Eastern NY Entomology Update on Invasive Species Management











2015 Hudson Valley Commercial Fruit Growers' School

Best Western Plus Kingston, NY February 10th, 2015

Peter Jentsch Senior Extension Associate – Entomology



Cornell University College of Agriculture and Life Sciences

Historical Invasive Insect Pests Of Fruit In Eastern New York

Apple maggot, *Rhagoletis pomonella* (Wash, 1867) Tephritidae; Diptera European red mite, Panonychus ulmi, *Acari*: Tetranychidae **Grape berry moth**, *Lobesia botrana* ([Dennis & Schiffermuller]) Tortricidae; Lepidoptera Scarabaeidae; Coleoptera Japanese beetle, Popillia japonica Newman, **Oriental fruit moth**, *Grapholita molesta* (Busck) Tortricidae; Lepidoptera **Oystershell scale**, *Lepidosaphes ulmi* (Linnaeus) Diaspididae; Hemiptera **Pear psylla**, *Cacopsylla pyricola* Foerster, Homoptera: Psyllidae Rose leafhopper, Edwardsiana rosae (Linnaeus) Cicadellidae; Homoptera **San Jose scale**, *Quadraspidiotus perniciosus* (Comstock) Diaspididae; Hemiptera



New Pest Update: Spotted Lanterfly. Hemiptera: Fulgoridae

- The **Spotted Lanternfly**, *Lycorma delicatula* (White), is a **planthopper** orinating from China, Korea, India, Vietnam, and parts of eastern Asia.
- On Sept. 22, 2014, the Pennsylvania Department of Agriculture, in cooperation with the Pennsylvania Game Commission, confirmed the presence the Spotted Lanternfly in Berks County, PA.
- It is an invasive insect in Korea where it was introduced in 2006 and since has attacked 25 plant species which also grow in Pennsylvania. In the U.S. it has the potential to greatly impact >70 plant host species including grape, pome and stone fruit.
- Adults appear in July & moves to Tree of Heaven (Ailanthus altissima) to lay eggs in October
- SLF pierces the bark to feed on sap.



Adult SLF



Cornell University College of Agriculture and Life Sciences

New Pest Update: Spotted Lanterfly. Hemiptera: Fulgoridae

- Nymphs hatch from Late April to early May egg masses laid on smooth bark, stone, and other vertical surfaces. Nymphs **climb, feed and fall** repeatedly onto host plants.
- Nymphs complete **four immature stages**. The first stage is black with white spots and wingless.
- As it grows, the Spotted Lanternfly will start to develop red patches in addition to the white spots. Nymphs spread from the initial site by crawling and feeding on woody and non-woody plants.





Cornell University College of Agriculture and Life Sciences

Lycorma Detection Survey

Results Through 15 December 2014





180 miles south of Highland, NY

Lycorma Detection Survey

Results Through 15 December 2014









New Pest Update: Spotted Lanterfly: Management

Target adults in mid-late September prior to egg laying & nymphs as they hatch

- Removal of egg masses from bark
- Trunk applications of Dinotefuran (*Safari, Scorpion, Venom*)
 - Systemic insetcicide activity kills insects as they feed on sap





Cornell University College of Agriculture and Life Sciences



SWD Adult Male

Infected Blackberry

Fruit Fly Egg 'Respitory Horns'



Life Cycle of the Spotted Wing Drosophila Drosophila suzukii (Matsumura)

Pupation 4-15 days Inside or outside of fruit

Three Larval Instars 5-7 days





Eggs 12-72 hours 350+ eggs in a lifetime Adults 20-30 days

> Development Range 10d – 4 weeks

Male Spotted Wing Drosophila (SWD)

UC Berkeley & UC Cooperative Extension

Photos: M. Hauser, CDFA



Female Drosophila species

UC Berkeley & UC Cooperative Extension Photos: M. Hauser, CDFA



SWD has a large, saw-like, serrated ovipositor with two even rows of teeth that are much darker than rest of ovipositor

Other Drosophila spp.

have smaller, more rounded ovipositors, sometimes with irregular, poorly defined teeth

























Cornell University College of Agriculture and Life Sciences

Crops at Highest Risk

- <u>Raspberries, blackberries, and blueberries</u>
- Fall-bearing and late maturing varieties
- <u>Day-neutral strawberry</u> varieties
- Late season tart and sweet cherries
- Thin-skinned grapes (Pinot Noir: Dejon Clones)
- Cracked or damaged fruit of peach.



Imature blackberry



Cornell University College of Agriculture and Life Sciences

Alternate hosts for SWD

*Lonicera sp -*Tartarian Honeysuckle







Cornell University College of Agriculture and Life Sciences

SWD SEASONAL DYNAMICS IN THE NORTHEAST



CLASSES OF SWD INSECTICIDES

Class	IRAC Code	Examples	SWD Efficacy	
Organophosphates	1B	Malathion	Excellent to good	
Pyrethroids	3A	Brigade, Danitol, Mustang Max	Excellent	
Spinosyns	5	Delegate, Entrust	Excellent to good	
Neonicotinoids	4A	Assail	Good to poor	
Carbamates	1A	Sevin	Good to poor	
Diamide	28	Exirel*	Excellent to good	

*Just received EPA label for blueberries, not raspberries

Credit: Greg Loeb Lab, NYSAES Geneva, NY

Survey on insecticide efficacy against SWD, collated by Rufus Isaacs, MSU - November, 2013



Enhancing Mortality with Sugar



Cultivar: 'Bluecrop'

Treatments: 4 wk spray program -Alternate Delegate & Assail -Delegate & Assail plus sugar

Plot size: 2 rows, 32 bushes

Replicates: 4

2 lbs. sugar / 100 gal. water

Credit: Greg Loeb Lab, NYSAES Geneva, NY

Sucrose Improves Insecticide Activity Against Drosophila suzukii (Diptera: Drosophilidae)

Richard S. Cowles, Cesar Rodriguez-Saona, Robert Holdcraft, Gregory M. Loeb, Johanna E. Elsensohn, Steven P. Hesler





Effect of Rain on Some Common Insecticides From Rufus Isaacs, MSU



0.8 inches of rain on treated bushes 1 day after application



African Fig Fly, Zaprionus indianus Gupta



- Damage: Predominately to citrus and grape
- Reports from Rutgers, NJ of wine grape injury independent of SWD injury.
- Hudson Valley:
 - 4 AFF in 2012
 - 0 AFF in 2013
 - 3 AFF in 2014
- Not yet a threat in NY



Managing the Brown Marmorated Stink Bug, Halyomorpha halys (Stål) in New York State





Cornell University



Brown Marmorated Stink Bug: Host Plants - Food for Success



Figure 1: Risk maps displaying the relative density of field, vegetable, and fruit crop hosts plants of BMSB throughout the United States.

Brown Marmorated Stink Bug: Urban mapping of adults



BMSB Management Threshold: Ag. Mapping Communication



Partnered with EEDMaps to extend outreach

 Early Detection & Distribution Mapping of Invasive Insects

By County:

- Weekly update
- Trap data per county
- Presence in degrees of risk
- Threshold levels

•

Cornell University



Eggs: Average 28/cluster; 1st instar: black & red; light green to white



cluster near eggs



2nd instar: striped antennae



3rd instar: striped antennae and legs



instar: thoratic spur 4th striped antennae & legs



5th instar: wing pads striped antennae & legs



BMSB Adults: red eyes, 4 cream colored dots on shoulders; banding on legs and antenna, smooth blunt shoulders. Banded abdomen; 14 -17 mm in length.

Stink Bug Survey: #4 100 acre Orchard; 5 acre block; Pink Lady Fruit damage survey September 10, 2012



987 55435



Evaluation of var. 'Pink Lady' Trees @ 3' x 12' spacing

10 fruit / tree = 100 fruit /30' 9 sections; 240' row



Eye alt 4814 ft 🔾





Elongate depression with two feeding punctures

BMSB Management Threshold: Insecticide Efficacy

Product	Active ingredient	Rate / A	REI Hrs.	PHI Days	Efficacy (USDA)	Max. per crop / season	App. Interval
Actara 25WDG	Thiamethoxam	2.0-5.5 oz/A	12	35	+++	16.5 oz./A (0.258 lb. a.i./A)	10d
Asana XL 0.66EC	Esfenvalerate	4.8-14.5 fl oz/A	12	21	++	101 fl oz/A (0.525 lb Al/A).	NA
Baythroid XL 1EC	Beta-Cyfluthrin	1.4-2.8 fl oz/A	12	7	++	2.8 fl oz/A (0.022 lb Al/A).	14d
Bifenture EC	Bifenthrin	5.2-12.8 fl oz/A	12	14	++++	32 fl ozs (0.50 lbs ai)	30d
Bifenture 10DF	Bifenthrin	12.8-32.0 oz/A	12	14	++++	80 ozs (0.50 lbs ai)	30d
Brigade WSB	Bifenthrin	12.8-32.0 oz/A	12	14	++++	80 ozs (0.50 lbs ai)	30d
Danitol 2.4EC	Fenpropathrin	10.66-21.33 fl oz/A	24	14	+++	42.56 fl ozs (0.80 lbs ai)	10d
Endigo ZC	Thiamethoxam / Lambda-cyhalothrin	5-6 fl fl oz/A	24	35	++++	19 fl oz./A (0.172 lb ai) NY	10d
Lannate 2.4LV*	Methomyl	2.25 pt/A	72	14	++++	240 ozs (0.50 lbs ai)	7d
Lannate 90SP*	Methomyl	8-16 oz/A	72	14	++++	5.0 lbs	7d
Leverage 360	Beta-Cyfluthrin / Imidacloprid	2.4-2.8 fl oz/A	12	7	+++	2.8 fl oz/A	14d
Surround 95WP	Kaolin	25-50 lb/A	4	0	+	NA	Od
Thionex 50WP	Endosulfan	Max. 5 lb/A	20 days	21	++++	6.0 lbs	NA
Thionex EC	Endosulfan	1.33-2.67 qts./A	7 days	21	++++	2-2/3 qts (2.0 lbs ai)	NA
Voliam Xpress EC	Chlorantraniliprole / Lambda-cyhalothrin	6-12 fl oz/A	24	21	+++	31.0 fl oz/A	10d
Vydate 2L*	Oxamyl	4-8 pt/A	48	14	++	281 fl oz/A (128 oz Al/A).	7d
Warrior 1CS	Lambda-cyhalothrin	2.56-5.12 fl oz/A	24	21	++	20.48 fl. oz. (0.28 lb. a.i.)**	5d
Warrior II 2.08CS	Lambda-cyhalothrin	1.28-2.56 fl oz/A	24	21	++	10.24 fl. oz. (0.28 lb. a.i.)**	5d

* Although these materials have excellent topical ratings in lab bioassay studies, field efficacy studies have shown economic fruit injury from BMSB feeding, suggesting low residual levels.

** Post bloom applications

(+) low to (++++) high efficacy

http://blogs.cornell.edu/jentsch/

BMSB Resources



Fruit Severity Damage Rating of BMSB Feeding to Fruit. HVRL, Highland, NY - 2014



http://blogs.cornell.edu/jentsch/

2014 Efficacy Screening Report



BMSB Adult Exposure to Insecticide Residue of Apple Foliage 72h Old Residue @ 1 d



BMSB Adult Exposure to Insecticide Residue of Apple Foliage 72h Old Residue @ 1 d

BMSB Adult Exposure to Insecticide Residue of Apple Foliage 72h Old Residue @ 3 d



Black Stem Borer: Xylosandrus germanus



Keyed out by Dan Gilrein

Slide Credits to:

- Deborah Breth CCE-LOF
- Art Agnello Cornell
- Kerik Cox Cornell
- Elizabeth Tee CCE-LOF
- Hannah Rae Warren Cornell Intern

http://www.barkbeetles.info

Xylosandrus germanus (female) (by J Hulcr, University of Florida).

Hulcr, J. 2012. http://xyleborini.myspecies.info/gallery (last accessed October 22, 2012).

Xylosandrus germanus (Blandford 1894) (introduced)

- Introduced from eastern Asia first found in NY in '32
- Ambrosia beetle, a general wood boring insect
- Attacks many ornamental/forest species
- American beech, maple, dogwood, black walnut, oak, magnolia.
- BSB observed in apple and sweet cherry in 1982
- Cornell research and extension have not seen this pest before in apple orchards over the past 30 years in NY.



Black Stem Borer, Xylosandrus germanus (Blandford 1894) (introduced) – NE Recorded findings http://www.barkbeetles.info



Cornell University College of Agriculture and Life Sciences

History

- Reported by Deb Breth in WNY:
- Growers complained of trees dying or oozing from holes or fire blight from oozing rootstocks with no history of FB in the planting in 2013 growing season.
- Identified 25 sites with trees dying 2013-14.
- •
- 1 to 15 year old plantings.

Grower sent this picture on May 1, '13 Fuji/M9(Pajam 2) in 4th leaf.





Found in 6 sites in 2013 associated with fire blight. Which came first? Fire blight or borers?

A second site 90 miles away in 2013.

Also found in apple nurseries, commercial and on-farm.

Biology



Adult female drills a hole ~1mm in diameter, and hollows out a channel into the heartwood of small trees (2-50 cm diameter).

Biology

- The female starts to culture a fungal food source, Ambrosiella hartigii, Fusarium?
- Food for the larvae and adults
- She lays her eggs in the chamber. (tiny, ~1mm white, football shaped)
- Larvae also white with 3 instars



Biology

Produce 2 generations per year

Late summer the beetles migrate to a hole lower in the trunk to overwinter - as many as 100 in one chamber.

The beetles go into diapause - not active again until the next spring.



Gallery with eggs, larvae and pupae for first generation BSB



Monitor for discoloration and blistering of bark.



• Monitor for bleeding sites on bark.





• Monitor: Trapping BSB Re: Peter Schultz

- Inverted "Simply" OJ traps with rectangular openings cut in side panels
- Agbio: ethanol lures (<u>agbio@agbio-inc.com</u>)
- Hung 2-3 feet off the ground
- > A drop of low toxicity anti-freeze in lid
- > Hung on edge of woods next to orchard.
- > Hung in interior of orchard.
- Checked traps weekly



BSB weekly trap catch.





Interior BSB trap counts



Black Stem Borer: Management

Apples

- Warrior II or Grizzly, **lambda-cyhalothrin**, labeled for tree borer species
- **DECLARE**: gamma-cyhalothrin.
- Lorsban: chlorpyrifos trunk sprays for borers may be effective
- Neonicotinoids, anthranilic diamides (cyazypyr, acelepryn), and tolfenpyrad, not found to be effective

Thank You



Technical staff and assistants Support: NYS Ag & Mkts, ARDP, NEIPM, EDDMaps, HATCH, Bayer, Dow, Nichino, Syngenta, Gowan



Cornell University College of Agriculture and Life Sciences