**Pest and Beneficial Arthropod Survey of Delaware Soybean, 2018**

**Final Report**

**Personnel**: David Owens and Bill Cissel

**Objectives**:

1. Monitor statewide soybean pest occurrence to advise stakeholders of pest activity to aid in targeting scouting efforts.

1. Monitor important natural enemies that may contribute to pest reduction.
2. Identify locations that may be suitable for research and demonstration pest management trials
3. Build a soybean arthropod pest and natural enemy reference collection for use in extension outreach training and support.

**Procedures**: A total of 45 soybean fields from 33 farmers were visited throughout the growing season between June and September - 17 Sussex County, 17 Kent County, and 11 New Castle County fields. Heavy May rains delayed planting in most fields and delayed survey initiation. Insect populations were sampled in 10 locations per field. Samples consisted of 10 sweeps with a standard 15” diameter sweep net and 5 leaflets were examined for spider mites and thrips. Stand data was collected up to V4, and plants were examined for feeding injury.

Insect pest abundance data from the survey was used to notify growers in the region about what to be looking for in a series of 13 weekly crop update posts: <http://extension.udel.edu/weeklycropupdate/>. Data from this survey and surveys of area crop consultants were also used to estimate soybean pest losses for Delaware (see page 13).

Six insecticide efficacy trials were conducted in Delaware and Maryland in fields identified as having suitable pest pressure. Field identification, insecticide application, and data collection activities were partially supported by funds provided by the DSB (see pages 6-12). These trial reports, among others, are posted to the UD insect management extension portal: <http://extension.udel.edu/ag/insect-management/research-and-extension-demonstration-results/>.

Collected insects were pinned, labeled, and used for an insect identification workshop at the 2018 Mid-Atlantic Crop Management School in Ocean City, MD. Collected insects were also available for display at 2019 Delaware AgWeek.

**Results**:

Two predatory mite species were identified from soybean fields: *Proprioseopsis mexicanus* and *Neoseiulus fallacis* (Acari: Phytoseiidae). Not much is known about *P. mexicanus* in the scientific literature, although it is widespread throughout North America. *Neoseilus fallacis* can be an important predator in orchards. Predator populations were extremely low.

Two of the surveyed fields in Sussex County were treated for two spotted spider mites along with other pests. Treatment timing corresponded with an early reproductive stage fungicide application. Spider mite populations peaked at the end of June due to hot dry weather, and crashed at the beginning of August. Kent County mites peaked in mid-July and crashed afterwards, likely due to rain events. Very few mites were intercepted in New Castle County.

Thrips populations were greatest in New Castle County. Direct thrips feeding injury is not normally considered to negatively impact soybean unless beneficial insects are not present, populations are greater than 12 per leaflet, and soybean fields are under severe drought stress. Thrips can vector a virus, soybean vein necrosis virus, but the virus impact on yield and the economic return of insecticide applications is uncertain. At this time, insecticide applications are not recommended.

The 3 most significant defoliators in 2018 were bean leaf beetles, green cloverworm, and soybean looper. Green cloverworm and soybean looper populations peaked in early September. It is extremely important to correctly identify these two species; cloverworms are easily controlled with pyrethroids while loopers are not. Soybean looper populations were greatest approximately 1 week after corn earworm populations peaked. Most fields treated for earworms were treated with a pyrethroid, which soybean loopers are not susceptible to. August pyrethroid applications can disrupt natural enemies that would feed on soybean looper eggs and early instars. If a field is treated with a pyrethroid this late in the season, follow up scouting is necessary to ensure soybean loopers do not establish. Green cloverworm populations were higher than usual in late July and August, but crashed by the beginning of September due to fungal pathogens favored by wet September weather. Several fields were visited in September in Sussex and Kent counties in which corn earworm, yellow striped armyworm, green cloverworm, and soybean looper had succumbed to pathogens in their 4th and 5th instars. Bean leaf beetle populations were greatest in Kent County, concentrated in two of the survey fields. Early season populations did not appear to influence stand establishment, mid-season populations are minor defoliators. Bean leaf beetle and Japanese beetle feeding is highly visible, concentrated on the uppermost leaves. However, when scouting for defoliation, the entire plant canopy needs to be assessed, and in visited fields, the overall canopy was very robust despite highly visual top canopy feeding. Late season bean leaf beetle populations can window-pane pods and affect quality in addition to feeding on foliage. Japanese beetle populations were low, peaking during the last half of July. None of the surveyed fields sustained significant defoliation during peak beetle activity period.

Kudzu bug was only found in a kudzu patch in late August near Laurel, DE. No kudzu bugs were observed in soybean fields.

One of the surveyed fields in the SW quadrant of Sussex County was treated for corn earworm. Corn earworm populations required treatment in numerous fields near Laurel and Seaford. Earworm populations in Kent and New Castle were low and peaked two weeks later than in Sussex. Populations quickly declined in September due to the aforementioned fungal pathogen outbreak in the worm populations.

In general, stink bug populations were low and did not reach economic thresholds in any surveyed fields. Populations peaked at a greater level in Kent County, well below threshold levels. Brown marmorated stink bug populations were very low in soybean, comprising 1.2% of the population. Field edges may be infested while the rest of the field is relatively free of stink bugs. In such cases, edges should be sampled more intensively and an effective treatment can focus on edges, sparing the field interior.

Dectes populations were greatest in Kent County, and were active for an 8 week period. New Castle Dectes populations were slightly lower and were active for 5 weeks; Sussex Dectes populations were lower and were active for 7 weeks. Stem samples were collected from 7 surveyed fields; infestation levels ranged from 4 – 56%. The most heavily infested field (56% infested stems) had 19 cumulative Dectes adults over a 4 week period, representing 400 sweeps. However, the percentage of infested stems in another surveyed field that had 14 adults over a 3 week period was nearly half (26%) that of the field with 19 Dectes in it. A third field had 15 adults over a 4 week period, but stem infestation was even lower at 16%. Sunflowers were sampled in 4 locations in Sussex County. Sunflower stem infestation ranged from 0 and 36% while adjacent soybean stem infestation was between 0 and 7%. Cocklebur was also sampled from one site with 28% stems infested whereas the adjacent soybean field had extremely low Dectes stem infestation. Exploring the interaction between Dectes, soybean, and other hosts could lead to additional management tactics.

**Soybean 2018 Bean Leaf Beetle**

**Location:** Cordova, MD

**Variety:** Asgrow ‘4135’

**Planting Date:**  10 May

**Experimental Design:** Randomized complete block design with 4 treatments and 3 replicates.

**Plot size:** 8 rows x 20’

**Row Spacing:** 15”

**Treatment Method:** CO2- pressurized backpack sprayer with 10’ boom equipped with 6 XR11004 nozzles delivering 16 GPA at 22 PSI.

**Treatment Date:** 27 August

**Sample Size**: 15 sweeps/plot

**Data Analysis:** ANOVA; Tukey-Kramer HSD means separation. Counts were LOG (x + 0.1) transformed prior to analysis.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **TRT** | **Material** | **Rate** | **2 DAT** | **7 DAT** |
| 1 | UTC | --- | 8.7 a | 5.3 a |
| 2 | Warrior II | 1.0 fl oz/A | 0.7 b | 1.0 b |
| 3 | Prevathon | 9.7 fl oz/A | 9.0 a | 4.0 ab |
| 4 | Steward | 9.2 fl oz/A | 0 b | 9.7 a |
|  | *ANOVA* |  | *P = 0.001* | *P = 0.008* |

**Soybean 2018 Dectes Stem Borer 1**

**Location:**  Middletown

**Variety:** Asgrow ‘44X6’

**Planting Date:**  11 May

**Experimental Design:** Randomized complete block design with 5 treatments and 4 replicates

**Plot size:** 4 rows x 25’

**Row Spacing:**  30”

**Treatment Method:** CO2 pressurized backpack sprayer equipped with a 9’ boom fitted with 6 XR11003 nozzles delivering 21.5 GPA at 40 PSI

**Treatment Date:** 13 July and 9 August

**Sample Size:** 10 sweeps per plot; 25 stems at R7

**Data Analysis:** ANOVA; Tukey-Kramer HSD means separation. Infested stem percentage data square root (x + 0.1) transformed prior to analysis

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TRT** | **Material** | **Rate** | **Application Timing** | **0-d Pre** | **4 DAT** | **11 DAT** | **18 DAT** | **27 DAT** | **% Lodging** | **% Infested** |
| 1 | UTC | -- | -- | 0.3 | 0.3 | 0 | 0.3 | 0 | 0.6 | 10.2 a |
| 2 | Prevathon | 20 fl oz/A | ~7 days after first adult | 0.3 | 0 | 0 | 0.3 | 0 | 0.4 | 4.0 ab |
| 3 | Prevathon + Steward | 14 fl oz. +  6 fl oz/A | ~7 days after first adult | 0 | 0 | 0 | 0 | 0.3 | 0.5 | 7.0 ab |
| 4 | Prevathon | 20 fl oz/A | ~7 days + 3-4 weeks after first adult | 0 | 0 | 0.3 | 0 | 0 | 0 | 6.0 ab |
| 5 | Prevathon + Steward | 20 fl oz. +  6 fl oz/A | ~7 days + 3-4 weeks after first adult | 0 | 0.3 | 0 | 0 | 0 | 0 | 1.0 b |
|  | *ANOVA* |  |  | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *P = 0.038* |

**Soybean 2018 Dectes Stem Borer 2**

**Location:** Warrington Irrigation Research Farm

**Variety:**  ‘S40LL35’

**Planting Date:**  10 May

**Experimental Design:** Randomized complete block design with 6 treatments and 4 replicates

**Plot size:**  10 rows x 25’

**Row Spacing:**  15”

**Treatment Method:** CO2 pressurized backpack sprayer equipped with a 13.3’ boom fitted with 8 XR8004 nozzles delivering 20 GPA at 38 PSI

**Treatment Date:** 16 July and 6 August

**Sample Size:**  10 sweeps per plot; 20 row-ft. pushed for lodging, 25 plants at R7

**Data Analysis:** ANOVA; Tukey-Kramer HSD means separation

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TRT** | **Material** | **Rate** | **Application Timing** | **0-d PRE** | **8 DAT** | **17 DAT** | **% Lodging** | **% Infested** |
| 1 | UTC | -- | -- | 1.3 | 0 | 0 | 7.1 a | 23.0 a |
| 2 | Prevathon | 20 fl oz/A | ~7 days after first adult | 1.0 | 0 | 0 | 1.1 b | 1.0 b |
| 3 | Prevathon + Steward | 14 fl oz. +  6 fl oz/A | ~7 days after first adult | 0.5 | 0.3 | 0 | 1.2 b | 3.0 b |
| 4 | Prevathon | 20 fl oz/A | ~7 days + 3-4 weeks after first adult | 1.0 | 0.3 | 0 | 0 b | 0 b |
| 5 | Prevathon + Steward | 20 fl oz. +  6 fl oz/A | ~7 days + 3-4 weeks after first adult | 0.3 | 0.3 | 0 | 0.8 b | 2.0 b |
| 6 | Besiege | 10 fl oz/A | ~7 days after first adult | 0.5 | 0 | 0 | 0.4 b | 3.0 b |
|  | *ANOVA* |  |  | *NS* | *NS* |  | *P < 0.001* | *P <0.001* |

**Notes:** Guard rows present between plots. 11 plots had tunneled stems, 9 plots had lodging. Of these plots, 4 were on the field edge, and two of those belonged to treatment 1. Use caution when interpreting results.

**Soybean 2018 Grasshopper**

**Location:** Carvel REC

**Variety:** Ag Venture ‘AV38E8LL’

**Planting Date:** 11 May

**Experimental Design:** Randomized complete block design with 4 treatments and 3 replicates

**Plot size:**  25’ x 100’

**Row Spacing:** 15”

**Treatment Method:** Crop Care 25’ side mount high pressure sprayer equipped with Tx 80015VK nozzles delivering 30 GPA at 250 PSI.

**Treatment Date:** 22 September

**Sample Size:** 25 sweeps per plot; visual observation from 200 row-ft.

**Data Analysis:** ANOVA; Tukey-Kramer HSD means separation. Data log (x + 0.1) transformed prior to analysis

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TRT** | **Material** | **Rate** | **Grasshoppers per 25 sweeps** | | | | **Grasshoppers per 200 row ft.** | | | |
|  |  |  | **Pre** | **2 DAT** | **9 DAT** | **13 DAT** | **Pre** | **2 DAT** | **9 DAT** | **13 DAT** |
| 1 | UTC | --- | 9.7 a | 6.7 a | 4.3 a | 1.7 | 46.0 | 23.7 a | 63.7 a | 11.7 |
| 2 | Prevathon + 1% v/v MSO | 20 fl oz/A | 6.0 ab | 1.7 ab | 0.3 b | 0.7 | 44.7 | 1.3 b | 4.7 b | 0 |
| 3 | Sniper | 6.4 fl oz/A | 3.3 b | 0 b | 0 b | 0.3 | 39.7 | 0 b | 8.7 b | 0.3 |
| 4 | Lorsban | 1.0 pt/A | 6.0 ab | 0.7 b | 0 b | 0.3 | 26.7 | 0.7 b | 7.0 b | 0 |
|  | *ANOVA* |  | 0.024 | 0.021 | <0.001 | NS | NS | 0.001 | <0.001 | NS |

**Notes:** Cool and cloudy conditions on 2 DAT and 13 DAT. Species present was migratory grasshopper.

**Soybean 2018 Slugs 1**

**Location:** Harbeson, DE

**Variety:** Asgrow ‘39x7’

**Planting Date:**  25 May

**Experimental Design:** Randomized complete block design with 3 treatments and 3 replicates

**Plot size:** 16’ x 30’

**Row Spacing:** 7.5”

**Treatment Method:** Deadline spread by farmer using fertilizer broadcast equipment mounted on a tractor. Ferroxx AQ spread using a Scott’s Handy Green lawn spreader

**Treatment Date:**  31 May

**Sample Size:**  same 2 10 row-ft. sections

**Data Analysis:** ANOVA, Tukey-Kramer HSD means separation

**Rainfall:** (Data from DEOS Harbeson station)

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Amount (inches)** | **Date** | **Amount (inches)** |
| June 1 | 0.04 | June 10 | 0.3 |
| June 3 | 1.75 | June 11 | 0.31 |
| June 4 | 0.11 | June 13 | 0.06 |
| June 9 | 1.84 |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TRT** | **Material** | **Rate** | **Stand** | | | | | **Dead Plants** | **Damaged Plants** | | | |
|  |  |  | **0-d PRE** | **4 DAT** | **7 DAT** | **12 DAT** | **19 DAT** | **4 DAT** | **0-D PRE** | **4 DAT** | **7 DAT** | **12 DAT** |
| 1 | UTC | --- | 8.7 | 10.0 | 8.7 | 10.7 | 10.3 | 5.3 a | 7.0 | 7.7 | 8.7 | 10.3 |
| 2 | Ferroxx AQ | 10 lbs/A | 10.3 | 25.0 | 25.3 | 15.3 | 14.0 | 1.7 ab | 7.0 | 20.3 | 19.7 | 11.7 |
| 3 | Deadline MPs | 10 lbs/A | 5.3 | 17.7 | 16.7 | 13.3 | 12.0 | 0.7 b | 4.7 | 13.0 | 15 | 10 |
|  | ANOVA |  | NS | NS | NS | NS | NS | P = 0.029 | NS | NS | NS | NS |

**Notes:** Field was replanted 20 June.

**Soybean 2018 Thrips**

**Location:** Felton, DE

**Variety:** 4.6 Plenish

**Planting Date:**  19 May

**Experimental Design:** Randomized complete block design with 2 treatments and 3 replicates

**Plot size:** 39’ x 250’

**Row Spacing:** 15”

**Treatment Method:** CO2 pressurized backpack sprayer with a 13.3’ boom equipped with 8 XR8004 nozzles delivering 20 GPA at 38 PSI

**Treatment Date:** 26 June

**Sample Size:** 10 uppermost fully expanded leaflets and 10 leaflets 3 nodes below.

**Harvest Date:** 24 October

**Data Analysis:** T-test

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TRT** | **Material** | **Rate** | **Pretreatment** | | **2 DAT** | | **Yield** |
| **Lower** | **Upper** | **Lower** | **Upper** |
| 1 | UTC | --- | 94.7 | 36.0 | 40.7 | 47.7 | 54.7 |
| 2 | Mustang Maxx | 4 fl oz/A | 47.7 | 49.3 | 44.3 | 36.7 | 54.7 |
|  | *T-test* |  | *NS* | *NS* | *NS* | *NS* | *NS* |

**Notes:** Field had been treated the week prior with a POST herbicide.

