

**Brown Marmorated Stink Bug
IPM Working Group Meeting**



**Alson H. Smith, Jr. Agricultural Research and Extension Center
Virginia Agriculture Experiment Station
595 Laurel Grove Road, Winchester, VA 22602**

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Submitted by:

Dr. Tracy Leskey

Research Entomologist

USDA-ARS

Appalachian Fruit Research Station

2217 Wiltshire Road

Kearneysville WV 25430-2771 USA

TEL: 304-725-3451 x329

FAX: 304-728-2340

EMAIL: tracy.leskey@ars.usda.gov

Dr. George Hamilton

Extension Specialist in Pest Management

Professor of Entomology and Chair

Department of Entomology

93 Lipman Drive

Rutgers University

New Brunswick, NJ 08901

TEL: 732-932-9774

PEST MANAGEMENT OFFICE: 732-932-9801

FAX: 732-932-9751

EMAIL: hamilton@aesop.rutgers.edu

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Brown Marmorated Stink Bug Working Group Participants

Name	Affiliation	Full Address
Acebes-Doria, Angelita	Virginia Tech	Virginia Tech 216A Price Hall 170 Drillfield Drive Blacksburg, VA 24061
Agnello, Art	Cornell	NYSAES Department of Entomology 630 West North Street Barton Lab Geneva, NY 14456
Aigner, John	Virginia Tech	Virginia Tech 216A Price Hall 170 Drillfield Drive Blacksburg, VA 24061
Beck, David	Crawford Beck Vineyard	Crawford Beck Vineyard PO Box 670 9100 SE Amity Road Amity, OR 97101
Behling, George	Nob Hill Orchards	Nob Hill Orchards 1572 Reunion Corner Road Gerrardstown, WV 25420
Bergh, Chris	Virginia Tech	Alson H. Smith, Jr. Agricultural Research and Extension Center 595 Laurel Grove Road Winchester, VA 22602
Bernhard, Karen	Penn State University	Lehigh County Cooperative Extension Lehigh County Agricultural Center, Room 104 4184 Dorney Park Rd Allentown, PA 18104
Bessin, Ric	University of Kentucky	Department of Entomology S-225 Agricultural Science Center N University of Kentucky Lexington, KY 40546-0091
Botch, Paul	Michigan State University	Michigan State University 288 Farm Lane, Room 46 East Lansing, MI 48824

Brown Marmorated Stink Bug Working Group Participants

Name	Affiliation	Full Address
Cambridge, John	Rutgers University	Rutgers University Dept. Entomology 96 Lipman Drive New Brunswick, NJ 08901-5824
Chen, Mengyano	University of Maryland	University of Maryland 4112 Plant Sciences Building College Park, MD 20742-4454
Coffey, Peter	University of Maryland	University of Maryland 4112 Plant Sciences Building College Park, MD 20742-4454
Colavecchio, Ashley	University of Delaware	University of Delaware Department of Entomology and Wildlife Ecology 250 Townsend Hall Newark, DE 19716
Dieckhoff, Christine	USDA-ARS-BIIRU	USDA-ARS-BIIRU 501 South Chapel Street Newark, DE 19713-3814
Dorsey, Tom	NJ Dept of Agriculture PABIL	NJ Dept of Agriculture PABIL State Police Drive & West Upper Ferry Road West Trenton, NJ 08628
Erwin, Nate	USDA-ARS-BARC IIBBL	USDA-ARS-BARC IIBBL 10300 Baltimore Avenue Bldg. 011A, Room 214 BARC-West Beltsville, MD 20705
Frank, Daniel	West Virginia University	West Virginia University Agricultural Sciences Bldg P.O. Box 6108 Morgantown, WV 26506
Gill, Stanton	University of Maryland Ext	University of MD Extension 11975 Homewood Road Ellicott City, MD 21042
Gonzales, Chris	Northeastern IPM Center	Northeastern IPM Center The Insectary Cornell University Ithaca, NY 14853

Brown Marmorated Stink Bug Working Group Participants

Name	Affiliation	Full Address
Gonzales, Chris	Northeastern IPM Center	Northeastern IPM Center The Insectary Cornell University Ithaca, NY 14853
Green, Tom	IPM Institute of North America	IPM Institute of North America, Inc. 1020 Regent St. Madison, WI 53715
Haas, Tom	Cherry Hill Orchards	Cherry Hill Orchards, Inc. 2194 New Danville Pike Lancaster, PA 17603
Hahn, Noel	Rutgers University	Rutgers University Dept. Entomology 93 Lipman Drive New Brunswick, NJ 08901-8524
Hamilton, George	Rutgers University	Rutgers University Dept. Entomology 93 Lipman Drive New Brunswick, NJ 08901-8524
Hancock, Torri	USDA-ARS-AFRS	USDA-ARS-AFRS 2217 Wiltshire Road Kearneysville, WV 25430
Hansen, Keoki	Northeastern IPM Center	Northeastern IPM Center The Insectary Cornell University Ithaca, NY 14853
Heller, Izzy	Bedoukian Research	Bedoukian Research Inc. 21 Finance Drive Danbury, CT 06810
Herbert, Ames	Virginia Tech	Virginia Tech 301 B. Price Hall Blacksburg, VA 24061
Herlihy, Megan	USDA-ARS-IIBBL	USDA-ARS-IIBBL 10300 Baltimore Avenue Bldg. 011A, Room 214 BARC-West Beltsville, MD 20705

Brown Marmorated Stink Bug Working Group Participants

Name	Affiliation	Full Address
Jentsch, Peter	Cornell University	Cornell University 144 East Ave. Ithaca, NY 14850
Jones, Sharon	USDA-ARS-AFRS	USDA-ARS-AFRS 2217 Wiltshire Road Kearneysville, WV 25430
Joy, Donna	USDA-ARS-AFRS	USDA-ARS-AFRS 2217 Wiltshire Road Kearneysville, WV 25430
Krawczyk, Greg	Penn State University	PSU FREC 290 University Drive Biglerville, PA 17307
Kuhar, Tom	Virginia Tech	Virginia Tech 301 B. Price Hall Blacksburg, VA 24061
Leskey, Tracy	USDA-ARS-AFRS	USDA-ARS-AFRS 2217 Wiltshire Road Kearneysville, WV 25430
Liu, Yifen	Northeastern IPM Center	Northeastern IPM Center The Insectary Cornell University Ithaca, NY 14853
Lovero, Angela	NJ Dept. of Agriculture (NJDA) PABIL	NJ Dept. of Agriculture PABIL State Police Drive & West Upper Ferry Road West Trenton, NJ 08628
Maclean, Priscilla	Hercon Environmental	Hercon Environmental P.O Box 435 Emigsville, PA 17318
Mathews, Clarissa	Shepherd University/Redbud	Shepherd University Redbud Organic Farm PO Box 5000 Shepherdstown, WV 25443

Brown Marmorated Stink Bug Working Group Participants

Name	Affiliation	Full Address
Mayer, Mark	NJ Dept. of Agriculture (NJDA) PABIL	NJ Dept. of Agriculture PABIL State Police Drive & West Upper Ferry Road West Trenton, NJ 08628
Myers, Clayton	U.S. EPA	U.S. Environmental Protection Agency 1200 Pennsylvania Avenue Washington D.C. 20004
Nielsen, Anne	Rutgers University	Rutgers Agricultural Research & Extension Center 121 Northville Road Bridgeton, NJ 08302
Ogburn, Emily	North Carolina State University	North Carolina State University 2101 Hillsborough Street Raleigh, NC 27695-7001
Park, Yong-Lak	West Virginia University	Entomology Program West Virginia University PO Box 6108 Morgantown, WV 26506
Pick, Leslie	University of Maryland	University of Maryland 3152 Plant Sciences Building College Park, MD 20742-4454
Pogoda, Mitch	Agriculture and Agri-Food Canada- Pest Management Centre	Agriculture and Agri-Food Canada- Pest Management Centre 960 Carling Ave Building 57 Ottawa, Ontario, Canada K1A 0C6
Polk, Dean	Rutgers Cooperative Extension	Rutgers Fruit Research and Extension Center 283 Route 539 Cream Ridge, NJ 08514-1519
Rice, Kevin	Penn State University	Penn State University 546 ASI Bldg. University Park, PA 16802
Schoof, Stephen	North Carolina State University	MHCR&EC 455 Research Drive Mills River, NC 28759

Brown Marmorated Stink Bug Working Group Participants

Name	Affiliation	Full Address
Schumacher, Dave	Hercon Environmental	Hercon Environmental P.O Box 435 Emigsville, PA 17318
Seetin, Mark	U.S. Apple Association	U.S. Apple Association 8233 Old Courthouse Rd (Ste200) Vienna, VA 22182
Short, Brent	USDA-ARS-AFRS	USDA-ARS-AFRS 2217 Wiltshire Road Kearneysville, WV 25430
Tatman, Kathy	USDA-ARS-BIIRU	USDA-ARS-BIIRU 501 South Chapel Street Newark, DE 19713
Taylor, Christopher	University of Maryland	University of Maryland 4112 Plant Sciences Building College Park, MD 20742-4454
Timer, Jody	Penn State University	Penn State University 662 N. Cemetery Rd. North East, PA 16428-2999
Trope, Taliaferro	Virginia Tech	Virginia Tech 205C Price Hall Blacksburg, VA 24061
Venugopal, Dilip	University of Maryland	University of Maryland 4124 Plant Sciences Building College Park, MD 20742-4454
Walgenbach, Jim	North Carolina State University	MHCR&EC 455 Research Drive Mills River, NC 28759
Weber, Donald	USDA-ARS-IIBBL	USDA-ARS-IIBBL 10300 Baltimore Avenue Building 011A, Room 214 BARC-West Beltsville, MD 20705

Brown Marmorated Stink Bug Working Group Participants

Name	Affiliation	Full Address
Welty, Celeste	Ohio State University	Ohio State University Rothenbuhler Lab 2501 Carmack Road Columbus, OH 43210
Zinati, Gladis	Rodale Institute	Rodale Institute 611 Siegfriedale Rd. Kutztown, PA 19530

Executive Summary

The brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål) continues to spread throughout the United States. BMSB has been detected in 42 states and 2 Canadian provinces, posing severe agricultural problems in 6 states and nuisance problems in 15 other states. Large populations are now established in PA, NJ, DE, MD, WV, VA and D.C.; each state has documented severe losses in crops and serious nuisance problems from BMSB since 2010. Agricultural and nuisance problems have been reported in KY, NC, NY, OH, OR, TN, WA. Though crop losses have not yet been reported, they are considered a nuisance problem only in CA, CT, IN, NH, MA, MI, RI, VT and Ontario. In addition, BMSB has been detected in AL, AR, AZ, CO, FL, GA, HI, IA, ID, IL, KS, ME, MN, MO, MS, NE, NM, SC, TX, UT, and WI. The BMSB IPM Working Group updated the BMSB map that is published on the www.StopBMSB.org web site: CO was listed as a state with an official detection; AL, GA, IL and SC were updated to reflect nuisance issues now.

The tenth formal BMSB Working Group meeting was held at the Alson H. Smith, Jr. Agricultural Research and Extension Center on December 3rd, 2014. Research and extension personnel from Cornell University, Michigan State University, North Carolina State University, Ohio State University, Oregon State University, Penn State University, Rutgers University, University of Connecticut, University of Delaware, University of Maryland, Virginia Tech, and West Virginia University as well as EPA, New Jersey Department of Agriculture, Northeastern IPM Center, Ontario Ministry of Agriculture, USDA-ARS, and industry representatives attended the meeting. In addition, participating through webinar were representatives from Cornell University, University of Connecticut, University of Kentucky, and industry members from DuPont and Hercon Environmental.

There were approximately 80 participants in attendance. Specific discussions were held on rearing protocols and diapause studies from University of Maryland. Interesting talks on rearing BMSB in Korea, Beltsville, and Rutgers were given as well as New Jersey rearing which included colony maintenance of the BMSB. Italy updated the group on the pest status of BMSB.

BMSB Presentations

WELCOME/OPENING REMARKS/MAP

Presented by: Tracy Leskey & George Hamilton

USDA-ARS-AFRS & Rutgers University

Department of Entomology

Link: <http://neipmc.org/go/NCnF>

Summary:

- Overview of day's schedule
- Introduction of Attendees
- BMSB map updates:
 - Colorado added as a detection state for map.
 - Illinois moved to nuisance problems.
 - Indiana to orange.
 - Georgia to nuisance.
 - South Carolina to nuisance.
 - Alabama to nuisance.
- Presented BMSB news clips.

MARMORATING: A DAY IN THE LIFE OF BMSB REARING AT USDA-ARS BELTSVILLE

Presented by: Megan Herlihy

Co-Authors: Nate Erwin and Don Weber

Invasive Insect Biocontrol & Behavior Laboratory

USDA-ARS

Link: <http://neipmc.org/go/BdLE>

Summary:

- BMSB colony provisioned with organic green beans, paper coated with sunflower and buckwheat seeds, and DI water.
- Food changed out 3x per week and containers cleaned weekly.
- Food propped up in containers.
- BMSB held at 25C, 50%RH, and 16:8 LD.

REARING PROTOCOLS AND DIAPAUSE STUDIES

Presented by: Peter Coffey and Christopher Taylor

University of Maryland

Department of Entomology

Link: <http://neipmc.org/go/BSmf>

Summary:

- Due to large collapses in laboratory colonies, collections of wild adults have been performed.
- No eggs laid from adults wild-collected after August 26.
- Greater survivorship from bugs stored at 9C for 5 weeks than at longer durations.
- Shorter latency until egg production with increased time in diapause.
- Seven weeks of diapause seems to be the shortest diapause duration yielding the most number of eggs in the shortest period of time.
- Question was posed: Could colony survivorship be compared between UMD and Weber's USDA colony? Don Weber said comparisons could be made but wasn't sure if they should.

BMSB IN KOREA: REARING, HISTORICAL OCCURRENCE AND CURRENT STATUS

Presented by: Yong-Lak Park

West Virginia University

Department of Entomology

Summary:

- Little available land for agricultural production in Korea. Maximize space to produce high yields. Major crop is rice. Will bag apples to prevent injury.
- Korean rearing of BMSB: peanuts + Peperomia (radiator plant)...this plant is drought tolerant so little watering needed. Lay cloth over plant to collect eggs, but BMSB will also lay eggs directly on the plant
- BMSB overwinter in Korean greenhouses and complete lifecycle in greenhouses (2 generations). In winter, greenhouse colony of BMSB moved to temp/light controlled conditions inside.
- No colony crashes reported thus far.
- Found tachinid fly eggs on Korean museum BMSB specimens. Eggs lay under BMSB wings are considered successful parasitism; while eggs found on scutellum are not.
- No information from Korea on tachinid behavior.
- The location of fruit production areas has changed in Korea. Currently surveying whether the BMSB distribution has also changed.
- Policy changes in loss of pesticide in Korea leading to increased BMSB presence.

Discussion Period:

Any information on observed mortality rates in colony from egg to adult?

UMD and Virginia Tech reported about 50%.

Yong-Lak (WVU) and Don Weber (USDA Beltsville) do not keep track of mortality rates.

NJDA NON-DIAPAUSE LABORATORY REARING AND COLONY MAINTENANCE OF THE BROWN MARMORATED STINK BUG, *HALYOMORPHA HALYS*

Presented by: Thomas Dorsey, Angela Lovero and Mark Mayer

NJ Dept of Agriculture

Phillip Alampi Beneficial Insect Laboratory (PABIL)

Link: <http://neipmc.org/go/LRsT>

Summary:

- Late instars and adults reared in Plexiglas boxes with bean, *Euonymus* plant, and tarnished plant bug supplemental diet pack.
- Food changed twice weekly.
- Nymphs sprayed with water to maintain high humidity as they are sensitive to desiccation.
- Question: How do you manage for thrips? Sticky cards and safer soap.

GUIDED DISCUSSION ON BMSB REARING

Presented by: Tracy Leskey and George Hamilton

USDA-ARS-AFRS and Rutgers University

Department of Entomology

Summary:

- Several reports of reduced defensive odor from BMSB long-reared in laboratory colonies.
- UMD regularly supplements its colony with field-collected adults to maintain colony size as colony-produced egg masses are frequently used in other laboratory studies.
- Differences between two locations in UMD study?
- Differences in amount of soybeans grown. Also different elevation.
- Hypotheses for documented BMSB laboratory colony crashes?
 - Anne Nielsen and Galen Dively both reported the presence of microsporidia in dead BMSB from colonies.

UPDATE ON THE PEST STATUS OF BMSB IN ITALY

Presented by: Lara Maistrello

University of Modena and Reggio Emilia

Department of Entomology

Link: <http://neipmc.org/go/ypBj>

Summary:

- First reported in 2004 from Switzerland.
- Recently reported in Greece (Athens), Hungary (Budapest) and France (Paris)
- First reported from Italy in 2012?
- Used citizen science surveys and requested submission of specimens to determine distribution of BMSB in Italy in 2013.
- No detections in 2013 from agriculture using sweep net samples.
- In 2014 they used visual, beat and sweep net samples for BMSB detection.
- Determined BMSB has 2 full generations in Emilia Romagna, Italy.
- Reported injury to pear, peach, plum and apple and active feeding in vineyards.
- Suspect only 1 generation in Piedmont.
- Plant protection service deliberating on what pesticides to authorize for use against BMSB.

THE IMPORTANCE OF TIME WHEN SAMPLING FOR BMSB IN PEACHES

Presented by: John Cambridge

Rutgers University

Department of Entomology

Link: <http://neipmc.org/go/hcYC>

Summary:

- Used visual sampling to determine time of greatest presence of BMSB nymphs and adults in peaches.
- Increase in nymph populations up to 10 hours after sunrise, large drop off at 15 hours after sunrise, and subsequent increase at sunrise.
- Numbers of nymphs were highest at warmest times of day.
- There was no statistical difference in adult density throughout the day.
- Also presented data on location of BMSB in the tree canopy by time of day.
- Suggested to focus higher amount of spray onto upper part of tree canopies for BMSB management.

UPDATE FOR BMSB IN ONTARIO

Presented by: Hannah Fraser

Ontario Ministry of Agriculture, Food and Rural Affairs

Summary:

- Low populations observed until late July when new generation adults are present.
- Buckthorn, lilac, catalpa, and tree of heaven utilized as wild hosts.
- Visual and beat samples performed in high density agriculture areas.
- Populations established across southern part of Ontario.
- BMSB recovered from traps in agriculture locations near Niagara.
- Low populations observed in apple in Hamilton, Ontario.

REGIONAL UPDATES

Presented by: George Hamilton

Rutgers University

Department of Entomology

Summary:

- **BMSB Update in Southern Region of US – Research Activities**
Link: <http://neipmc.org/go/KESD>
 - Kentucky (Ric Bessin)
 - Exclusion netting for organic control
 - Impact of biological control
 - Stink bug communities in soybean
 - Tennessee (Jenny Moore)
 - Exclusion netting for organic control
 - Impact of biological control agents
 - Virginia (C. Bergh, A. Herbert, T. Kuhar, D. Pfeiffer)
 - Management on tree fruit, vegetables, grapes and field crops
 - Seasonal movement patterns among habitats
 - Overwintering biology and ecology
 - Development on different hosts
 - Impact on soybeans, corn and cotton
 - Organic management on vegetables
 - Structural and household pest control approaches
 - Development of climate models for predicting spread
 - North Carolina (J. Walgenbach, D. Reissig, G. Kennedy)
 - Management on fruits, vegetables and field crops
 - Impact of biologic control agents
 - Overwintering biology and ecology
 - Trap crops in organic systems
 - Factors affecting colonization of different regions

- Georgia (Mike Toews)
 - Impact on cotton
- One detection of BMSB in cotton in NC and GA
- **BMSB Update in Midwest**

Link: <http://neipmc.org/go/xmhN>

 - Ohio – Crop Damage
 - Soybean, field corn
 - Apple, peach, raspberry
 - Sweet corn
 - Positive in 9 of 11 counties
 - Indiana
 - Confirmed in 26 of 92 counties
 - Greatest concentration in north
 - Increasing damage to crops in last 2 years
 - Levels still quite low
 - Sweet corn, soybeans, tomato, peppers, apples
 - Illinois
 - Confirmed in 18 counties
 - Highest near Chicago & St Louis
 - Some fruit growers seeing bugs in buildings near orchards
 - No significant crop damage reported
 - Iowa
 - Since 2011
 - Specimens from 11 counties
 - 1 new county in winter 2014
 - All from buildings
 - Michigan
 - Primarily a nuisance pest
 - Damage in a few peach orchards
 - Abundant in some soybean fields
 - Confirmed detections in 20 counties
 - ✓ 2010: Berrien
 - ✓ 2011: Eaton, Genesee, Monroe, Lenawee, Ingham
 - ✓ 2012: Allegan, Clinton, Kent, Oakland, Washtenaw, Wayne
 - ✓ 2013: Grand Traverse, Ottawa
 - ✓ 2014: Jackson, Oceana, Cass, Kalamazoo, Van Buren, Livingston
 - Wisconsin
 - Confirmed in 8 counties (orange)
 - Suspected in 3 counties (yellow)
 - Sightings sparse

- No crop damage reported
 - Minnesota
 - Since 2010, in 8 counties
 - Most reports: 1-2 adults in structures
 - One report 2013 & 2014 of nymphs in urban area
 - No detection in agriculture
- **BMSB Update in West**

Link: <http://neipmc.org/go/AwPF>

 - Washington:
 - Continued BMSB damage in Vancouver
 - ✓ Peaches, apples, peppers, French pumpkins
 - Yakima County now considered to have established populations
 - ✓ Increasing threat to important pome and stone fruit growers
 - King County
 - ✓ The first two documented finds of BMSB suggest established populations already present
 - Increasing threat to small fruit growers in Western WA
 - Increasing probability of spread from major urban area
 - Oregon
 - No new Counties
 - More grower finds or damage
 - ✓ hazelnut, wine grapes, tree fruits
 - First BMSB damage in blueberries
 - ✓ Willamette Valley
 - Considerable increase in homeowner complaints
 - ✓ Range and volume
 - ✓ Long, extended dry season
 - Many BMSB from 2nd gen able to attain adult stage
 - First major aggregations south of Salem in the Willamette Valley
 - Idaho
 - Confirmed find in Ada County
 - Near Treasure Valley
 - ✓ OR/ID growing region
 - ✓ Field /specialty crops
 - Possibly established populations in Boise
 - ✓ Unconfirmed reports
 - California
 - Many new reports
 - No commercial damage known
 - Backyard fruit/veg damage or urban nuisance problems
 - ✓ LA County
 - ✓ Sacramento Area

IR-4 REGULATORY RESEARCH UPDATE

Presented by: Van Starner

Rutgers University

IR-4 Project

Link: <http://neipmc.org/go/CbTY>

Summary:

- Risk-cup stills an issue for bifenthrin registration.
- On-going cooperation with USDA PDP program to get refined real-world estimate of usage and residues.
- Registration of bifenthrin will help open the door for combination materials if pursued by registrants.

SHEDDING NEW LIGHT ON MARK-RELEASE-CAPTURE: LASER DETECTION OF FLUORSCENT-MARKED BMSB

Presented by: Kevin Rice

Penn State University

Department of Entomology

Summary:

- Fluorescent marking is cheap and fast to mark lots of individuals. However, the detection distance is limited to about 3 m.
- LED lighting is helping to improve detection distance to 21 m, while laser detection has increased searching range to almost 40 m.
- Technique can be used to detect the fluorescence through 3-4 m of water
- Question: How long will fluorescent powder stay on bugs?
 - Seemingly indefinite

DEFENDING VEGETABLES IN ORGANIC PRODUCTION FROM THE BROWN MARMORATED STINK BUG: ATTRACTION AND RETENTION USING TRAP CROPS

Presented by: Rob Morrison

USDA-ARS-AFRS

Department of Entomology

Link: <http://neipmc.org/go/ynJP>

Summary:

- Greater BMSB retention time in trap crop prior to fruiting period of cash crop, but no difference thereafter.

- Significant decreases in damage to cash crop when protected by sunflower/sorghum trap crop than in unprotected cash crop (peppers).
- Question: What about succession planting of the trap crop to account for maturity of cash crop?
 - Yes, potential for succession planting in future research.
- Question: Did you record whether females were mated or not?
 - Used wild-collected adults for experiments, so mating status unknown.

REVIEW OF OUTREACH AND GROWER SURVEY

Presented by: Chris Gonzales, Keoki Hansen and Yifen Liu

Northeastern IPM Center

Link: <http://neipmc.org/go/kpNj>

Summary:

- Results of online and paper surveys given to growers, farm managers and workers.
- Growers reported the need for scouting, spraying, trapping and biology/behavior information.
- Updates about stopBMSB.org site traffic and kits to be handed out.
- Potential to use grower surveys to provide information for Section 18 submissions.

UPDATE ON INSECTICIDE EFFICACY WORK AT VIRGINIA TECH

Presented by: Tom Kuhar

Virginia Tech

Department of Entomology

Link: <http://neipmc.org/go/aepG>

Summary:

- Showed significant reduction of injury to pepper plants in second harvest when treated with any of the tested organic materials.
- No efficacy of tested organic materials on tomatoes.
- Cyclaniliprole 50SL expected to be labeled for use on pome and stone fruits in 2016, safe on beneficials. Potential efficacy on BMSB?
- Sulfoxaflor has some efficacy against BMSB and short PHI.

VOLUNTEER GEOGRAPHIC INFORMATION: HOW CROWD SOURCED DATA IS HELPING TO MAP THE SPREAD OF BROWN MARMORATED STINK BUG

Presented by: Noel Hahn
Rutgers University
Department of Entomology
Link: <http://neipmc.org/go/XWGg>

Summary:

- High number of crowd-sourced reports in 2009.
- In 2010, there was a large increase in the number of BMSB found in blacklight traps.
- High number of reports in 2009 — high numbers of BMSB captured in blacklight traps in the summer. However, this was not the case in 2012.
- The greatest density of reports from 2006 and 2009 were located in central/northern New Jersey, reflecting the higher density of BMSB captured in traps in those areas.

STATUS OF HOST RANGE TESTS

Presented by: Christine Dieckhoff
USDA-ARS-BIIRU
Department of Entomology
Link: <http://neipmc.org/go/PdJN>

Summary:

- Four *Trissolcus* in quarantine and being tested for host specificity.
- *Podisus maculiventris* attacked in both choice and no-choice tests.
- Presented listed of native predators and parasitoids reported thus far...excluding katydids as reported by Anne Nielsen.
- Reported very low rates of parasitism in Delaware from native parasitoids.

FIELD COLLECTION AND LABORATORY REARING OF PENTATOMOIDEA FOR HOST-SPECIFICITY TESTING

Presented by: Paul Botch
Michigan State University
Department of Entomology
Link: <http://neipmc.org/go/WAhg>

Summary:

- Collected 38 species of Pentatomoidea in Michigan and reared some in colony.
- Provided further details on development, identification and rearing results on collected species.

DO BROWN MARMORATED STINK BUGS TRACK RESOURCES WHEN DIVERSE PLANT HOSTS ARE AVAILABLE?

Presented by: Dilip Venugopal
University of Maryland
Department of Entomology

Summary:

- Higher BMSB abundances on trees with mature fruit for mobile stages: late nymphs and adults.
- Timing of tree use coincided with timing of fruiting.
- Fruit removal greatly decreased BMSB abundance.
- Higher BMSB abundance at edges compared with field centers.

UPDATE ON PHEROMONE-BASED MONITORING TOOLS FOR BMSB

Presented by: Tracy Leskey
USDA-ARS-AFRS
Department of Entomology
Link: <http://neipmc.org/go/dNWw>

Summary:

- Synergistic effect of aggregation pheromone and MDT.
- Trece lure was the only tested commercial lure that outperformed the experimental standard.
- In a comparison of different trap types, the highest season-long captures were recorded in coroplast pyramids. Small limb- and ground-deployed traps performed reasonably well. The Rescue trap did not perform as well.
- Traps can be refined to make them more “grower-friendly” given the attractiveness of the aggregate pheromone with synergist.
- The area of arrestment around the aggregation pheromone deployed in an apple tree appears to be limited to the baited tree. Baited apple trees will retain BMSB for >20 h.
- Nymphal captures were higher in exterior traps, but adult densities were similar in exterior and interior traps deployed in apple orchards.
- Question: In the treatment threshold study, what was the latency between trap check and insecticide application? Insecticides were applied 2 days after the cumulative threshold was reached.