Mating Disruption, Stink Bugs, and Reduced Insecticide Use for Apples at the Snyder Research & Extension Farm, 2016

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Brown marmorated stink bug (BMSB) has cost many growers both in terms of crop loss and additional dollars spent on insecticides. Prior to BMSB establishment, many growers were using mating disruption to control oriental fruit moth, combined with ground cover management to control catfacing insects. These high impact IPM practices resulted in high percentages of clean fruit, reduced insecticide use, and "good neighbor relationships." Since BMSB has so many hosts, can reproduce in the orchard over the entire season, and is so motile, it has practically destroyed our traditional IPM programming. BMSB also spends much of its time in the woods and wooded edges around orchards. This behavior helps define BMSB as an edge pest, where much of the time it moves into orchards from wooded edges, hedgerows or other borders, such as field corn or maturing grain. Over the past several years we have been working to bring back high impact IPM practices. These efforts originally focused in peach orchards, and combined oriental fruit moth (OFM) mating disruption, with the elimination of broad leaf weeds and legumes on the orchard floor for control of tarnished plant bug and other catfacing insects. This program also monitors BMSB with traps around the edge of the orchard, and combines weekly orchard border sprays of insecticide for BMSB control, while eliminating insecticide from the orchard interior. We coined the term, "Crop Perimeter Restructuring (IPM-CPR)" for this combined set of practices.

We are currently expanding this research to apples. In 2016, as part of a larger USDA funded program, we worked with the entire Snyder Research & Extension Farm tree fruit acreage, placing an IPM-CPR treatment in about half the acreage, while using standard insecticides in the other half. There is only one block of peaches at the Snyder Farm, so while this was monitored and treated under IPM-CPR guidelines, it is not covered here.

Methods

During 2016 the Snyder Farm tree fruit plantings totaled 12.1 acres in various small plantings originally designed for rootstock, tree training and other horticultural practices. We collected data from block 12.1 (2.1 acres) as the standard insecticide treatment, and blocks 25 and 26 (4.4 acres) as the mating disruption/IPM-CPR treatments. In effect, a line was drawn through half the plantings with half the area devoted to the Standard and half to the IPM-CPR. However due to the size and layout of the plantings, only those mentioned were monitored. The peach block (17.1, 17.2) was included in the mating disruption, but has no comparison and is composed mostly of early to mid-season varieties, so is not dealt with here. In both treatments, 6 pyramid BMSB traps were established, 1 on the outside row or end tree, half way down, such that there were 4 traps in the middle of the block edge, and 2 traps in the center, spaced about 40 feet apart. Two trees were marked by each trap from which in-season and at-harvest fruit injury data was taken. Traps were baited with AgBio XtraCombo lures at the end of May, and monitored every 7 days for BMSB and native stink bug nymphs and adults. Lures were changed every 4 weeks. Codling moth pheromone traps (2 placed near the center of each planting) were checked every 7 days with lures replaced every 12 weeks. During each weekly monitoring session a 25 insect sweep net sample was taken in the ground cover to count tarnished plant bugs and other catfacing insects. The tall fescue groundcover

Table 1. Weekly stink bug trap summary.

Treatment	Total Weekly Counts of BMSB and Native Stink Bugs in Traps*												
	6/8	6/13	6/22	6/29	7/7	7/13	7/18	7/27	8/3	8/10	8/17	8/24	9/7
BMSB IPMCPR	0	0	0	0	3	0	0	0	0	8	0	6	15
BMSB Standard	0	0	0	0	0	0	0	0	0	0	0	35	35
Native IPMCPR	0	0	0	0	9	4	1	0	2	2	0	0	0
Native Standard	0	2	0	0	1	2	2	2	0	0	0	0	0

*Each number represents a total of 6 traps with both adults and nymphs for each date.

in all blocks had been annually treated with 2,4-D and clopyralid (Stinger) to eliminate broad leaf weed hosts for catfacing insects. A non destructive 25 fruit sample was scanned each week for the presence of catfacing or other pest injury. Within several days of the normal apple harvest for each variety, a 25 fruit sample was picked from each of 2 trees bordering the BMSB pyramid traps, for 16 total samples per block/treatment.

The IPMCPR blocks received a treatment of Isomate CM/OFM TT @ 200 dispensers per acre in early May. This product disrupts the mating of both oriental fruit moth and codling moth, and was intended to replace any insecticide normally used for those pests. Regular pesticide cover sprays were applied to the standard treatment throughout the season, but only through May in the IPMCPR treatment for plum curculio. After May insecticide was eliminated from the IPM-CPR blocks, with only border sprays of insecticide applied to that treatment starting on June 3. If a pyramid trap count reached a combined 10 nymphs and adults, then a whole block insecticide application would be justified.

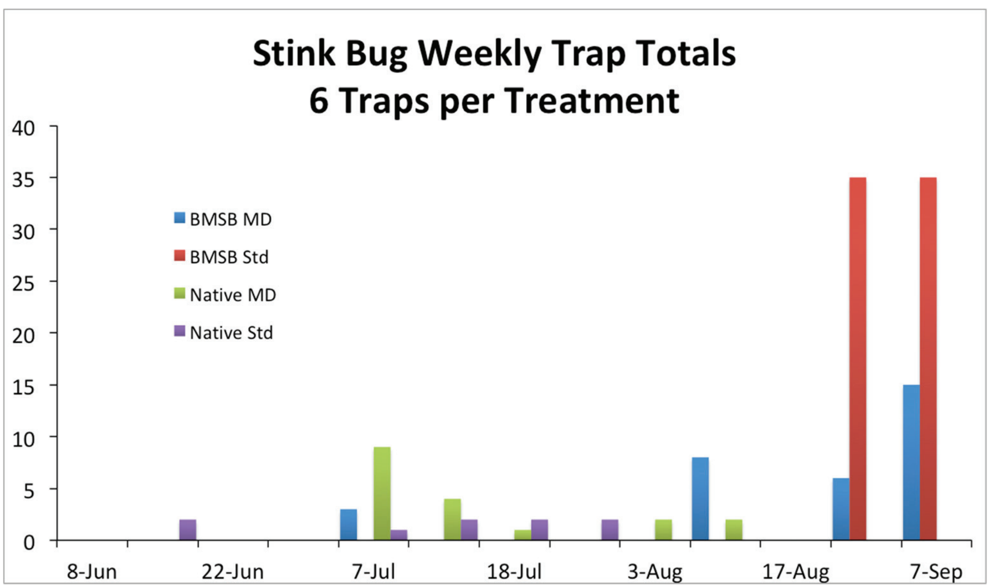

Figure 1. Graphic summary of weekly trap count totals.

Results & Discussion

Very few BMSB were captured until late August (Table 1, Figure 1). Native stink bugs, the majority of which were brown stink bugs, were captured during the middle of the season. Numerically higher numbers of brown stink bugs were seen in the IPMCPR plots, while numerically higher numbers of BMSB were seen in the standard plots.

Stink bug feeding damage is often seen only after the fruit is peeled and cut to see internal damage. While the majority of damage can be seen externally without peeling, cutting the fruit is the only way to get a 100% accurate assessment of the damage. With low levels of

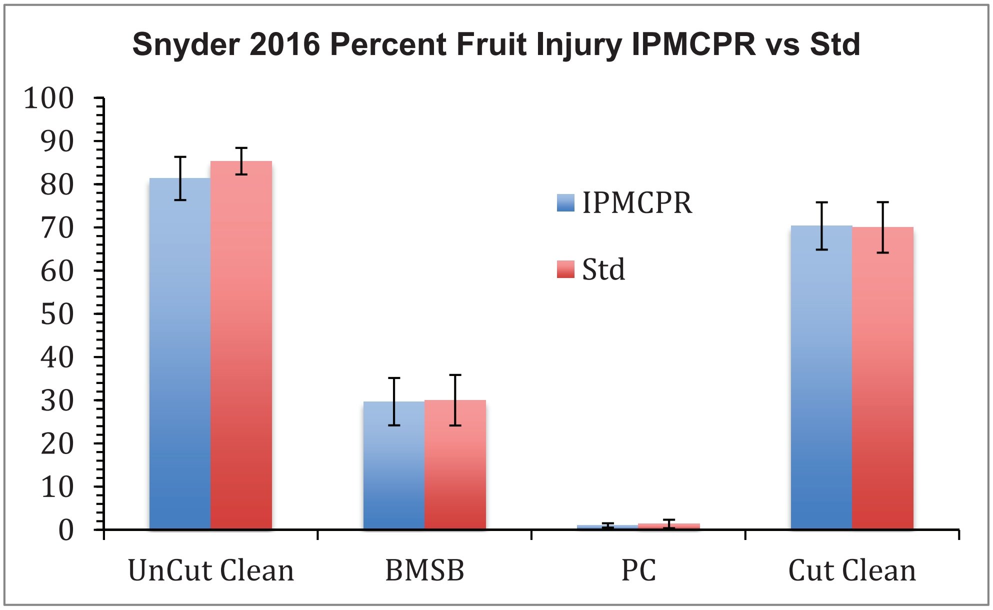

Figure 2. Percent fruit injury from at harvest samples.

damage, growers will often assume that since there may be no external feeding signs, then the fruit is undamaged. While this may be true for marketing, there still may be low levels of feeding. Therefore, we report the clean fruit here as both uncut and cut fruit (Figure 2). The difference between the truly undamaged uncut and cut fruit was about 10%. Uncut visible clean fruit was about 80%, while cut fruit scored 70%. There were no differences between the standard spray program compared to the IPMCPR program. BMSB damage was the same in both treatments.

The insecticide program summary (Table 2) is reported as the number of applications, the number of full rate equivalents, and the total pounds of product used. A rate equivalent (Rate Eq. or REq) is defined as when any product was used within the range of the full labeled rate for a specific target pest. For example, if Sevin XLR was used at 32 oz/A as an insecticide, it is 1 REq., but if it was use as a thinner at 8 oz/A, then it is calculated as .25 REq. The IPMCPR treatment used almost 40% less insecticide in terms of the number of applications, and about 50% in terms of REqs. However, the percentage of clean fruit would have probably been increased if the number of applications, full covers and borders, had been increased in late August and early September when BMSB moved into the apples. These blocks consisted of multiple varieties, some of which are early ripening and being used for human consumption. This combined with the lack of late season insecticides, prevented late season applications. In commercial situations, this points to the need of having uniform blocks and the availability of late season, short PHI materials for BMSB treatments. The results also demonstrate that in many cases, insecticide use can be reduced and that regular cover sprays can be excessive, but that application timing is important to match insect activity. This work is being continued in commercial orchards.

Table 2. Insecticide use in 2016.

Treatment	Number of applications	Number of rate equivalents	Product used (lbs)
Standard	8	7.25	3.6
IPMCPR	5	3.45	2.9

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