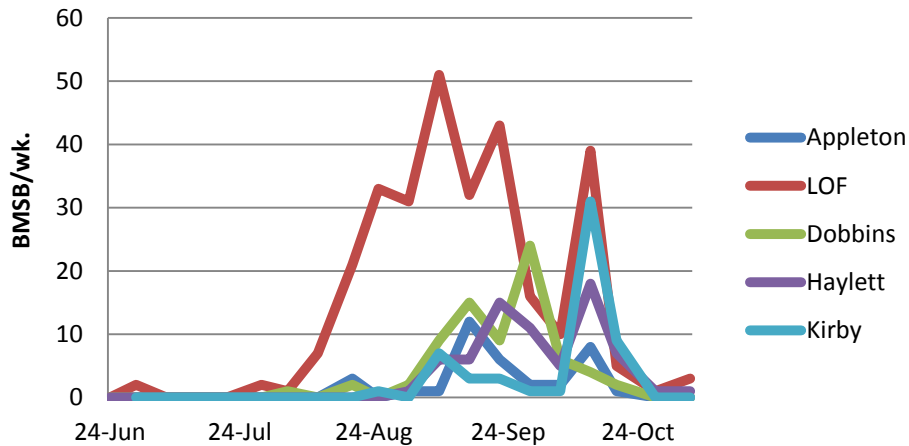
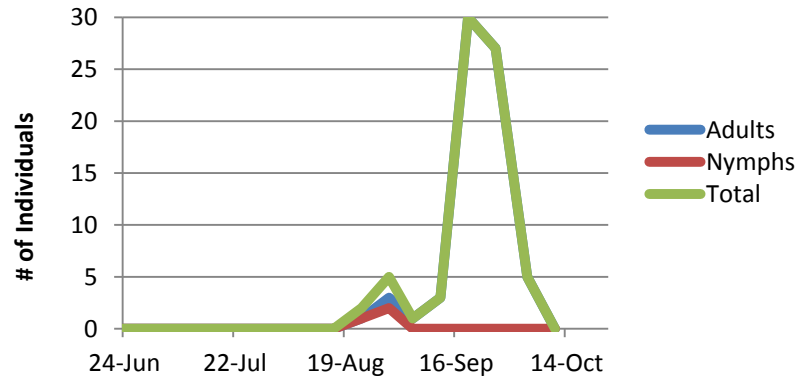


BMSB Feeding and Mortality Comparison on Sulfoxaflor and Bifenthrin Treated Apple.

Total BMSB; WNY-2016



BMSB; HV-2016 Clintondale



2016 Objectives

Majority of injury from BMSB occurs near harvest of late season apple varieties (Mid-August-November).

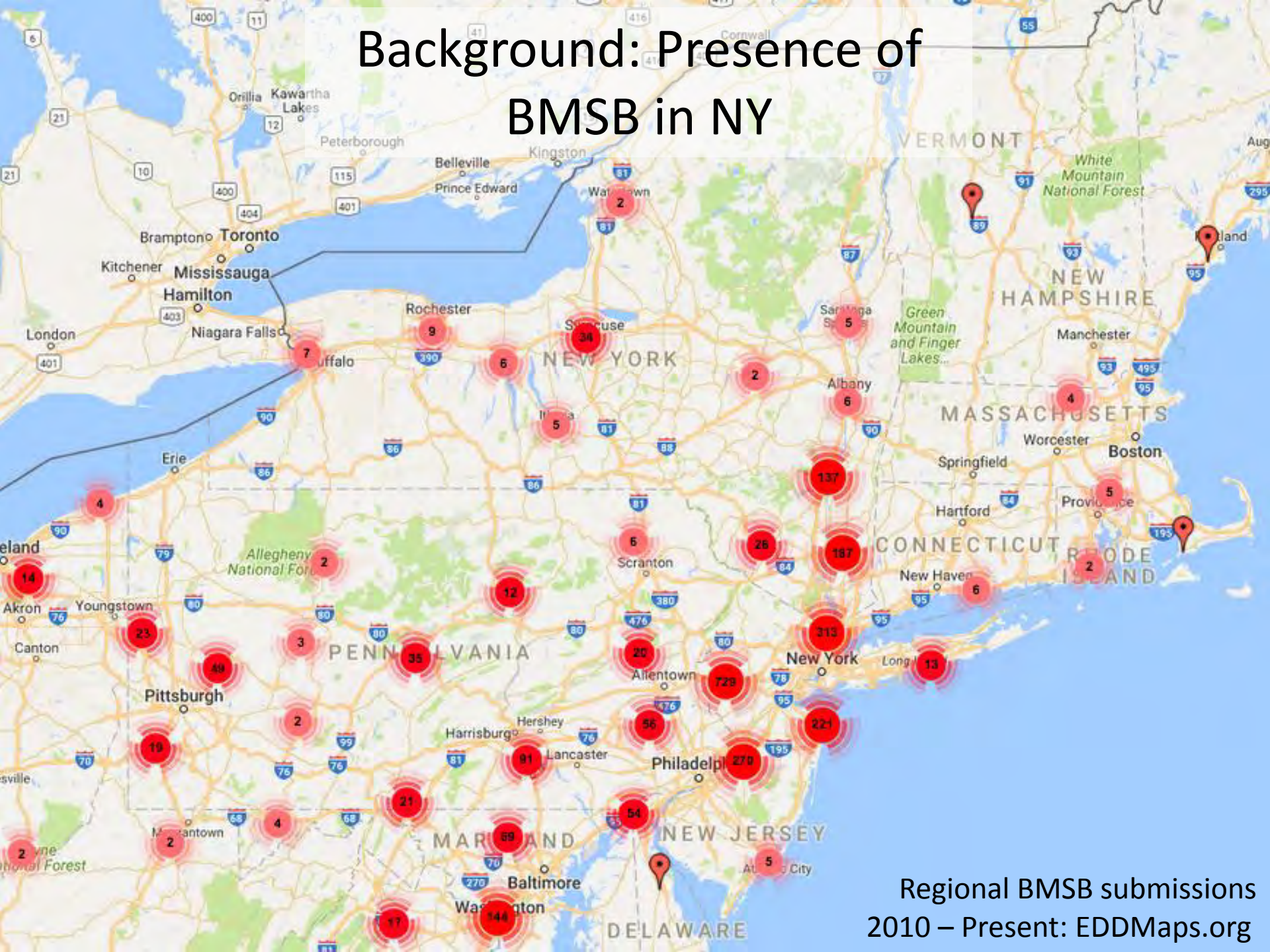
- Pre-harvest intervals of effective insecticides ≥ 14 d

Sulfoxaflor has been re-registered as of Oct. 14, 2016

- 7d PHI; 4 applications / season
- 1. To determine if ‘Confined Field Population’ of BMSB can be used as indicators of insecticide efficacy.***
 - 1. Test Sulfoxaflor to determine its efficacy as an anti-feedant near harvest of apple.***



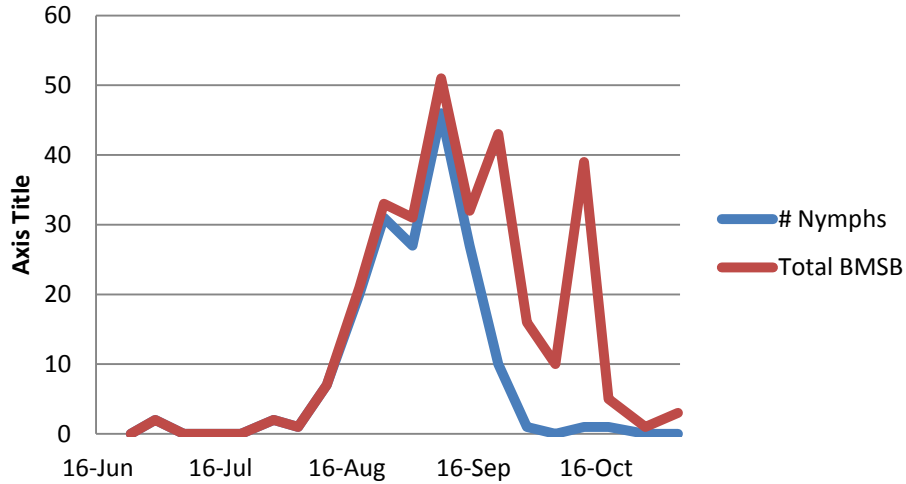
Background: Presence of BMSB in NY



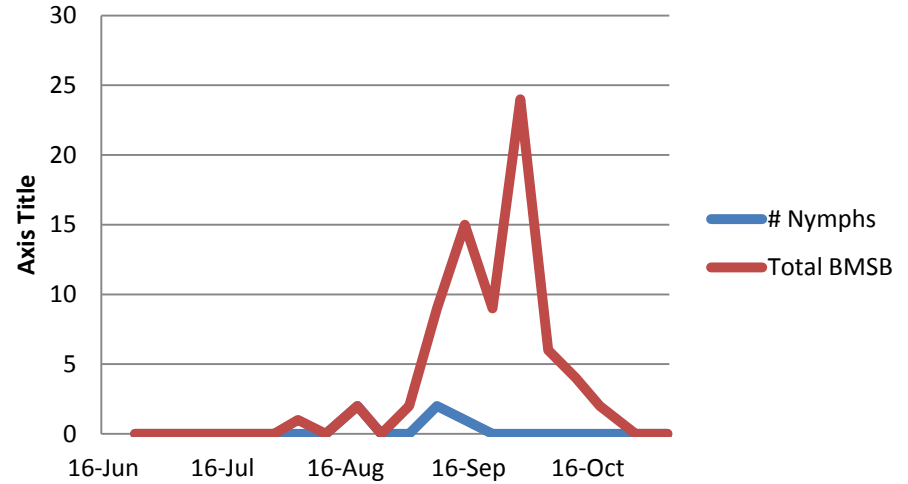
Regional BMSB submissions
2010 – Present: EDDMaps.org

Lake Ontario Fruit Growing Region - 2016

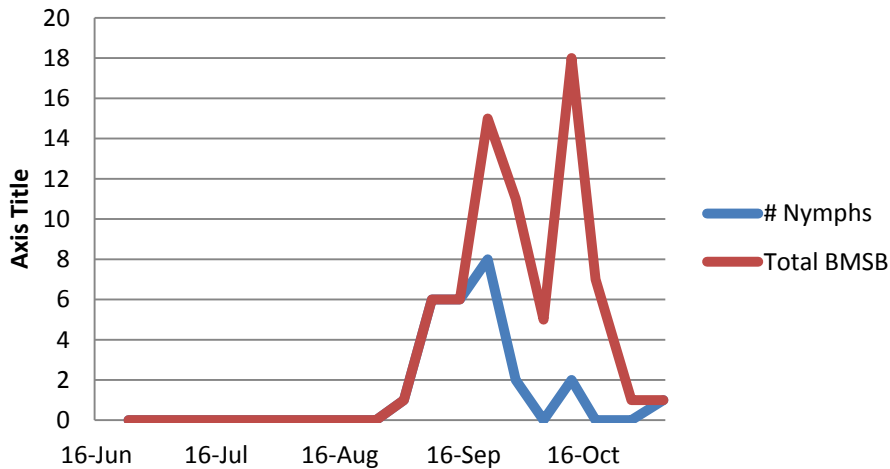
Albion.1, WNY (Orleans)



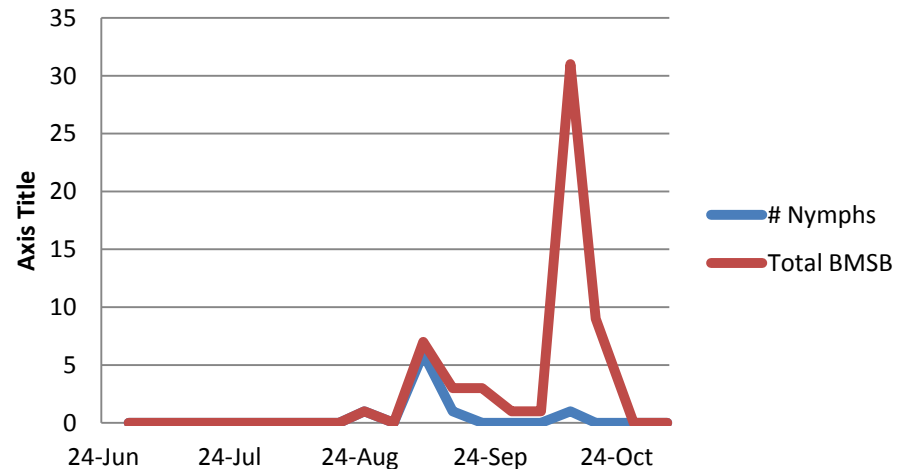
Lockport, WNY (Niagara)



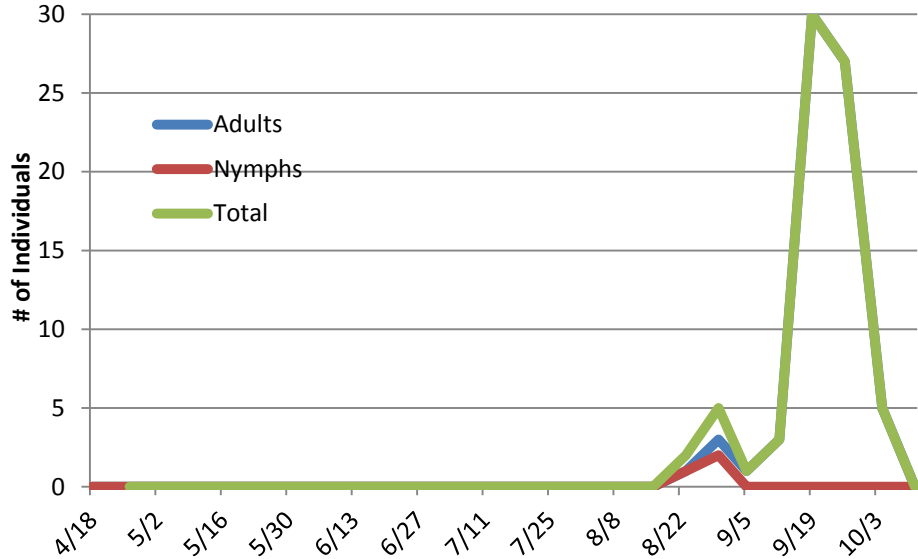
Albion.2, WNY (Orleans)



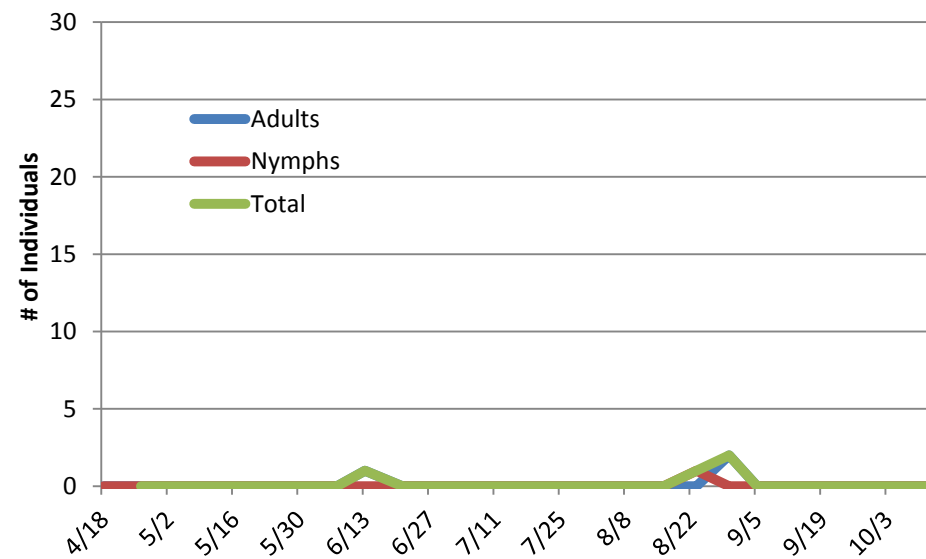
Brockport, WNY (Orleans)



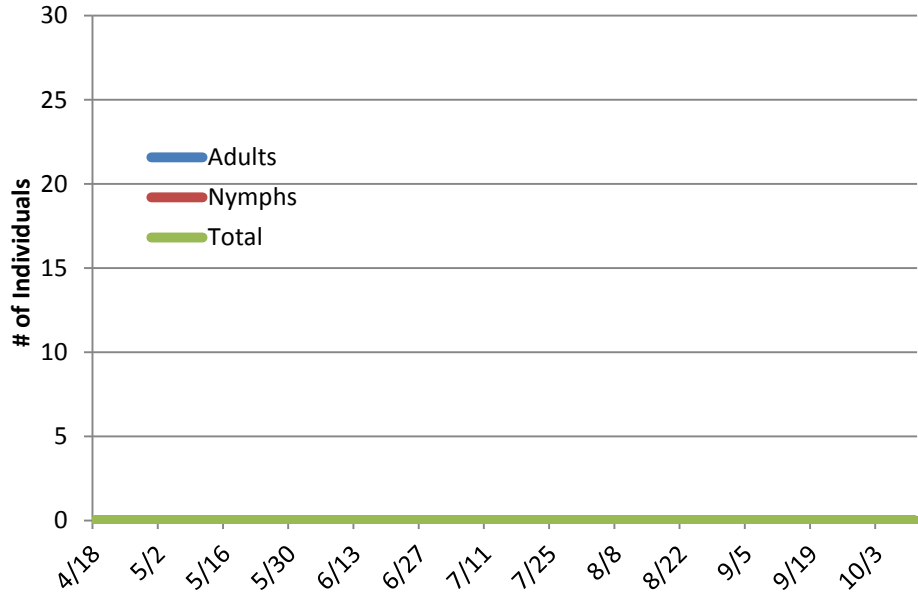
**HVRL BMSB Trapping 2016
Clintondale - Coy North**



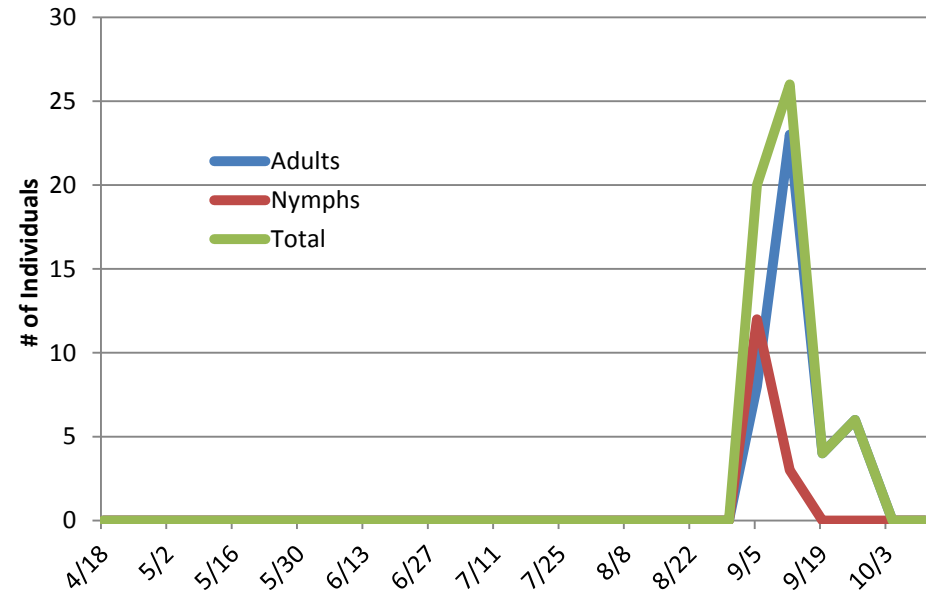
**HVRL BMSB Trapping 2016
Clintondale - Coy South**



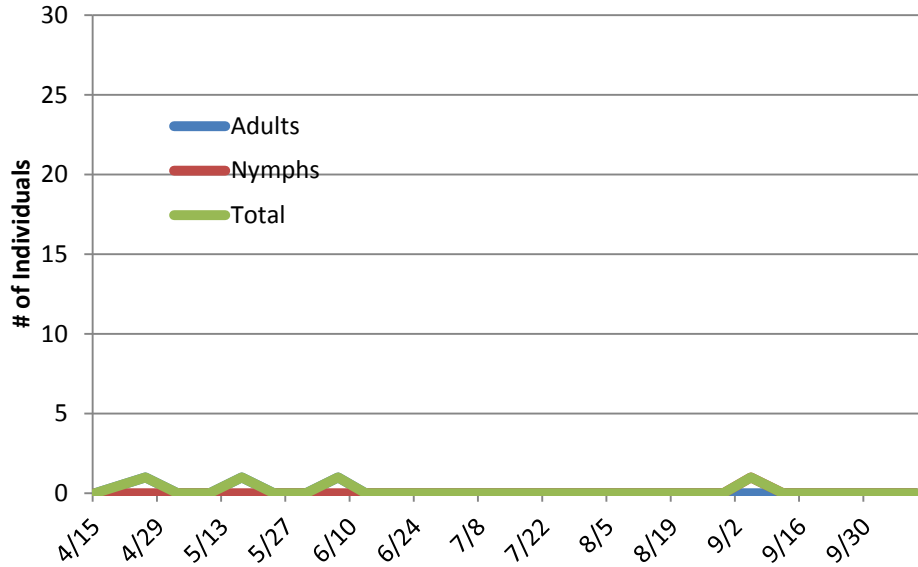
**HVRL BMSB Trapping 2016
Clintondale - Hurds**



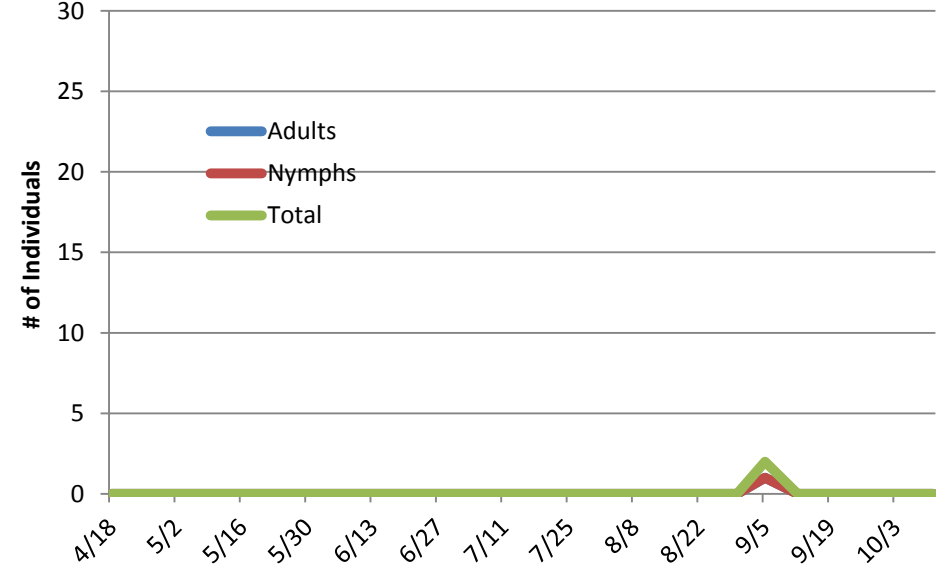
**HVRL BMSB Trapping 2016
Clintondale - MInard**



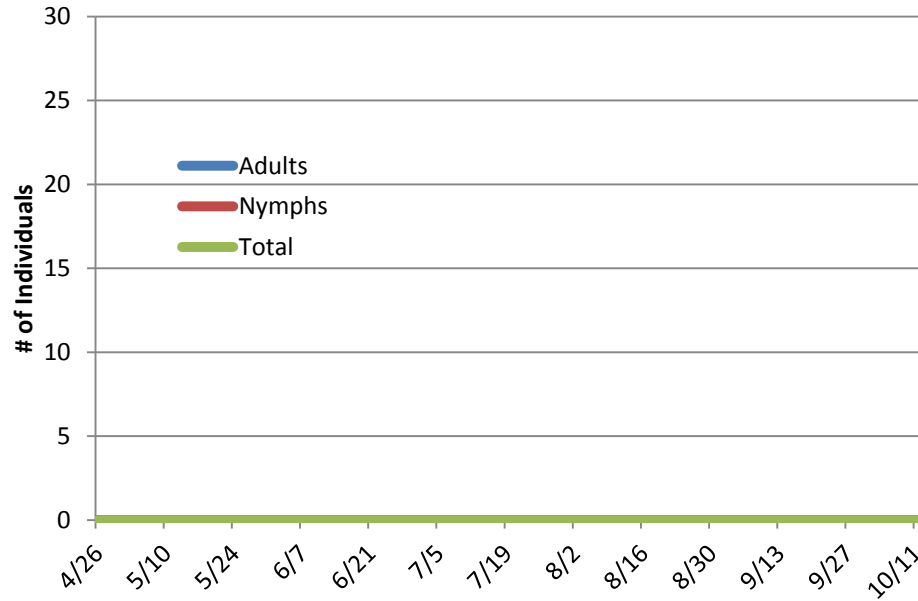
**HVRL BMSB Trapping 2016
New Paltz - Dressels West**



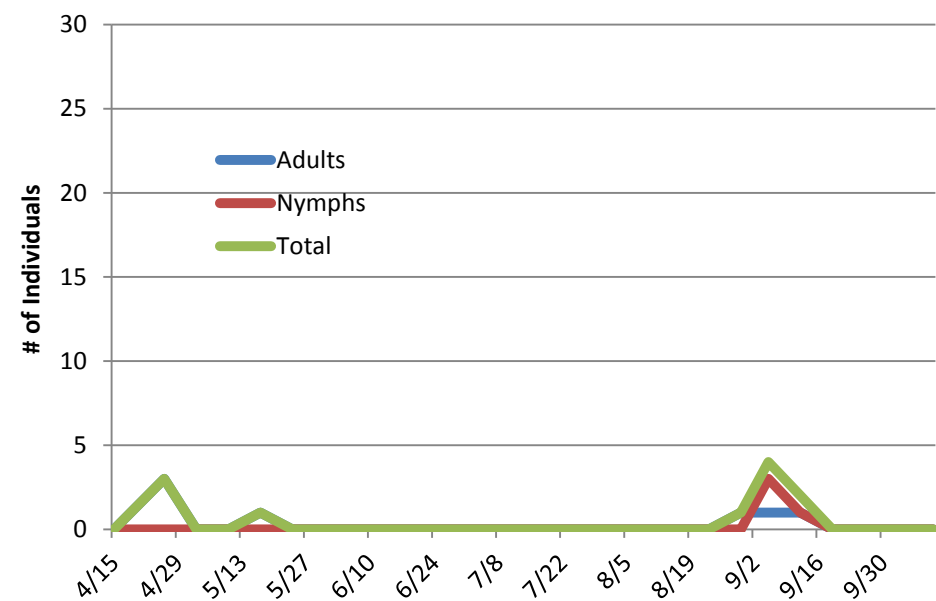
**HVRL BMSB Trapping 2016
New Paltz - Dressels East**



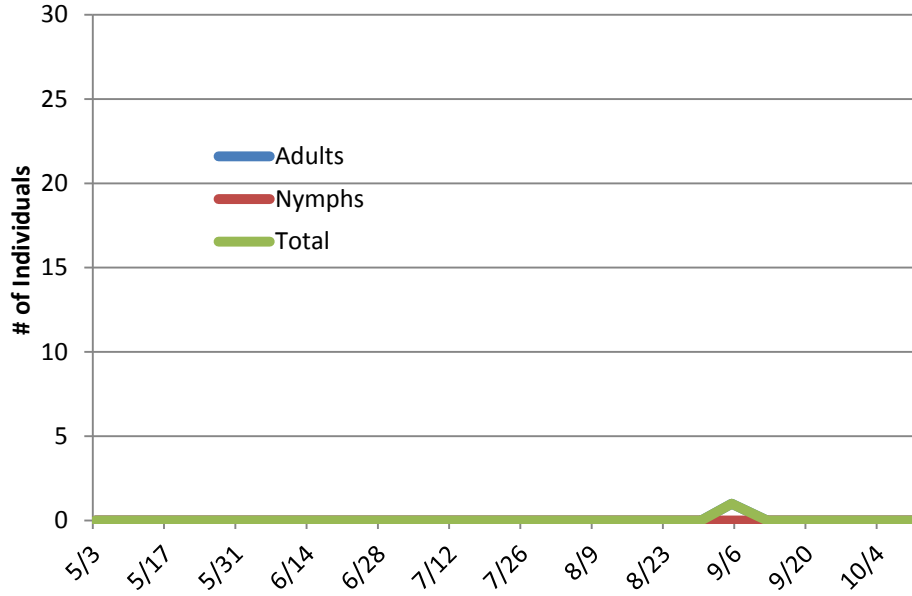
**HVRL BMSB Trapping 2016
Walden - Crist Home West**



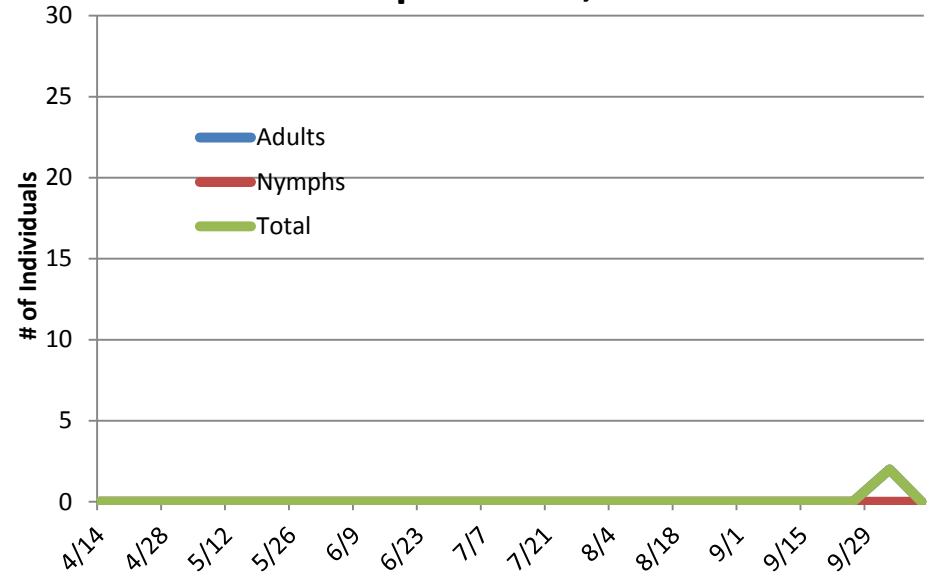
**HVRL BMSB Trapping 2016
Walden - Crist Home East**



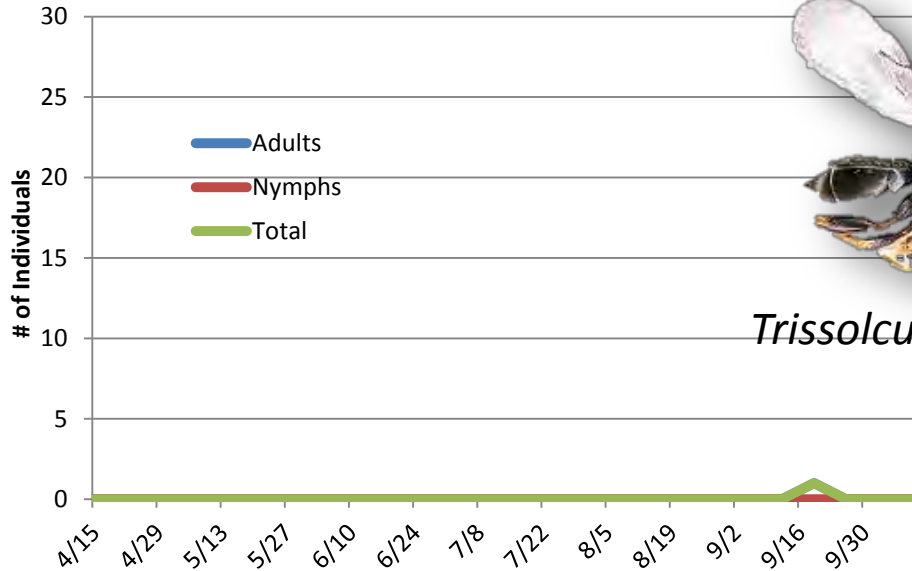
HVRL BMSB Trapping 2016 East Poughkeepsie, NY



HVRL BMSB Trapping 2016 Campbell Hall, NY



HVRL BMSB Trapping 2016 Marlboro, NY



Trissolcus japonicus



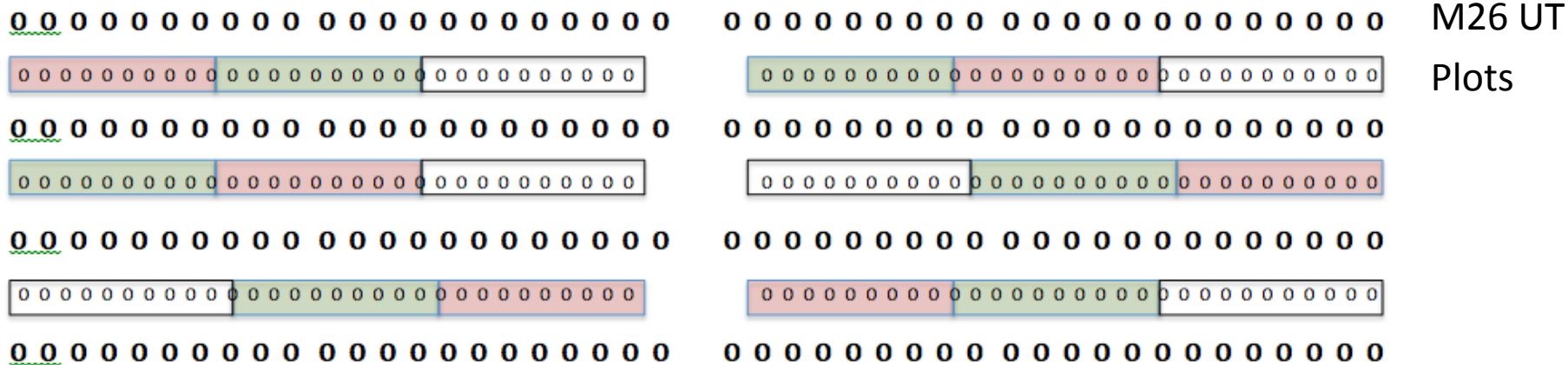
Using 'Confined Field Population' of BMSB as Indicators of Insecticide Efficacy



- Seven year old Red Delicious fruit trees on variety dwarfing rootstock strains were used in a complete block design.

Block consisted of 3 rows between 4 untreated rows of M26 apple varieties

- 10 trees per plot; 6 center trees used for study
- 3 fruit per BMSB life stage per replicate
- 6 replicates



Using 'Confined Field Population' of BMSB as Indicators of Insecticide Efficacy



- Closer SC @ 5.75 fl.oz./A and Bifenthrin EC at 12.8 fl.oz. on 2nd August applied dilute using handgun \geq 250psi @ 75 GPA.
- Placement of BMSB **3rd instar nymphs** and **adults** @ 24hr, 48hr and 72hr post application onto **shaded side** of fruit, **north side** of each tree.
- Over top of each insect was placed a 1 oz. screened cup.
- Insects were removed after 7d with container perimeter circled using black marker to isolate BMSB feeding site.

Using 'Confined Field Population' of BMSB as Indicators of Insecticide Efficacy



- Fruit were harvest on August 14th
- Fruit assessed for :
 - Feeding sites
 - Discoloration & depression (dimples)
 - Peeled to observe corking
 - % damage
- BMSB nymphs and adult observations:
 - longevity

Using 'Confined Field Population' of BMSB as Indicators of Insecticide Efficacy



Company: Dart

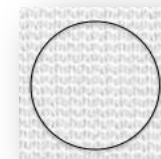
Stock Number: 100PC

Description: 1 oz.

Diameter of Top (in): 1.7

Diameter of Base (in): 1.2

Height (in): 1.3



$\frac{3}{4}$ " spade bit to bore cup base

Hot glue PAK 'no-see-um insect net' to base



BMSB Feeding and Mortality Comparison on Closer and Bifenthrin Treated Apple.



Harvest Field Means

| Trmt | Hr. Post Application | Life Stage | # Feeding Sites | # / fruit Green Dimples | Corking | % Clean |
|------------|----------------------|---------------|-----------------|-------------------------|---------|---------|
| Closer | 24h | adult & nymph | 0.2 | 0.3 | 0.3 | 71.4 |
| Bifenthrin | 24h | adult & nymph | 0.2 | 0.5 | 0.3 | 60.0 |
| UTC | 24h | adult & nymph | 1.4 | 1.2 | 1.4 | 26.7 |
| Closer | 48h | adult & nymph | 0.4 | 0.1 | 0.4 | 71.4 |
| Bifenthrin | 48h | adult & nymph | 0.3 | 0.9 | 0.4 | 61.5 |
| UTC | 48h | adult & nymph | 1.4 | 1.9 | 2.1 | 20.0 |
| Closer | 72h | adult & nymph | 0.4 | 0.4 | 0.6 | 53.8 |
| Bifenthrin | 72h | adult & nymph | 0.0 | 0.6 | 0.1 | 64.3 |
| UTC | 72h | adult & nymph | 1.1 | 1.4 | 1.9 | 23.1 |

BMSB Feeding and Mortality Comparison on Closer and Bifenthrin Treated Apple.



| Stage | Hr.post Appl. | Trmt | # Feeding Sites | Green Dimples | Corking | Clean |
|-------------------------|---------------|------------|-----------------|---------------|---------|--------|
| BMSB Adult | 24hr | Closer | 0.0a | 0.3a | 0.0a | 0.1a |
| | | Bifenthrin | 0.3a | 0.6a | 0.4a | 0.5ab |
| | | UTC | 1.6b | 0.9a | 1.6b | 0.9b |
| | | P-Value | 0.0079 | 0.6411 | 0.0109 | 0.024 |
| | 48hr | Closer | 0.3a | 0.0a | 0.7a | 0.1a |
| | | Bifenthrin | 0.7a | 0.3a | 0.7a | 0.7ab |
| | | UTC | 0.9a | 1.4b | 1.1a | 0.7b |
| | | P-Value | 0.6113 | 0.0018 | 0.7383 | 0.0641 |
| | 72hr | Closer | 0.0a | 0.4a | 0.3a | 0.3a |
| | | Bifenthrin | 0.9a | 0.4a | 1.1a | 0.4a |
| UTC | | 1.1a | 0.8a | 1.8a | 0.6a | |
| P-Value | | 0.3548 | 0.499 | 0.3131 | 0.4854 | |
| Fisher's Protected LSD | | | | | | |
| Significance level: .05 | | | | | | |



BMSB Feeding and Mortality Comparison on Closer and Bifenthrin Treated Apple.



| Stage | Hr.post Appl. | Treatment | # Feeding Sites | Green Dimples | Corking | Clean |
|--|---------------|------------|-----------------|---------------|---------|--------|
| BMSB Nymphs 3 rd Instar | 24hr | Closer | 0.1 a | 0.3 a | 0.1 a | 0.4 a |
| | | Bifenthrin | 0.4 a | 0.3 a | 0.6 a | 0.6 a |
| | | UTC | 1.1 a | 1.4 a | 1.1 a | 0.7 a |
| | | P-Value | 0.149 | 0.3699 | 0.1649 | 0.4526 |
| | 48hr | Closer | 0.0 a | 0.3 a | 0.1 a | 0.3 a |
| | | Bifenthrin | 0.3 a | 1.4 a | 0.3 a | 0.6 a |
| | | UTC | 1.8 b | 2.0 a | 2.8 b | 0.7 a |
| | | P-Value | 0.0267 | 0.3394 | 0.007 | 0.2 |
| | 72hr | Closer | 0.0 a | 0.4 a | 0.3 a | 0.3 a |
| | | Bifenthrin | 0.9 a | 0.4 a | 1.1 a | 0.4 a |
| | | UTC | 1.1 a | 0.8 a | 1.8 a | 0.6 a |
| | | P-Value | 0.3548 | 0.499 | 0.3131 | 0.4854 |
| Fisher's Protected LSD | | | | | | |
| Significance level: .05 | | | | | | |



BMSB Feeding and Mortality Comparison on Closer and Bifenthrin Treated Apple.



| Hr.post Appl. | Treatment | Stage | # Feeding Sites | Green Dimples | Corking | Clean |
|-----------------|--------------------------|-----------|-----------------|---------------|----------|---------|
| 24hr | Closer | Adults | 0.00 a | 0.29 a | 0.00 a | 0.86 b |
| | | Nymphs | 0.43 ab | 0.29 a | 0.57 abc | 0.57 ab |
| | Bifenthrin | Adults | 0.25 ab | 0.63 a | 0.38 ab | 0.50 ab |
| | | Nymphs | 0.14 ab | 0.29 a | 0.14 a | 0.71 b |
| | UTC | Adults | 1.57 c | 0.86 a | 1.57 c | 0.14 a |
| | | Nymphs | 1.13 bc | 1.38 a | 1.13 bc | 0.38 ab |
| | Type III Sums of Squares | Treatment | 0.0018 | 0.2691 | 0.0036 | 0.0367 |
| | | Stage | 0.8825 | 0.892 | 0.8998 | 0.7135 |
| Treatment*Stage | | 0.4503 | 0.7175 | 0.3165 | 0.2728 | |
| 48hr | Closer | Adults | 0.71 ab | 0.00 a | 0.71 a | 0.71 b |
| | | Nymphs | 0.00 a | 0.29 ab | 0.14 a | 0.71 b |
| | Bifenthrin | Adults | 0.33 a | 0.33 ab | 0.67 a | 0.67 ab |
| | | Nymphs | 0.29 a | 1.43 ab | 0.29 a | 0.57 ab |
| | UTC | Adults | 0.86 ab | 1.43 ab | 1.14 a | 0.14 a |
| | | Nymphs | 1.75 b | 2.00 b | 2.75 b | 0.25 ab |
| | Type III Sums of Squares | Treatment | 0.036 | 0.052 | 0.0098 | 0.0142 |
| | | Stage | 0.8999 | 0.2159 | 0.6246 | 0.9788 |
| Treatment*Stage | | 0.1629 | 0.8177 | 0.0897 | 0.8566 | |
| 72hr | Closer | Adults | 0.00 a | 0.33 a | 0.17 ab | 0.50 ab |
| | | Nymphs | 0.86 a | 0.43 a | 1.14 ab | 0.57 ab |
| | Bifenthrin | Adults | 0.00 a | 0.71 a | 0.00 a | 0.86 b |
| | | Nymphs | 0.00 a | 0.43 a | 0.29 ab | 0.43 ab |
| | UTC | Adults | 1.20 a | 2.80 a | 2.40 b | 0.20 a |
| | | Nymphs | 1.13 a | 0.75 b | 1.75 ab | 0.25 a |
| | Type III Sums of Squares | Treatment | 0.0819 | 0.021 | 0.0364 | 0.0932 |
| | | Stage | 0.5314 | 0.0788 | 0.7361 | 0.5159 |
| Treatment*Stage | | 0.5984 | 0.0985 | 0.5574 | 0.3331 | |

Fisher's Protected LSD
Significance level: .05

Comparison of a Late Season BMSB Feeding and Mortality Of Closer and Bifenthrin Treated Apple.



Adult Mortality

| Day after Exposure | Treatment | Alive (%) | Dead (%) |
|--------------------|------------|-----------|----------|
| 2 | Closer | 76.2 a | 23.8 a |
| | Bifenthrin | 16.7 a | 83.3 a |
| | UTC | 70.4 a | 29.6 a |
| | P-Value | 0.0947 | 0.0947 |
| 10 | Closer | 38.1 a | 61.9 a |
| | Bifenthrin | 0.0 a | 100.0 a |
| | UTC | 51.9 a | 48.1 a |
| | P-Value | 0.0895 | |
| 14 | Closer | 76.2 a | 23.8 a |
| | Bifenthrin | 16.7 a | 83.3 a |
| | UTC | 70.4 a | 29.6 a |
| | P-Value | 0.3787 | |

Fisher's Protected LSD

Significance level: .05

Comparison of a Late Season BMSB Feeding and Mortality Of Closer and Bifenthrin Treated Apple.



| Day after Exposure | Treatment | Alive (%) | Dead (%) |
|--------------------|------------|-----------|----------|
| 2 | Closer | 86.3 b | 13.7 a |
| | Bifenthrin | 44.3 a | 55.7 b |
| | UTC | 90.5 b | 9.5 a |
| | P-Value | 0.0086 | |
| 10 | Closer | 28.0 a | 72.0 a |
| | Bifenthrin | 8.9 a | 91.1 a |
| | UTC | 39.9 a | 60.1 a |
| | P-Value | 0.3023 | |
| 15 | Closer | 18.5 a | 81.5 a |
| | Bifenthrin | 4.7 a | 95.2 a |
| | UTC | 35.7 a | 64.3 a |
| | P-Value | 0.2239 | |
| 21 | Closer | 18.5 a | 81.5 a |
| | Bifenthrin | 4.8 a | 95.2 a |
| | UTC | 26.8 a | 73.2 a |
| | P-Value | 0.2756 | |

Fisher's Protected LSD
Significance level: .05

Conclusion



- Sulfoxaflor (Group 4C), is a sulfoximine insecticide with a distinct mode of action, acting as an agonist at insect nicotinic acetylcholine receptors (nAChRs) and functions in a manner distinct from other insecticides in Group 4.
- During late season infestations of BMSB, Closer SC applications made prior to the 7 DTH label constraint have been shown to reduce feeding to apple.
- For growers, Sulfoxaflor may provide an option to reduce late season feeding near harvest.