



Potential New Invasive pest:

# Spotted lanternfly

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*G. Krawczyk, 2019*

Next potential challenge:

# Spotted lanternfly

*Lycorma delicatula*

Order: Fulgoroidea



# Spotted lanternfly in Pennsylvania

*Slide courtesy of Sven-Eric Spichinger*

*Lycorma delicatula* (WHITE)

A planthopper in the family Fulgoridae

696 Species of lanternflies in the world

Only 17 species in North America

Like most planthoppers, SLF pierce the stems of plants, trees, and vines and feed on phloem.



Christopher Marley Planthopper Formation

# Spotted lanternfly in Pennsylvania

*Slide courtesy of Sven-Eric Spichinger*

The spotted lanternfly is native to Asia and is found in China, Bangladesh, Vietnam

It was introduced to Japan, South Korea and Pennsylvania

In South Korea, it is considered an invasive pest and impacts grapes and peaches

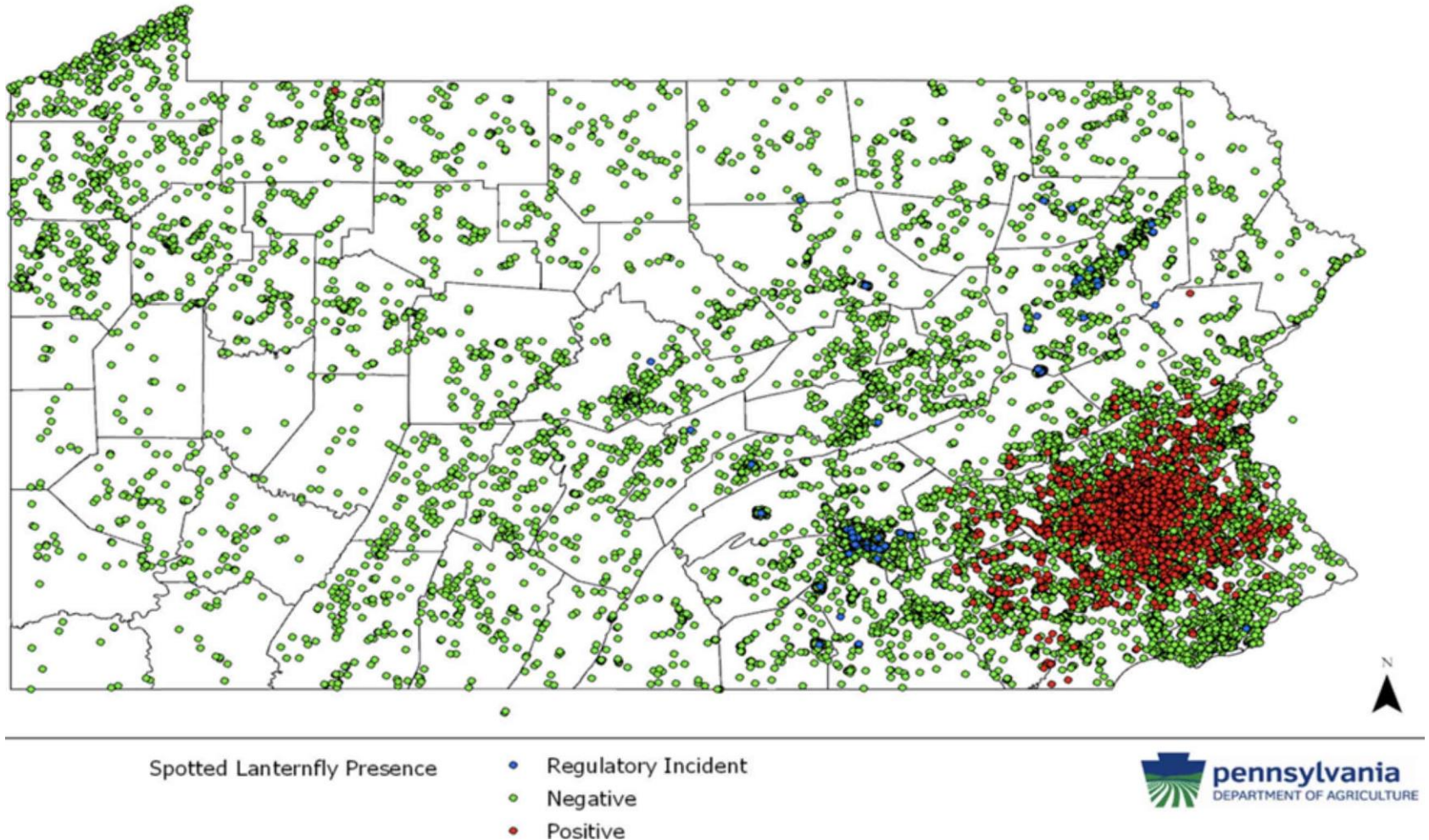


Follow FLOW:



# Spotted lanternfly in Pennsylvania

SLF Distribution as of Dec 06, 2018



# Spotted lanternfly in Pennsylvania

*Slide courtesy of Sven-Eric Spichinger*



**Adults: July - December**



**Egg Laying:  
September - November**



**Eggs: October - June**



**Fourth Instar:  
July - September**

## One Generation Per Year



**Third Instar: June - July**



**Second Instar: June - July**



**Hatch and 1st Instar:  
May - June**

# Spotted lanternfly in Pennsylvania

*Slide courtesy of Sven-Eric Spichinger*

Egg masses have on average between 30-50 eggs and can be laid on trees or any smooth surface



# Spotted lanternfly in Pennsylvania

*Slide courtesy of Sven-Eric Spichinger*

All life stages can hitchhike to new areas, but egg and adults pose the greatest risk for movement





# Spotted lanternfly in Pennsylvania

*Slide courtesy of Sven-Eric Spichinger*

Impact: damage grape, hops, orchards, hardwood, nursery industries but also reported from various vegetables and field crops

Damage comes mostly from feeding waste (honeydew) which turns into sooty mold



# Spotted lanternfly *Lycorma delicatula* over a vineyard

Berks County, Pennsylvania, USA (2018)



Spotted  
lanternfly  
*Lycorma  
delicatula* in  
a vineyard  
Berks County, PA





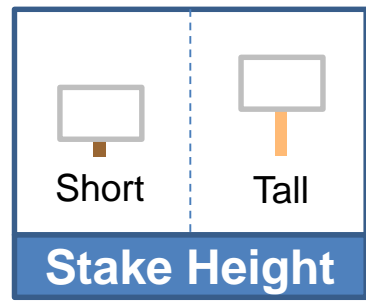
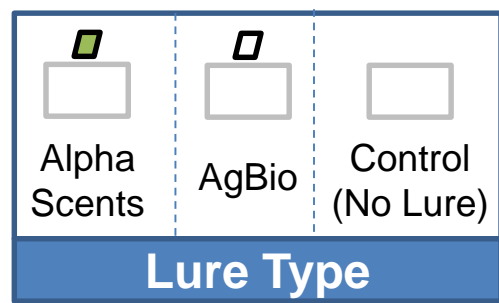
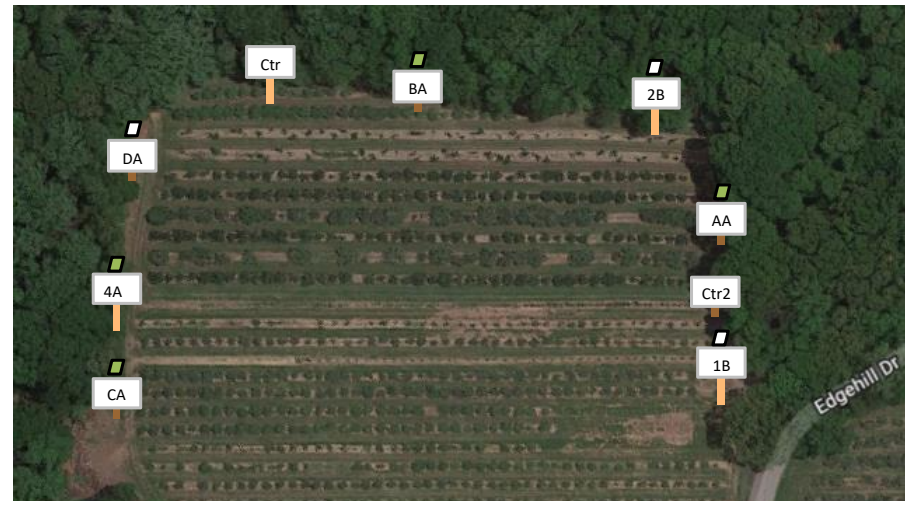
# SLF Lure Comparison Project,

Berks County, PA 2018

- 
- Comparison of 2 commercial lures for monitoring SLF:
    - **PredaLure MS90** (from Ag-Bio, Inc.)
    - **LYCDEL SLF** monitoring lure (from AlphaScent, Inc)
  - Three commercial orchards: peach, apple, grapes
  - Double side sticky trap (Trece Inc.)
  - Traps placed at two heights (4 and 7 ft)
  - Traps located on the edge of woods
  - Traps checked weekly from June until October
  - visual sampling (2 minute/tree)

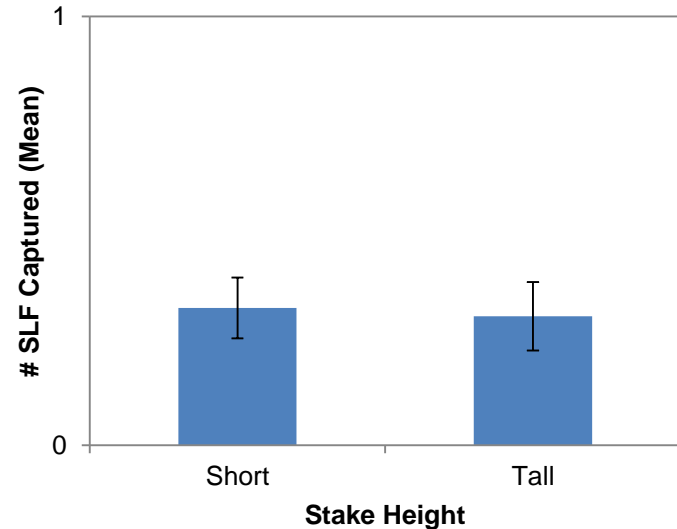
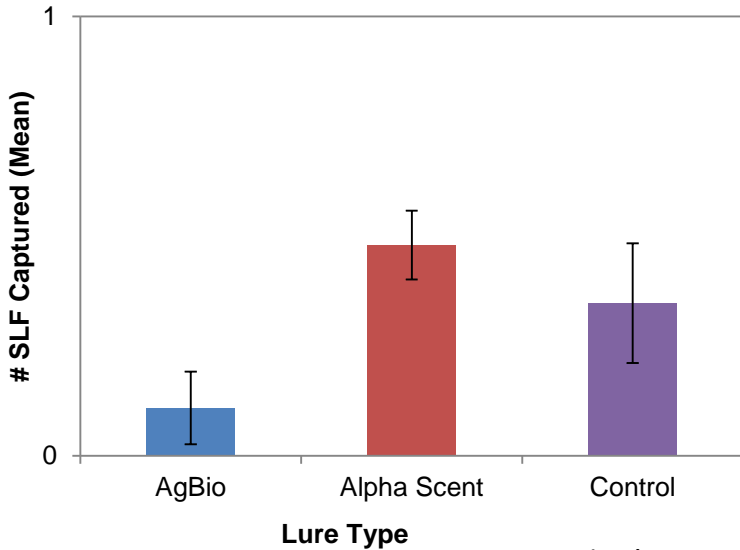
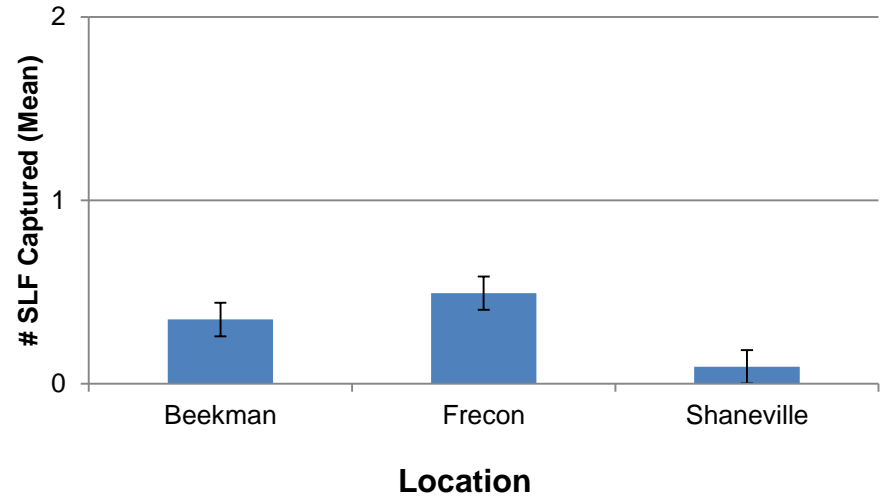
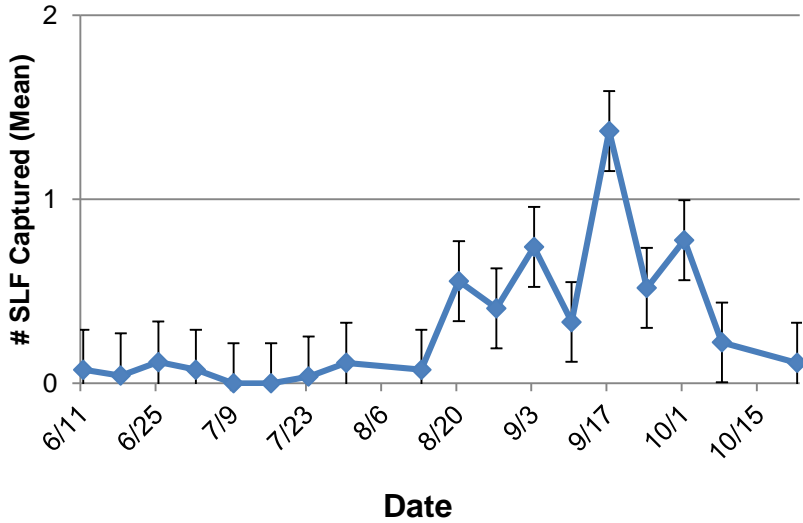


# SLF Lure Comparison Project, Berks County, PA 2018



# SLF Lure Comparison Project,

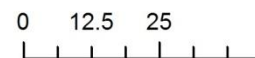
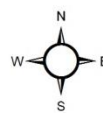
All farms combined, Trap only data, Berks County, PA 2018



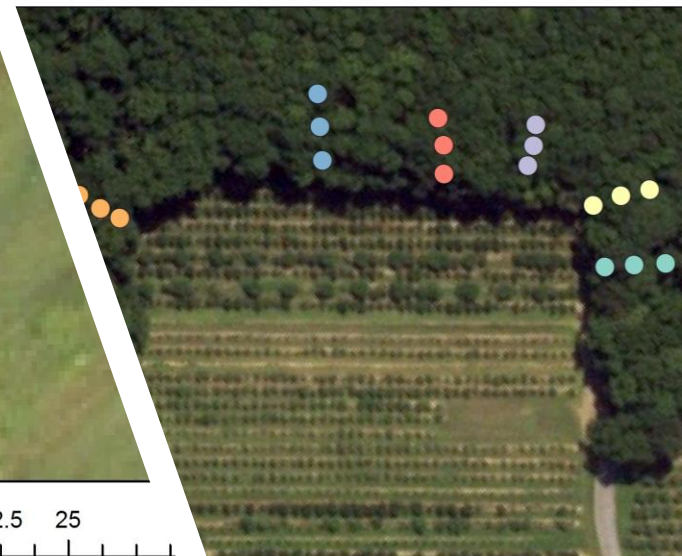
ANOVA, Fisher's Protected LSD test, sqrt x transformation,  $p \leq 0.05$

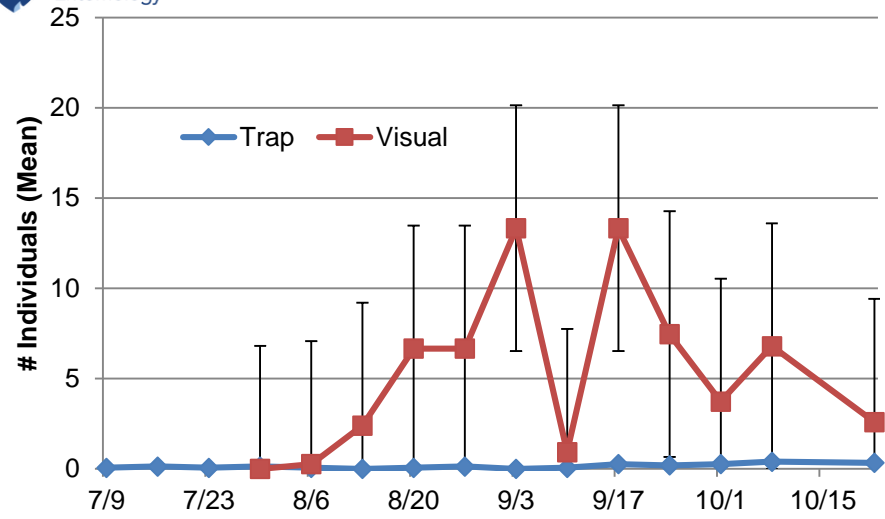
# SLF Movement Project, Berks County, PA 2018

SLF Movement Project 2018: Shaneville Orchards

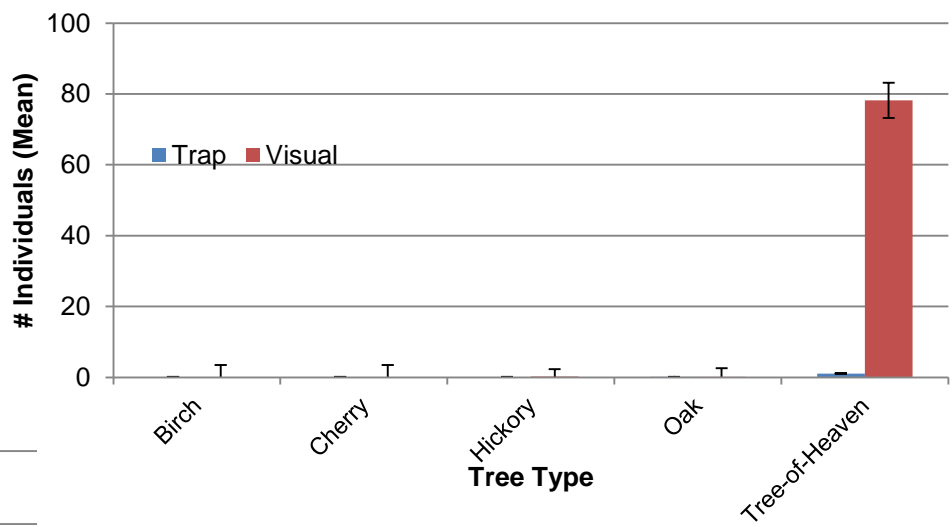
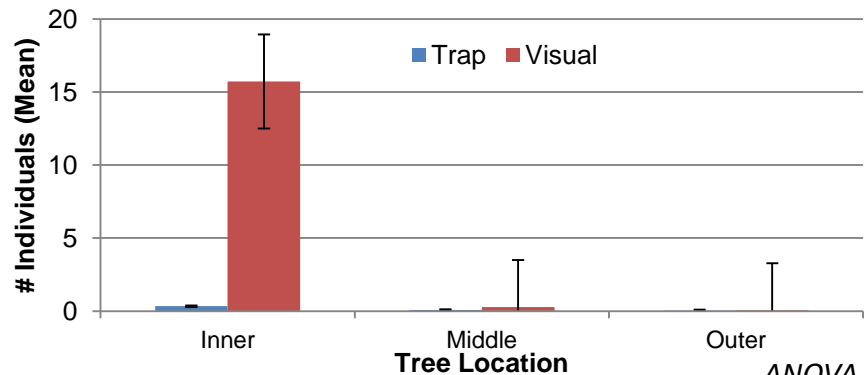


SLF Movement Project 2018: Frecon Orchards





# SLF Movement, Vineyard B, Berks County, PA 2018





# Spotted lanternfly *Lycorma delicatula* egg masses on maple tree (spring 2018)

Berks County, Pennsylvania



# SLF ovicidal mortality, direct contact bioassays, 2018

- Egg masses collected during the Feb-April 2018
  - Egg masses from small branches (“lab” bioassays in grower’s office)
  - Egg masses directly in the field on natural hosts
- Direct applications of commercially available products with potential ovicidal activity
- Six individual bioassays at various conditions
- Mortality assessed at egg hatch by counting the numbers of hatched eggs vs total number of eggs



# SLF ovicidal mortality, direct contact bioassays, 2018

Product Rate/100 gal	Percent mortality at different locations:					
	Beekwoods	Beekoff	Decmapleft	Decmapright	Decwoods	Beekoil
Assail 30 SG, 8.0 oz	7.3 ± 10.9 b	18.9 ± 7.7 b	41.8 ± 6.7 a	34.2 ± 7.7 ab	n/a	n/a
Centaur WDG, 34.5 oz	14.3 ± 8.7 a	7.3 ± 7.1 b	3.7 ± 10.1 ab	26.4 ± 5.5 a	4.3 ± 10.1 ab	n/a
Dimilin 25W, 3.0 lb	n/a	3.7 ± 7.7 b	n/a	n/a	6.7 ± 1.3 a	n/a
Rimon 0.83EC, 40.0 fl oz	n/a	25.7 ± 6.2 a	n/a	n/a	17.9 ± 6.8 a	n/a
Sivanto Prime, 14 fl oz	55.9 ± 12.0 a	25.7 ± 8.5 a	41.1 ± 13.9 a	21.3 ± 9.0 a	30.9 ± 13.9 a	n/a
Venom 30 SG, 6.75 oz	36.8 ± 22.0 a	41.2 ± 15.6 a	52.9 ± 17.9 a	66.7 ± 17.9 a	36.6 ± 22.0 a	n/a
<b>Lorsban Adv., 1.5 qt</b>	100.0 ± 0.0	100.0 ± 0.0	100.0 ± 0.0	100.0 ± 0.0	100.0 ± 0.0	n/a
Golden oil, 2.0 %	30.0 ± 18.4 bc	16.6 ± 10.6 c	49.9 ± 7.5 ab	21.6 ± 13.0 c	n/a	79.4 ± 15.0 a *
JMS Stylet oil, 3.0 %	81.9 ± 16.0 bc	51.3 ± 9.2 c	83.9 ± 11.3 ab	54.2 ± 13.1 c	62.0 ± 16.0	72.2 ± 11.3 a
Water control	28.6 ± 9.3 a	n/a	39.4 ± 16.0 a	31.5 ± 9.3 a	41.3 ± 13.1 a	28.8 ± 8.5 a
Dry control	n/a	24.2 ± 8.8 a	n/a	n/a	n/a	5.3 ± 8.1 a

\* - 100 percent solution of oil

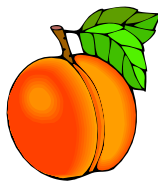


## SLF nymphs mortality, residual bioassays, 2018

- SLF nymphs collected from the field;
- Sunflower plants treated to the point of drip directly before the placement of the nymphs;
- Thirty 3<sup>rd</sup> and 4<sup>th</sup> instar nymphs placed per individual net sleeve;
- Two placement of nymphs: directly after the insecticide application and 7 days after the application;
- Mortality reading at 24 and 48 hours after the placement of nymphs;

*All tested commercial products available to homeowners*

# Spotted Lanternfly Nymphs on Peach



Data from Dr. David Biddinger, PSU FREC, July 2018

**Mortality = Percent Dead + Moribund**

## Neonicotinoids/Systemic

Insecticide	Rate/A	0 dat	7 dat	14 dat
Scorpion 35SL	5.0 oz	100	56	25
Closer 2SC	5.75 fl oz	91	63	23
Assail 30SG	8.0 oz	90	9	-
Sivanto Prime 1.67SC	14.0 fl oz	100	23	-
Actara 25WDG	3.5 oz	100	70	17
Movento 2SC + LI-700	9.0 fl oz + 1qt/100gal	38	-	-
Lannate 90SP	1.0 lb	100	8	-
Vydate 2L	8.0 pt	100	84	2
Acephate 97WDG	1.0 lb	100	46	-
Unsprayed control	--	0	25	0

## Contact Chemicals

Insecticide	Rate/A	2 dat	7 dat	14 dat
Beleaf 50SG	2.8 oz	15	-	-
Avaunt 30DG	6.0 oz	98	-	-
Imidan	3.0 lb	100	97	48
Mustang Maxx 0.8EC	4.0 fl oz	100	29	-
Danitol 2.4EC	21.33 fl oz	100	81	24
Carbaryl 4L	3.0 qt	100	100	10
Esteem 35WP	5.0 oz	29	26	-
Brigade 10WSB	16.0 oz	100	100	79
Exirel 0.83EC	20.5 fl oz	15	-	-
Rimon 0.83EC	40.0 fl oz	25	-	-
Entrust 2SC	10.0 fl oz	58	24	-
Unsprayed control	--	0	25	0

# SLF nymphs mortalities, residual bioassays, 2018

Product name	Active ingredient	Percent mortality (nymphs)			
		fresh residue		7 days old residue	
		24h	48h	24h	48h
Amdro Quick Kill Outdoor	Zeta-cypermethrin	<b>80.0 ab</b>	<b>98.0 a</b>	<b>87.0 abc</b>	<b>97.0 a</b>
Bayer Advanced Complete	Imidacloprid/ $\beta$ -cyfluthrin	<b>100.0 a</b>	<b>100.0 a</b>	<b>95.0 a</b>	<b>98.0 a</b>
Black Flag Extreme Home	Deltamethrin	<b>100.0 a</b>	<b>100.0 a</b>	<b>100.0 a</b>	<b>100.0 a</b>
Ortho Home Defense	Bifenthrin / Zeta-cypermethrin	<b>100.0 a</b>	<b>100.0 a</b>	<b>100.0 a</b>	<b>100.0 a</b>
Garden Tech Sevin	Carbaryl	<b>98.0 ab</b>	<b>100.0 a</b>	<b>92.0 ab</b>	<b>100.0 a</b>
BioAdvance 3 in 1	Taufluvalinate / Tebuconazole	<b>95.0 ab</b>	<b>98.0 a</b>	<b>97.0 a</b>	<b>100.0 a</b>
Spectracide Malathion	Malathion	<b>100.0 a</b>	<b>100.0 a</b>	<b>100.0 a</b>	<b>100.0 a</b>
Bonide Captain Jack's Deadbug	Spinosad	<b>28.0 c</b>	<b>43.0 cd</b>	<b>23.0 de</b>	<b>43.0 bc</b>
Garden Safe Insecticidal Soap	Potassium salts of fatty acids	<b>8.0 c</b>	<b>20.0 cd</b>	<b>19.0 de</b>	<b>52.0 abc</b>
Bonide Neem Oil	Extract of neem oil	<b>73.0 b</b>	<b>73.0 ab</b>	<b>51.0 bcd</b>	<b>63.0 abc</b>
Garden Safe Multi-purpose	Pyrethrins / Piperonyl butoxide	<b>88.0 ab</b>	<b>97.0 a</b>	<b>44.0 cde</b>	<b>76.0 abc</b>
Water control	N/A	<b>3.0 c</b>	<b>20.0 cd</b>	<b>25.0 e</b>	<b>50.0 bc</b>
Dry control	N/A	<b>5.0 c</b>	<b>15.0 d</b>	<b>30.0 e</b>	<b>40.0 c</b>

ANOVA, LSD test, sqrt x transformation,  $p \leq 0.05$

# SLF adults mortality, residual bioassays, 2018

- SLF adults collected from the field (max 2 d old);
- Sunflower plants treated to the point of drip directly before the placement of the nymphs;
- Thirty SLF males or females placed per individual net sleeve;
- Two placement of adults: directly after the insecticide application and 7 days after the application;
- Mortality reading at 24 and 48 hours after the placement of adults;
- Additional bioassay to evaluate natural mortality of adults in sleeves



*All tested commercial products available to homeowners*

# Spotted Lanternfly Adults on Grape

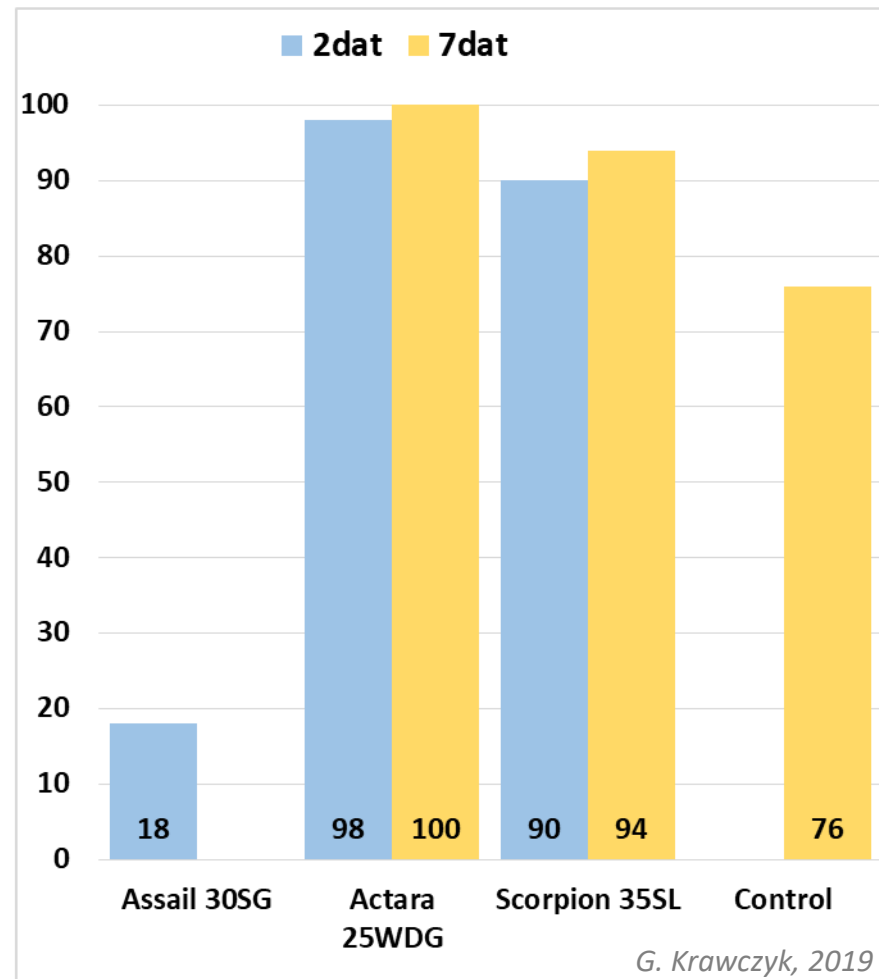
Mortality= Percent Dead + Moribund

Data from Dr. David Biddinger, PSU FREC, Aug-Sept, 2018



Chemicals applied Aug. 20, 2018

Insecticide	Rate/A	0 dat	7 dat
Assail 30SG	5.2 oz	18	0
Actara 25WDG	3.5 oz	98	100
Scorpion 35SL	5.0 oz	90	94
Unsprayed control	--	0	76

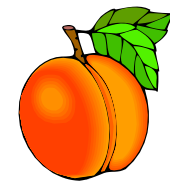


High control mortality due to 95 F heat on 7DAT reading.



# Spotted Lanternfly Adults on Peach

Data from Dr. David Biddinger, PSU FREC, Aug-Sept, 2018



Mortality = Percent Dead + Moribund

## Neonicotinoids/Systemic

Insecticide	Rate/A	Mortality at 7 days
Scorpion 35SL	5.0 fl oz	18
Closer 2SC	5.75 fl oz	10
Sivanto Prime 1.67SC	14.0 fl oz	9
Assail 30SG	5 oz	16
Actara 25WDG	3.5 oz	52
Scorpion 35SL	5.0 fl oz	20

## Contact Chemicals

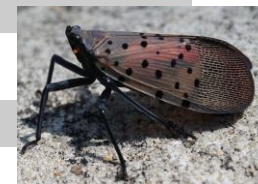
Insecticide	Rate/A	Mortality at 7 days
Avaunt 30DG	6.0 oz	42
Imidan	2.125 lb	36
Mustang Maxx 0.8EC	4.0 fl oz	10
Danitol 2.4EC	21.33 fl oz	40
Carbaryl 4L	2.0 qt	16
Admire Pro 4.6SC	1.4 fl oz	9
Brigade 10WSB	16 oz	92
Venom 70WP	3.0 oz	40
Control	--	20

Rates of insecticides legal for grapes !



# SLF adult mortality, residual bioassays, 2018

Product name	Active ingredient	Percent mortality on fresh residue (24h)	
		Fresh residue	7 d old residue
Amdro Quick Kill Outdoor	Zeta-cypermethrin	55.6 cdef	46.7 cde
Bayer Advanced Complete	Imidacloprid / $\beta$ -cyfluthrin	<b>93.3 a</b>	<b>71.1 abcd</b>
Black Flag Extreme Home	Deltamethrin	<b>88.9 ab</b>	<b>88.9 a</b>
Ortho Home Defense Insect Killer	Bifenthrin / Zeta-cypermethrin	<b>100.0 a</b>	<b>100.0 a</b>
Garden Tech Sevin Ready-to-Spray	Carbaryl	52.2 cdef	51.1 abcd
BioAdvance 3 in 1	Taufluvinate / Tebuconazole	<b>86.7 abc</b>	<b>82.2 abc</b>
Spectracide Malathion Insect Spray	Malathion	<b>100.0 a</b>	48.9 abcd
Bonide Captain Jack's Deadbug Brew	Spinosad	33.4 def	48.9 abcd
Bonide Neem Oil	Extract of neem oil	30.0 ef	40.0 bcde
Garden Safe Insecticidal Soap	Potassium salts of fatty acids	26.7 f	35.6 bcde
Garden Safe Multi-purpose	Pyrethrins / Piperonyl butoxide	<b>100.0 a</b>	48.9 cde
Stylet oil	Paraffinic oil	<b>57.8 bcde</b>	28.9 de
V (org exp)	Experimental (organic)	<b>63.7 abcd</b>	31.1 de
Water control	N/A	39.0 def	6.7 e



*Products available to homeowners from Lowe's and Home Depot*

G. Krawczyk, 2019



# Thank you

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and the Pennsylvania Department of Agriculture*