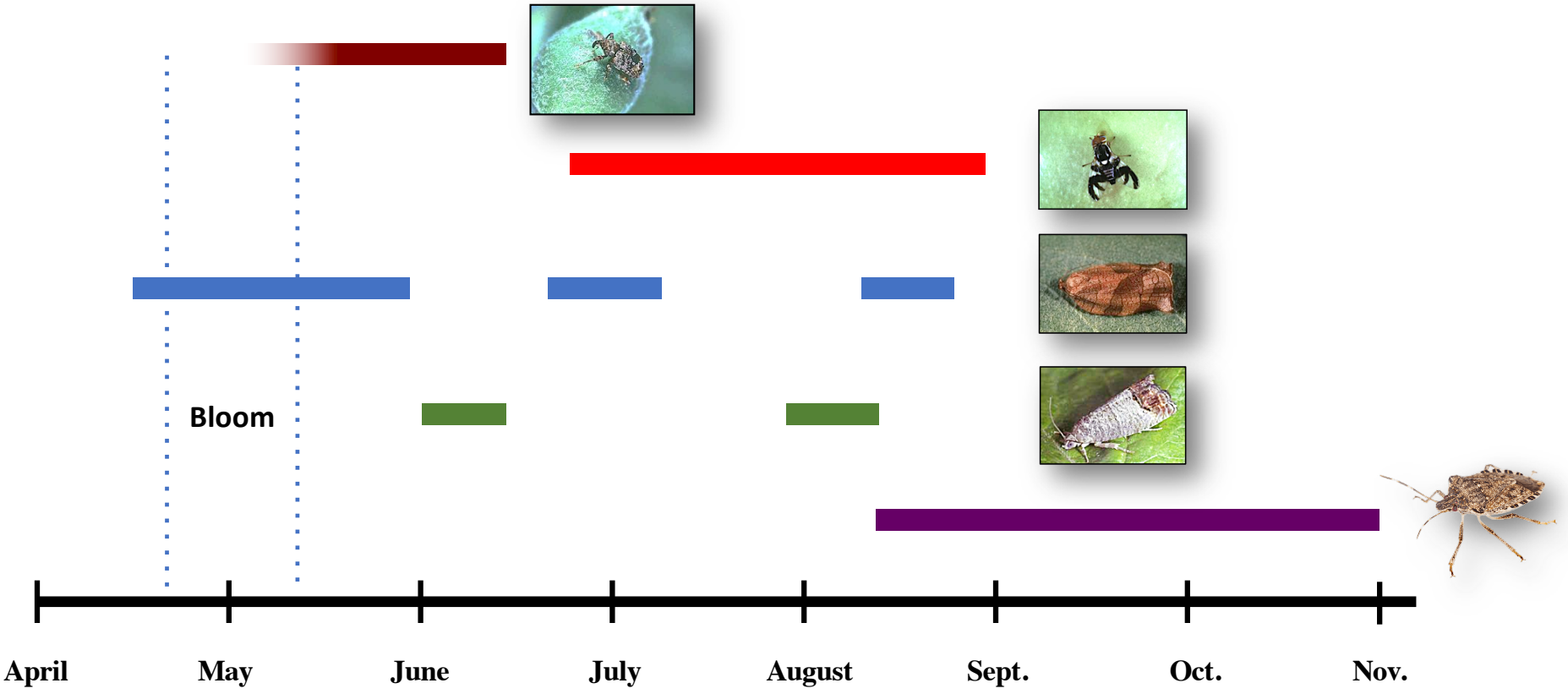
Rating of insect damage taken on 16 June on 'Crimson Crisp'.

Table 21 **Evaluation of Drape Net for Controlling Insect Complex on Apple**
Hudson Valley Research Laboratory, Highland, NY - 2020

		Incidence (%) of insect damaged fruit							
Trmt.	Net App. Date	PC	EAS	TPB	AMP	AMT	SB	SJS	Clean
1. Drape Net	29 April	24.1	0.0	0.6	1.9 b	0.6 b	11.3	1.1	61.5 a
2. Drape Net	21 May	14.0	0.0	4.2	5.4 b	5.5 b	11.5	0.0	67.1 a
3. Unnetted		35.0	0.0	3.9	46.7 a	51.7 a	29.4	1.1	20.6 b
P value		0.2279	NA	0.2829	0.0001	0.0001	0.1529	0.3361	0.0004

Assessments from apples harvested 9 and 11 September from 'Honeycrisp', 'Crimson Crisp', and 'Liberty'.
Data were analyzed by ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported.

Seasonal Activity Of Major Pests Of Apples In The Hudson Valley Of New York State



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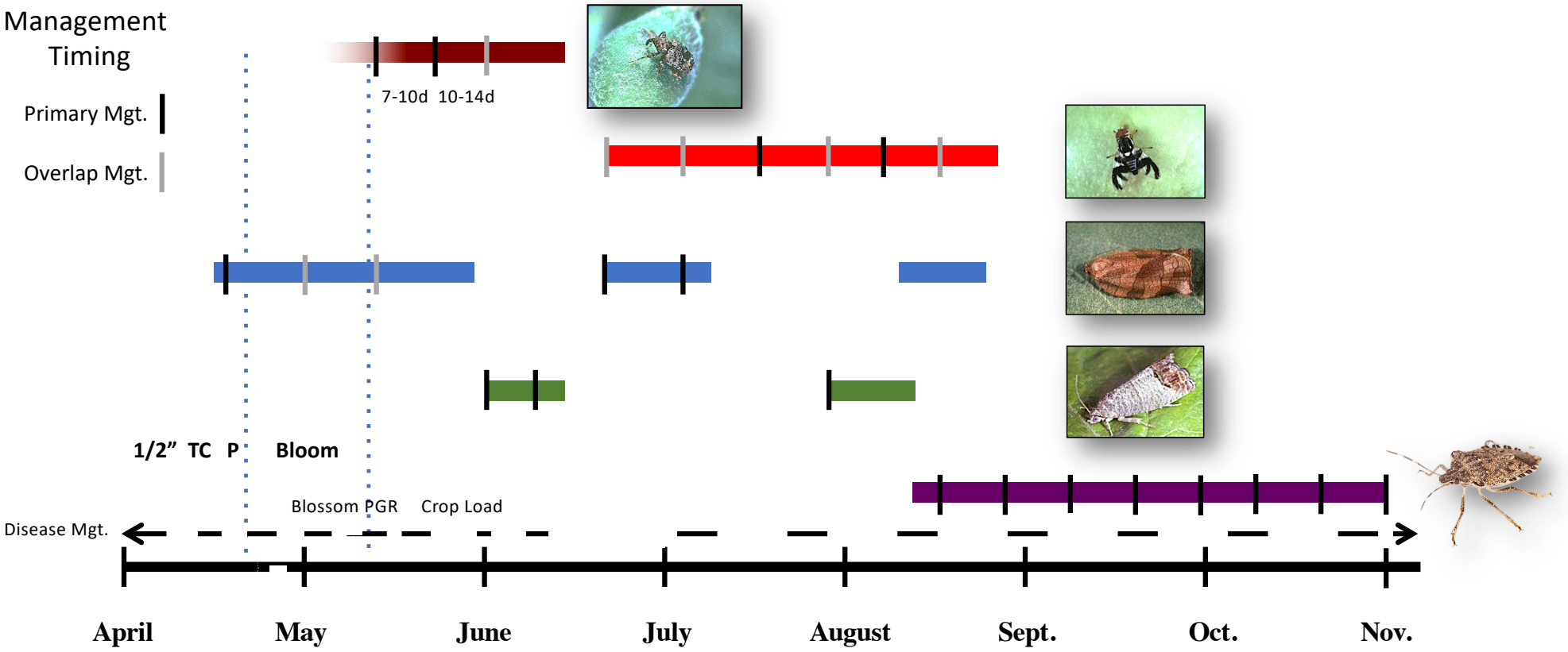
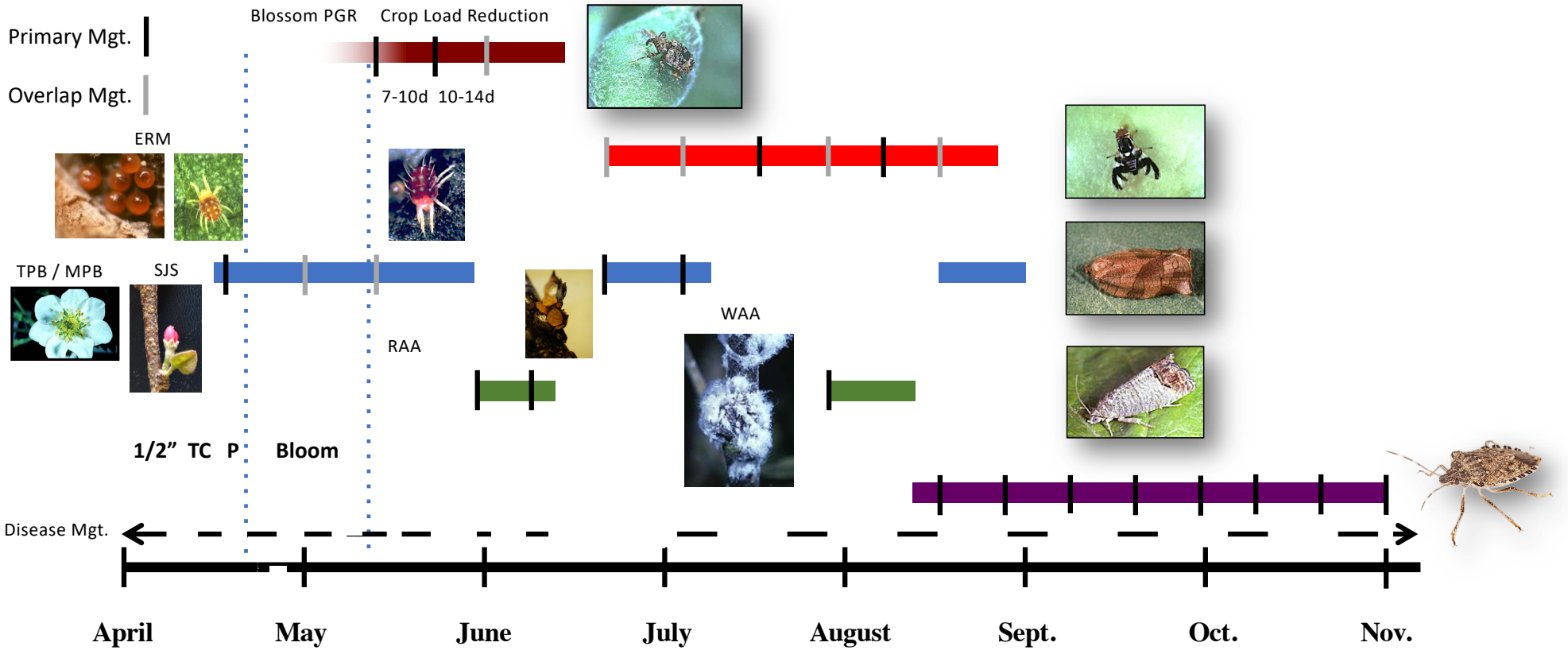


Seasonal Activity Of Major & Secondary Pests Of Apples In The Hudson Valley Of New York State



Apple / Pear Orchard Insect Pest Complex
Pheromone Captures Timing

Pest	Earliest 1st Catch	Average 1st Catch	Latest 1st Catch
SGFW	11-Mar	26-Mar	10-Apr
Pear psylla eggs	14-Mar	27-Mar	10-Apr
RBLR	14-Mar	29-Mar	20-Apr
STLM	27-Mar	15-Apr	11-May
OFM	29-Mar	19-Apr	7-May
Pear Psylla nymphs	26-Mar	20-Apr	5-May
Black Stem Borer	22-Apr	28-Apr	4-May
FTLR	16-Apr	2-May	18-May
LAW	17-Apr	5-May	31-May
CM	6-May	13-May	20-May
BMSB adults	14-Apr	14-May	6-Jul
SJS	11-May	22-May	24-Jun
VLR	19-May	26-May	5-Jun
DWB	16-May	29-May	19-Jun
OBLR	23-May	1-Jun	16-Jun
TABM	21-May	11-Jun	27-Jul
LPTB		14-Jun	
SPAR	31-May	18-Jun	22-Jul
AM	14-Jun	1-Jul	13-Jul
BMSB nymphs		6-Jul	
SWD	14-Jun	10-Jul	4-Aug

Pre-Bloom Management Driven Pests

Spotted Green Fruit Worm (SGFW) – Larva emergence - Pink

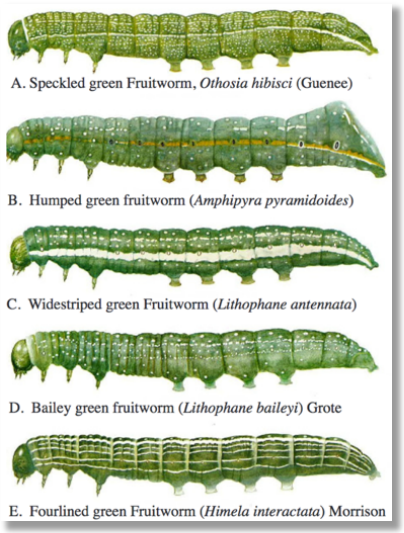
Red Banded Leafroller – Larval Emergence
Tarnish Plant Bug – Adult & nymph (3d @ 70F (TC-1C)
Rosy Apple Aphid – TC/Pink to 1st C

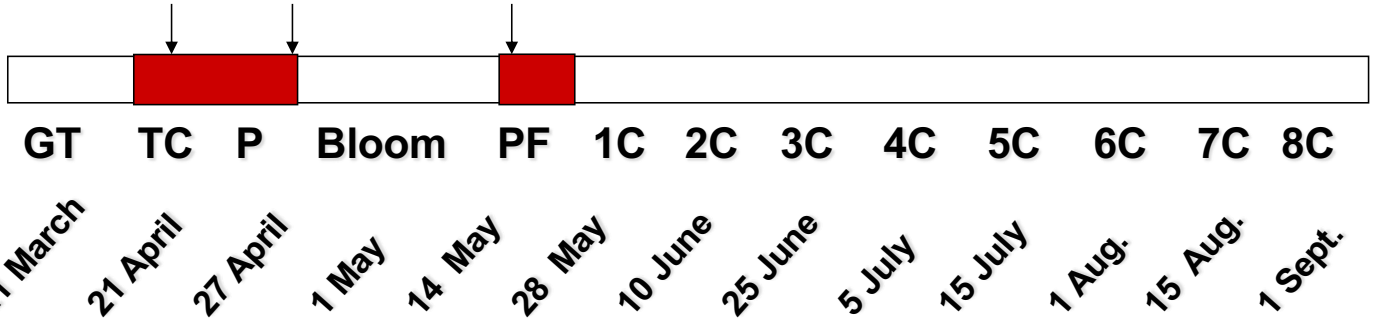
Black Stem Borer – Adult Female – 1st attack – Trunk Mgt.

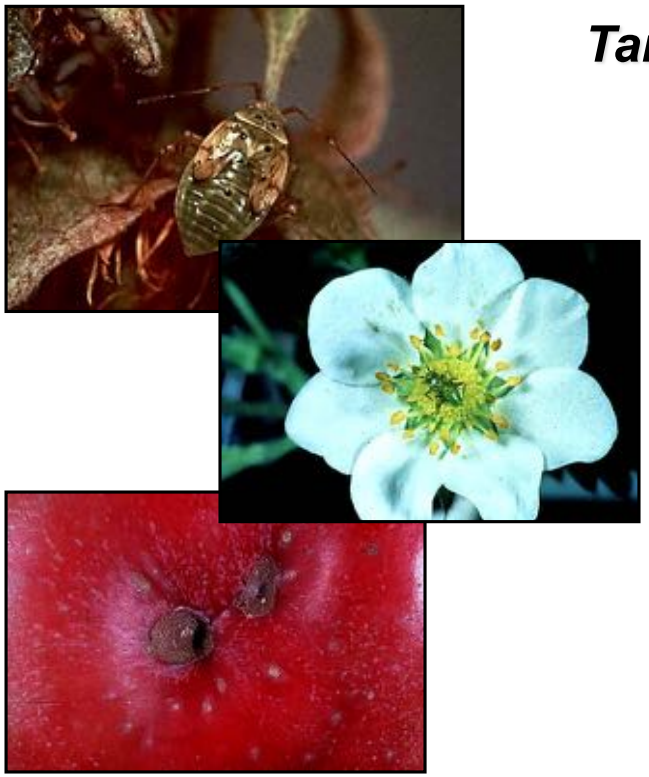
Dogwood Borer – OW larva – Trunk Mgt.
Oblique Banded Leafroller – OW Larval Emergence

Insect population and damage differ regionally, by orchard and often block by block

Green Fruit Worm Complex, Overwintering OBLR Management







Tarnished Plant Bug - Management

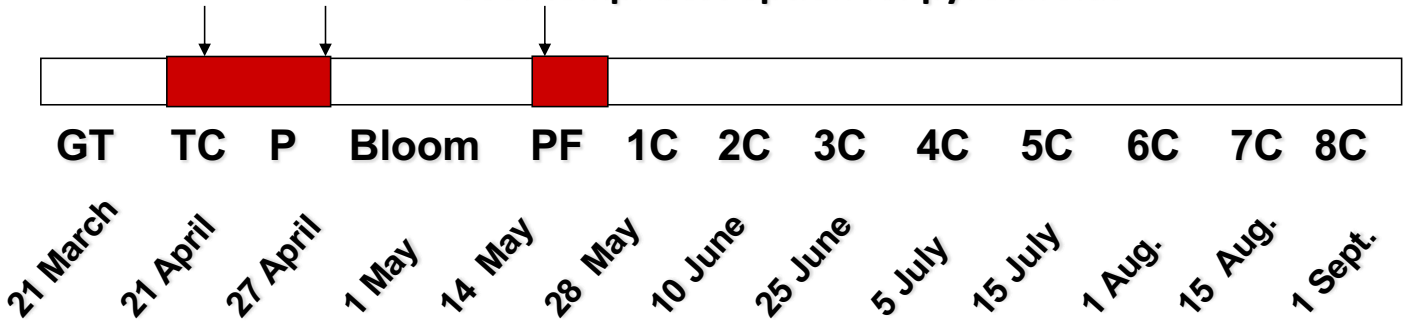
Begin scouting at tight cluster *and* note observation of TPB activity. Movement from flowering broadleaf weeds to apple.

Treatment for TPB should be considered during periods of increasing and prolonged temperatures above 65°F.

Bleeding sites on buds and developing fruit are indicators of TPB injury.

Neonicotinoids - Assail
Excellent choice for T. pyri mgt.

Cool temp. best option for pyrethroids

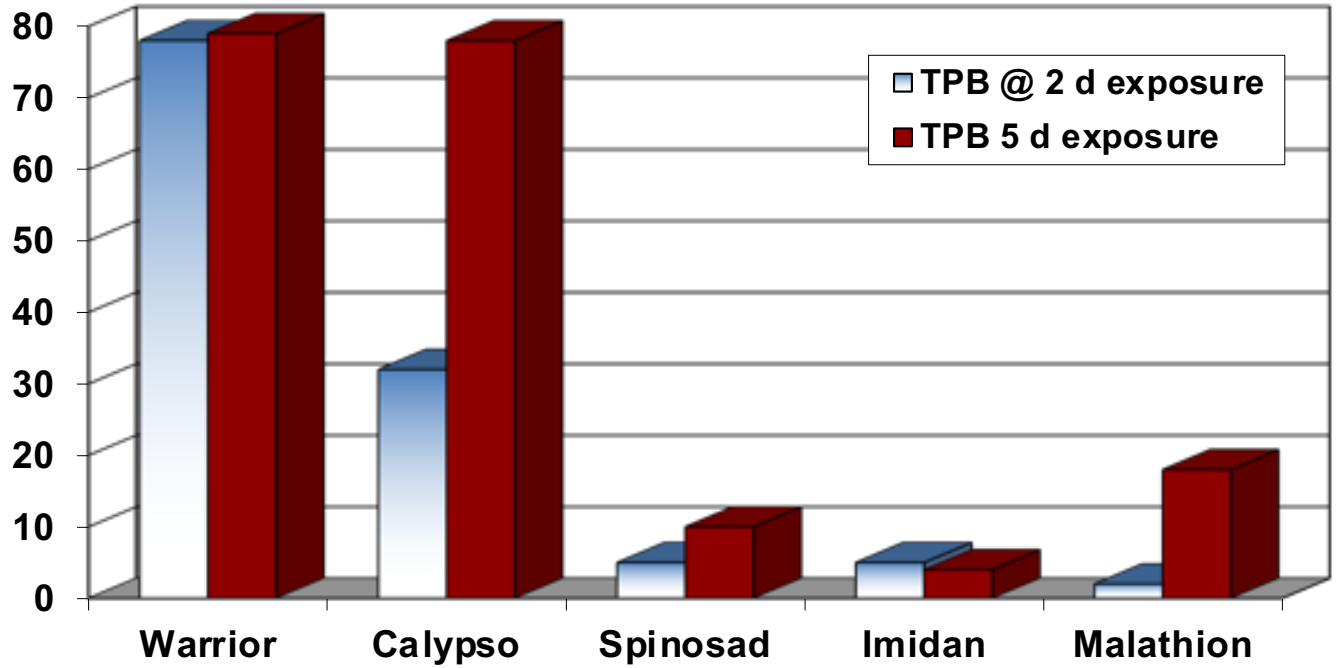


Percent of Apples at Harvest Injured by Tarnished Plant Bug in Three Types of Groundcover Plots.

* Hardman et al., Kentville N.S. Canada 2002

*Weed management reduces TPB injury to fruit.

Efficacy of Insecticides on TPB placed on apple 6d post application



* Hardman et al., Kentville N.S. Canada 2002

Effects of Pre-bloom Applications on TPB Damage on Apple
Cornell's Hudson Valley Lab

Treatment	Rate	Timing	% TPB Fruit Damage
Calypso	4.0 oz. /A	LTC	0.1 a
Calypso	6.0 oz. /A	P	2.5 bcde
Assail 70WP	2.5 oz./A	LTC	0.8 abc
Untreated	-	-	3.3 cde

Late tight-cluster (LTC) on 22 April
Pink (P) on 26 April

Effects of Pre-bloom Applications on TPB Damage on Apple
Cornell's Hudson Valley Lab

Treatment	Rate	Timing	Fruit Damage
Asana XL	5.8 oz. /100	TC, P	0.0 a
Warrior ZT	1.7 oz. /100	TC	1.1 bcd
Assail 70WP	1.1 oz./100	TC	0.4 abc
Actara 25WP	1.7 oz./100	TC	0.2 abc
Calypso	1.0 oz. /100	P	3.5 de
Untreated	-	-	3.3 cde

Late tight-cluster (LTC) on 25 April
Pink (P) on 29 April

Is the Management of Early Season Tarnished Plant Bug Cost effective?

If left untreated = 8.8% TPB Injury

1 application at pink = 5.3% Injury (3.5% less injury)

2 applications at TC & P = 2.5% Injury (5.3% less injury)

Product	Rate/A	Timing	Ginger Gold	Red Delicious
Asana XL	14.5 oz./A	P	5.3 ab	2.6 a
Calypso SC	6.0 oz./A	PF-1C		
Asana XL	14.5 oz./A	TC, P	2.5 a	0.0 a
Calypso SC	6.0 oz./A	PF-1C		
Untreated			8.8 b	3.3 a

House Bill 699
Birds & Bees Protection Act

Senate Bill S699

2021-2022 Legislative Session

Enacts the birds and bees protection act

Brad Hoylman
(D, WF) 27TH SENATE DISTRICT

CURRENT BILL STATUS -
In Senate Committee Environmental Conservation Committee

- Places restrictions on the use of neonicotinoids, specifically the use of treated seed.
- Places restrictions on turf and ornamental uses.
- Requires the DEC to review the latest scientific information concerning neonicotinoid insecticide.
- Originally crafted to ban the sale and use of neonicotinoids in NYS.

San Jose Scale

Pre-Bloom

*** Oil – alone @ 1%**

*** Esteem (w/o oil)**

*** Centuar (w oil)**

*** Venerate XC**

San Jose Scale

PF & 2 Cover

Movento + 0.25% NIS (LI700; oi)

- **Penetrant essential for absorption.**
- **A systemic insecticide, moving throughout the tree to provide control in remote crotch angles and shaded limbs from foliage where SJS can survive air assist applications.**
- **Excellent tool for Wooly Apple Aphid control in summer.**

San Jose Scale

Issues: Oil increases absorption of Captan to cause phytotoxicity to foliage

- Slow drying conditions, wet, high rH post application
- Young, susceptible leaf and fruit tissue without cuticle protection
- Tank mixtures containing surfactants and spreader/stickers that may disrupt waxy cuticle – Oils, urea, calcium chloride, LI-700? Regulaid

Nearly 100% incidence of damage to leaves when oil applied in tank mixture with Captan Gold (Kerik Cox 2013)

COMPATIBILITY AND PLANT SAFETY: CAPTAN 80WDG can be combined safely and effectively at recommended dosage rates with most commonly used fungicides and insecticides, with the exception of oil and strongly alkaline materials. Alkaline materials such as spray lime, lime-sulfur, and Bordeaux mixture will reduce the fungicidal activity of CAPTAN 80WDG. Do not apply CAPTAN 80WDG in combination with or immediately before or closely following oil sprays. Do not allow oil sprays on adjacent crops to drift onto crops which have been or will shortly be treated with CAPTAN 80WDG. The time factor governing the safe interval between CAPTAN 80WDG and oil sprays varies due to general climatic conditions, therefore, consult local agricultural spray programs and authorities to determine the proper timing. The use of spreaders which cause excessive wetting is not advised. Combinations with solvent formulations of organic phosphates should not be used. Combinations of CAPTAN 80WDG and sulfur should not be used on crops sensitive to sulfur. Used at high rates or in drenching sprays, CAPTAN 80WDG may cause a necrotic spotting of tender, immature leaves of certain varieties of apples, peaches, plums, and cherries. This type of injury is most likely to occur in the early cover sprays during long periods of warm, cloudy, humid weather. To avoid the hazard of leaf spotting under such conditions, use CAPTAN 80WDG and other spray materials at lowest recommended rates and avoid drenching trees.

Pre-bloom - San Jose scale

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

Treatment	Quantity	Timing	% mortality per # of days post application				
			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

San Jose Scale

Crawler Stages – Contact insecticides

(2 appls. @ 3-4C; 2 appls @ 5-6C)

*** Admire Pro 4.6SC at (2.8 fl.oz./A) a feeding toxicant (Translaminer)**

*** Assail 30SG (8.0 oz./A) a translaminar feeding and contact**

*** Centaur 0.7WDG (34.5 oz./A) Insect Growth Regulator (IGR)**

*** Esteem 35WP (4-5 oz./A) IGR – does not need a penitrant**

*** Imidan 70WP 70WS (2.13-5.75 lb./A), contact insecticide**

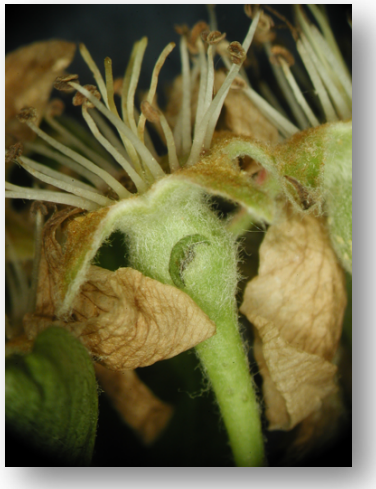
Pre-mix insecticides: contact and feeding activity

***Endigo ZC (5-6 fl.oz./A),**

***Leverage 360 (2.4-2.8 fl.oz./A)**

***Voliam Xpress EC (6-12 fl.oz./A)**

Plum Curculio: Biology



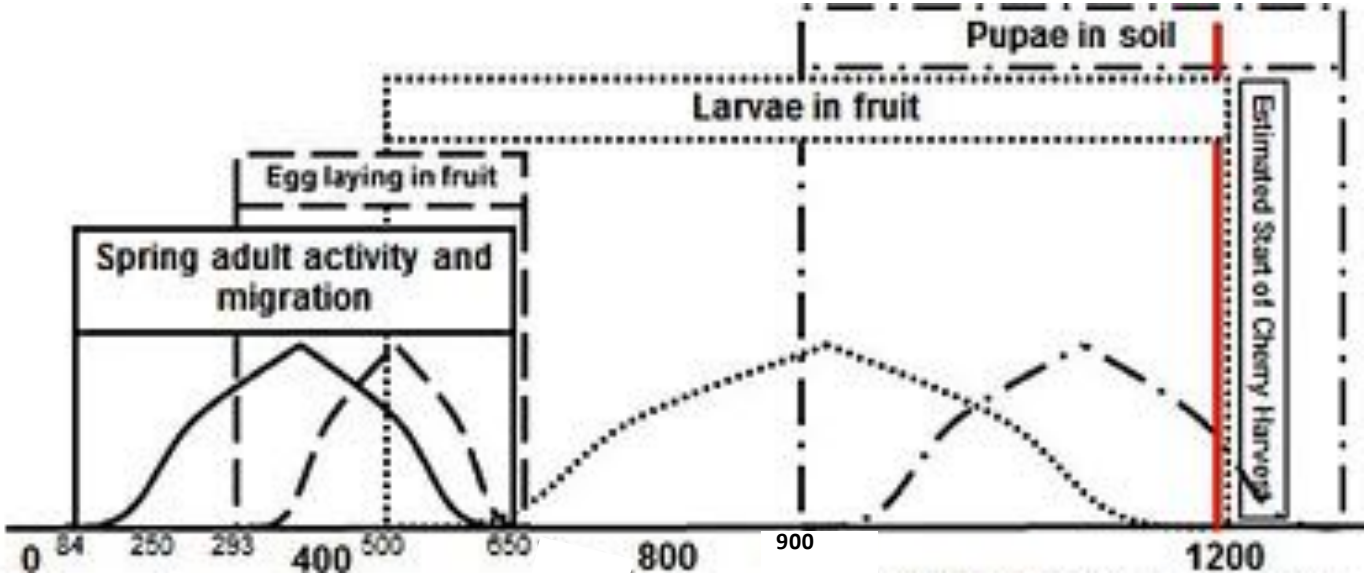
- Adults overwinter in hedgerow and woodland
- Organic orchards have endemic populations.
- Migrate into trees during bloom period
- After mating females carve crescent slit and flap to deposit single egg
- Summer adults emerge from soil to feed on fruit

PC Scar Flap Removed Concealing Egg

PC Larva Feeding in Fruit

PC Larva (L) leave fruit to burrow in soil to Pupate (R)

Plum Curculio: Management Window



Insecticide Modes of Action MOA

Contact
Adults

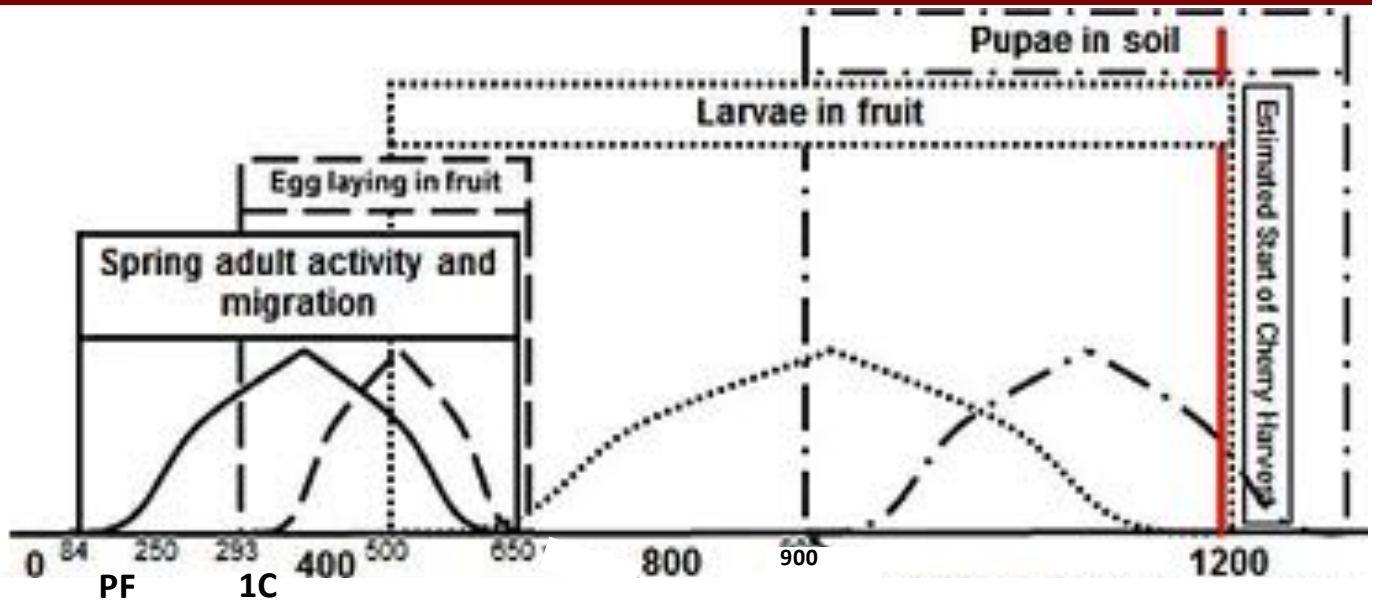
Curative
Egg

Anti-Feedant Contact

Insecticidal modes of activity on plum curculio life stages. (John Wise Michigan State.

Compounds	Chemical class / activity	Crop	Rate	Crop stage and initial control timing (DD50)
Imidan 70W**	Organophosphate	Pome fruit	3 lb	Petal fall (approx. 250 DD)
Lethal via contact	Stone fruit	2.125 lb	Petal fall (approx. 175 DD)	
Actara 25WG**	Neonicotinoid	Pome fruit Stone fruit	4½ oz	Petal fall + 3-5 days (approx. 300 DD)
Lethal, Antifeedant and Curative		Shuck-off (approx. 250 DD)		
Assail 30SG**	Neonicotinoid	Pome fruit	6 oz	Petal fall + 3-5 days (approx. 300 DD)
Lethal, Antifeedant and Curative	Stone fruit		Shuck-off (approx. 250 DD)	
Belay 2.13SC**	Neonicotinoid	Pome fruit	6 oz	Petal fall + 3-5 days (approx. 300 DD)
Lethal, Antifeedant and Curative	Peach	Shuck-off (approx. 250 DD)		
Exirel 10SE	Diamide	Pome fruit	6 oz	Petal fall (approx. 250 DD)
Lethal via ingestion	Stone fruit	Petal fall (approx. 175 DD)		
Verdepryn 100SL	Diamide	Pome fruit	8.2 – 11 oz	Petal fall (approx. 250 DD)
Lethal via ingestion	Stone fruit	Petal fall (approx. 175 DD)		
Delegate 25WG*	Spinosyn	Pome fruit	6 oz	Petal fall (approx. 250 DD)
Lethal via ingestion	Stone fruit	Petal fall (approx. 175 DD)		
Avaunt 30WG	Oxadiazine	Pome fruit	5 oz	Petal fall (approx. 250 DD)
Lethal via ingestion	Stone fruit	Petal fall (approx. 175 DD)		
Venerate XC	Biopesticide	Pome fruit	4-8 qts	Petal fall (approx. 250 DD)
Lethal via ingestion and egg sterilization	METI 1	Stone fruit		Petal fall (approx. 175 DD)
Apta	Lethal via contact	Pome fruit Stone fruit	21-27 fl oz	Shuck-off (approx. 250 DD)
Pyrethroids	Asana, Warrior, Baythroid	Pome fruit Stone fruit	Variable	Petal fall (approx. 250 DD)
Lethal, repellent	Petal fall (approx. 175 DD)			
Rimon* (targeting codling moth, OBLR)	IGR	Pome fruit Stone fruit	20-40 oz	Petal fall (approx. 250 DD)
Egg sterilization				
Esteem* (targeting scale)	IGR	Pome fruit Stone fruit	5 oz	Post-harvest
Adult sterilization				
Leverage 2.7F	Pyrethroid + Neonicitinoid	Pome fruit	4.4-5.1 oz	Petal fall (approx. 250 DD)
Lethal, Repellent, Curative	Stone fruit	4.5-5.1 oz	Shuck-off (approx. 250 DD)	
Voliam Xpress	Pyrethroid + Diamide	Pome fruit	6-12 oz	Petal fall (approx. 250 DD)
Lethal, Repellent	Stone fruit	6-12 oz	Petal fall (approx. 175 DD)	
Voliam flexi	Neonicotinoid + Diamide	Pome fruit	6-7 oz	Petal fall (approx. 250 DD)
Lethal, Antifeedant, Curative	Stone fruit	6-7 oz	Shuck-off (approx. 250 DD)	

Plum Curculio: Management Window

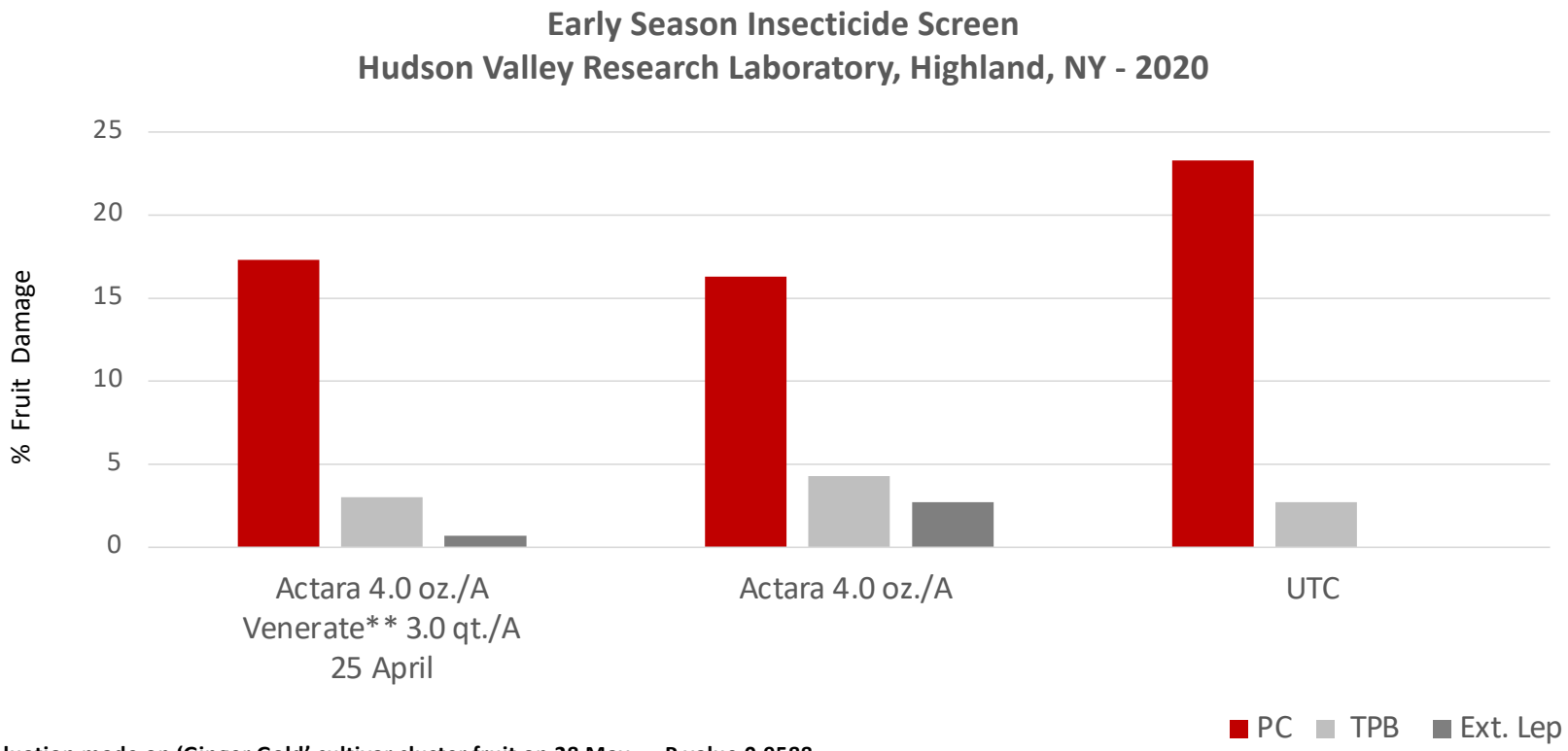


Insecticide Modes of Action MOA

Contact
Adults
Actara, Verdepryn
Imidan, Exirel

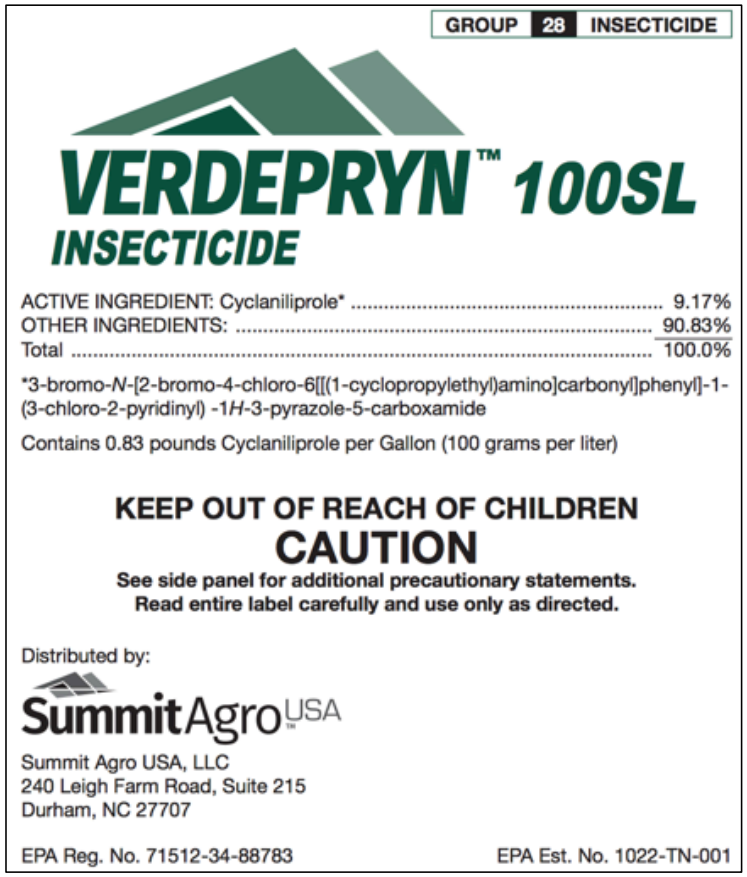
Curative
Egg
Voliam Flexi

Rate Response of Actara at 4.0 oz vs 5.5 oz.



Evaluation made on 'Ginger Gold' cultivar cluster fruit on 28 May. P value 0.9588

New Insecticides



GROUP 28 INSECTICIDE

VERDEPRYN™ 100SL

INSECTICIDE

ACTIVE INGREDIENT: Cyclaniliprole* 9.17%
OTHER INGREDIENTS: 90.83%
Total 100.0%

*3-bromo-*N*-[2-bromo-4-chloro-6[[(1-cyclopropylethyl)amino]carbonyl]phenyl]-1-(3-chloro-2-pyridinyl) -1*H*-3-pyrazole-5-carboxamide

Contains 0.83 pounds Cyclaniliprole per Gallon (100 grams per liter)

KEEP OUT OF REACH OF CHILDREN

CAUTION

See side panel for additional precautionary statements.
Read entire label carefully and use only as directed.

Distributed by:

SummitAgro USA

Summit Agro USA, LLC
240 Leigh Farm Road, Suite 215
Durham, NC 27707

EPA Reg. No. 71512-34-88783 EPA Est. No. 1022-TN-001

Diamide Class (Altacor, Exiril) IRAC Group 28: Ryanodione Receptor

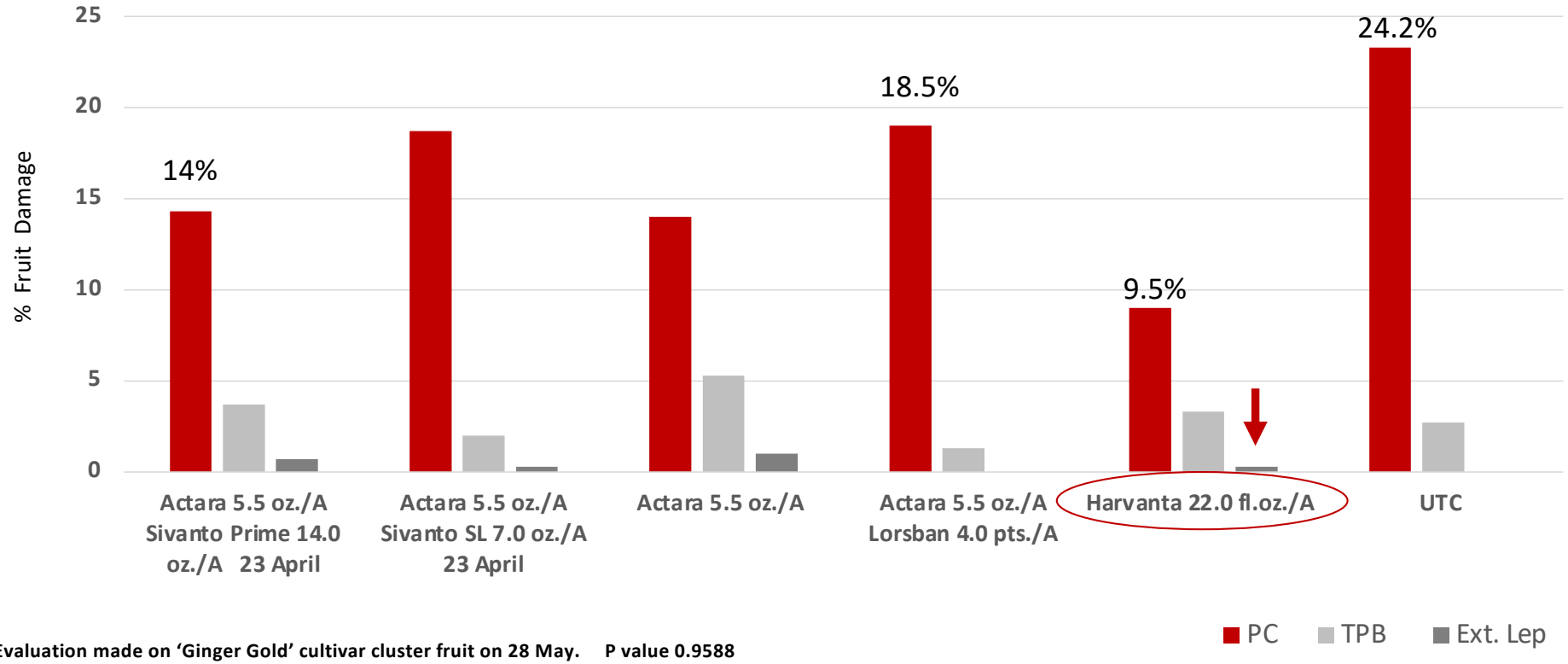
Cyclanilprole 9.17%
Verdepryn 100SL @ 5.5-11.0 FL.OZ. /A

Label: Pome Fruit Insect Pest Complex Management

- **Plum Curculio**
- European Apple Sawfly
- Leafhopper complex
- **Lepidopteran Complex**
  - Leafroller
  - Internal worm (codling Moth)
  - Spotted Tentiform Leafminer
  - European Corn Borer

*Not for sale, sale into, distribution and/or use in Nassau and Suffolk Counties of New York State.

Early Season Insecticide Screen
Hudson Valley Research Laboratory, Highland, NY - 2020



Evaluation made on 'Ginger Gold' cultivar cluster fruit on 28 May. P value 0.9588
Harvanta 4.58%

Treatment/formulation	Rate amt product/acre	Mean #		Mean % fruit injury	
		Scars/fruit	Larvae/fruit	Feed	Egg scars
IKI-3106 50SL	22.0 oz	0.46b	1.8ab	4.0b	30.0b
IKI-3106 50SL	27.0 oz	0.41b	1.0ab	5.0ab	28.0b
Apta +	21.0 oz	0.86b	2.5 ab	7.0ab	42.0b
MSO	0.25%				
Asana XL	14.0 oz	0.56b	1.5ab	7.0ab	41.0b
Venerate	3.0 pts	2.84a	2.5ab	25.0a	93.0a
Actara 25WG	5.5 oz	0.37b	0.0b	3.0b	27.0b
UTC		3.51a	6.0a	17.0ab	91.0a

IKI-3106 50SL (cyclaniliprole), Diamide

Plum Curculio Control on Nectarine, 2015 Anne L. Nielsen, Ann Rucker

		% Damaged fruit				
Treatment	**Rate/acre**	**29 Apr**	**6 May**	**13 May**	**21 May**	**5 Jun**
Cyclaniliprole 4.6% EC	22.0 fl oz	4.5a	11.5a	10.0a	17.5a	13.0a
Imidan 70WP	3.5 lb	7.5a	18.0a	14.0a	14.5a	13.5a
Actara 25WDG	5.0 oz	5.0a	11.0a	15.5a	16.5a	16.5a
Check	—	30.0b	61.5b	46.0b	59.5b	33.3a

Means within a column followed by the same letter are not significantly different (LSD, $P \geq 0.05$).

Evaluation of Cyclaniliprole for Control of Plum Curculio on Apples, 2015 J. F. Walgenbach, NC State

Codling Moth Biology

Codling Moth, C*ydia pomonella* (L.) (Lepidoptera:Tortricidae)

- Eurasian Invasive introduced pest
- Wide host range of fruit and nuts
- Feeds on developing seeds within the fruit.
- CM is a primary pest of pome fruit with 2 generations / year.
- Once established within the orchard the insect can become

endemic, having constant exposure to pest management tools year after year, leading to reduced insecticide susceptibility and resistance.

Codling Moth
Model Based Precision Thresholds

- 1st generation **codling moth** (CM) adult flight occurred on 15th May (Bloom)

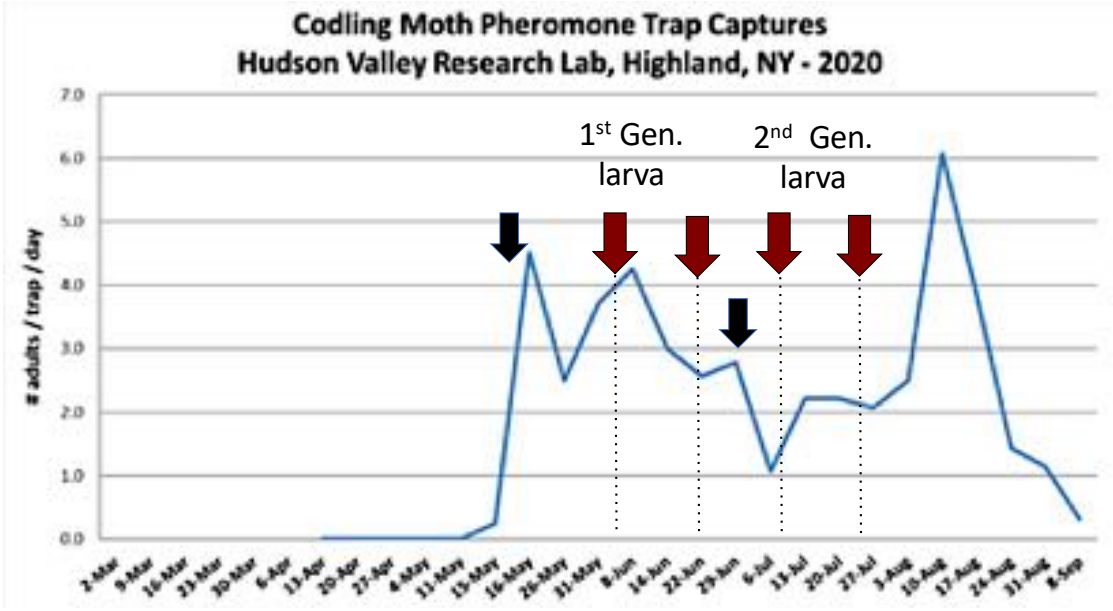
Larval emergence predicted for 30th May using **220 DD_{50}** from the biofix.

- The 2nd generation CM management adult emergence using 29th June

Larval emergence predicted **250 DD_{50}** to occur on 8th July

Biofix

Application Date



Codling Moth
Mating Disruption

Cidetrak CMDA Combo Meso-A

Codling moth pheromone mating disruption

EPA Reg. No. 51934-16

- Dispenser registered in pome fruits (≥ 5 Acres)
- "Meso" formulation releases for 120-150 days
- **Hand-applied at 36 dispensers per acre**.
- Monitor CM using high release lures
- Apply insecticides 1st yr; along boarders 2nd yr.
- Very effective combined with CM granulosis virus

EVALUATION OF MATING DISRUPTION FOR CONTROLLING DOGWOOD BORER ON APPLE
Commercial Apple Farm, Hudson Valley, NY 2020
Apple: *Malus domestica*
Dogwood Borer (DWB) *Synanthedon scitula* (Harris)

This trial compares two DWB mating disruption products for DWB, DWB MESO and ISOMATE PTB DUAL, with grower standard management (Table 24). The trial was conducted at a commercial orchard in Modena, NY using a randomized block design with 3 replicates of 3 treatments. Each replicate was 3 acres; ages of trees and rootstocks varied within and between treatments; treatments were randomized across orchard blocks to lessen tree age and rootstock effects. The site has a history of moderate DWB pressure. Mating disruption dispensers (32/A) and PHEROCON DWB lure baited PHEROCON 1C traps (2 per 3A plot) were deployed on 26 May, prior to the first flight of DWB.
In this trial, the cooperating grower decided DWB management was not needed, therefore, the grower standard is untreated for DWB. Traps were checked weekly from 5 June until 25 September, and lures were replaced every 4 weeks. Trap liners were replaced as needed, at least every 4 weeks. Spring evaluation of DWB in trunks and burr knots was not possible due to COVID19 cases among techniicians. An end of season evaluation of trunks was conducted on 30 and 31 July (Table 25).

Trial map at Sunshine Orchard in Modena, NY. 86.5 total acres, 2.0 mile perimeter. "R" denotes "replicate"; "T" denotes "treatment".

DWB Mating Disruption: treatments

Treatment	Trap Canopy Location	Lure	Dispenser Rate
DWB MESO	**Center**	**Pherocon DWB**	**32/A**
ISOMATE PTB DUAL	**Center**	**Pherocon DWB**	**32/A**
Grower Std	**N/A**	**Pherocon DWB**	**N/A**

DWB Mating Disruption: DWB Measures

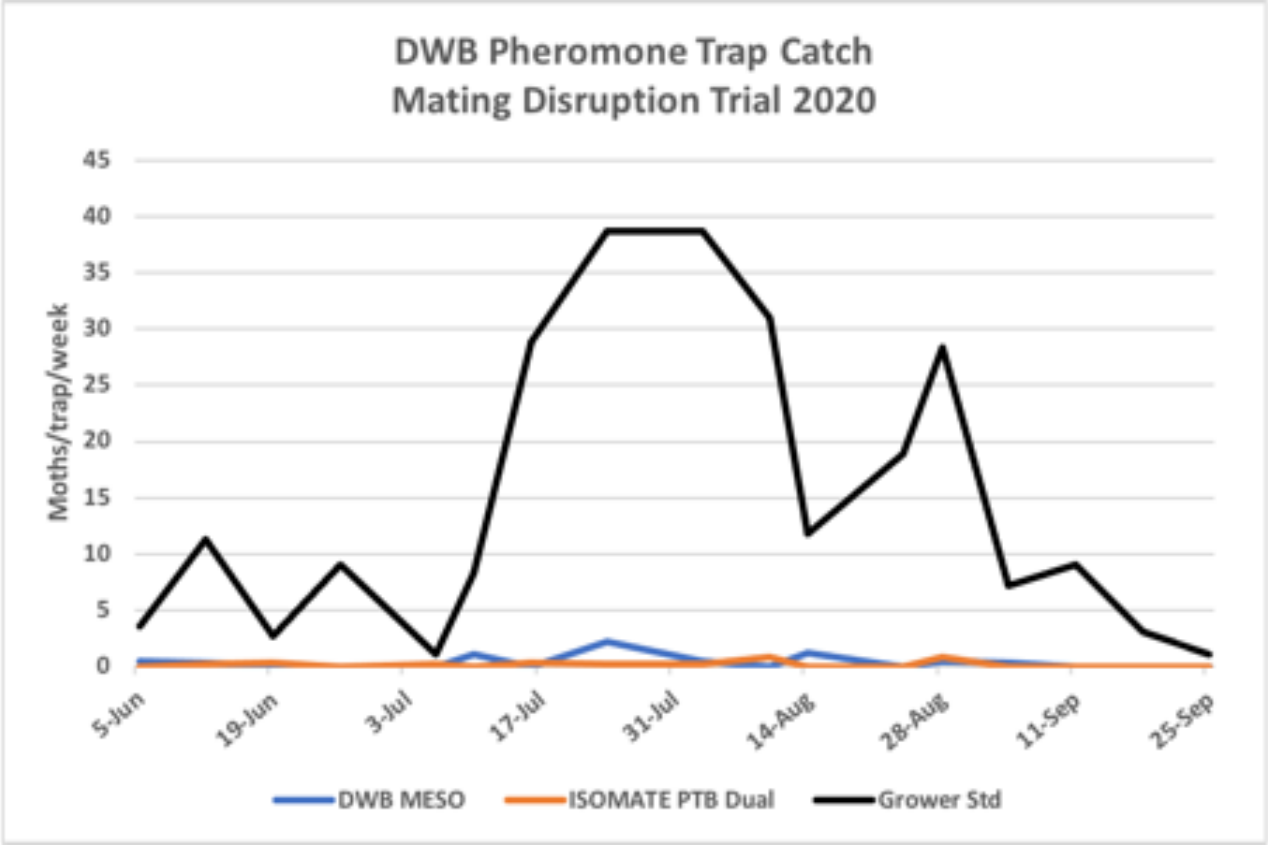
Treatment	% Trees with DWB Frass		% Trees with DWB Larvae	Rating (0-3) Burr Knots	
DWB MESO	15.0	AB	2.7	0.5	B
ISOMATE PTB DUAL	24.0	A	2.7	1.2	A
Grower Std	12.7	B	1.3	1.0	A
P-value	0.0252		Non-Sig	0.0001	

DWB Mating Disruption: DWB Trap Captures

Treatment	Season-Long Pheromone Trap Capture
DWB MESO	6.5
ISOMATE PTB DUAL	3.0
Grower Std	252.2*
P-value	0.0863*

*Two traps in the Grower Standard consistently caught high numbers of DWB adults, but other traps in the Grower Standard did not. This imbalance explains why the numbers appear to be vastly different but are not showing as statistically significant.

DWB Mating Disruption: DWB Trap Captures

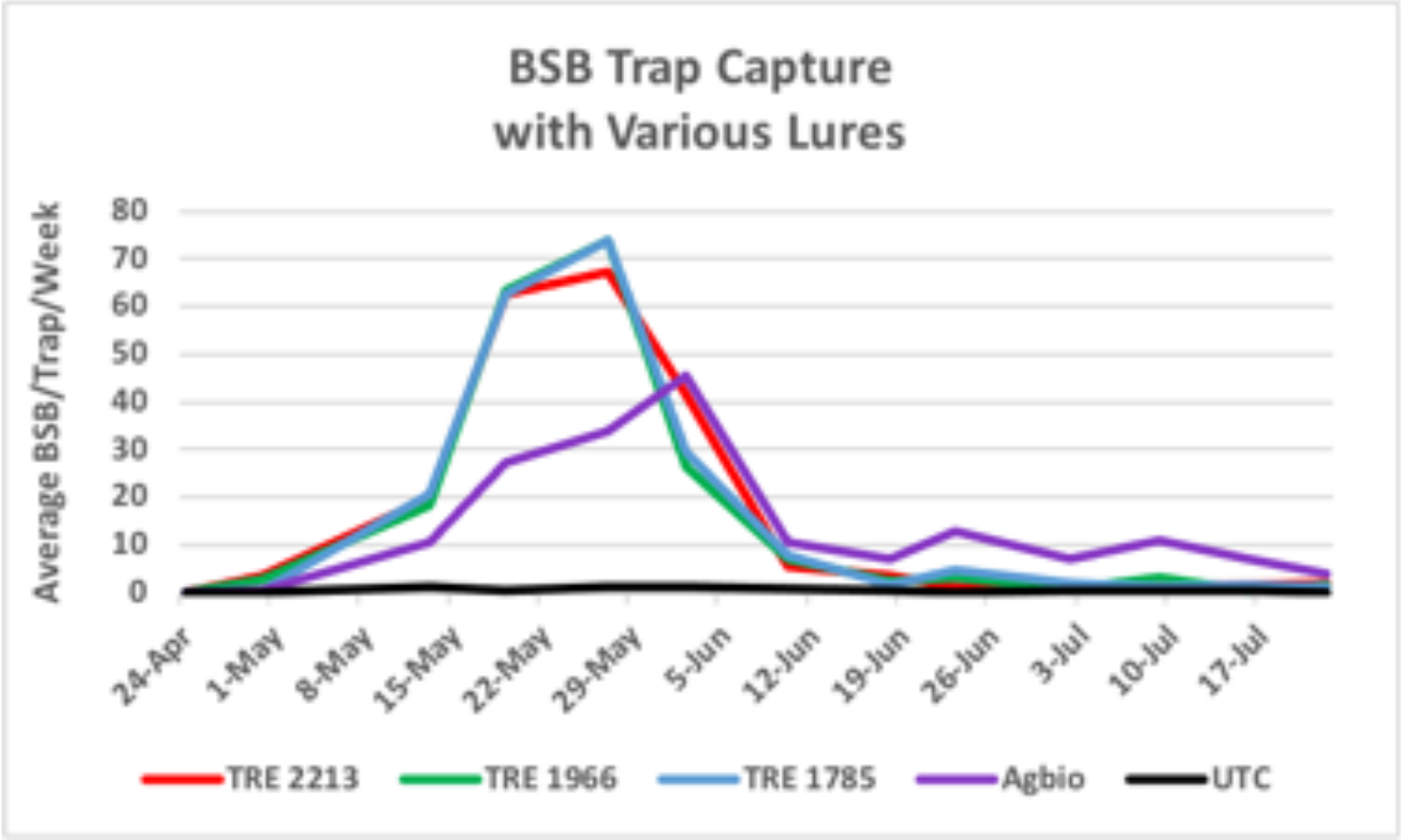


Trap catch numbers averaged across 6 traps per treatment

Black Stem Borer: Lure Comparison

Lure	Season-Long Pheromone Trap Capture	
TRE 2213	214.0	A
TRE 1966	209.7	A
TRE 1785	204.3	A
AgBio	184.7	A
UTC	6.3	B
P-value	0.0011	

Black Stem Borer: Lure Comparison



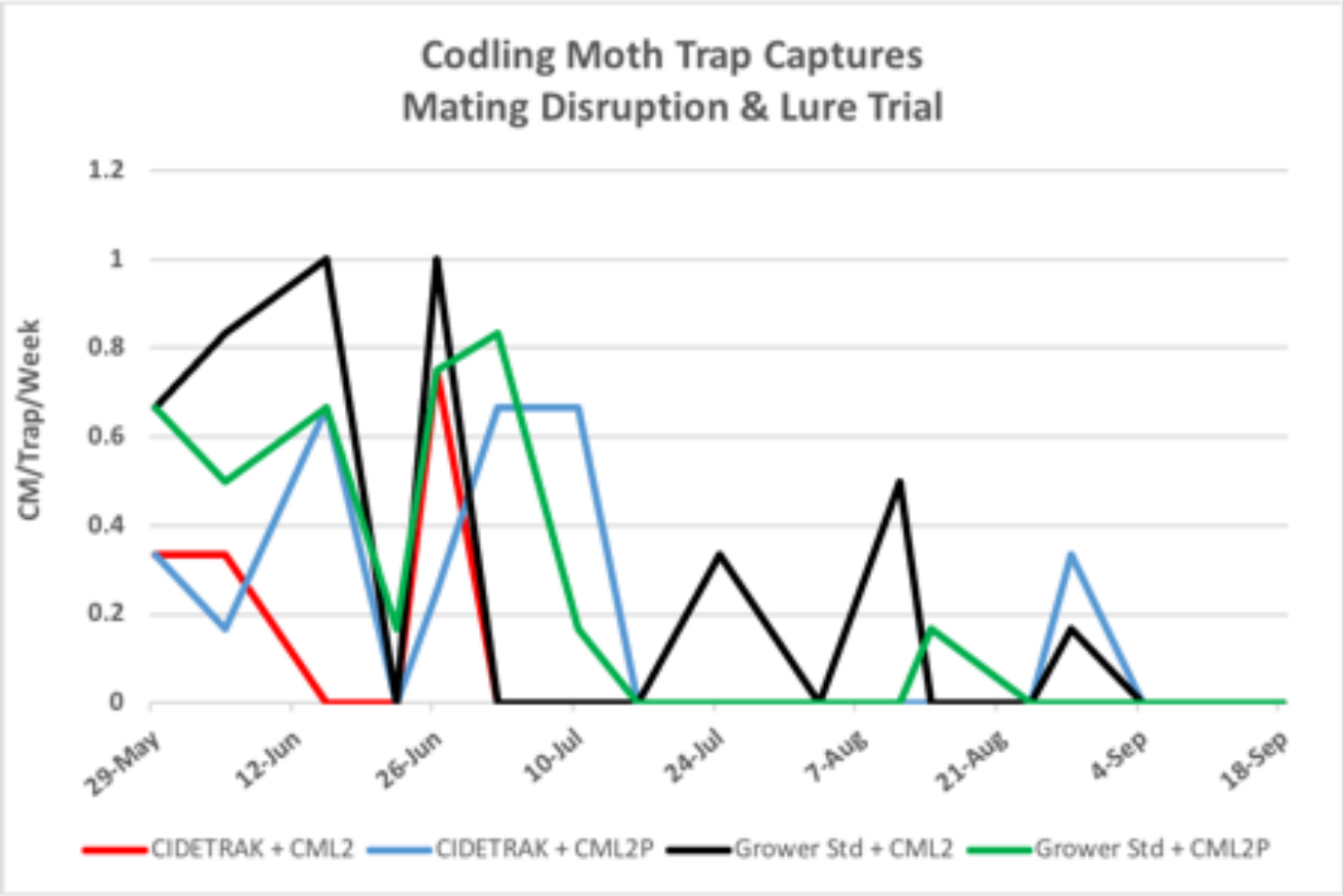
Codling Moth Mating Disruption: treatments

Treatment	Trap Canopy Location	Lure	Dispenser Rate
CIDETRAK CDMA + LR MESO	**Upper 1/3**	**PHEROCON CML2**	**32/A**
CIDETRAK CDMA + LR MESO	**Upper 1/3**	**PHEROCON CML2P**	**32/A**
Grower Std	**N/A**	**PHEROCON CML2**	**N/A**
Grower Std	**N/A**	**PHEROCON CML2P**	**N/A**

CM Mating Disruption: Season Long Trap Capture

Treatment	Lure	Season-long Trap Capture
CIDETRAK CDMA + LR MESO	PHEROCON CML2	2.7
CIDETRAK CDMA + LR MESO	PHEROCON CML2P	3.3
Grower Std	PHEROCON CML2	6.7
Grower Std	PHEROCON CML2P	9.2
P-value		0.0519

Codling Moth: Trap Capture throughout Season



Leaf Roller Mating Disruption: treatments

Treatment	Trap Canopy Location	Lure	Dispenser Rate
CIDETRAK CDMA + LR MESO	Upper 1/3	PHEROCON LR	32/A
CIDETRAK CDMA + LR MESO	Upper 1/3	PHEROCON LR COMBO DUAL	32/A
Grower Std	N/A	PHEROCON LR	N/A
Grower Std	N/A	PHEROCON LR COMBO DUAL	N/A

Mating Disruption: OBLR Season Long Trap Capture

Treatment	Lure	Season-long Trap Capture	
CIDETRAK CDMA + LR MESO	PHEROCON LR	0.0	B
CIDETRAK CDMA + LR MESO	PHEROCON LR COMBO DUAL	0.1	B
Grower Std	PHEROCON LR	1.0	A
Grower Std	PHEROCON LR COMBO DUAL	0.7	A
P-value		0.0153	

CM & OBLR Mating Disruption: Almost no Fruit Damage

Treatment	% Fruit Infested CM	% Fruit Infested LR
CIDETRAK CDMA + LR MESO	**0.02**	**0.0**
Grower Std	**0.02**	**0.0**

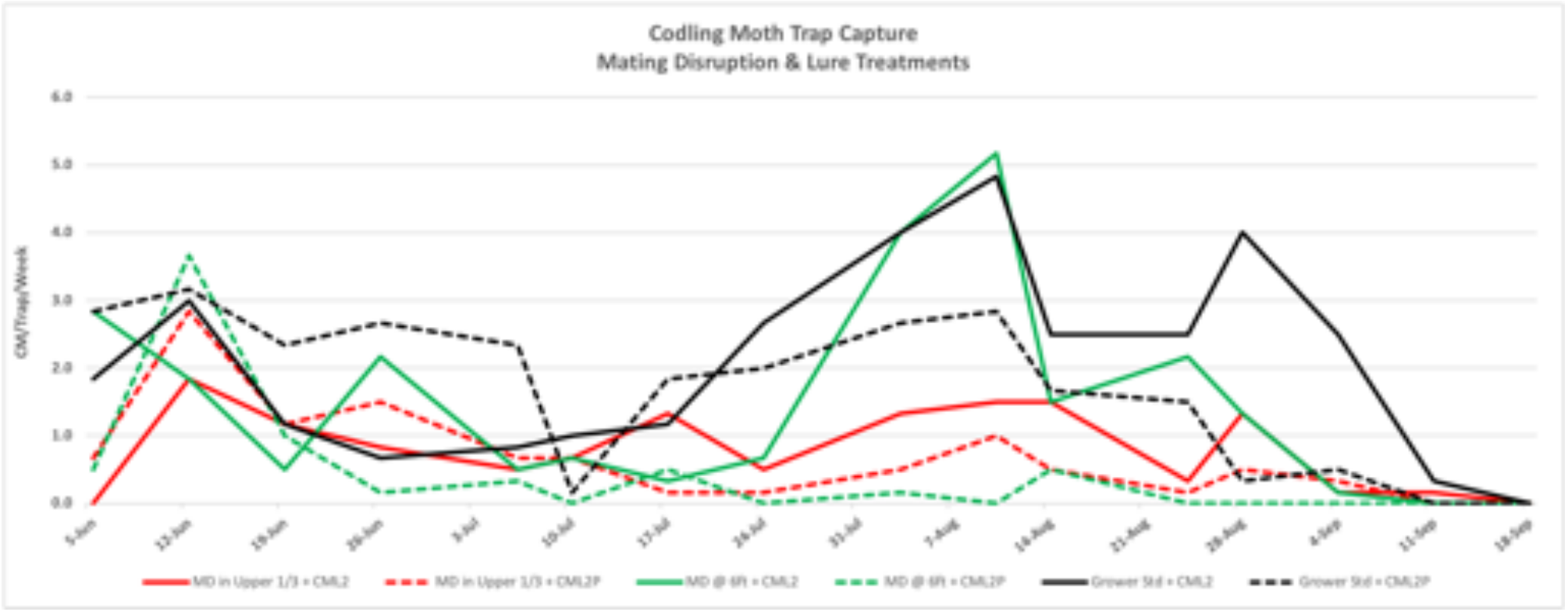
CM (Clarke) Mating Disruption: treatments

Treatment	Trap Canopy Location	Dispenser Rate	Lure
CIDETRAK CDMA + OFM MESO	Upper 1/3	32/A	PHEROCON CML2
CIDETRAK CDMA + OFM MESO	Upper 1/3	32/A	PHEROCON CML2P
CIDETRAK CDMA + OFM MESO	Arm's Length	32/A	PHEROCON CML2
CIDETRAK CDMA + OFM MESO	Arm's Length	32/A	PHEROCON CML2P
Grower Std	N/A	N/A	PHEROCON CML2
Grower Std	N/A	N/A	PHEROCON CML2P

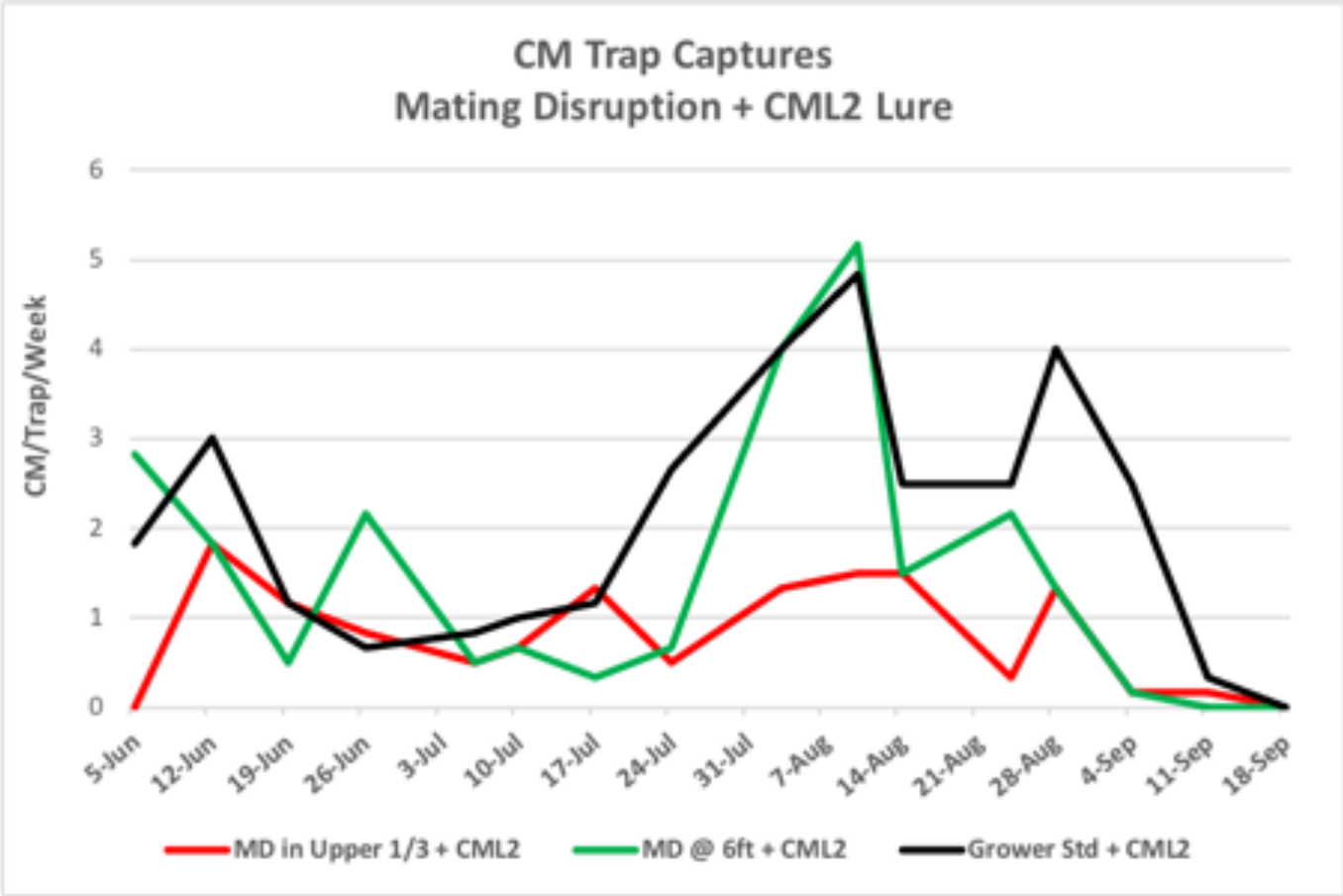
CM (Clarke) Mating Disruption: Trap Capture

Treatment	Lure	Trap Canopy Location	CM season-long trap capture
CIDETRAK CDMA + OFM MESO	CML2	Upper 1/3	13.2
CIDETRAK CDMA + OFM MESO	CML2P	Upper 1/3	10.8
CIDETRAK CDMA + OFM MESO	CML2	Arm Length	23.8
CIDETRAK CDMA + OFM MESO	CML2P	Arm Length	6.8
Grower Std	CML2	N/A	33.0
Grower Std	CML2P	N/A	26.8
		P-Value	0.0803 (NS)

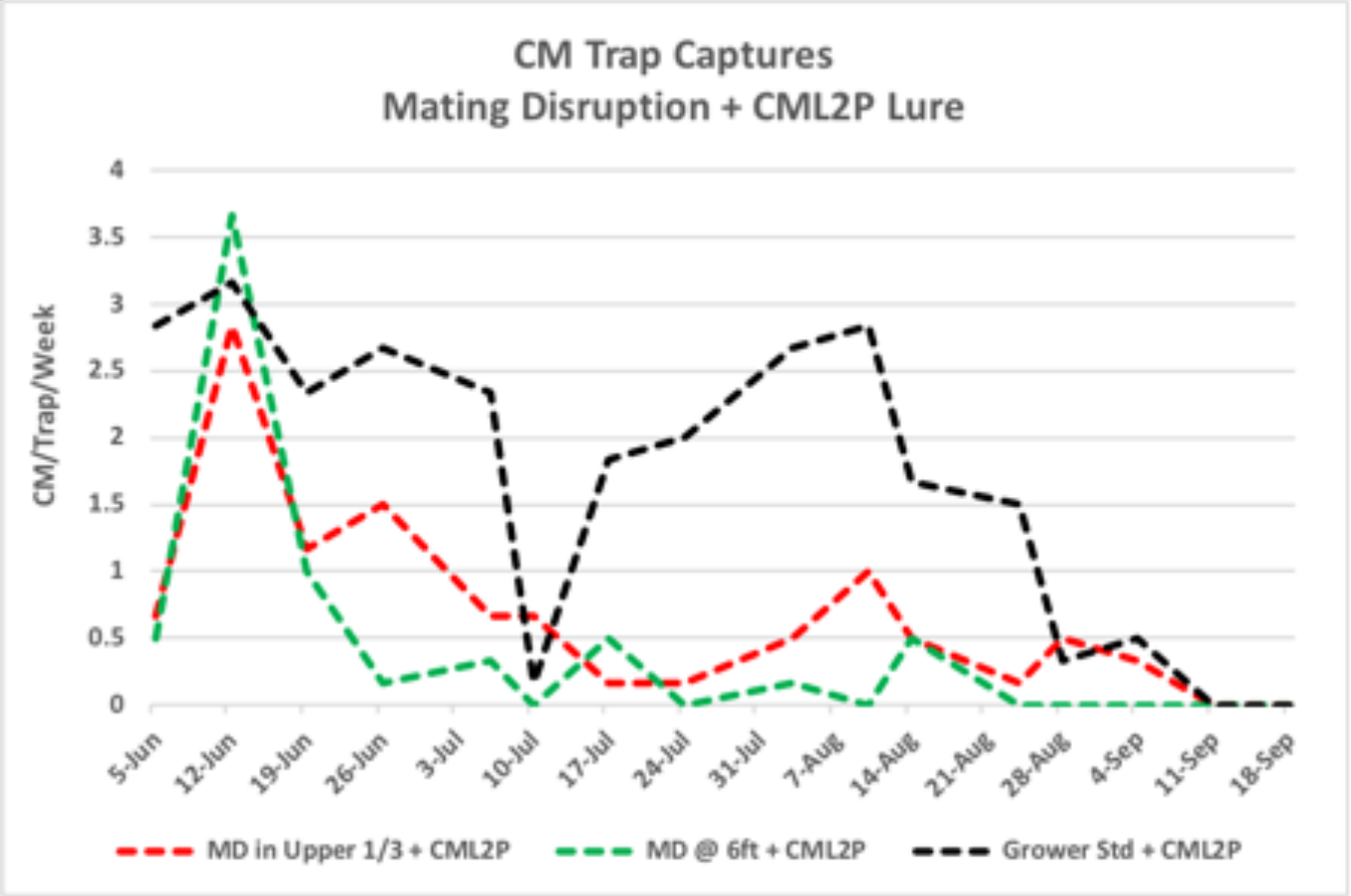
CM (Clarke) Mating Disruption: Season Long Trap Capture



CM (Clarke) Mating Disruption: Season Long Trap Capture



CM (Clarke) Mating Disruption: Season Long Trap Capture



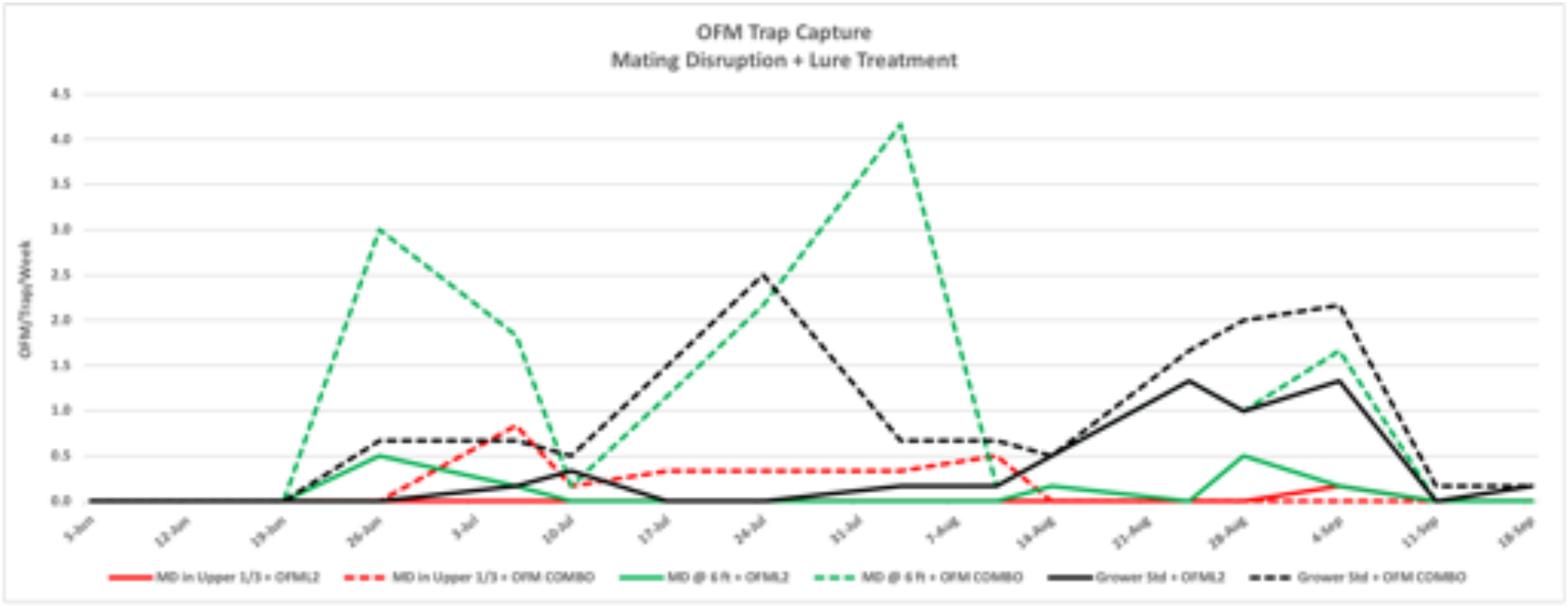
OFM (Clarke) Mating Disruption: treatments

Treatment	Trap Canopy Location	Disp. Rate	Lure
CIDETRAK CDMA + OFM MESO	Upper 1/3	32/A	PHEROCON OFM
CIDETRAK CDMA + OFM MESO	Upper 1/3	32/A	PHEROCON OFM COMBO
CIDETRAK CDMA + OFM MESO	Arm's Length	32/A	PHEROCON OFM
CIDETRAK CDMA + OFM MESO	Arm's Length	32/A	PHEROCON OFM COMBO
Grower Std	N/A	N/A	PHEROCON OFM
Grower Std	N/A	N/A	PHEROCON OFM COMBO

OFM (Clarke) Mating Disruption: Trap Capture

Treatment	Lure	Trap Canopy Location	OFM season-long trap capture
CIDETRAK CDMA + OFM MESO	OFM	Upper 1/3	2.5
CIDETRAK CDMA + OFM MESO	OFM combo	Upper 1/3	0.2
CIDETRAK CDMA + OFM MESO	OFM	Arm Length	17.2
CIDETRAK CDMA + OFM MESO	OFM combo	Arm Length	1.5
Grower Std	OFM	N/A	13.8
Grower Std	OFM combo	N/A	5.2
		P-Value	NS

OFM (Clarke) Mating Disruption: Season Long Trap Capture



CM & OFM Mating Disruption: Low Fruit Damage

Treatment	Tree Canopy Location	% Fruit Infested CM		% Fruit Infested OFM	
CIDETRAK CDMA + OFM MESO	Upper 1/3	0.0	B	0.0	B
CIDETRAK CDMA + OFM MESO	Arm's Length	1.4	A	0.9	A
Grower Std	N/A	1.1	A	0.3	B
	P-Value	0.0803		0.0005	

Exirel®

- **EPA Reg No. 352-859**
- **Active Ingredient: Cyazypyr (Cyantraniliprole) 10.2%**
- **IRAC Group 28**
- **Diamide group; same group as Altacor; Rynaxypyr®**

Exirel®

- **Minimum application interval: 7d**
- **Max. 0.4 lb ai/A per season**
- **Max. of 3 apps of Group 28 insecticides / generation**
- **Codling moth – 1st application at first hatch @ 10-14d**
- **Summer OBLR - 1st application at first hatch**
- **Overwintering OBLR at pink to petal fall**
- **RAA beginning at GT to pink**

Evaluations Of Insecticide Schedules For Controlling Codling Moth On Apple.
N.Y.S.A.E.S. Hudson Valley Lab. Highland N.Y. 2014 (24 June)

Trmt.	Rate	Timing	Ginger Gold	Red Delicious
Actara	5.5 oz./A	PF-1C	0.0 a	0.0 a
Delegate WG	6.0 oz./A	1st gen. CM		
Actara	5.5 oz./A	PF-1C	0.0 a	0.0 a
Exirel	13.5.0 oz./A	1st gen. CM		
Actara	5.5 oz./A	PF-1C	0.0 a	0.0 a
Belt	5.0 fl.oz./A	1st gen. CM		
Actara	5.5 oz./A	PF-1C	2.6 c	3.0 b
Lorsban 4E	64.0 oz./A	DD		
Actara	5.5 oz./A	PF-1C	5.2 d	2.5 b
Centaur	46.0 oz./A	DD		
UTC			6.0 d	4.0 ab

SPEAR®-LEP

For Control of Lepidopterans

OPEN

GROUP	32	INSECTICIDE

Biological Insecticide

Control of Lepidopteran pests in fruits, vegetables and other high-value field crops.

Active Ingredient: GS-omega/kappa-Hxtx-Hv1a 2.0%
Other Ingredients: 98.0%
Total: 100.0%

KEEP OUT OF REACH OF CHILDREN

CAUTION

See back panel for Precautionary Statements, First Aid, and Storage and Disposal.

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 eye. • Call a poison control center or doctor for treatment advice.
If on skin or clothing	• 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.

HOTLINE 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 1-800-535-5053 {and 1-352-323-3500 for International} for emergency medical treatment information.

Produced for:
Vestaron Corporation
600 Park Offices Drive, Suite 117
Research Triangle Park, NC 27709

EPA Reg. No.: 88847-6
EPA Est. No.: Printed on Container
Made in USA

VESTARON
THE POWER OF PEPTIDES™

- Peptide-based Bio-pesticide
- Labeled for pome and stone fruits
- To be tank mixed with a Bt product (Leprotec)

Crop	Insect Pest	Application Rate (Pint/acre)
Pome and Stone fruits **Such as:** Apples, Pears, Quince, Prunes, Apricots, Cherries, Nectarine, Peaches, Plums, Prunes **Nut Trees** **Such as:** Almonds, Filbert, Chestnuts, Walnuts, Pecans	Variegated leafroller Redbanded Leafroller Walnut Caterpillar Coding moth Cutworms Filbert Leafroller Oblique Banded Leafroller Cankerworms Fruitworms Winter moth (Apples only)	1.0 - 2.0
	Pandemis Leafroller European grapevine moth (crymax) Hickory shuckworm Citrus cutworm Navel Orangeworm Redhumped Caterpillar Tent Caterpillar Omnivorous leafroller Tortix Moth Peach twig borer Fruittree leafroller Gypsy moth Tufted Apple Budmoth Fall Webworm	

APPLICATION RATES FOR SPEAR - LEP + *BACILLUS THURINGIENSIS* IN A TANK MIX ON THE FOLLOWING CROPS

Pre-harvest Interval (PHI) = 0 days

LEPROTEC®

OPEN

FOR OUTDOOR FOOD, NON-FOOD, AND GREENHOUSE

AQUEOUS BIOLOGICAL INSECTICIDE

Active Ingredient: *Bacillus thuringiensis* ssp. *kurstaki* strain EVB-113-19 fermentation solids, spores, and insecticidal toxin.....14.49%*

Other Ingredients:.....85.51%

TOTAL:.....100.00%

*Potency: 17,500 Cabbage Looper Units (CLU) per mg of product (equivalent to 76 billion CLU per gallon of product) The percent active ingredient does not indicate product performance and potency measurements are not federally standardized.

KEEP OUT OF REACH OF CHILDREN

CAUTION

See back panel for additional first aid and precautionary statements.

FIRST AID	
If on skin or clothing	• 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 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 eye. • Call a poison control center or doctor for treatment advice.

HOTLINE NUMBER - Have the product container or label with you when calling a poison control center or doctor or when going for treatment. You may contact your local poison control center at 1-800-222-1222 for emergency and medical information. For information concerning this product, call the National Pesticide Information Center (NPIC) at 1-800-858-7378. Open from 8:00AM to 12:00PM Pacific Time, Mon-Fri.

Distributed by:
Vestaron Corporation
4717 Campus Drive
Kalamazoo, MI 49008

EPA Registration No.: 89046-12-88847
EPA Establishment No.: 89046-CAN-2
Use this product within 18 months of the date of manufacture.
Date of Manufacture: _____
Lot number: _____

NET CONTENTS: 1 GALLON (128 FL OZ)

03/14/2019v1

VESTARON
THE POWER OF PEPTIDES™

Treatment Schedule for Seasonal Apple Insecticide Screen
Hudson Valley Research Laboratory, Highland, NY - 2019

5.	Altacor 35 WG*	4.0 oz./A	PF, 1-8C	17 May, 3, 11, 24 June, 3, 23 July, 11, 20 Aug
	Actara*	4.0 oz./A	PF, 1C	17 May, 3 June
6.	Actara*	4.0 oz./A	PF, 1C	17 May, 3 June
	Spear-Lep*	32 fl.oz./A	1st gen CM	3, 11, 24 June, 3 July
	Leprotec*	16.0 fl.oz./A	1st gen CM	3, 11, 24 June, 3 July
	Exirel	20.5 fl.oz./A	2nd gen. CM	23 July 11, 20 Aug
7.	Actara*	4.0 oz./A	PF, 1C	17 May, 3 June
	Spear-Lep*	32.0 fl.oz./A	1st gen CM	3, 11, 24 June, 3 July
	Leprotec*	16.0 fl.oz./A	2nd gen CM	23 July 11, 20 Aug
8.	Actara*	4.0 oz./A	PF, 1C	17 May, 3 June
	Exirel	20.5 fl.oz./A	1st & 2nd gen CM	11, 24 June, 3, 23 July, 11, 20 Aug
	UTC			

* LI-700 @ 0.25% was added to spray solution throughout the season

Table 13a **Evaluations of Insecticides for Controlling Early Season Insect Complex on Apple [a]**
Hudson Valley Research Laboratory, Highland, NY - 2019

Trmt.	Formulation	Rate	Incidence (%) of insect damaged cluster fruit						
			PC	TPB	Int. LEP	Ext. LEP	EAS	SJS	Clean
5.	Altacor 35 WG*	4.0 oz./A	24.3	0.8	1.3 cd	4.5 bc	0.0	47.5	39.3 ab
	Actara	4.0 oz./A							
6.	Actara*	4.0 oz./A	24.6	1.0	10.5 bc	14.0 ab	0.0	6.0	45.2 ab
	Spear-Lep	32 fl.oz./A							
	Leprotec	16.0 fl.oz./A							
	Exirel	20.5 fl.oz./A							
7.	Actara*	4.0 oz./A	22.0	2.8	12.8 b	11.0 abc	0.3	6.3	51.5 ab
	Spear-Lep	32.0 fl.oz./A							
	Leprotec	16.0 fl.oz./A							
8.	Actara*	4.0 oz./A	18.9	2.3	2.8 bcd	2.3 bc	0.3	35.3	46.0 ab
	Exirel	20.5 fl.oz./A							
	UTC		36.6	0.8	47.3 a	25.7 a	0.3	19.2	6.1 b
P value for transformed data			0.2827	0.1960	0.0001	0.0001	0.9164	0.3697	0.0235

* Evaluation made on 'Ginger Gold' cultivar on 31 July. Applications specifically timed for emergence of SJS nymph and apple maggot. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were transformed using arcsine(sqrt(x)) prior to ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.25%.

Evaluations of Insecticides for Controlling Early Season Insect Complex on Apple [a]
Hudson Valley Research Laboratory, Highland, NY - 2019

	Trmt. / Formulation	Rate	Incidence (%) of insect damaged cluster fruit					
			Lf. Roller	CM	AMP	AMT	SB	Clean
5.	Altacor 35 WG*	4.0 oz./A	0.0 c	0.5 d	0.8 b	0.3 b	0.0	39.3 ab
	Actara	4.0 oz./A						
6.	Actara*	4.0 oz./A	2.0 abc	7.8 bc	4.5 ab	4.0 ab	0.5	45.2 ab
	Spear-Lep	32 fl.oz./A						
	Leprotec	16.0 fl.oz./A						
	Exirel	20.5 fl.oz./A						
7.	Actara*	4.0 oz./A	3.0 ab	9.5 bc	3.3 ab	2.0 ab	0.0	51.5 ab
	Spear-Lep	32.0 fl.oz./A						
	Leprotec	16.0 fl.oz./A						
8.	Actara*	4.0 oz./A	0.0 c	1.0 cd	0.3 b	0.3 b	0.8	46.0 ab
	Exirel	20.5 fl.oz./A						
	UTC		6.4 a	27.0 a	18.9 a	8.3 a	0.5	6.1 b
P value for transformed data			0.1746	0.0001	0.0038	0.0027	0.6205	0.0235

* Evaluation made on 'Ginger Gold' cultivar on 31 July. Applications specifically timed for emergence of SJS nymph and apple maggot. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were transformed using arcsine(sqrt(x)) prior to ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.25%.

Treatment Schedule for Seasonal Apple Insecticide Screen
Hudson Valley Research Laboratory, Highland, NY - 2019

	Treatment/Formulation	Rate	Phenology / Timing	Application Dates
1.	Compound A*	6.16 fl.oz./A	PF, 1-8C	17 May, 3, 11, 24 June, 3, 23 July, 11, 20 Aug
	LI700	0.25%	PF, 1-8C	17 May, 3, 11, 24 June, 3, 23 July, 11, 20 Aug
	Actara*	4.0 oz./A	PF, 1C	17 May, 3 June
2.	Compound A *	8.21 fl.oz./A	PF, 1-8C	17 May, 3, 11, 24 June, 3, 23 July, 11, 20 Aug
	LI700	0.25%	PF, 1-8C	17 May, 3, 11, 24 June, 3, 23 July, 11, 20 Aug
	Actara*	4.0 oz./A	PF, 1C	17 May, 3 June
3.	Compound B*	3.08 fl.oz./A	PF, 1-8C	17 May, 3, 11, 24 June, 3, 23 July, 11, 20 Aug
	LI700	0.25%	PF, 1-8C	17 May, 3, 11, 24 June, 3, 23 July, 11, 20 Aug
	Actara*	4.0 oz./A	PF, 1C	17 May, 3 June
4.	Compound B*	4.11 fl.oz./A	PF, 1-8C	17 May, 3, 11, 24 June, 3, 23 July, 11, 20 Aug
	LI700	0.25%	PF, 1-8C	17 May, 3, 11, 24 June, 3, 23 July, 11, 20 Aug
	Actara*	4.0 oz./A	PF, 1C	17 May, 3 June
5.	Altacor 35 WG*	4.0 oz./A	PF, 1-8C	17 May, 3, 11, 24 June, 3, 23 July, 11, 20 Aug
	LI700	0.25%	PF, 1-8C	17 May, 3, 11, 24 June, 3, 23 July, 11, 20 Aug
	Actara*	4.0 oz./A	PF, 1C	17 May, 3 June

[a] Evaluation made on 'Ginger Gold' cultivar on 31 July. Applications specifically timed for emergence of SJS nymph and apple maggot. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were transformed using arcsine(sqrt(x)) prior to ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.25%.

Treatment Schedule for Seasonal Apple Insecticide Screen
Hudson Valley Research Laboratory, Highland, NY - 2019

Trmt. / Formulation	Rate	Incidence (%) of insect damaged cluster fruit						
		PC	TPB	Int. LEP	Ext. LEP	EAS	SJS	Clean
1. Compound A* Actara	6.16 fl.oz./A 4.0 oz./A	16.3	3.0	1.5 cd	5.3 bc	0.3	22.3	52.0 ab
2. Compound A * Actara	8.21 fl.oz./A 4.0 oz./A	15.5	3.8	1.3 cd	2.3 bc	0.3	16.0	63.5 a
3. Compound B* Actara	3.08 fl.oz./A 4.0 oz./A	20.6	1.6	0.3 d	1.5 bc	0.5	15.7	65.6 a
4. Compound B* Actara	4.11 fl.oz./A 4.0 oz./A	11.8	1.3	0.8 d	1.3 c	0.0	21.3	63.8 a
5. Altacor 35 WG* Actara	4.0 oz./A 4.0 oz./A	24.3	0.8	1.3 cd	4.5 bc	0.0	47.5	39.3 ab
8. Actara* Exirel	4.0 oz./A 20.5 fl.oz./A	18.9	2.3	2.8 bcd	2.3 bc	0.3	35.3	46.0 ab
UTC		36.6	0.8	47.3 a	25.7 a	0.3	19.2	6.1 b
P value for transformed data		0.2827	0.1960	0.0001	0.0001	0.9164	0.3697	0.0235

[a] Evaluation made on 'Ginger Gold' cultivar on 31 July. Applications specifically timed for emergence of SJS nymph and apple maggot. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were transformed using arcsine(sqrt(x)) prior to ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.25%.

Treatment Schedule for Seasonal Apple Insecticide Screen
Hudson Valley Research Laboratory, Highland, NY - 2019

Trmt.	Formulation	Rate	Incidence (%) of insect damaged cluster fruit						
			PC	TPB	Int. LEP	Ext. LEP	EAS	SJS	Clean
1.	Compound A* Actara	6.16 fl.oz./A 4.0 oz./A	10.5	1.3	0.0 c	1.3 cd	0.0	31.3 a	62.0 a
2.	Compound A * Actara	8.21 fl.oz./A 4.0 oz./A	14.0	1.0	0.5 bc	0.5 d	0.0	28.8 a	61.0 a
3.	Compound B* Actara	3.08 fl.oz./A 4.0 oz./A	11.3	0.8	0.3 bc	2.8 cd	0.3	33.5 a	54.8 ab
4.	Compound B* Actara	4.11 fl.oz./A 4.0 oz./A	6.2	1.7	0.3 bc	1.3 cd	0.0	35.8 a	56.0 a
5.	Altacor 35 WG* Actara	4.0 oz./A 4.0 oz./A	8.4	1.5	0.3 bc	1.3 cd	0.3	75.9 a	20.7 cd
8.	Actara* Exirel	4.0 oz./A 20.5 fl.oz./A	10.3	0.5	0.0 c	1.0 cd	0.0	80.8 a	13.3 cd
	UTC		28.2	0.8	56.5 a	39.9 a	0.5	32.2 a	3.8 d
P value for transformed data			0.0807	0.8383	0.0001	0.0001	0.6392	0.0222	0.0001

[a] Evaluation made on 'Red Delicious' cultivar on 5 Sept. Applications specifically timed for emergence of SJS nymph and apple maggot. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were transformed using arcsine(sqrt(x)) prior to ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.25%

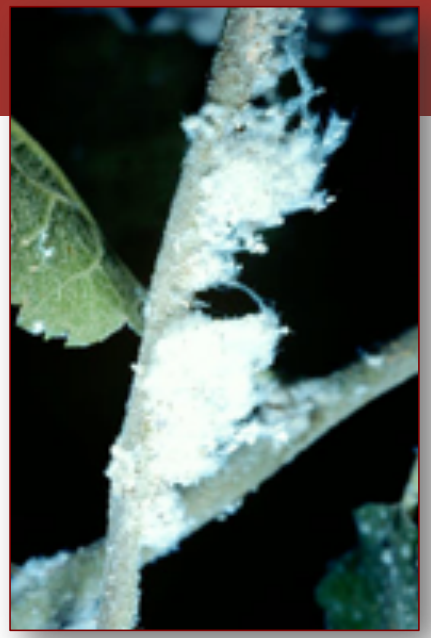
Treatment Schedule for Seasonal Apple Insecticide Screen
Hudson Valley Research Laboratory, Highland, NY - 2019

Trmt. / Formulation	Rate	Incidence (%) of insect damaged cluster fruit					
		Lf. Roller	CM	AMP	AMT	SB	Clean
1. Compound A* Actara	6.16 fl.oz./A 4.0 oz./A	0.3 bc	0.3 d	4.5 ab	1.3 ab	0.3	52.0 ab
2. Compound A * Actara	8.21 fl.oz./A 4.0 oz./A	0.3 bc	1.3 cd	0.3 b	0.0 b	1.0	63.5 a
3. Compound B* Actara	3.08 fl.oz./A 4.0 oz./A	0.0 c	0.3 d	0.0 b	0.0 b	0.3	65.6 a
4. Compound B* Actara	4.11 fl.oz./A 4.0 oz./A	0.3 bc	0.3 d	1.0 b	0.5 b	0.5	63.8 a
5. Altacor 35 WG* Actara	4.0 oz./A 4.0 oz./A	0.0 c	0.5 d	0.8 b	0.3 b	0.0	39.3 ab
8. Actara* Exirel	4.0 oz./A 20.5 fl.oz./A	0.0 c	1.0 cd	0.3 b	0.3 b	0.8	46.0 ab
UTC		6.4 a	27.0 a	18.9 a	8.3 a	0.5	6.1 b
P value for transformed data		0.1746	0.0001	0.0038	0.0027	0.6205	0.0235

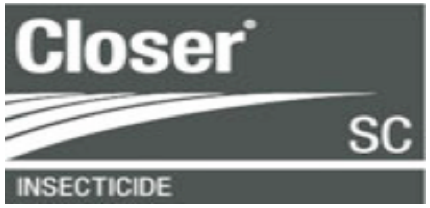
* Evaluation made on 'Ginger Gold' cultivar on 31 July. Applications specifically timed for emergence of SJS nymph and apple maggot. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were transformed using arcsine(sqrt(x)) prior to ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.25%.

Wooly Apple Aphid

- Mid-Late Season Pest. Feeding leads to 'honeydew' sugars
- Causes 'sticky' foliage and fruit at harvest, sugars acting as a substrate for sooty mold
- Very difficult to manage late season due to foliage density
- **Diazinon 50WP** most effective *contact insecticide* onset of infestation.
  - (onerous smell, high human and pollinator toxicity)
- **Movento** + penetrant ≥ 0.25% excellent late season
  - control applied at PF, 2C and 5C



Wooly Apple Aphid



- **EPA Reg No. 62719-623**
- **Active Ingredient: sulfoxaflor 21.8%**
- **IRAC Group 4C Insecticide**
- **Targets insect nicotinic acetylcholine receptors (nAChR)**
- **Available in NY**
- **Control or suppression of aphids (wooly apple aphid), fleahoppers, plant bugs, stink bugs, whiteflies and certain psyllids, scales, and thrips.**

Wooly Apple Aphid

Closer SC INSECTICIDE

DOW Dow AgroSciences

Pome Fruits (Crop Group 11)[1]

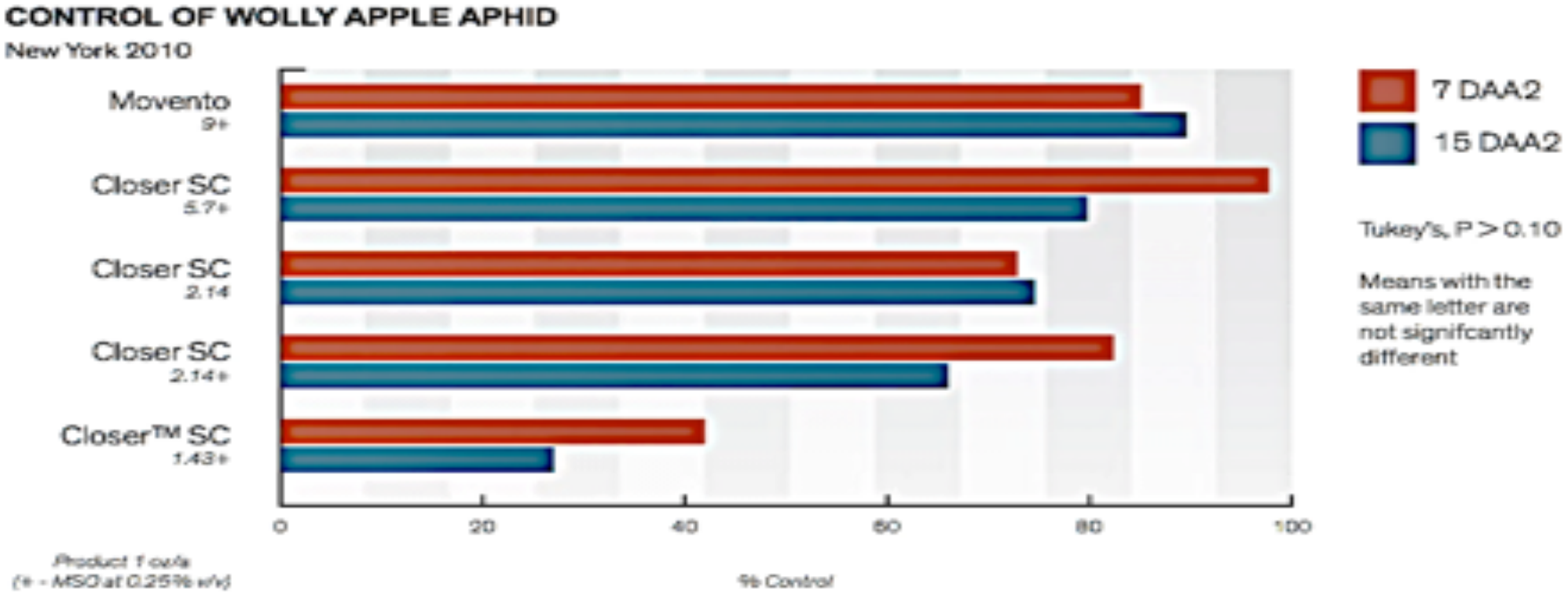
[1]Pome fruits (crop group 11) including apples, crabapple, loquat, mayhaw, pears, quince

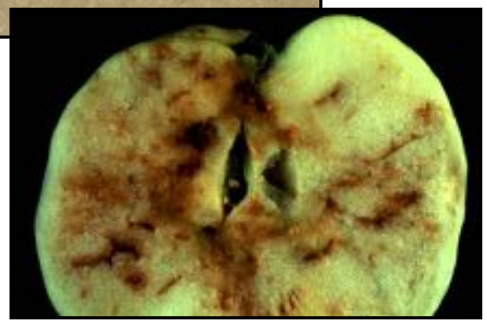
Pests and Application Rates:

Pests	Closer SC (fl oz/acre)
Aphids (except woolly apple aphid) white apple leafhopper	1.5 – 2.75 (0.023 – 0.043 lb ai/acre)
plant bugs woolly apple aphid	2.75 – 5.75 (0.043 – 0.09 lb ai/acre)
pear psylla (suppression only) San Jose scale (suppression only)	5.75 (0.09 lb ai/acre)

Wooly Apple Aphid

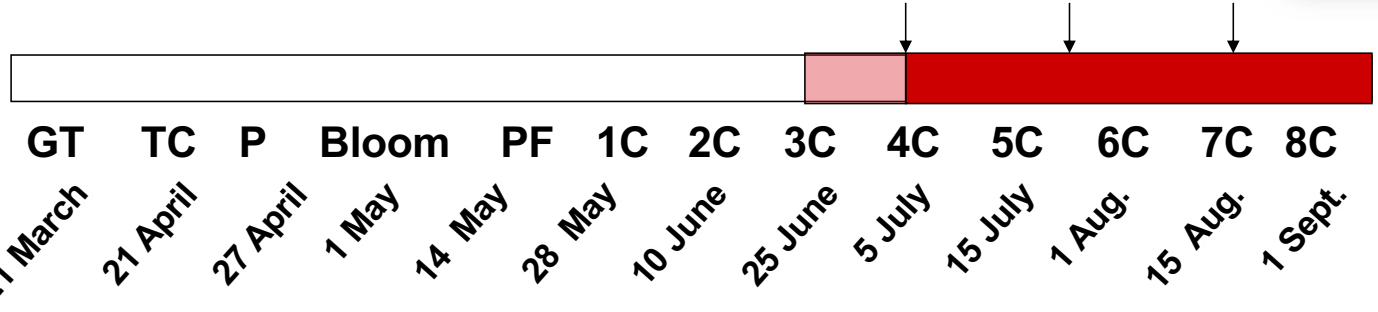
Ressig & Combs, NYSAES, Geneva 2010





Apple Maggot:

- *OW as pupae*
- *Single generation / season*
- *Emerge from soil late-June; emergence completed by 1 Sept.*
- *Typically do not OW in commercial orchards (hail years)*
- *Reduced risk AM materials include Assail, Actara, Provado, Delegate*
- *3 – 4 OP applications (rain?)*



Treatment Schedule for Seasonal Apple Insecticide Screen
Hudson Valley Research Laboratory, Highland, NY - 2019

Trmt. / Formulation	Rate	Incidence (%) of insect damaged cluster fruit					
		Lf. Roller	CM	AMP	AMT	SB	Clean
1. Compound A* Actara	6.16 fl.oz./A 4.0 oz./A	0.3 bc	0.3 d	4.5 ab	1.3 ab	0.3	52.0 ab
2. Compound A * Actara	8.21 fl.oz./A 4.0 oz./A	0.3 bc	1.3 cd	0.3 b	0.0 b	1.0	63.5 a
3. Compound B* Actara	3.08 fl.oz./A 4.0 oz./A	0.0 c	0.3 d	0.0 b	0.0 b	0.3	65.6 a
4. Compound B* Actara	4.11 fl.oz./A 4.0 oz./A	0.3 bc	0.3 d	1.0 b	0.5 b	0.5	63.8 a
5. Altacor 35 WG* Actara	4.0 oz./A 4.0 oz./A	0.0 c	0.5 d	0.8 b	0.3 b	0.0	39.3 ab
8. Actara* Exirel	4.0 oz./A 20.5 fl.oz./A	0.0 c	1.0 cd	0.3 b	0.3 b	0.8	46.0 ab
UTC		6.4 a	27.0 a	18.9 a	8.3 a	0.5	6.1 b
P value for transformed data		0.1746	0.0001	0.0038	0.0027	0.6205	0.0235

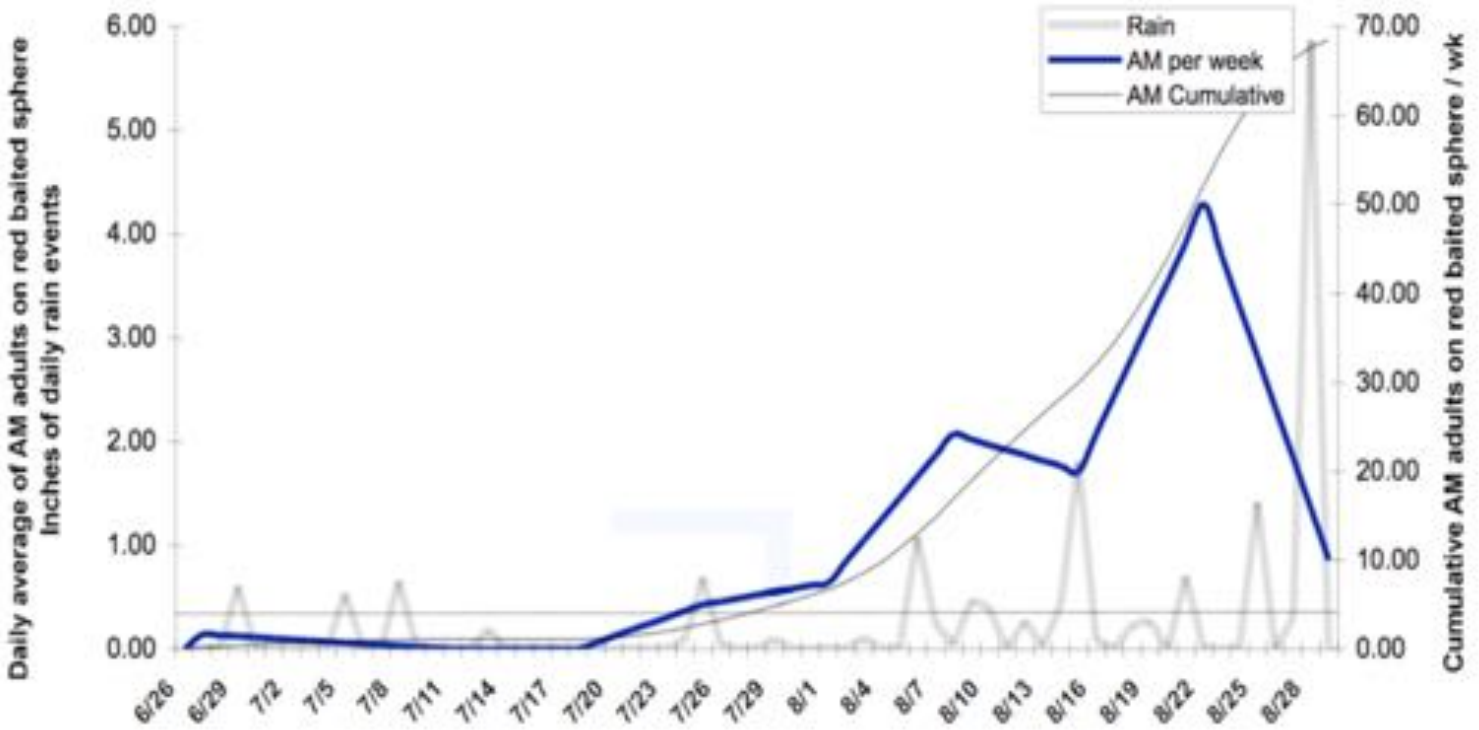
* Evaluation made on 'Ginger Gold' cultivar on 31 July. Applications specifically timed for emergence of SJS nymph and apple maggot. All insecticide calculations (presented as amt/A) are based on a standard dilution of 300 gal/A trees. Data were transformed using arcsine(sqrt(x)) prior to ANOVA (P ≤0.05). Means separation by Tukey-Kramer HSD (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported. * LI-700 @ 0.25%.

Brown Marmorated Stink Bug, *Halyomorpha halys*
Cyclaniliprole

Treatment/formulation	Rateamt/acre	% BMSB Mortality	
		Nymphs ($n = 20$)	Adults ($n = 20$)
Untreated check	n/a	10.0c	5.0b
IKI-3106 50SL	11.0	70.0b	30.0ab
IKI-3106 50SL	16.4	95.0a	45.0a
IKI-3106 50SL	22.0	100.0a	40.0a
Coragen 1.67 SC	5.0	25.0c	10.0b

Bioassay Evaluation of IKI-3106 (Cyclaniliprole) for Control of Brown Marmorated Stink Bug and Harlequin Bug, 2014.
Thomas P. Kuhar, Virginia Tech,

Apple Maggot & Rain Events
Cornell's Hudson Valley Laboratory ,
Highland, NY 2011



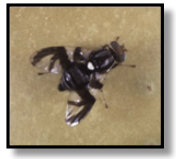
AM adult threshold

Insect Cultivar Preference

Evaluation of Insect Populations on NE-183 Varietal Apple Trial
USDA Tree Fruit Research Center., Kearneysville, WV.- 2005*

Variety / Rootstock	TPB	PC	CM & OFM	AM	% Clean Fruit
Braeburn/ M.9	1.4 e	7.9 a-d	8.9 lm	39.9 ab	35.3 h-k
Golden Supreme/ M.9	8.1 a	12.6 abc	17.6 ijk	11.0 h-k	56.7 bcd
Ginger Gold/ M.9	4.2 b-c	14.0 ab	6.3 lm	47.1 a	37.9 g-k
Pristine/ M.9	3.3 de	8.1 a-d	2.8 m	0.0	80.3 a
Yataka/ M.9	1.8 c	9.7 a-d	21.3 h-j	16.5 f-l	54.2 b-e

* H. Hogmire, S. Miller



Reduced Risk Materials for Apple Maggot Management

Trevor Nichols / John Wise - Michigan State

Formulation Treatment	amt./A	Timing	# AM. Stings per. 20 fruit	AM Pupa / bushel
Assail 30SG	5.0 oz.	14, 28 July, 11 Aug	3.5 b	0.0 c
Provado Pro 1.6SC+	8.0 oz.	14, 28 July, 11 Aug	3.5 b	1.0 c
Nu-Film 17	14.3 oz.			
Provado Pro 1.6SC	8.0 oz.	14, 28 July, 11 Aug	8.5 ab	7.3 bc
Provado Pro 1.6F	8.0 oz.	14, 28 July, 11 Aug	14.3 a	9.5 bc
Nu-Film 17	14.3 oz.	0.8 c		
Untreated	-	-	10.8 a	40.0 a

Airblast 100 GPA at 2.5 mph. RCBD

BMSB Feeding and Mortality

Comparitive Efficacy of 4 Insecticides to Adult BMSB Topical Treatment & Field Applied (Fruit Residue)

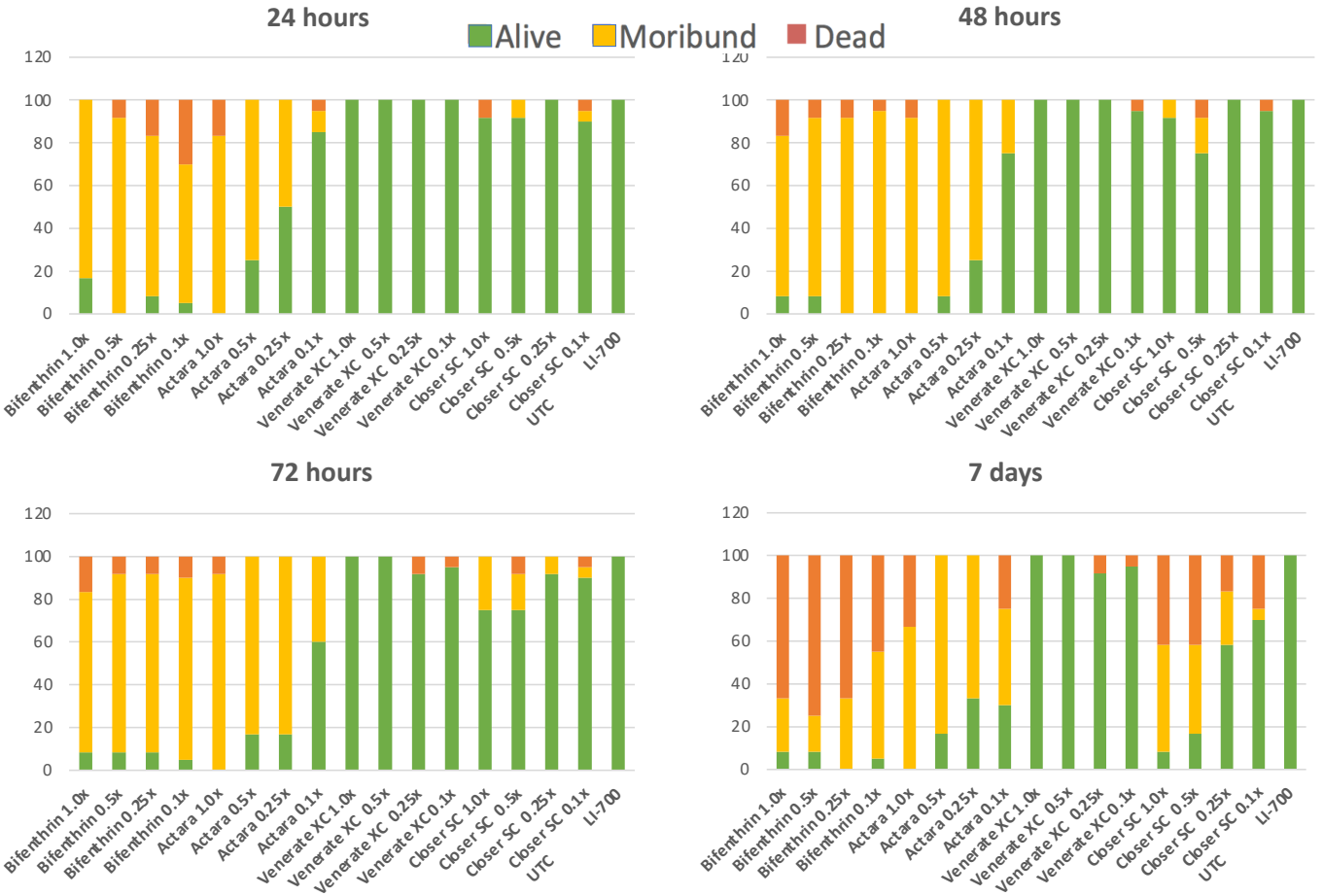
Adult BMSB Topical Bioassays

- Stink bug were separated into individual cups for **male and female**
- Individuals **received 2 uL of distilled water, 0.25% LI700,** individual insecticide to the dorsal thoractic plate.
  - Treatments: **Actara, Bifenthure, Closer, Venerate, UTC**
  - **Doses: 1, 0.5, 0.25, and 0.1** times the highest labeled rate
- Status **(alive, moribund, dead**) was recorded **at 24, 48, 72 hours and at 7d** post treatment.

BMSB Adult Topical Treatment

- Applications to BMSB adults on 28th Sept. 2017
- Placed on the tree in 10 replicates for each treatment
- BMSB were removed after 7d and evaluated for mortality
- Fruit was collected on 12th October
- Fruit feeding evaluations to assess feeding injury
- Evaluated ‘arena’ for surface dimpling,

Topical Bioassays



BMSB Adult Topical Treatment

BMSB treated topically on Sep.28, 2017 and placed on apples for 7 days.

	Number of feeding sites per fruit	Dimpling per fruit	Corking per fruit	Clean fruit (%)	Survival (%)
Closer SC	0.3a	0.2a	0.2a	90a	30b
Bifenthrin	0.1a	0a	0a	90a	0b
Actara	0a	0a	0a	100a	10b
Venerate	0a	0a	0a	100a	100a
UTC	0.9a	0a	0a	60a	90a
Kruskal-Walis Test, Prob>ChiSq	0.1288	0.5348	0.5348	0.1093	<.0001

Means followed by the same letter are not significantly different by Steel-Dwass Method at α=0.05 Apples were rated on Oct.12, 2017. BMSB survival were recorded 7 days after exposure to the fruit.

2017 Field Application

Applications using tractor mounted sprayer on 20th Sept. 300 psi. handgun applications:

• **Closure SC**	**7d PHI**	**5.75**	**fl.oz./A**
• **Bifrenthrin SC**	**14d PHI**	**32.0**	**fl.oz./A**
• **Actara 25 WDG**	**14d PHI**	**5.5**	**oz./A**
• **Venerate XC**	**0d PHI**	**128.0**	**fl.oz./A**

- BMSB adults placement beginning on 20th Sept.
  - 24h; 48hr; 72hr placement. Collection made after 7d of placement.
  - Insects placed in screened portion cups onto the north side of fruit to reduce sun exposure with arena defined using marker.
  - Fruit harvested on 12 Oct. for fruit feeding evaluations

Field Application: Fruit Residue

BMBS placed on apples 24 hours after pesticide application on Sep.20, 2017.

	Number of feeding sites per fruit	Dimpling per fruit	Corking per fruit	Clean fruit (%)	Survival (%)
Closer SC	0.1a	0.1a	0.1a	90a	0a
Bifenthrin	0a	0a	0a	100a	0a
Actara	0a	0a	0a	100a	0a
Venerate	0a	0a	0a	100a	20a
UTC	0.7a	0a	0a	50a	20a
Kruskal-Walis Test, Prob>ChiSq	0.0115	0.8123	0.8123	0.0136	0.3071

Means followed by the same letter are not significantly different by Steel-Dwass Method at α=0.05 Apples were rated on Oct.12, 2017. BMSB survival were recorded 7 days after exposure to the fruit.

Field Application: Fruit Residue

BMBS placed on apples 48 hours after pesticide application on Sep.20, 2017.

	Number of feeding sites per fruit	Dimpling per fruit	Corking per fruit	Clean fruit (%)	Survival (%)
Closer SC	0.1b	0.1a	0.1a	90a	0a
Bifenthrin	0b	0a	0a	100a	10a
Actara	0.1b	0.1a	0.1a	90a	0a
Venerate	0.2ab	0a	0a	80ab	40a
UTC	1.2a	0.4a	0.4a	20b	0a
Kruskal-Walis Test, Prob>ChiSq	0.0001	0.4313	0.4313	0.0002	0.0873

Means followed by the same letter are not significantly different by Steel-Dwass Method at α=0.05 Apples were rated on Oct.12, 2017. BMSB survival were recorded 7 days after exposure to the fruit.

Field Application: Fruit Residue

BMBS placed on apples 72 hours after pesticide application on Sep.20, 2017.

	Number of feeding sites per fruit	Dimpling per fruit	Corking per fruit	Clean fruit (%)	Survival (%)
Closer SC	0.2a	0.2a	0.2a	90a	80a
Bifenthrin	0.2a	0.2a	0.2a	90a	10b
Actara	0.2a	0.2a	0.2a	90a	100a
Venerate	0.1a	0a	0a	90a	70a
UTC	1.2a	0.1a	0.1a	40a	30ab
Kruskal-Walis Test, Prob>ChiSq	0.0687	0.9254	0.9254	0.0795	0.0006

Means followed by the same letter are not significantly different by Steel-Dwass Method at α=0.05 Apples were rated on Oct.12, 2017. BMSB survival were recorded 7 days after exposure to the fruit.

New Pests: *Black Stem Borer*
Sudden or Rapid Apple Decline (SAD / RAD)

Early Tree Decline:
Slight Yellowing

Late Tree Decline:
Dramatic Yellowing & Browning

Tree Death

Single Season Decline and Tree Death
Fuji on M.9

New Pests: *Black Stem Borer*
Sudden or Rapid Apple Decline (SAD / RAD)

New Pests: *Black Stem Borer*
Sudden or Rapid Apple Decline (SAD / RAD)

New Pests: *Black Stem Borer*
Sudden or Rapid Apple Decline (SAD / RAD)

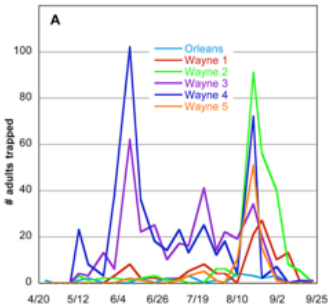
- Monitor BSB populations using ethyl alcohol or ethanol (ETOH) beginning in

- Using a bolt of 1 inch beech limb, soaked in ethanol to attract BSB. Monitor for start of boring activity.

- At first sign of BSB boring, make first pre-bloom (Pink) then Petal Fall application of directed insecticide using high volume and high pressure course trunk spray

Lorsban (Pre-bloom), Pyrethroid or Pyrethroid in Pre-mix will provide control of 1st generation

Continue monitoring throughout the season.



New Pests: *Dogwood Borer*
Sudden or Rapid Apple Decline (SAD / RAD)

- Monitor adult (clear wing moth) population using pheromone for first flight
- Use Mating Disruption in 5 acre block for best control after first flight and prior to egg laying
- A single application of Lorsban during pre-bloom using high volume and high pressure course trunk spray, or Assail in multiple applications
- Scout trunks of trees for presence of DWB larva in June. Additional applications may be required after second flight.

State-wide Trap Monitoring of BMSB in NY: Tedders Trap

Vented trap container:

- MDT/epoxy and bisabolen lure
- Killing strip of Vapon

Plywood /plastic triangle black base to mimmic tree trunk

Screened base to reduce weeds and provide contrast for crawling SB

Placed along decidious woodland

AgBio-inc.com: Trap, lures, kill strip

State-wide Trap Monitoring of BMSB in NY: Tedders Trap vs. AtK

Tedders Trap
+ duel pheromone

Sticky Card Trap
+ duel pheromone

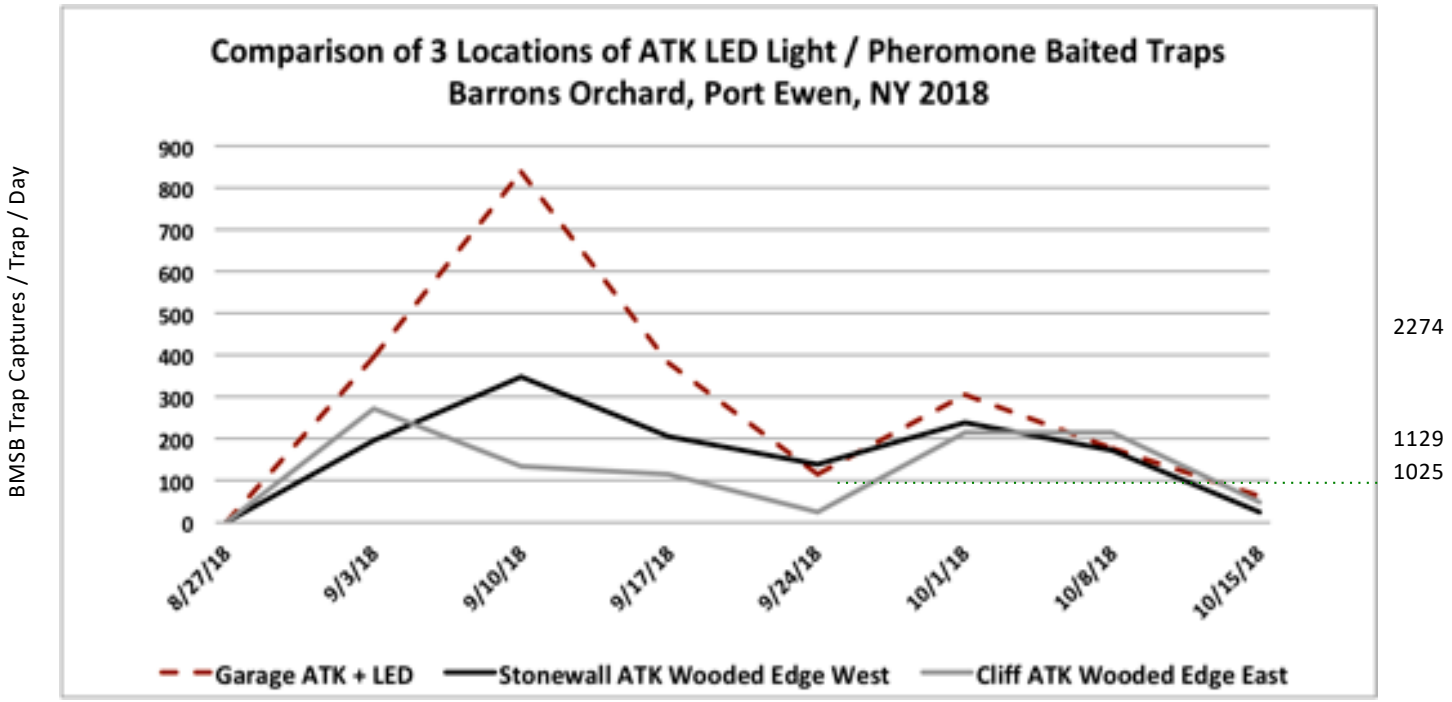
AtK Trap (Vesteegard)
Net + duel pheromone

Threshold: 10 adults / trap / week

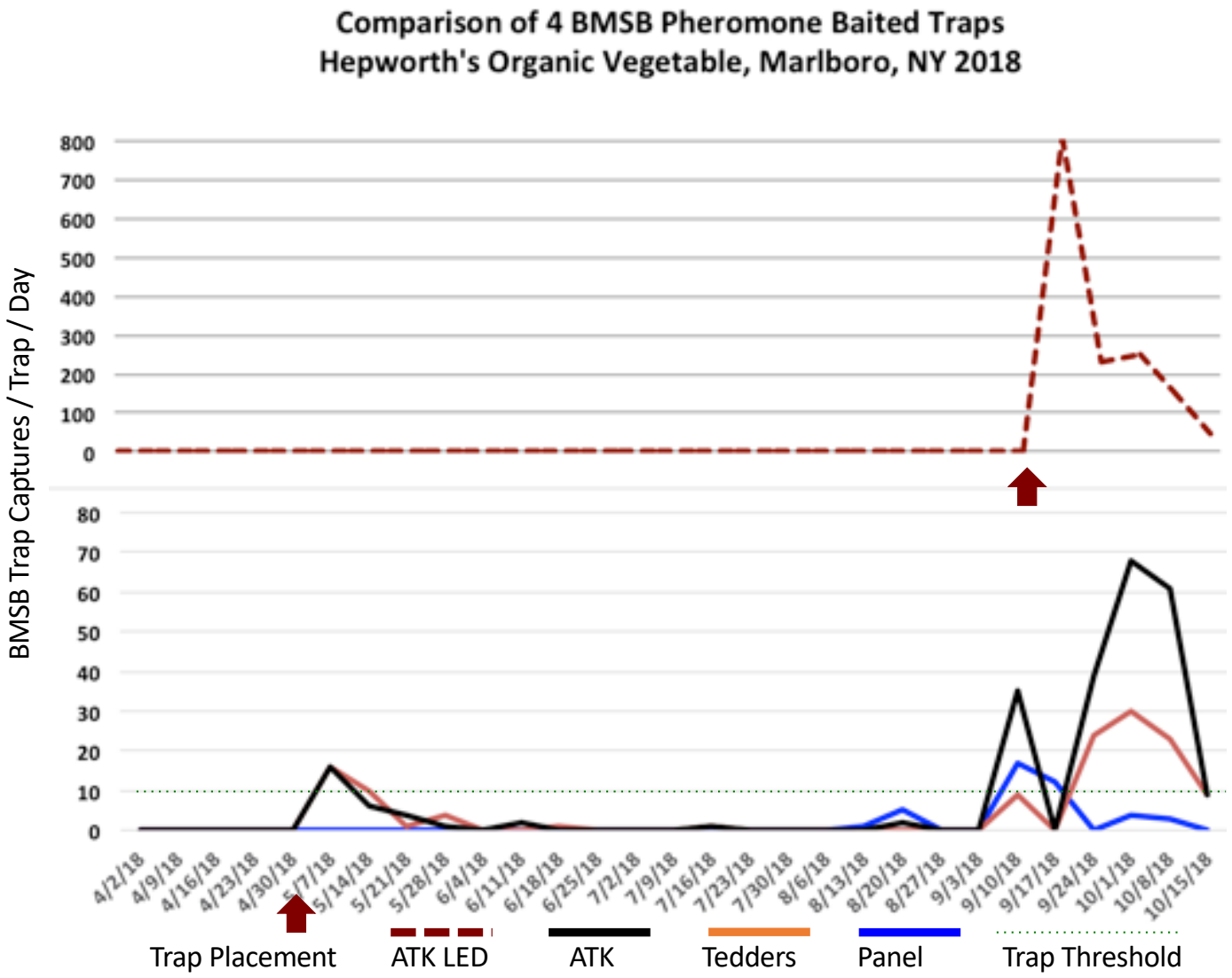
State-wide Trap Monitoring of BMSB in NY: AtK Net Trap

State-wide Trap Monitoring of BMSB in NY: Green Stink Bug

Attract & Kill of the Stink Bug Complex
To Reduce BMSB Populations Along the Orchard Edge



Including Solar LED auto-on with ATK / pher. increases BMSB captures


Comparison of 4 BMSB Pheromone Baited Traps
Hepworth's Organic Vegetable, Marlboro, NY 2018
BMSB Trap Captures / Trap / Day
800
700
600
500
400
300
200
100
0
80
70
60
50
40
30
20
10
0
4/2/18
4/9/18
4/16/18
4/23/18
4/30/18
5/7/18
5/14/18
5/21/18
5/28/18
6/4/18
6/11/18
6/18/18
6/25/18
7/2/18
7/9/18
7/16/18
7/23/18
7/30/18
8/6/18
8/13/18
8/20/18
8/27/18
9/3/18
9/10/18
9/17/18
9/24/18
10/1/18
10/8/18
10/15/18
Trap Placement
ATK LED
ATK
Tedders
Panel
Trap Threshold

Future Studies: Stink Bug Monitoring & Insect Exclusion

1. **Attract and Kill**
   - Pheromone and Insecticide impregnated netting
   - Use of LED rechargeable lighting to increase BMSB captures

1. **Exclusion**
   - Drape netting to reduce hail, bird injury & sunburn
   - Enclosure of the base seam (Zip Ties)
   - Bee exclusion at King Blossom set to reduce crop load
   - Stink bug exclusion

Drape Net Insect Exclusion Study

Samurai Wasp Conservation

Drape Net Insect Exclusion Study

Stink Bug Exclusion ?

Hudson Valley Research Lab

- Scab Resistant Block
- 11 Varieties on G.11
  - 2018 Drape Net Study
    - Insect Exclusion

Drape Net Insect Exclusion Study
Samurai Wasp Conservation

Treatment/Formulation	Rate	Timing	Application Dates	
Early Season IPM				
Actara	5.5 oz/A		18th May	Pre-Net
Avaunt	6.0 oz/A		25th May	↓
Entrust SC	10.0 fl oz/A		8th June	Post-Net Application
Venerate	2.0 gal/A		21st June	↓
Season Long IPM				
Actara	5.5 oz./A		18th May	Pre-Net
Avaunt	6.0 oz./A		25th May	↓
Imidan 70W	4.9 lbs/A		7th June	Post-Net Application
Esteem 35WP	5.0 oz/A		21st June	↓
Assail 30SG	4.0 oz/A		21st June	
Altacor	4.5 oz/A		21st June	
Assail 30SG	4.0 oz/A		10th July	
Exirel	20.5 oz/A		24th July	
Exirel	20.5 oz/A		31st July	
Exirel	20.5 oz/A		6th Aug.	
Bifenture 10DF	32.0 oz/A		6th Aug.	

Drape Net Insect Exclusion Study
Samurai Wasp Conservation

Results of 2018 Insecticide and Acaricide Studies in Eastern New York. Jentsch et. al.

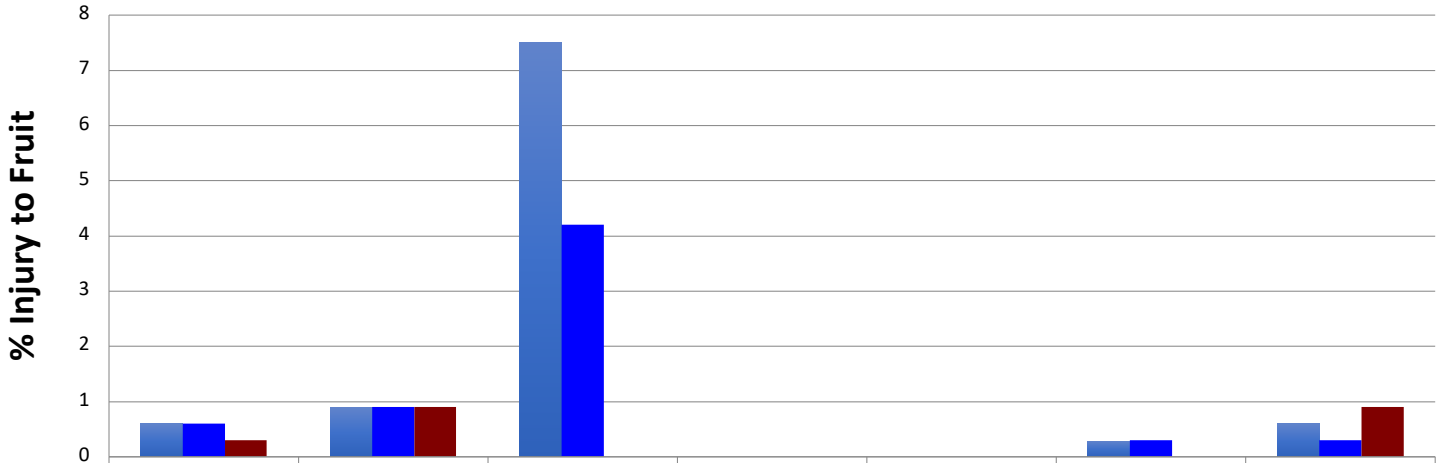
Table 1 **Management of the Apple Insect Complex Using 'Drape Net' IPM / Organic Split and Season Long IPM Management . Hudson Valley Research Laboratory, Highland, NY - 2018**

Net Type / Treatment / Rate	Incidence (%) of insect damaged cluster fruit											
	PC	EAS	TPB	Lf.Rlr	Int. Lep	Ext.Lep	CM	AM.P	AM.T	SJS	SB	Clean
1. Black Drape Early Season IPM	3.0 a	0.6 a	4.4 a	10.9 bc	2.2 b	18.8 b	11.3b	0.6 b	0.6 b	96.3 a	0.3 b	1.3 c
2. White Drape Early Season IPM	4.7 a	0.0 a	4.4 a	11.9 b	3.1 b	20.3 b	12.5 b	0.9 b	0.9 b	95.6 a	0.9 b	0.6 c
3. No Drape Early Season IPM	**10.8 a**	**0.8 a**	**4.6 a**	**22.9 a**	**6.7 a**	**37.1 a**	**23.8 a**	**7.5 a**	**4.2a**	**83.8 b**	**3.8 a**	**1.3 c**
4. Black Drape Season Long IPM	5.6 a	1.3 a	7.8 a	0.3 d	0.0 c	1.6 c	0.3 c	0.0 bc	0.0 b	6.6 d	0.0 b	82.5 a
5. White Drape Season Long IPM	7.8 a	0.9 a	7.8 a	0.3 d	0.0 c	0.6 c	0.0 c	0.3 b c	0.3 b	20.0 c	0.0 b	65.9 b
6. No Drape Season Long IPM	**5.6 a**	**0.9 a**	**5.0 a**	**0.6 cd**	**0.3 c**	**1.3 c**	**0.0 c**	**0.6 b c**	**0.3 b**	**6.3 d**	**0.9 b**	**81.3 a**
P value	0.2062	0.6565	0.5998	0.0001	0.0001	0.0001	0.0001	0.0001	0.0135	0.0001	0.0154	0.0001

* Evaluation made on 'Crimson Crisp, Honey Crisp & Gold Rush cultivars harvested on 29 September. Data were transformed using arcsine(sqrt[x]) prior to ANOVA (P ≤0.05). Means separation by Fisher Protected (P ≤0.05); treatment means followed by the same letter are not significantly different. Arithmetic means reported.

Drape Net Insect Exclusion Study
Samurai Wasp Conservation

IPM / Organic Split and Season Long IPM in Apple Management Programs Using 'Drape Net' .



	Black Drape Early Season IPM	White Drape Early Season IPM	No Drape Early Season IPM		Black Drape Season Long IPM	White Drape Season Long IPM	No Drape Season Long IPM
AM.P	0.6	0.9	7.5		0	0.3	0.6
AM.T	0.6	0.9	4.2		0	0.3	0.3
SB	0.3	0.9	0		0	0	0.9

Conclusion – 2019

Failure to control apple pests in the field , especially the internal worm complex (CM), has caused economic losses over the past 3 years.

- Developing **rotational insecticide management strategies** is critical to long term management sustainability.
- Use of **exclusion netting** will likely aid in reducing insect populations, decreasing the need for late season pesticide use while reducing the insecticide resistance potential.

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Insecticide Efficacy for Insect Management of Eastern NY Tree Fruit

Thank You

Peter Jentsch
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