AUGMENTING STINKBUG CONTROL WITH THE USE OF PHEROMONES

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Abstract: Stinkbug injury was significantly reduced when aggregation lures were placed along orchard edges before border spraying commenced in July. Damage was 24% lower along borders that had lures placed in weed hosts every 20 feet. Further improvements are expected when overwintered adults are controlled in the same manner beginning in May.

Stinkbug injury is the single highest insect-caused cull factor in many parts of the Pacific Northwest, surpassing leafroller and codling moth. Some growers lose 10 to 20% of their crop to stinkbug and damage approaching 50% is found occasionally, especially along borders facing native brush, from which the bugs migrate during hot, dry weather. Currently, there are no alternatives to heavy spray programs, which are often solid-block applications of endosulfan (Thiodan) or formentate hydrochloride (Carzol). Codling moth mating disruption is now used on 30% of the bearing acreage of apple in Washington, and has allowed 75% fewer applications of organophosphate insecticides for codling moth control. Unfortunately, some of these orchards are at risk of abandoning MD due to the stinkbug problem. Similarly, some orchards in transition to organic production have been sprayed out to control stinkbug. The use of aggregation pheromones to concentrate and retain these pests in the borders may substantially enhance the efficacy of border sprays. This would obviate the need for whole-orchard treatments and keep the biological control benefits of mating disruption. Growers are very interested in finding a less disruptive way to control stinkbug.

Active aggregation pheromones have been identified, synthesized and field-tested for some New World species of the Pentatomid genus *Euschistus*. Methyl (2,4)-decadienoate is produced by male *Euschistus* and attracts females, males and nymphs of numerous species. The role this pheromones plays in mating and other behaviors is not well understood but it has been used to trap *Euschistus* and other species in cylindrical plastic "jug traps". A great deal of fruit damage often occurs within 2 to 3 feet of the trap when placed in apple trees, even when only 5 or 6 insects have been caught in a week. It seems that the pheromone only attracts stinkbugs to a local area, at which point they rely upon visual cues to find mates or food. This investigation exploited the phenomenon to concentrate the pest population along the orchard borders, where border sprays might control them before significant crop damage occurred. If successful, this would reduce biological disruption and the amount of insecticides used.

Materials and Methods:

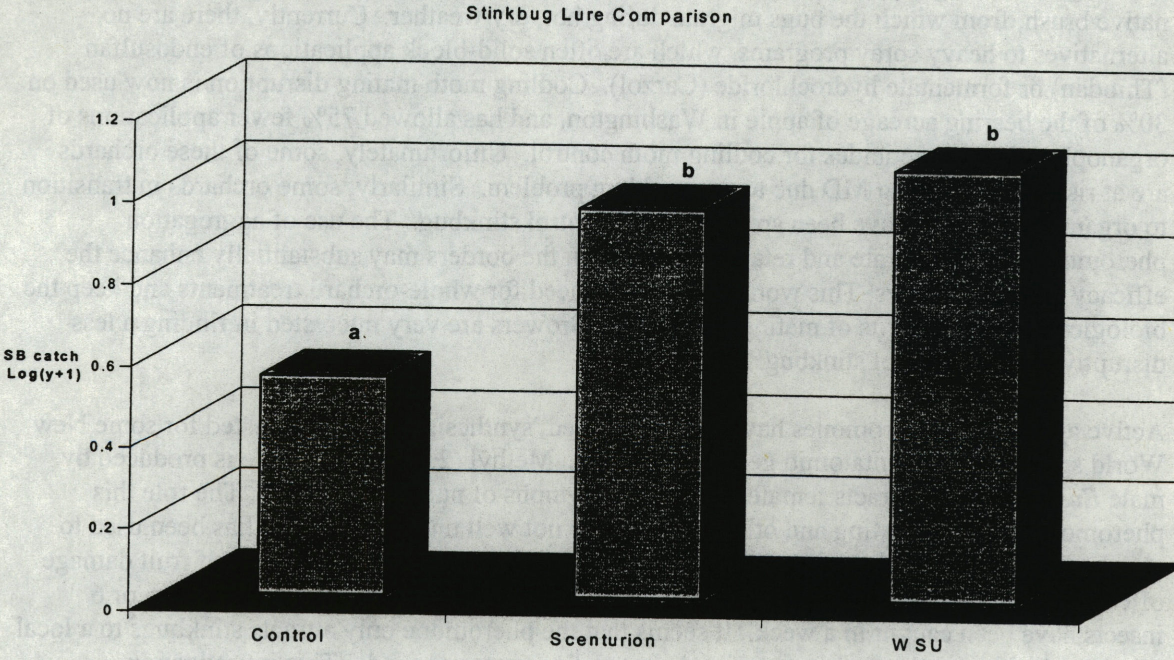
Relative attractiveness of 2 dispenser types. Methyl (2,4)-decadienoate was formulated into 2 types of dispensers; a paraffin based matrix from Scenturion, Inc., and a polyethylene vial used by USDA and WSU scientists. 15 replications were set up in either bitterbrush or mullein habitat, consisting of Scenturion, untreated controls, and WSU lures placed 30 meters apart. Sites were established on or about 5/27, and were sampled weekly for a period of 1 month. Bitterbrush sites were limb tapped onto plastic tarps, while mullein plants were hand inspected. All stinkbugs were removed each time to avoid recapturing the same individuals.

Border treatments with "attract and spray" technique. In July, eight replicates were established consisting of 400 feet of orchard border, 200 feet of which was treated with a WSU lure placed every 20 feet and loaded with 0.5 ml methyl (2,4) decadienoate, and 200 feet without any aggregation lures. Lures were placed in host plants wherever possible. Borders (both brush and fruit trees) were sprayed 3 to 4 times during the season regardless of pheromone treatment, initially with either Asana (brush only) or Phosphamidon, and subsequently with Carzol. Damage evaluations were taken shortly before harvest by visually enumerating 20 adjacent fruit from the upper canopy and 20 from the lower canopy. Trees were sampled from the border row, 2nd row, and 4th row into the orchard. Data from each section were pooled, and a total proportion of damaged fruit was calculated.

Results:

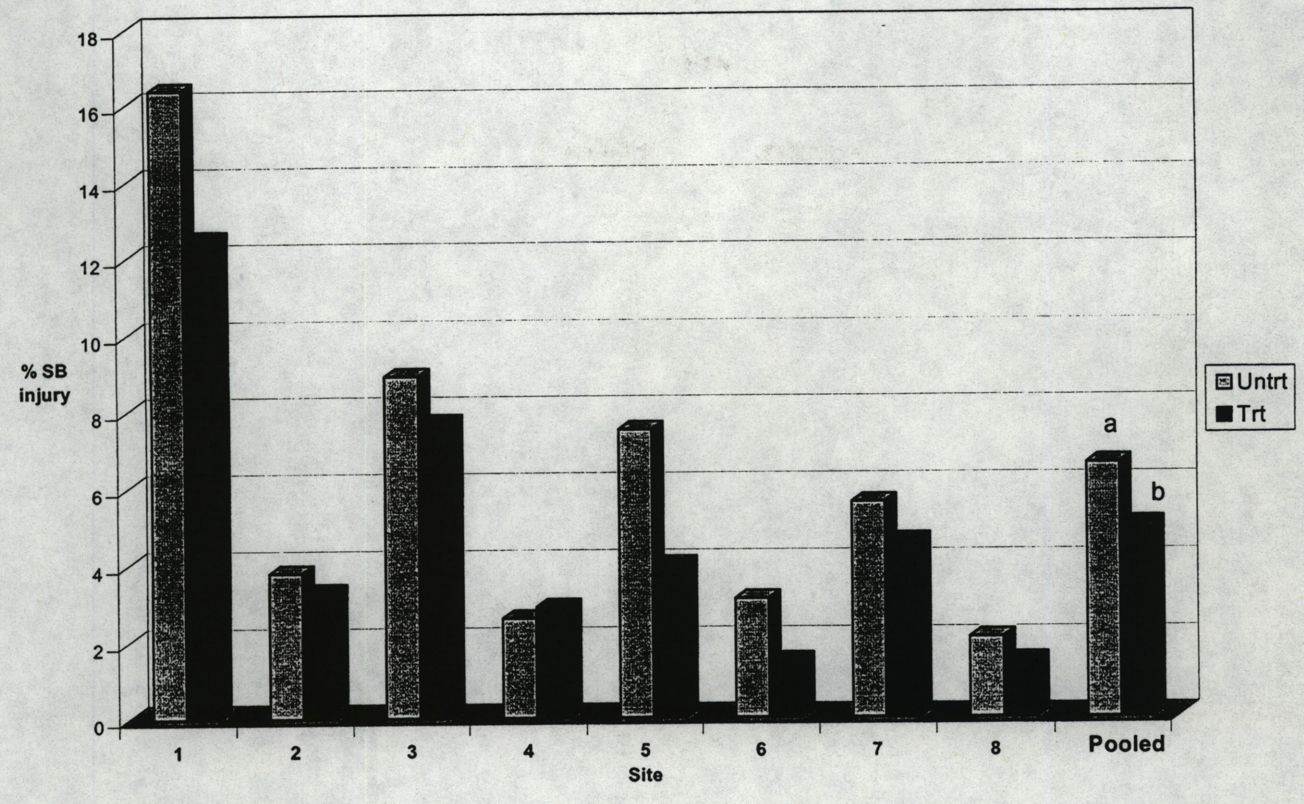
Dispenser comparison:

Stinkbug collections were significantly higher in the lure treated sites compared to the untreated, and the WSU lure tended to attract more than the paraffin based lure, although this difference was not statistically significant in this study.



Attract and Spray:

Stinkbug injury was 24% lower in the pheromone treated borders compared to the non-augmented borders, declining from a total of 6.6% damage to 5%. Damage varied widely between the 8 blocks, from a low of 2% to a high of 16.4%. Declines due to pheromone augmentation ranged from a 12% increase (due to site bias), to a 52% decrease. Several sites were recognized as biased, that is, the pheromone section was placed in areas that had more mullein habitat and therefore more stinkbug pressure. Nonetheless, the trend was towards reduced damage with pheromone augmentation in all but one of the eight sites.



Discussion:

The technique of augmenting border insecticide spays with aggregation pheromones shows promise in reducing damage caused by the stinkbug complex. It should help reduce the frequency of solid block spraying by improving efficacy of border-only sprays. Evidence from several highly infested borders also suggests a delay in immigration as well.

Improvements are expected with the technique also being directed at the overwintered generation, before reproduction occurs in June. This would allow a greater reduction in the local population, at least. Also, a higher density of dispensers may be tried. Data on active space of the lures is currently being generated by others.

Certain sites have a lack of appropriate host plants along their borders, despite a history of stinkbug problems. Sage and grasses will not retain a stinkbug population, despite presence of a lure. Mullein is by far the best; bitterbrush, asparagus, salsify, service berry, Russian thistle, red osier dogwood will serve, although poorly. An alternative may be to use trap trees, especially pollenizers, where adequate weed hosts are lacking.

Complete coverage with insecticide border sprays is critical. Often the population is well concealed beneath thick vegetation. High volume airblast spraying, or hand guns, are best. A complicating issue is the immigration of individuals from beyond the spray zone. In some instances, it may even appear that insecticides are ineffective, yet baited plants from which bugs have been removed by hand are often repopulated after 5 days.

Further testing of insecticides including Carzol, Orthene, Provado, Lorsban and newer chemistries is needed. The dispenser must be improved to protect the active components from isomerization, by using adjuvants to the pheromone and/or UV protectants in polyethylene vial.

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