Brown Marmorated Stink Bug
IPM Working Group Meeting

Alson H. Smith Jr. Agricultural Research and Extension Center
595 Laurel Grove Road
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Executive Summary

The brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål) continues to spread throughout the United States. BMSB has been detected in 39 states and the District of Columbia with Utah recently reporting an official detection. Agricultural problems have recently been reported in OH, TN, NC, and NY for the first time. In addition, nuisance problems have been reported in MA, MI, and WA. BMSB has also become a nuisance problem in the port city of Hamilton, Ontario, Canada.

The sixth formal BMSB IPM Working Group meeting was held at the Virginia Tech, Alson H. Smith Jr. Agricultural Research and Extension Center in Winchester, Virginia on 27 November 2012. Research and extension personnel from USDA/ARS, Rutgers University, Penn State University, Cornell University, North Carolina State University, University of Delaware, University of Maryland, Oregon State, Virginia Tech, University of Minnesota, Ohio State University, Shepherd University, Michigan State, and WV Wesleyan College were in attendance along with representatives from USDA/APHIS, EPA, and the National Wildlife Federation. Local growers and industry representatives were also in attendance.

The key topics covered during the meeting included advances and challenges in the development of BMSB monitoring tools, movement and dispersal studies, and host-use patterns. Regulatory representatives updated the group on Section 18 applications for tree fruit and discussions were held on commercial lure formulations and topics for the next 2013 IPM Working Group meeting.

Oral Presentation Summaries

Tracy Leskey: Welcomed and introduced the group. She stated BMSB remains in the news and showed reports and video clips of news coverage around the country. The season began with a low population and news reports asking "where have all the stink bugs gone" but by late season the reports changed due to an increase in the population. Some areas saw as much as a 60% increase from 2011, but not as high as 2010. In 2011, we experienced drought conditions as well as cool, wet weather which may have contributed to the low numbers and lack of a second generation in the late season in many areas. In 2012, large populations of stink bugs were present in many locations during the late-season contributing to some problems in apples and numerous reports of nuisance pest problems.

Map Update on Distribution of BMSB in the United States
Presented by: Tracy Leskey, USDA/ARS/AFRS

Summary:

- Working group members added a fourth grouping to the map – referred to as "agricultural and nuisance problems". This category was added to capture activity in states with documented problems, but not to the severity experienced in the mid-Atlantic.
  - Four states fall under this new category: New York, North Carolina, Ohio and Tennessee
- Three states elevated their status from "Detected" to "Nuisance problem only"
  - Massachusetts, Michigan, and Washington
- One new state had an official detection
  - Utah

BMSB Monitoring Session

Pattern of Release of a *Halyomorpha halys* Male-produced Pheromone
Presented by: Christina Harris, Virginia Tech
Co-Authors: Sitra Abubeker, Bob Bennett, Ashot Khrimian, Tracy Leskey, and Aijun Zhang

Summary:

- Purpose is to find a pheromone compound in males you don't find in females
  - Pheromone coming from males is highest during daytime when virgin males are held solitarily
  - Males release pheromone ~12 days into adult stage
  - Amount pheromone decreases when numbers of males is increased in collection chambers
  - Pheromone is released in cyclic bursts, declining every 3.25 days
  - Pheromone emission is highest from 9:00am – 3:00pm
- Repellents
  - Four compounds were tested

        - 3 natural and plant/insect-derived, one is derivative, non-toxic, used in cosmetics and environmentally safe
        - Chose pentane to dilute the compound
    - Three methods were used
        - Petri dish assays with green beans
        - Small cage assays with gala apples and peaches
        - Field assays, peaches (Brent Short), blueberries (Cesar Rodriguez, Joyce Parker), and grapes (Cesar R., Joyce P., Anne Nielson, Dan Ward)
    - #1 is a great repellent in closed air system
    - 3- & 4-component blends are most effective in open-air system
    - Repellents work better on nymphs. Hungrier?
    - Need to try and stabilize the compounds - repellents wore off throughout the day
    - The next step is more dose response, different formulations, and field trials

Identification and Synthesis of the Male-produced Aggregation Pheromone of BMSB, *Halyomorpha Halys*
Presented by: Ashot Khrimian, USDA/ARS
Co-authors: Jeffrey Aldrich, Hsiao-Yung Ho, Aijun Zhang, Tracy Leskey, Don Weber and Karl Vermillion

Summary:
- Goal
    - Synthesize and determine absolute and relative configurations of male-specific compounds found in *Halyomorpha halys*
    - Develop affordable synthetic routes to A and B stereoisomeric mixtures and test their attractiveness to *Halyomorpha halys*
- Chemicals A and B were used and are stereoisomers of a natural compound that can exist in 16 stereoisomeric forms
- A and B used in identification of *Halyomorpha halys* male-specific compounds consisted of at least 4 compounds each
- Bioassay with A and B revealed no attractiveness to *Halyomorpha halys* in Taiwan
- Nine selected lures were field-tested against *Halyomorpha halys.* Results:
    - Single isomer A-S2 was the only isomer matching the main male-specific compound that was active against BMSB; two others were inactive
    - Single isomer B-S1 matched the minor male-specific compound and was moderately active in the field
    - AS-2 and B-S1 are two most likely components of BMSB aggregation pheromone
    - Mixtures containing AS-2 and B-S1: #10, #12, #20, and #21 lures were highly active in trapping BMSB and easier to manufacture than any single isomer

Season-long Pattern of Trap Captures using Pheromone and Light-based Stimuli
Presented by: Tracy Leskey, USDA/ARS

Summary:

- Key objective is to develop monitoring tools to assist growers in making informed management decisions
- Early studies used black pyramid traps. Using the stink bug's behavior of walking up the pyramid surface worked well. A total of 350 black pyramid traps were placed in peripheral row of orchard and deployed across 12 states
- Results – Methyl (2E, 4E, 6Z) – decatrienoate (MDT) was the only attractant used and failed during the early- and mid-season. MDT proved to be attractive to adults only during the late-season.
    - Almost no captures in traps baited with MDT, despite very large immigrating populations
- Visual cues used white, yellow, blue, red and black lights
- Conclusion
    - Traps provisioned with a white light source captured significantly more BMSBs and significantly more non-targets.
    - Traps provisioned with blue light sources captured fewer BMSBs, but also fewer nontargets.
    - Although captures of BMSB were lower in traps provisioned with black light sources, patterns of capture are significantly correlated among all light-based stimuli.
    - Capture patterns essentially identical among white, blue and black light sources.
- The next step will be to establish physiological and behavioral state of responders to different stimuli. Attractive visual and olfactory stimuli will be combine and improvements will be made in monitoring tools and in the development of attract and kill strategies.

Synergy of BMSB Aggregation Pheromone with Other Attractants
Presented by: Don Weber, USDA/ARS

Summary:

- Goal is to develop attractant(s) for season-long monitoring (and possible suppression tactics) for brown marmorated stink bug management.
    - Identify and synthesize components of aggregation pheromone
    - Determine optimal doses for attraction
    - Assess possible synergy with other attractants (other compounds, light)
    - Determine deployment strategies (trapping, suppression)
- Season long totals combined with #10 totals were higher and separation was quite distinct. A positive interaction from both the nymphs and adults was detected
- "Compound A"
    - Will be widely available in 2013
    - Enhances attraction to #10 in pyramid traps, such that numbers captured either are similar to or in many cases, significantly exceed captures for either attractant presented separately.
- Next step
    - Publicize specs in 2013

    - Work with groups to optimize attractant combinations
- Question
    - Are you going to use a different schedule in 2013?
        - No, will use same schedule.

Pennsylvania Experience with BMSB Monitoring
Presented by: Grzegorz Krawczyk, Penn State University
Co-author: Steve Jacobs

Summary:

- Over 150 BMSB traps were serviced during the 2012 season
    - Used over 10 trap designs and 7 different BMSB lures plus light traps
- #10 lures trials at 3 sites in Pennsylvania. Very few were caught in early season.
    - Similar capture patterns between #10 and commercial lures even though numbers were different.
- Commercial MDT trials (AgBio vs. Rescue) out performed #10 trials.
    - Similar capture patterns between the two commercial lures even though numbers were different.
- Interest in their website *stinkbug-info.org* has increased. Information as reported by Steve Jacobs: From July 2009 to July 2012 there were 851,929 website visits with the peak occurring in the summer of 2010.
- Question
    - 2011 hurricane washed out nymphs in Maryland; did it have an impact in PA?
        - Not sure

New Monitoring Tools and Updates from the Field
Video Presentation by: Andrew Strube, Strube's Stink Bug Traps

Summary:

- Strube's Stink Bug Trap company tested a new light trap that was deployed above the trees and was successful attracting BMSB throughout the growing season. The first version was 4000 watts and was overkill so they came up with a smaller trap. It continued to catch bugs the entire season and worked very well.

Utility of Black Light Traps for Monitoring Spread and Population Growth of BMSB in New Jersey
Presented by: Anne Nielsen, Rutgers University
Co-Author: George Hamilton

Summary:

- Used 45-75 black light traps in NJ as monitoring tool on vegetables from May-Oct 2012. Identified bugs in traps twice a week.
- In 2004 goal was to detect new populations, rate of spread, and ecological impact
- In 2005 it spreads
- In 2007 80% of traps caught BMSB.

- By 2009 significant increase in traps and rate of spread is 75%, 2-8 new farms detected with BMSB.
- 2011 – 39,000 total trap captures
- 2012 – 7000 total trap captures
- BMSB had a 3-5 year lag time between when an insect was detected and when it became a pest.
- Black light is not a control method but a monitoring tool. It holds promise and is good for states who already use it for other species. It is attractive early season when bugs are moving from woods/house to fields. As traps break, they are repaired because they cost $1200.00 a piece. Bottom tends to rust out and they replace it with stainless steel bottom.
- Question
    - What was the date of the first egg mass?
        - May 20-25, 2012

BMSB Movement Session

Insecticide Treatment and Monitoring of BMSB on Tree of Heaven, *Ailanthus, altissima*
Presented by: Peter Jentsch, Cornell University

Summary:

- Citizen Science survey indicates 44% saw more bugs, 48% respondents reported fewer bugs and 8% reported about the same.
- First year of economic injury in apples in NY occurred in 2012
    - 20-22% damage in Red Delicious and Pink Lady
    - Significant numbers of green and brown marmorated stink bugs, damage likely from a combination of both bugs.
    - NY had highest trap captures to date
    - 72-90% damage was on border rows
    - Rented a 50 foot lift to monitor tops of trees and found high numbers in seed pods of *Ailanthus*
    - Two generations of BMSB in the Hudson Valley this year
- Ants may have an impact on the BMSB population
- When exposed to BMSB egg, the ants feed on them aggressively.
- Trap trees
    - *Ailanthus* utilized testing a systemic insecticide (Acephate) in plug or injection form
    - Trees were injected (liquid and granular) and foliage was removed weekly and BMSB was exposed to foliage and fruit
    - Monitored population on seed pods, cone traps found dead bugs below seed pods
    - Plugs were clean and easy, injection more complicated.
    - Plugs have a lower scale vs. injection. Injection high degree of control
    - Found few BMSB and no damage to fruit the last 2 years.
    - Overall, plugs had fewer adults in treated trees versus untreated trees.
- Question
    - Was there a difference in bugs where there was ***Ailanthus*** versus no ***Ailanthus***?

        - Trees were all over so no comparison could be made.

Defining Dispersal Ecology and Behavior of Adult *Halyomorpha halys* using Multiple Approaches
Presented by: Doo-Hyung Lee, USDA/ARS
Co-Author: Cameron Scorza, Starker Wright, and Tracy Leskey

Summary:

- Dispersal Ecology and Behavior
    - Why dispersal? 13% of dead trees harbor overwintering population
    - Free-flight observation in the field
        - Watched 660 bugs from 8:00AM-6:00PM. Bugs were not active in cool weather but as the temperatures went up, flight increased. 17°C critical temperature
        - Data suggests the bugs flew away from the sun's position.
    - Flight Mill – BMSB can easily fly >1 km/day
        - Measured flight capacity of 3 different populations
            - August-September (foraging) Host
            - September-Oct (intermediate) Host
            - October-November (significantly heavier weight) Overwintering
        - All have similar flight capacity
    - Harmonic Radar
        - Field flight – continuous tracking
        - Requires radar tags on insect (bond holds up to 170 units of gravitational force)
        - Survivorship? Flight capacity? Mobility?
            - They were not affected by the tag
            - Can detect bugs from 15 meters away
    - Used 3 types of glue; Krazy, Loctite and FSA. There was no significant different in glue types.
    - Flight distance – no significant difference in distance on tagged versus untagged bugs.
    - Speed- 3 meters per second. Again, no difference in tagged versus untagged
    - Canada gave us a harmonic radar unit to use for flight experiment. It detected bugs from 15 meters.
- Question
    - Did you look at windbreaks on side of trees where bugs went?
        - Yes, found wind was a strong factor, but need to do more studies with different factors.

BMSB and Blueberries
Presented by: Cesar Rodriguez-Saona, Rutgers University

Summary:

- BMSB has become less of a concern in small fruit like blueberries, growers now are more concerned about the Spotted Wing Drosophila (SWD)
- Mapped 8 different blueberry farms in New Jersey, monitored them weekly by performing 3 minute counts. Found more around the edges of woods versus in the interior. Numbers were not very high in south central New Jersey. Maximum numbers of adults was 4. Nymphs had higher numbers.
- Bag Experiment: Bagged branches with different development stages. Left for a week and moved to another bag. Did this for 5 weeks. Experiment looked at discoloration; many berries fell inside bag. This experiment was difficult to see the stylet marks on dark berries. Plan to use a staining method next year to help locate the stylet marks. Found nymphs caused more damage than adults.
- Choice Test – Do adult BMSB feed on damaged versus undamaged berries?
- Data looks promising on SPLAT

Presence of BMSB on *Rhamnus* in Ontario
Video Teleconference by: Hannah Fraser and Tara Gariepy, Ontario

Summary:
- BMSB is being detected in their provinces as a nuisance.
- Homeowner found BMSB in 2010 in Hamilton, Ontario.
- Spring of 2012 had another find and in July was presented with 3rd instars in Hamilton and an egg mass, so a decision was made to start working more on BMSB.
- Found BMSB adults and nymphs on buckthorn all through the area in mid-July early-August.
- By fall of 2012 more homeowner detections were reported and collected. Over 80 locations recorded.
- Field surveys were conducted in soybean, corn and wheat in 2011-2012 but found zero BMSB.
- Next year will redesign their survey and will look for egg masses in the area they found BMSB this year.

Processing Lima Beans and Sweet Corn
Presented by: Joanne Whalen, University of Delaware

Summary:
- BMSB monitoring in Delaware with blacklights and Rescue lures
- Sweep netting – don't know how else to sample them
- Field cage studies on lima beans (bloom, pin, flat)
  - BMSB damage looks same as native damage
- Sweet corn damage timing
  - Susceptibility starts after silking
  - R1 (silking), R2 (blistering), R3 (milk)
  - BMSB need to be sprayed throughout the stages, not sure if it should be weekly but do not think it can be done just during a certain time period.

- BMSB prefer sweet corn over lima beans. Late July-early August found tons in sweet corn and zero in lima beans.
- Questions
    - What is causing the silking effect?
        - It is something we will have to watch
    - Is there a difference between field corn and sweet corn?
        - Have not looked to see if there is a preference between the two

Section 18 – Guided Discussion
Guided by: Clayton Meyers, EPA-OPP and David Epstein, USDA-OPMP

Summary:

- Extension on bifenthrin on peaches and apples was approved
- Growers stated it worked well and they want to use it more. PA had very positive results.
- Working on getting minor use put on the label, evaluate 21 days versus 30 days may be recommended. It's a tight risk and will be very conservative.
- They have not heard back on residue sampling
- NY may be joining use of bifenthrin
- Will need to reapply but it's a simple process, may not have to supply a sample
- If new states join in the application they don't have to do the entire process but will need state specific data. They can cite what is already out there.
- Need to start working on reauthorization now if you want bifenthrin in 2013
- Endosulfan good through July 2015 on apples. No longer can be used on peaches.

BMSB Host-use Session

BMSB Host-use in a Diversified Vegetable System with Trap Crops
Presented by: Clarissa Mathews, Shepherd University
Co-Author: Haroun Hallack

Summary:

- Redbud Farm, small scale, highly diverse organic farm in Berkeley County, West Virginia. Certified in 1998 as an organic vegetable farm and is surrounded by woods.
    - Goal is to have a BMSB strategy that does not disrupt the agroecosystem stability
    - Preliminary 2011 observation
        - Highly attracted to green amaranth (*amaranthus spp.)* and sunflower – possible trap crops
        - Organic pyrethrin (Pyganic) was ineffective
        - Baited trap was effective in late season
    - 2012 study on directional source, trap crop buffer, Host-use patterns, and host-plant preferences
        - Methods used were:
            - Cash crops, okra ('Clemson Spineless'), sweet pepper ('Red Ace'), tomato ('Big Boy') and summer squash ('Zephyr')

        - Trap crops of green amaranth (*Amaranthus spp.*) and sunflower (open pollinated mixture)
        - Pheromone traps
            - "Rescue" dual lure (Sterling International, Inc.)
      - RCBD with two blocks (old and new)
      - Two replicates per block
  - Conclusions
      - BMSB colonize earlier, use hosts more effectively in habitats with prior production (14 day earlier colonization and 2-fold higher density in old vs. new block)
      - Sunflower trap more attractive than cash crops (>2-fold increase, as compared to cash crops)
      - Trap crop system removed BMSB on average 112 (new block) and 213 (old block) across the season. Delayed colonization and lowered densities for tomato and pepper in late season only.
      - BMSB colonize sunflower first and consistently use the trap even after senescence, then moved to okra before other cash crops; no preference for squash.
      - First BMSB detection on Northern side for both blocks.
- Questions:
  - Do you think planting by date would further enhance trap crop?
      - Yes, but less necessary because sunflowers worked even after flower was gone.
      - Learned trap crop is too attractive to natural enemies so need to put further from cash crop.

Spatial Patterns of BMSB Host-use in Nurseries: A Multi-scale Analysis
Presented by: Holly Martinson, University of Maryland
Co-Authors: Erik Bergmann and Michael Raupp

Summary:
- In the Fall of 2010 high numbers of BMSB in nurseries
- Feeding through bark directly - may cause damage in trees
- Indirect damage to ornamentals - could be a vector for disease
- Economically and ecologically important. Nurseries have high plant diversity with large blocks of trees.
  - "Horticulture is Maryland's second largest agricultural sector with total gross receipts from nursery and greenhouse crops and landscaping in 2008 totaling $1.96 billion"
- Adamstown, Maryland farm used plants in the ground 1-7 years with heavy BMSB pressure for the last 3 years.
  - BMSB feed on a wide range of woody plants; utilize almost all cultivars in a different way at different times. (2011: 84%, 2012: 66%)
  - Leaves, fruits and bark utilized over time.
- Spatial patterns of BMSB host-use

   - BMSB frequently exhibit edge effects, especially adjacent to high quality alternative hosts and at high BMSB densities:
     - Soy adjacent – strong
     - Corn adjacent – weak
   - Spatial sample started in 2011-2012.
     - Edge effect dependent on what crops are in the adjacent field.
     - 2011 greater bug presence in edge and closest to soybeans.
     - 2012 no significant difference between edge and core trees or side with corn (no soybean in 2012, corn instead)
- Question
   - Over time do you think you will compare mature trees to young trees and see what the effects are?
     - Yes, do think the age of the plant is something that needs to be looked at.

Visual Surveys of BMSB in agroecosystems in Southwest Virginia
Presented by: Tom Kuhar, Virginia Tech
Co-Authors: Kathy Kamminga and D. Ames Herbert

Summary:
- Anecdotal visual observations from beginning to end of season.
- Observations made on a typical sampling site in Virginia with classic tree line great for stink bugs. Commodities: corn, squash, tomatoes, and pumpkins
- Weekly visual survey method in 2011 and 2012 from April to October
   - April to mid-May occasional adult activity around human dwellings and on trees and shrubs
   - May 2, 2012 observed a mating pair on Chinese privet; probably a little early but did see it.
   - Observed BMSB adult aggregation in the spring with harlequin bugs on mustard and horseradish. Did not find any on tree of heaven.
   - May 21, 2012 – 2nd instars found on a Paulownia tree in Suffolk, VA
   - May 25, 2012 – 1st egg mass found in Winchester, VA on catalpa (Angel, Acebes)
   - May 26, 2012 – Egg mass detected in Kearneysville, WV on peach (Tracy Leskey)
   - May 28, 2012 – Egg mass detected on Tree of Heaven (*Ailanthus*) in Salem, VA (Tom Kuhar)
   - June 6, 2012 – Found in vineyards (Basnet and Pfeiffer)
   - Similar date from previous years. Due to a very warm spring, thought they would find egg masses earlier, but didn't.
     - Believe it is linked to day length 14:10 hr (light: dark) phase triggers reproductive development in adult females. Explains why eggs were not found until late May despite unusually warm 2012 spring.
   - June - catalpa discovered to be host plant, 80% of egg masses found on catalpa, and then later found on other trees.
   - 2012 late season - found females laying eggs, finally agree that there may be two generations in Blacksburg, VA.

  - October 2012 - during a research project found numerous BMSB in the pods of Tree of Heaven.

Host-use Patterns of BMSB in Oregon
Presented by: Nik Wiman, Oregon State University
Co-Authors: Peter Shearer, Silvia Rondon, and Vaughn Walton

Summary:

- BMSB first found in Portland 2004, primarily known from urban reservoirs
- 2012 had 240 sampling sites covering 214 miles
  - BMSB detected in 3 new counties
  - BMSB established population in 4 new counties
  - Pattern – bugs showing up on farms with grapes, hazelnut and also had positive identification in commercial caneberry.
  - Clear trend toward English holly as dominant host, but also found on maple, ash and lilac
    - Attracted to female holly versus male holly
    - Female holly has berries all year
    - Thick dense leaves
  - Farmers are concerned about having holly on property and question whether they should cut it down. Were told to keep it as an indicator of BMSB in the area or maybe as trap crop.
- Conclusion – What makes holly an ideal BMSB host plant?
  - Berries are abundant and on all year (female)
  - Dense foliage with spiny defense, provides overwintering?
  - Slow decomposition of leaves
- Questions
  - Were they feeding on leaves of holly?
    - No, feeding on berries, leaves were too thick.

Performance of Egg Parasitoids from Maryland on BMSB Eggs in the Laboratory
Presented by: Jeffrey Aldrich
Co-Authors: Shanie Gal-Edd, Matthew Buffington, and Pedro Barbosa

Summary:

- Will native North American parasitoids adapt to BMSB eggs?
- Egg parasitoids are hopeful for controlling BMSB
- *Trissolcus halomorphae* is #1 choice. It is in quarantine in Newark, DE
  - Testing and establishment takes years.
  - May parasitize native bugs
  - Will select BMSB either naturally or artificially
- *Trissolcus euschisti* is competent to parasitize BMSB.
  - Low parasitism is due to failure to recognize host-associated chemicals
  - Natural selection will result in "normal" parasitization
  - Goal is "Unclassical biocontrol" need to speed up the natural process of host shifts

Does Host Origin Influence Patterns of Utilization in Brown Marmorated Stink Bug *Halyomorpha halys*?
Presented by: Erik Bergmann
Co-Authors: Kathy Kamminga, Holly Martinson, Tom Kuhar, Paula Shrewsbury, and Michael Raupp

Summary:

- Research objectives are to know which trees are used for feeding and oviposition and how do taxonomy and host origin influence host use?
- Site used was a wholesale commercial nursery with well established woody trees and shrubs in Adamstown, Maryland
- Scope of survey
    - One minute visual survey on the three parts of the plant (bark, leaf, fruit)
    - 178 cultivars
    - 2006 individual plants
    - 7578 tree visits
    - 13,406 stink bugs and egg masses
- Results
    - BMSB used 150 of 178 cultivars surveyed
    - Later life stages use a wider range of hosts
    - All life stages strongly favored Angiosperms (deciduous) as opposed to Gymnosperms (evergreens, conifers)
    - Prefer hosts they "know" evolutionarily *(Cornus*), but some naïve hosts (*Acer, Ulmus*) may be favored.
    - No statistical significant of Asian vs. non-Asian as a whole
    - Begin to design BMSB out of landscapes

Host-use, Current Distribution, and Damage Potential of BMSB in NC
Presented by: Matthew Bickerton
Co-Authors: Mark Abney and Jim Walgenbach

Summary:

- Bernon (2004) documented >60 wild host plants in PA
- Nielsen and Hamilton (2009) studied population dynamics in ornamentals and found that densities in PA were highest in
    - Early season: *Paulownia tomentosa*
    - Mid-late season: *Viburnum, spp., Fraximun americanum; Paulownia tomentosa*
    - Late season *: Pyrus, spp. (pear), Paulownia tomentosa*
- Methods
    - 3 minute timed samples performed every 2 weeks
    - 5 reps (crop sampling)
    - Variable # reps for wild hosts
- Visual
    - Beat sheet
    - 3 whacks / branch

    - Sweep net, 20 sweeps/sample x 30
- Conclusion
    - Wild hosts are an important part of BMSB's life cycle.
    - BMSB present in >29 cultivated plants in Virginia; 11 in North Carolina.
    - Presence of wild host plants around agricultural areas may contribute greatly to BMSB densities in crops at certain periods.
    - Catalpa and soybean is the most common host plants associated with BMSB in VA and NC.

Spatial Patterns of Infestation and Management of BMSB in Grain Crops
Presented by: Dilip Venugopal
Co-authors: Galen Dively and William Lamp

Summary:
- Objective is to prevent infestation and control further spread of damage.
- BMSB is a serious pest in mid-Atlantic agronomic row crops
- Fewer research projects involving grain crops and soybean than specialty crops
- Particularly, few research studies on BMSB movement into field corn and soybean in relations to adjacent non-crop habitat
    - Understanding the movement can help us devise effective and efficient treatment options
- Chemical control options widely used
- Method used – field sampling
    - Sampled corn July-August
    - Sampled soybean August-September
    - Direct visual counts
- Conclusion
    - Behaviorally classified as "Disperser", clumped at the margin.
    - Soybean – overall abundance lower than past years; highest along woods, then buildings. Lowest in fields next to open areas.
    - Corn – overall abundance low, abundance along woods greater than buildings.
    - Chemical treatments can be limited to field edges, up to 40 feet in field and entire field treatment probably not required.

Grower Survey Report
Presented by: Eric Day
Co-authors: Galen Dively and William Lamp

Summary:
- First year of a 3 year longitudinal study on the impact of the brown marmorated stink bug
- Four key states surveyed: Virginia, Pennsylvania, Maryland and New Jersey
- Surveyed during grower and commodity meetings
    - Audience was growers, farm managers, and farm workers
- Majority surveyed were able to properly identify an adult BMSB but only 50% could properly identify a nymph.
- 1/3 surveyed were seeing damage on corn and peppers and higher on fruit

- Preference for getting information out to the growers was through meetings and university sources, plus internet.

Guided Discussion

Summary:

- Feedback
    - Increase active ingredients in lures
    - Commercializing pheromone and getting it in the hands of the growers. Need to have more companies making it to give growers more options.
    - Looking at using different traps with lures
    - Is there a record to find out about upcoming studies that weren't presented at the working group meeting?
        - In addition to our 2 working group meetings our website www.northeastipm.org captures this information. We will look at other ways to get this information also.
    - Do people still want to continue using the Scholar site since it is enrollment only?
        - Main advantage to using it is archiving material for just their use, i.e. articles with copyrights.
    - Topics for next meeting, June timeframe
        - May combine the Biocontrol Workshop with the Working Group meeting. Downside is that it will have space limitations
        - Invite ESA members to the working group since there is research going on with BMSB around the country.
            - Look at changing working group meeting to a national meeting.
            - Potential to combine working group meetings together with BMSB multi state project meeting
            - Is there a mechanism to use working groups funded by different regional IPM Centers?