EFFECTS OF STINK BUG (*Euschistus servus*) DAMAGE ON EARLY VEGETATIVE STAGE CORN AND YIELD LOSS

William C. Hardman
D.R. Cook
J. Gore
Mississippi State University
Stoneville, MS
A.L. Catchot
W.B. Henry
Mississippi State University
Mississippi State, MS

Abstract

Studies were performed to evaluate the yield loss potential of brown stink bug feeding on early vegetative stage field corn. Brown stink bug is a sporadic pest of corn in Mississippi. However, during 2017 2018, and 2019, a substantial number of corn fields experienced infestations and subsequent damage. Two studies were conducted in commercial fields to determine the potential damage of this pest. A single plant experiment was conducted to examine the impact of stink bug damage, at varying severities, on yield. The intensity of damage was categorized using visual symptomology with 0 representing no visible damage, 1 representing the characteristic holes in a line across the leaf, 2 representing line(s) of holes across leaves with plant stunting, and 3 representing "dead heart" (whorl death and tiller formation) or plant death. With each increase in damage severity a significant reduction in yield was observed. Another experiment examined the impact of the occurrence of stink bug damage (varying percentage of damaged plants, 0-40%) on yield. The experimental unit for this study was 3 meters of row, so yields could be converted to kilograms per hectare. All levels of stink bug damaged plants significantly reduced yield compared to the non-damaged control.

Introduction

Brown stink bugs, *Euschistus servus* (Say), are polyphagous, bivoltine insects that commonly feeds on grasses, shrubs, trees, and cultivated crops (McPherson 1982, McPherson and McPherson 2000). It has been noted to feed on cultivated crops like soybean (*Glycine max* (L.)), corn (*Zea mays* (L.)), alfalfa (*Medicago sativa* (L.)), cotton (*Gossypium hirsutum* (L.)), pecan (*Carya illinoinensis* (Wangenh.)), sorghum (*Sorghum bicolor* (L.)), pear (*Pyrus* spp. (L.)), tomato (*Solanum lycopersicum* (L.)), and tobacco (*Nicotiana tabacum* (L.)) (McPherson and McPherson 2000). Adults and nymphs have piercing-sucking mouthparts to puncture plant tissue, and they can attack all plant parts like stems, petioles, foliage, flowers, and fruits/seeds (McPherson et al. 1994, McPherson and McPherson 2000). In Mississippi, brown stink bug can typically be seen from March until September depending on weather conditions. They become active during the first warm days of spring when temperatures rise above 21°C.The first generation typically occurs on wild hosts, while the second generation is on cultivated crops (Ehler 2000). Since corn is the first cultivated crop to be planted in the spring of most years, it is usually the only cultivated host present when brown stink bug leaves winter/spring wild hosts (Bergman 1999). Brown stink bugs are problematic at two stages in corn. The first being seedling corn, and the second is prior to ear emergence. A unique symptomology characteristic is the elongated holes with the chlorotic edges, and this occurs when a brown stink bug feeds at the base of a plant on the unfolded whorl. As the corn plant's whorl unfolds, it will show the symptomology. Adults and nymphs can both damage corn plants and inject a digestive enzyme that causes leaf destruction, plant stunting, tillering, and "dead-heart" (Townsend and Sedlacek 1986, Sedlacek and Townsend 1988, Apriyanto et al. 1989a, Apriyanto et al. 1989b, McPherson and McPherson 2000, Catchot et al. 2018). Injury from brown stink bugs is often more severe when partially open seed slots allow the bugs to reach the growing points (Bergman 1999). The objective of my research is to evaluate the impact of brown stink bug damage to vegetative stage field corn growth and yield.

Materials and Methods

Studies were conducted during 2018 and 2019 in eleven commercial fields across the Mississippi Delta to determine the yield loss potential of brown stink bugs in corn. Single plants and 3-meter sections of row (these would allow for yield to be converted to a per hectare basis) were marked at each location. The plants were flagged for observation between 8 May and 10 June in both years, and a completely randomized design was used at all locations with at least three replications for damaged sections. Plant damage for the single plant experiment was rated on a 0-3 scale with 0 representing no visible damage, 1 representing the characteristic holes in a line across the leaf, 2 representing line(s) of holes across leaves with plant stunting, and 3 representing "dead heart" (whorl death and tiller formation) or plant death. A minimum of 15 plants per damage class was identified at each location. For the 3-meter sections at each location, three to five sections of row representing each damage level (0%, 10%, 20%, 30%, or 40% of plants with stink bug damage) were marked for observation.

To evaluate the growth impact of brown stink bug damage, plant heights were taken 7 to 10 days after tassel on the single plants and 3-meter sections in 2019. Plant heights were taken in centimeters by using a 4.3-meter pipe to measure the entire corn plant to the tip of the tassel. Also in 2019, damage ratings within damaged sections were recorded at the time of flagging. In order to rate damaged sections of row, the rating scale mentioned above was to get a mean damage rating for each damage level.

When grain had reached maturity, both experiments were hand harvested. Grain from each sample was weighed and moisture was determined. Grain moistures were corrected to 15%. Data from plant heights and yields were subjected to GLIMMIX procedures, with means separated according to Fisher's Protected LSD.

Results

For the single plant experiment, plant damage with leaf puncture symptomology resulted in a significant reduction in plant height compared to the non-damaged control (Figure 1). As damage severity increased, significant reductions in plant heights were observed. When looking at damaged sections, a much less drastic effect is seen on mean plant heights due to the non-damaged plants being incorporated into the means (Figure 2). However, all damage treatments resulted in significantly lower plant height means than the non-damaged control.

For the damaged section ratings in 2019, mean rating were recorded for each damage level across all locations. The mean rating for 10%, 20%, 30%, and 40% plants damaged were 2.6, 4.2, 6.5, and 8.4; respectively. Figure 5 shows the proportion of symptomology classes within each level of damaged sections.

For the single plant experiment, plant damage with leaf puncture symptomology resulted in a significant yield reduction compared to the non-damaged control (Figure 3). As damage severity increased, additional significant yield reductions were observed. Some plants with damage symptoms of tillering/dead-heart did not produce any yield. For the 3-meter section trials, all levels of damaged plants resulted in significantly lower yields than the non-damaged control (Figure 4). Stink bug damage to 10% or 20% damage of plants resulted in approximately a 10% yield reduction. Stink bug damage to 30% or 40% damage of plants resulted in approximately a 16% yield reduction.

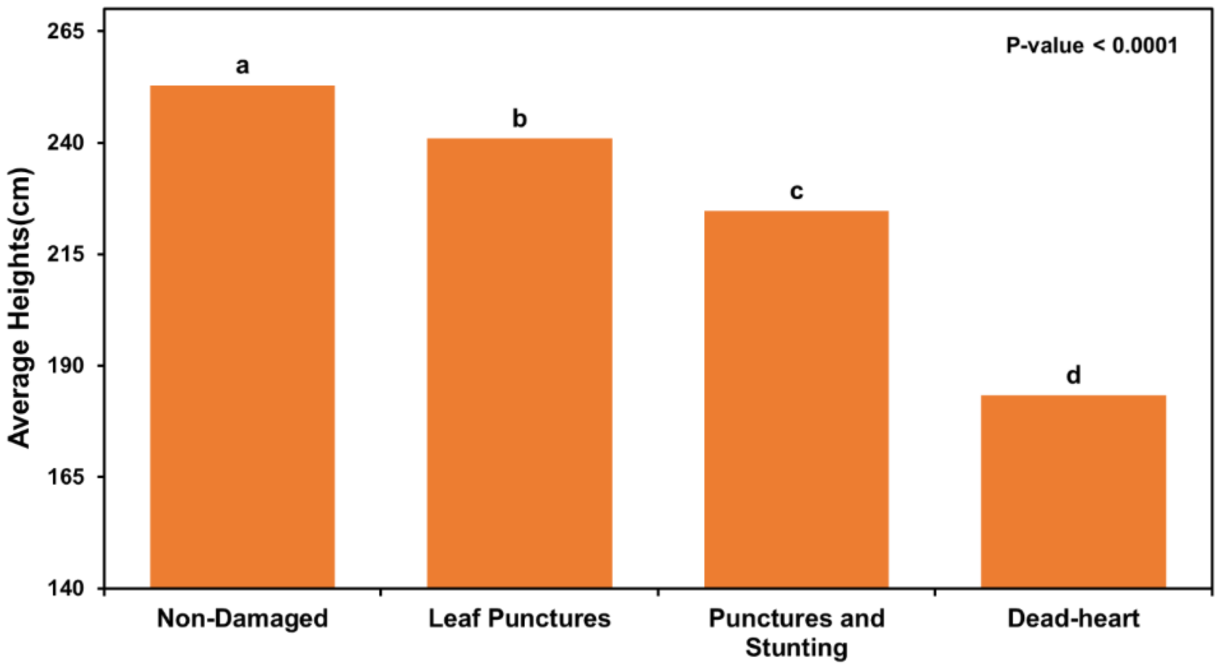

Figure 1. Impact of natural infestation damage on height of individual corn plants.

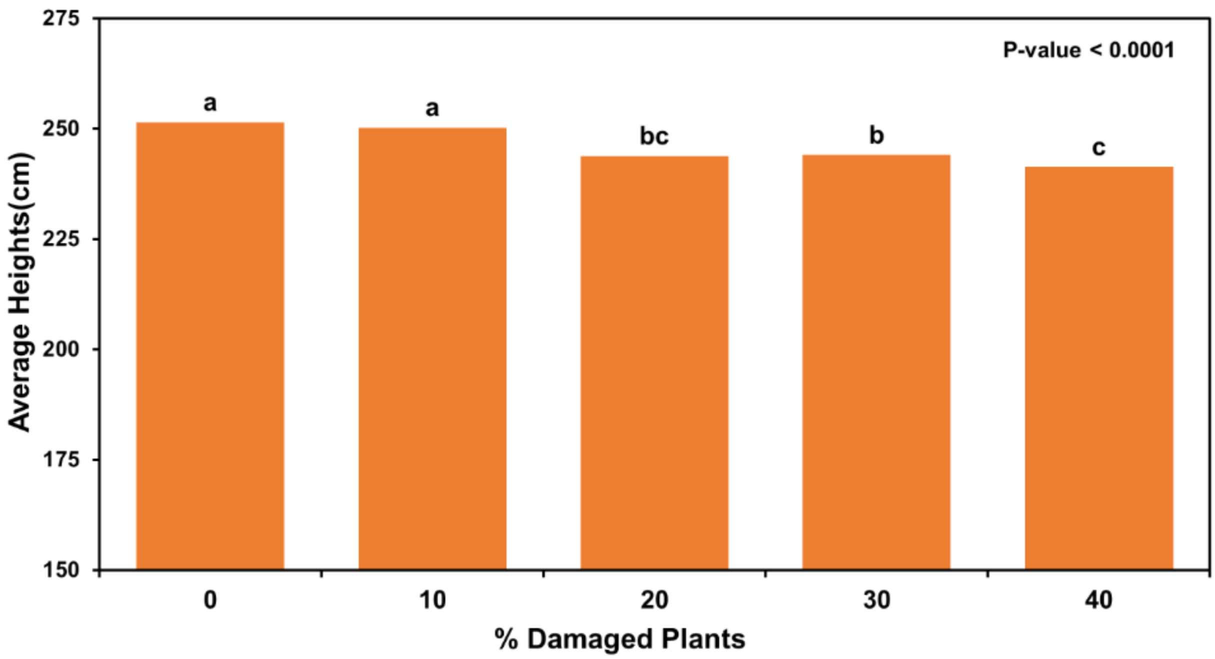

Figure 2. Impact of natural infestation damage on mean height of corn plants in 3 m sections of row with varying percentages of damaged plants.

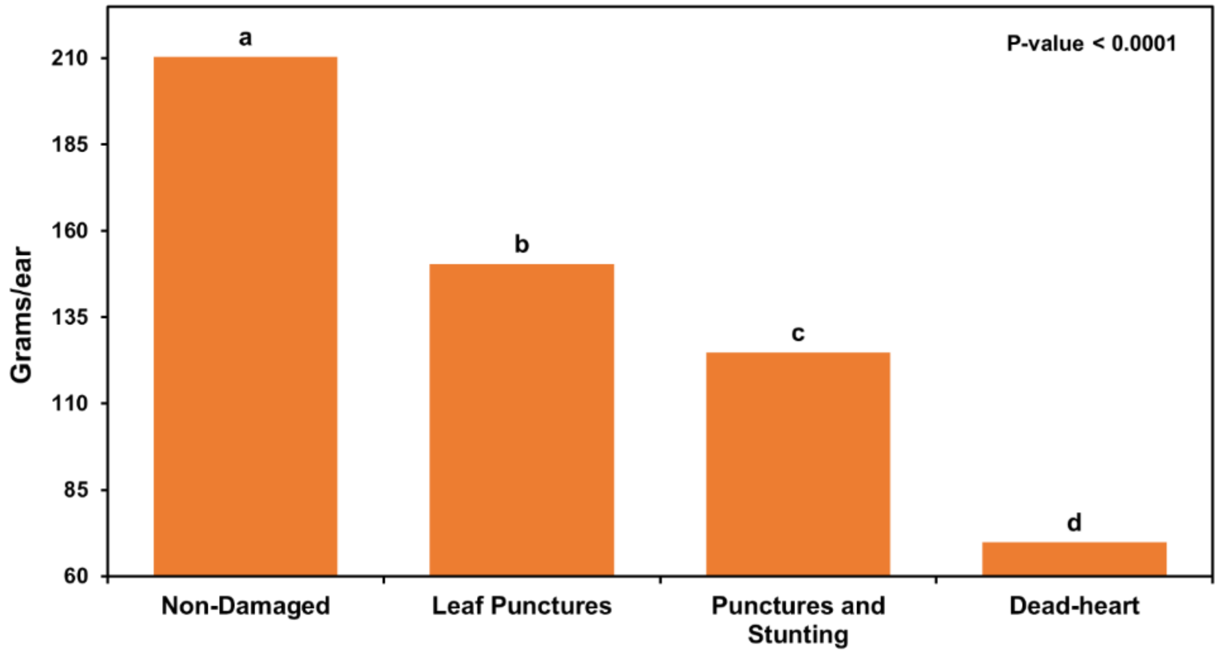

Figure 3. Impact of natural infestation damage on yield of individual corn plants.

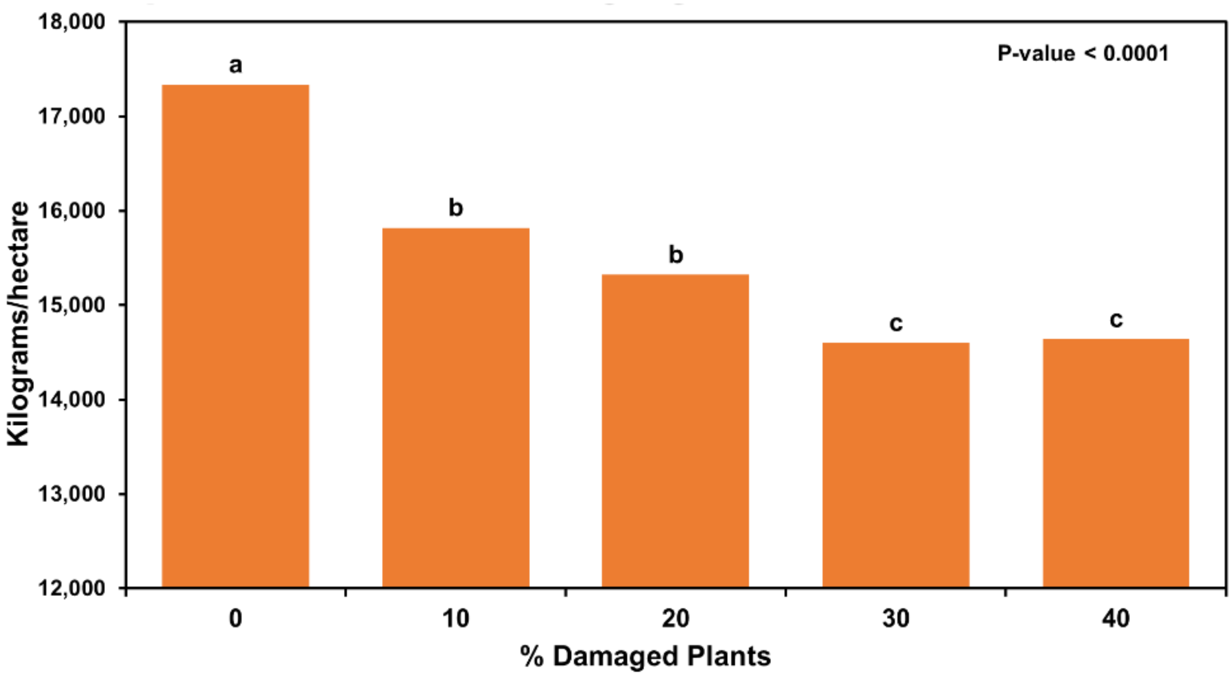

Figure 4. Impact of natural infestation damage on yield of corn plants within 3 m sections of row with varying percentages of damaged plants.

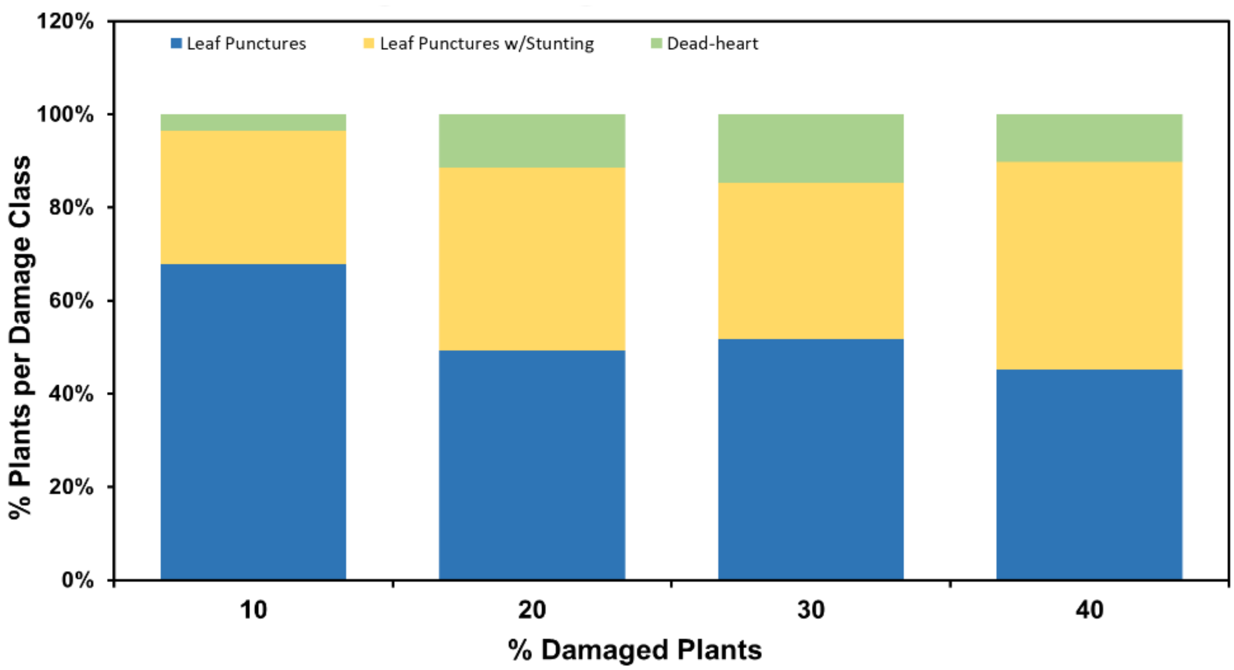

Figure 5. Mean damage ratings of corn plants within 3 m sections of row with varying percentages of damaged plants in 2019.

Acknowledgments

The authors would like to thank my committee members, technicians, and summer employees at the Delta Research and Extension Center for their assistance with these studies. The authors would also like to thank Mississippi State University and the Mississippi Corn Promotion Board for financial support.

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