Biology/Phenology

Biology and Management of Stink Bugs in Tree Fruits

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Pheromones represent the most promising alternative tactic for controlling codling moth in pome fruit orchards of Washington. However, a pheromone-based pest management program (PBPM) will represent a drastic departure from current IPM programs. Control decisions will become more site-specific in response to local pest problems. One of the greatest challenges to a PBPM will be managing pests which reside outside the orchard and visit or invade only at specific times of the year, causing damage. The most notable examples of these are true bugs in the families Miridae *(Lygus* sp.), Rhopalidae (boxelder bug) and Pentatomidae (stink bugs).

Stink bugs have caused serious crop loss to cherry, peach, nectarine, apple and pear. Control with insecticides is difficult. Stink bugs invade orchards late in the growing season when choice of chemical controls is limited by PHI considerations. Repeat sprays are often required because stink bugs continue to migrate into orchards. At least six species of stink bugs occur in native habitats in Washington. The biology of different species is known to a greater or lesser degree from research in California and other states. However, no research has been conducted on stink bugs in Washington since the late 1970s.

Phenology and Species Complex

Studies were conducted in the growing regions surrounding the Yakima valley and Wenatchee/Manson region. Data obtained during the summer of 1995 indicated these areas were heavily infested with stink bugs.

Native pest stink bug complex

Four species of stink bug were determined to cause damage to tree fruits: the consperse stink bug *(Euschistus conspersus),* the conchuala stink bug *(Chlorochroa ligata),* the green soldier bug *(Acrosternum hilare),* and the red-shouldered stink bug *(Thyanta accerra)*. The consperse and conchuala stink bug have caused the most economic loss in apples and pears.

Pest plant host succession

Plant host succession was determined by sampling the native vegetation surrounding orchards throughout the growing season. Overwintering adults of the two most injurious species emerge and feed on mullein early in the spring. The adults move onto bitterbrush in late spring and early summer to lay eggs where the immature stink bugs will complete development. Later in the summer (July/Aug) the new adults return to mullein surrounding the border of orchards. Adults move into orchards and feed, causing fruit damage.

Phenology

During the summer of 1995 the consperse stink bug had two reproductive generations. In 1996 only one reproductive generation was recorded. It is possible that the number of generations was reduced because 1996 was cooler and wetter than 1995. In 1996 eggs were laid from mid-June through mid-July. The nymphs began hatching in early July and developed through five larval instars extending throughout early September. Adults begin invading orchards in mid-August through late September.

Development

Rearing of *E. conspersus* at constant temperature provided preliminary estimates of developmental threshold for this stink bug species. *E. conspersus* was reared on soybeans and peanuts so data on stage longevity might not correspond directly to field conditions where it would be feeding on a variety of host plants. However, it was found that the eggs required an average of 13 days to hatch at 21°C but only 6 days at 31°C. Development from the egg to adult required 60 days at 21°C and 24 days at 31°C. The lower developmental threshold for the egg stage was 10°C while the lower developmental threshold for development of the nymphs, 1st through 5th instars, was 14°C.

Monitoring

Three trap designs were tested this year. Clear 18 x 18 inch Plexiglas pane traps covered with tanglefoot were placed, hanging from limbs, along the borders of orchards. The second trap consisted of a modified cotton boll weevil trap. This trap resembled a clear plastic tube, 4 inches in diameter, with small circular openings at each end. Traps were placed in trees where the limb joins the trunk. The third trap was obtained from a commercial supplier. It consisted of a modified clear plastic jug with two inverted screen funnels attached to the side. These traps were also placed where the limb attaches to the trunk. Each of the trap designs was baited with a commercially available stink bug attractant. The sticky-pane trap was the least effective and captured less than 0.5 stink bugs per week. The modified boll weevil trap was slightly more effective and captured 1.32 stink bugs per week. The jug trap was the most effective at capturing stink bugs and averaged 3 stink bugs per week.

Biological Control

A microwasp in the family Scelionidae was determined to occur in the growing regions associated with stink bug damage. The wasp is a parasitoid of stink bug eggs. Sentinel stink bug egg masses were placed in orchards and on native vegetation surrounding the orchards. The wasp parasitized 47.4% of the total number of egg masses. Further research can determine the possibility of utilizing the wasp as a natural control method of stink bugs in tree fruits.

Trap Crops

Orchards that had high stink bug populations in the surrounding native habitat were selected for trap crop studies. The trap plant tested was tomato, as stink bugs cause major economic loss to this crop in California. In this study, stink bugs did not appear on any of the tomato plots grown near orchards. Naturally occurring mullein at the borders of orchards attracted large numbers of stink bugs. Because mullein occurs naturally around orchards and attracts stink bugs, this might make an ideal trap crop.

Chemical Control and Fruit Injury

Field-aged pesticide residues were tested for stink bug mortality. Results indicated that one-day-old residues of Carzol 92SP and Thiodan 50WP killed 100% of the consperse and conchuala stink bugs. These same insecticides were most active as 7-day-old residues though Carzol was a little more effective than Thiodan. Asana 0.66EC was active as a 1-day-old residue against both stink bug species but was not active as a 7-day-old residue. Guthion 50WP was not effective against either stink bug species. Lorsban 50WP was more effective against Say's stink bug but not consperse.

High levels of fruit injury were noted in some orchards where stink bugs were observed either in traps or on mullein adjacent to orchards. Sampling of fruit injury in one orchard revealed an average of 40% fruit injury in the border row; however, injury dropped to only about 1% in interior trees. Fruit injury was also 3 to 4 times higher in the top of trees than at mid-canopy height. The pattern of border injury strongly suggests that well-timed border treatments could prevent most fruit injury in threatened orchards. It is also obvious that mullein plays a critical role in some orchards as a bio-accumulator of stink bugs as they move from native habitats toward orchards. Cultural practices that limit mullein along orchard borders would be an easy and possibly effective management option to help reduce stink bug damage in orchards.