The IPM Corner
A Pest Management Newsletter

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In this issue…

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Insect Pest Monitoring in Almonds and Walnuts

Jhalendra Rijal

By now, winter sanitation (removal of mummies from the trees and from the ground) has been completed in most of the orchards. Also, I fully understand the difficulties in doing winter sanitation this year due to the constant rain events and flood situations. However, orchard sanitation is the most effective method to control navel orangeworm (NOW). Almond mummies not only harbor overwintering larvae (Fig. 1, page 1), but also serve as the resource for egg laying (Fig. 2, page 1) by NOW females in the spring, during which new nuts are not yet vulnerable to NOW infestation.

For insect monitoring **in almonds**, we already passed the trap placement timing (February 15) for **Oriental fruit moth** (remember the biofix of OFM was February 16 last year). We recommend no insecticide sprays (except Bt products if needed) during the bloom time due to the potential risks of the insecticides to pollinators. We can wait to spray until May, if worm control spray is needed (i.e. peach twig borer, leaf rollers, etc.). Put **navel orangeworm** egg traps out by March 15 (South San Joaquin Valley) or by April 1 (North San Joaquin and Sacramento Valleys). Use black egg traps filled with the almond meal + 10% crude almond oil. Hang the traps at head height on the north side of the non-pareil tree, at least 5 trees in from the edge. Put one trap per 10 acres with at least 4 traps per orchard. Remember to change the bait frequently, given that bad bait (lumpy, rancid) is not very effective in attracting females for egg laying. The biofix of NOW egg laying was April 18 last year. Follow the link for the details of egg trapping: (http://ipm.ucanr.edu/PMG/C003/m003bceggtrapsnvl.html).

Fig. 1. Multiple NOW larvae infested a mummy nut

Fig. 2. Several NOW eggs laid on almond mummies

Pheromone traps and lures (e.g. Suterra, Trècè, Alpha Scents) are available to monitor male NOW activity. Although the relationship between egg and pheromone traps has not been fully understood, pheromone trap capture data helps in making NOW control decision. In the orchard with NOW mating disruption, use of the pheromone trap is strongly recommended to evaluate whether the mating disruption product is working or not. Negligible moth counts to complete trap shut-down is expected if the mating disruption working properly. The male moth activity of navel orangeworm in the Modesto area is presented below (Fig.3, page 3).

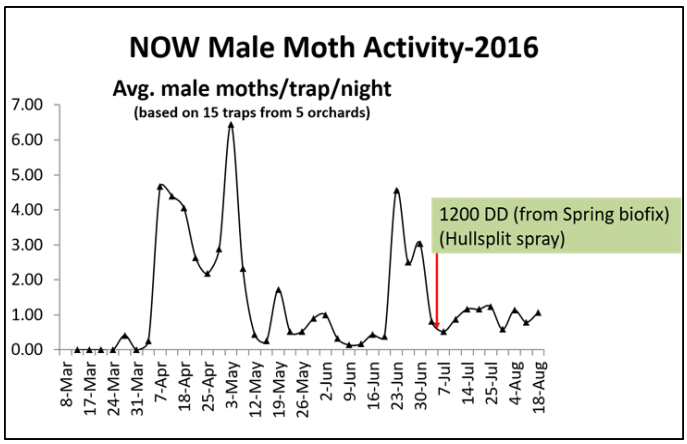


Fig. 3. Seasonal NOW male flight activity in Modesto area

For **San Jose scale**, put out pheromone traps by March 1. For peach twig borer, the time to put the traps out is mid-March (2016 biofix was on 28 March). Follow this link:http://ipm.ucanr.edu/PMG/C003/m003bcsanjosescale.html to learn more about how and when to set up traps and monitor San Jose scale and peach twig borer.

Leaffooted bug (LFB) may not be a big issue in every orchard every year, but when they occur, the damage impact can be severe. The LFB adults overwinter in the orchard and also in other host plants outside the orchard. Adults of LFB move to the orchard during March-April and attack young nuts. Early infestation on nuts before the shell hardening causes aborted nuts, internal gumming and staining nut shells. Feeding on the young nuts may lead to significant nut drops. Late-season infestation (after shell hardening) results in stained nuts and deformed nutmeats. Stink bug attacks can produce similar signs on nuts, including nut drops, but this will happen later in the season (May-June), compared to March-April as in the case of LFB. Unfortunately, we don't have a specific trap/lure to monitor LFB activity in the orchard. Thus, regular scouting in the orchard to look for eggs, live bugs and dropped nuts, are the ways to detect the presence of leaffooted bugs in the orchard. Almond varieties with softer shells such as Fritz, Sonora, Aldrich, Livingston, Monterey, and Peerless are more susceptible to LFB damage.

For **spider mites and their predators**, start monitoring orchards biweekly from March-May, and weekly after that. Early mite damage is indicated by the lightly stippled leaves (http://ipm.ucanr.edu/PMG/T/I-AC-TSPP-CD.113.html) and is likely seen in the lower and interior portion of the tree canopy. Take a minimum of 75 leaves from 5 random trees and inspect the leaves using hand lens for the presence of mites and mite predators (No need to count the number of mites and eggs). Sampling before July 1 should focus on 'hot spots' of the orchard (i.e., area near to the dirt roads, weak trees, and edges). Follow the sampling guidelines for details: http://ipm.ucanr.edu/PMG/C003/m003fcspdmites02.html).

Ant colony survey begins in June in the upper San Joaquin Valley and April-May in the lower San Joaquin Valley. Select five locations within the orchard (~1000 sq. ft. per location). Count a total number of ant colonies from the sampled area and compare it with the Table 2 (page 3) to estimate the potential nut damage at harvest. The longer the nuts remain on the ground after harvest, the more damage you can expect.

In Walnuts, the activity in **codling moth** in the upper San Joaquin Valley begins from late-March to early-April. Hang codling moth traps with 1x lures (standard 1-mg pheromone lures) at 6-7 ft height on trees in March to determine biofix and start accumulating degree-days. Biofix is the first date that moths are consistently found in traps and sunset temperatures have reached 62°F. 2016-biofix was March 25 in the Modesto area. Keep in mind that if your orchard or nearby orchards is under codling moth mating disruption, the 1x trap is not useful for biofix/degree day calculation due to very few to no moth capture. So, if you have one of these situations, we recommend to use both 1x and CM-DA combo trap. The combo trap attracts both male and females, and it is useful to know the seasonal flight patterns. No moth capture in the 1x trap is the indicative of disruption happening. In addition to traps, conducting nut sampling for damage particularly near the end of each generation is important. For the damage evaluation, look for the larvae entry points packed

with the larval frass (excrement) in nuts. Based on 1000 nuts sampled, damage exceeding 1% (after 1st generation) or 2% (after 2nd generation) may result in >5% damage at harvest. Not only that, codling moth damaged nuts are vulnerable to navel orangeworm infestation which has become a major insect problem in walnuts in recent years. Follow UCIPM guidelines for other details, http://ipm.ucanr.edu/PMG/r881300211.html

As in almonds, winter sanitation is the important method of controlling **navel orangeworm** in walnuts. Before husk-split, early season NOW utilizes nuts that are damaged (by codling moth sunburn, blight, mechanical injury) for egg laying. All sound nuts become vulnerable to NOW damage after the husk-split in walnuts. Use pheromone traps for monitoring NOW adult activity in the orchard. In Modesto area in 2016, the early season peak activity was found between the last week of April and the first week of May, and later peak was on September 7 in the Modesto area. In a recent study, we found that Trècè L2L lure and Suterra Biolure are consistent and effective in capturing male moths compared with the Alpha Scents lure. If your orchard has NOW mating disruption, you should be able to see very minimum to no moth catches in the traps.

The ideal time for the **walnut scale** monitoring and treatment is during the delayed-dormant period. However, if you miss that opportunity, put out double -sided sticky traps in May to determine the crawlers' emergence and treat the crawlers with insect growth regulators (Centaur or Seize).

Table 1. Timeline to deploy traps in almond orchard

Insect species	Trap placement date	2016 Biofix dates (Modesto area)	Purpose
Navel orangeworm (eggs)	April 1	April 18	Determine biofix and hull-split spray timing
Navel orangeworm (pheromone and/or kairomone)	March 15	March 28, first moth catch (this is NOT the biofix)	Follow seasonal moth flight activity which can help to properly time spray; deploying pheromone trap is critical for mating disrupted orchards
Oriental fruit moth	February 15	February 16 (1st biofix) April 28 (2nd biofix) June 9 (3rd biofix) July 14 (4th biofix)	Determine biofix and spray timing; monitoring needed only in orchards with a history of damage
Peach twig borer	March 20	28 March (1st biofix) 2 June (2nd biofix) 11 July (3rd biofix)	Set biofix for each generation and determine may spray timings
San Jose scale	February 25 (SJ Valley) March 1 (Sac. Valley)	-	Determine biofix, and monitor scale parasites (i.e., *Aphytes* spp., *Encarsia* spp.)
Obliquebanded leafroller Fruitree leafroller	April 1	April 12 (biofix for OBLR)	Determine biofix; monitoring needed only in orchards with history of leafroller damage

Modified from: Almond UC IPM Guidelines

Table 2. Percent damage by ants to almonds on ground in an almond orchard

No. of colony entrances per 5,000 sq. ft. in spring	Days nuts are on ground				
	4	7	10	14	21
15	0.9%	1.6%	2.1%	3.1%	4.9%
45	1.4%	2.3%	3.2%	4.7%	7.0%
185	2.0%	3.6%	5.0%	7.0%	11.1%

Source: UCIPM Guidelines

Brown Marmorated Stink Bug Survey in Cling Peach Orchards

Jhalendra Rijal and Roger Duncan

Background. The brown marmorated stink bug (*Halyomorpha halys*) (BMSB) originated in East Asia and was first detected in the US in Pennsylvania in 2001, and has now spread to over 40 States (www.stopbmsb.org). In 2010, BMSB caused about $37 million in damage to fruit crops in the Mid-Atlantic region. BMSB has a host range of over 170 species, including virtually all fruit crops and vegetables with fruiting structures. Peach is one of the preferred hosts of BMSB, and rated as a high-risk crop. Adult and nymphs (except first instar) can damage fruits. Physical damage to fruits includes surface deformation/depression, pitting, and scarring, sometimes leading to a mealy texture in the fruit. BMSB feeding injury on young and mature peach fruit can develop discolored necrotic areas inside the fruits and that makes the fruit unmarketable as a fresh or canned product. BMSB usually produce one or two generations per year in cooler climates and up to five generations in its native range climate (i.e., Korea, Japan) with warmer climates. BMSB adults and nymphs have a typical white bands on antennae and legs (Fig 1, page 5) and this feature is lacking in other similar looking stink bugs (rough stink bug, consperse stink bug, brown stink bug).

In California, a large BMSB population was discovered in Midtown Sacramento in early September 2013, and subsequent surveys showed that they now infest downtown Sacramento and nearby cities. Established populations have now been documented in Butte, Sutter, Yolo, Sacramento, San Joaquin, Santa Clara, Los Angeles, and most recently in Siskiyou and Stanislaus Counties. In November 2016, BMSB was detected in urban area in Merced, Merced County (Personal communication, Merced County Ag Commissioner's Office). In Stanislaus County, for the first time, a reproducing population (i.e. several batches of egg masses, different stages of immatures, and adults) was discovered in a group of Trees of Heaven (i.e. *Ailanthus* sp), one of the favorite hosts, near Highway-99 in Modesto during July 2015. Following the first detection, we received unofficial reports of finding BMSB at least in four locations in Modesto and nearby cities, Turlock and Empire in 2015. All evidence suggests that BMSB might have established in Stanislaus County near multiple canning peach growing areas. In order to increase assurance of discovering BMSB presence before it has built up large numbers, we conducted a BMSB detection survey using BMSB pheromone traps (Fig. 2a, page 5) in 9 peach orchards in 2016. Traps were checked every week from April through November. In addition to checking pheromone traps on each inspection date, we conducted a timed search of each orchard including beat tray sampling.

Results. BMSB adults were captured only from one of the nine peach orchards surveyed in 2016. On July 5, 2016, one BMSB adult was captured in a peach orchard ~9 miles east of the first BMSB finding site (i.e., trees of heaven site near Highway 99, Modesto). After that, we increased the trap numbers, four traps baited with the Trécé lure and four traps baited with the Alpha Scents lure. Traps were placed along the edges of the peach orchard. Beginning mid-September, we started catching BMSB adults in a peach orchard. The highest mean capture was on 17 October in which 2.5 adults/trap/week for Trécé lure, and 0.75 adults/trap/week for Alpha Scents lure were captured (Fig. 3, page 5). The total number of adults captured in four Trécé and four Alpha Scents lures were 23 and 7, respectively (Fig. 4, page 5). To our knowledge, this is the first report of consistent BMSB captured from any agricultural crops in California. No BMSB was recorded from any sites based on the visual and beat tray samplings. Other stink bugs, harlequin bug, red-shouldered and consperse stink bugs were captured in the trap in a few instances.

At the tree of heaven site in Modesto, we monitored BMSB activity beginning September. The average BMSB adult count was the highest (~170.5 adults/trap/week) on 22 September while nymph counts were at the peak (116.5 nymphs/trap/week) on September 8 (Fig. 5, page 5).

Conclusion. Based on this study, there is a clear indication that BMSB has been moving to agricultural areas in Stanislaus County. Since peach is considered a high-risk crop for BMSB attack (www.stopBMSB.org), it is critical that growers and PCAs pay close attention in monitoring peach orchards. Regular scouting of the orchard and use of pheromone traps in will help to detect any significant infestation. Traps and lures are available to use from commercial companies. NOW, sticky card type of trap (Fig. 2b, page 5) are now commercially available to use. The sticky trap is easier to use compared to the pyramid trap (Fig. 1, page 5).

Fig. 1. BMSB adult and nymph

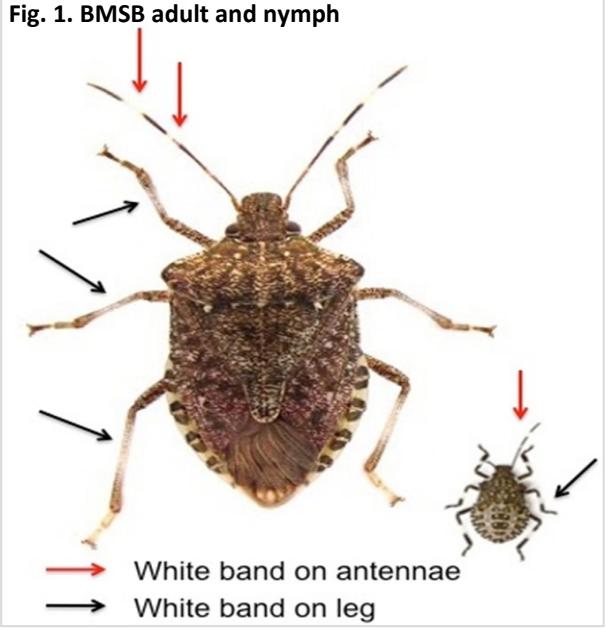


Fig. 2A. BMSB standard black pyramid

Fig. 2B. BMSB sticky card trap baited with BMSB lure

Fig. 3. Seasonal abundance of BMSB in a peach orchard in Modesto, CA, 2016

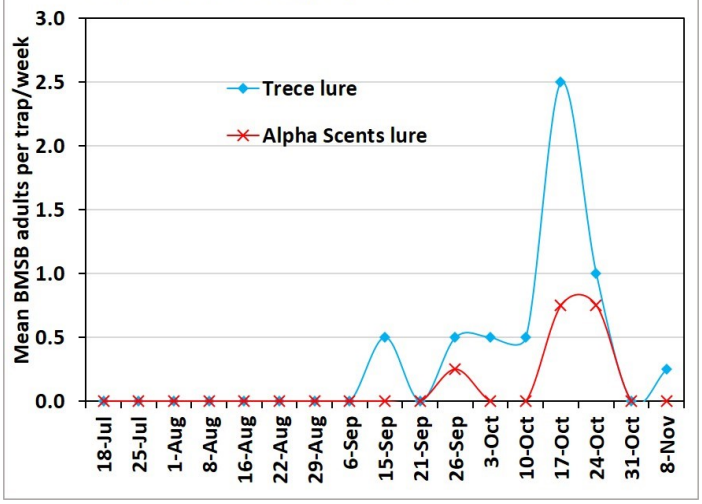


Fig. 4. Seasonal total BMSB adults in in a peach orchard in Modesto, Stanislaus County, CA 2016

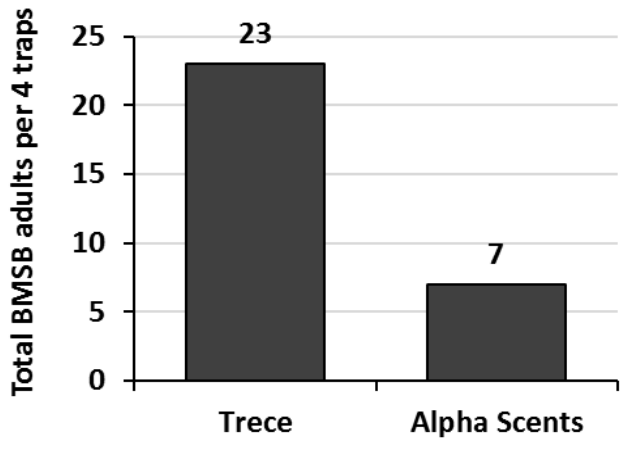
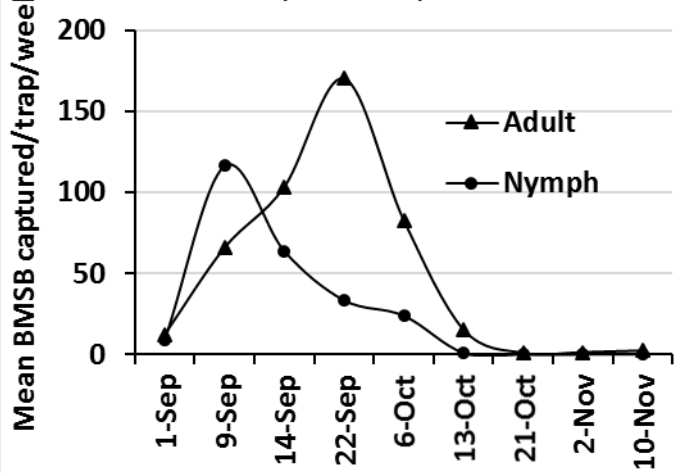


Fig. 5. Average BMSB adults and nymphs captured in an urban site dominated by trees of heaven, Modesto, CA-2016



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- June 7
- June 21

Meeting time: 7-8 am

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