IMPROVED TRAP CAPTURE OF *EUSCHISTUS SERVUS* AND *EUSCHISTUS TRISTIGMUS* (HEMIPTERA: PENTATOMIDAE) IN PECAN ORCHARDS

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Some phytophagous stink bugs (Hemiptera: Pentatomidae) are economically important pests of pecan, *Carya illinoensis* (Wang.) K. Koch, throughout the Southeastern U.S. Feeding damage to fruit before shell-hardening usually causes fruit abscission whereas after shell-hardening, feeding punctures induce localized, black lesions on the kernel (Demaree 1922; Osburn et al. 1966). Ellis & Dutcher (1999) estimated that during 1997, losses and cost of control of kernel-feeding hemipterans in Georgia, alone, were $1.8 million. Also, because these lesions are bitter, affected kernels must be removed during postharvest processing.

Predominant pentatomid species attacking pecan are *Acrosternum hilare* (Say), *Euschistus servus* (Say), *E. tristigmus* (Say), and *Nezara viridula* (L.). Sampling for these species on pecan typically is done using visual searches of terminals or knockdown insecticide sprays (Ellis et al. 2000). However, a pentatomid trap developed by Mizell & Tedders (1995) and coupled with a *Euschistus* spp. aggregation pheromone identified by Aldrich et al. (1991) has been used to monitor *E. servus* and *E. tristigmus* in pecan (Mizell et al. 1997; Yonce & Mizell 1997; Cottrell et al. 2000). In fact, Yonce & Mizell (1997) reported that 93% of pentatomids captured from pecan orchards in these pheromone-baited traps were *E. servus* and *E. tristigmus.*

Although *Euschistus* spp. are attracted to, and enter, these traps, some are not prevented from escaping over time (T. E. Cottrell, pers. obs.). This leads to the need for frequent sampling intervals. Cottrell et al. (2000) reported that traps were sampled 3× per wk (except during winter months when traps were sampled 1× per wk). By preventing pentatomids from escaping, the need for frequent sampling could be decreased. But adding physical constraints to prevent escape might deter or prevent pentatomids from entering the trap. However, placing a selected insecticide inside the trap would not require modifications.

The objective of this study was to determine prevalence of escape by pentatomids from traps and to compare numbers of adult *E. servus* and *E. tristigmus* captured in pheromone-baited traps, with and without addition of an insecticide.

All studies were done at the Southeastern Fruit and Tree Nut Research Laboratory in Byron, GA. *Euschistus tristigmus* adults were collected during August 2000 from a mature pecan orchard in pheromone-baited yellow pyramidal traps. Traps consisted of 2.8-liter clear plastic PET jars (United States Plastic Corp., Lima, OH) on top of 1.22-m-tall yellow pyramidal traps (Mizell & Tedders 1995; Cottrell et al. 2000). All baits were made by loading rubber septa with 40 µl of the *Euschistus* spp. aggregation pheromone, methyl 2,4-decadienoate (Bedoukian Research, Inc., Danbury, CT). Collected *E. tristigmus* were held in the laboratory in 19 × 14 × 10 cm (l × w × h) vented plastic containers (Tristate Plastic, Henderson, KY) at a photoperiod of 14:10 (L:D) and room temperature. Snap beans (*Phaseolus vulgaris* L.) were provided as a food source. Specimens were held for ≤72 h in the laboratory. Males and females were marked on the pronotum with yellow and pink nontoxic acrylic Liquitex® (Binney & Smith, Easton, PA), respectively. Three males and one female were placed in each of eight unbaited traps in a mature pecan orchard (separate from where *E. tristigmus* were initially collected). After 24 h, traps were checked; numbers of *E. tristigmus* remaining and mortality were recorded. Percentage escape by *E. tristigmus* was calculated.

Testing the effect of using an insecticide in traps was done from June 30 through August 11, 2000 in a mature pecan orchard. Traps were arranged in a randomized complete block design using five replications and three treatments. Traps within blocks were separated by 90 m and blocks were separated by 90 m. All traps were baited and baits changed weekly. The three treatments used included traps with and without the addition of an insecticidal ear tag (Saber™ Extra, Coopers Animal Health, Inc., Kansas City, KS) sampled 1× per wk and traps without ear tags that were sampled 3× per wk. Active ingredients in the ear tag were lambda-cyhalothrin (10%) and piperonyl butoxide (13%). Collected pentatomids were returned to the laboratory for identification. *Euschistus servus* and *E. tristigmus* data were analyzed separately using analysis of variance (ANOVA) (SAS Institute Inc. 1996). Least significant difference (LSD) was used to separate means when a significant difference was found ($P \leq 0.05$).

A high percentage of *Euschistus tristigmus* escaped from traps during this study. After 24 h, percentage escape (±SE) was 90 ± 7%. Both sexes demonstrated a high rate of escape (96 and 88% by males and females, respectively). Four males, from three traps, died during the evaluation and were excluded from analysis. No females died during the study. The high percentage escape after only 24 h may have occurred because these traps did not contain the aggregation pheromone that might arrest or decrease local movement by

Euschistus spp. Additionally, confining these field-collected individuals in the laboratory could have created an agitated state whereby the stink bugs were compelled to disperse. Nonetheless, these results clearly demonstrate that this stink bug trap did not retain the pentatomids.

Significantly higher numbers of *E. servus* were captured in traps that were sampled 1× per wk and contained the insecticidal ear tag compared with traps that were sampled 1× or 3× per wk and did not contain the ear tag ($F = 6.60$; df = 2, 14; $P < 0.05$) (Fig. 1A). A similar trend was observed with trap captures of *E. tristigmus* across treatments. However, the difference only was significant between traps sampled 1x per wk with and without ear tags ($F = 6.17$; df = 2,14; $P < 0.05$) (Fig. 1B). A concern with using an insecticide in conjunction with the baited trap could be that *E. servus* and *E. tristigmus* are repelled from entering the trap. Results from this study demonstrate that the ear tag insecticide did not repel *Euschistus* spp. In fact, use of the ear tag improved trap captures of *E. servus* and *E. tristigmus*, by preventing escape, thus allowing sampling intervals to be increased. Another noted benefit of using the insecticide with the trap in this study was that captured specimens were not removed by foraging red imported fire ants, *Solenopsis invicta* Buren (Hymenoptera: Formicidae), plus various spider species were prevented from blocking the trap entrance with their webbing (T. E. Cottrell, per. obs.).

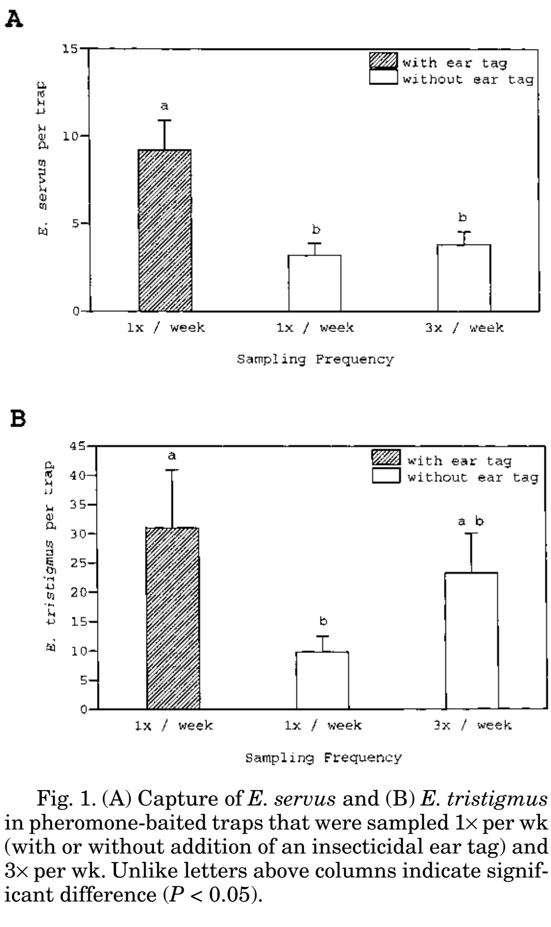

Fig. 1. (A) Capture of *E. servus* and (B) *E. tristigmus* in pheromone-baited traps that were sampled 1× per wk (with or without addition of an insecticidal ear tag) and 3× per wk. Unlike letters above columns indicate significant difference ($P < 0.05$).

Summary

Yellow pyramidal stink bug traps baited with the *Euschistus* spp. aggregation pheromone offer a more convenient method of sampling these pests than visual searches or knockdown insecticidal sprays. However, a high incidence of stink bugs that enter these traps may also escape. Addition of an insecticidal ear tag to the trap significantly improves capture by preventing escape.

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