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TEMPORAL OCCURRENCE OF STINK BUG SPP. (HETEROPTERA: PENTATOMIDAE) IN LOUISIANA SOYBEAN, GRAIN SORGHUM, AND COTTON FIELDS

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Abstract

The population dynamics of stink bugs (Heteroptera: Pentatomidae) were monitored during 2002 and 2003 (Jun to Sep) at four locations in Louisiana: Rayville (Richland Parish), Cheneyville (Rapides Parish), Ferriday (Concordia Parish), and Newellton (Tensas Parish). Soybean, *Glycine max* (L.) Merrill, grain sorghum, *Sorghum bicolor* (L.) Moench, and non-Bollgard cotton, *Gossypium hirsutum* (L.), fields were monitored weekly Jun - Aug (ca. 12 weeks). Stink bug densities were generally highest in soybean and grain sorghum and were collected in both crops from 6 Jun to 30 Aug. Considerably lower numbers were observed in non-Bollgard cotton. Peak densities in cotton fields were observed during growth stages of three to seven nodes above white flower (NAWF), which corresponded with a time interval of early Jul until mid Sep.

Introduction

Historically, stink bugs (Heteroptera: Pentatomidae) were considered pests in soybean, *Glycine max* (L.) Merrill, and field corn, *Zea mays* (L.). However, they are common in other row crops including cotton, *Gossypium hirsutum* (L.), and grain sorghum, *Sorghum bicolor* (L.) Moench, across the Southern United States. Stink bugs in cotton, were previously controlled with insecticides while targeting other cotton pests, such as boll weevil, *Anthonomus grandis grandis*, bollworm, *Helicoverpa zea* (Boddie), and tobacco budworm, *Heliothis virescens* (F.). A low-spray environment resulting from the the boll weevil eradication program, widespread use of Bollgard cotton cultivars, and new target selective insecticides has made stink bug populations more common in cotton (Leonard et al. 1999, Leonard and Emfinger 2002, Roof and Bauer 2002, Turnipseed et al. 2002, Greene and Capps 2003). Also, with the widespread adoption of conservation tillage and conservation reserve programs, stink bugs are provided numerous native host plants serving as sources for subsequent generations infesting cotton.

The polyphagous habit of stink bugs allows them to exploit a wide range (ca. 200 total species) of both cultivated and wild host plants (McPherson and McPherson 2000). Stink bugs can feed on many fruits, vegetables, nuts, and grain crops (McPherson et al. 1994). Stink bugs damage crops by inserting their piercing/sucking mouthparts into plants to extract plant fluids (McPherson et al. 1994, McPherson and McPherson 2000).

The stink bug complex in Louisiana cotton ecosystems is comprised primarily of brown stink bug (BSB), *Euschistus servus* (Say), southern green stinkbug (SGSB), *Nezara viridula* (L.), and green stink bug (GSB), *Acrosternum hilare* (Say). In Louisiana, stink bugs can infest soybean, field corn, grain sorghum, and cotton. Economic injury levels (EIL) vary with each crop, but thresholds in cotton rely on the number of bugs/row foot and/or the amount of internal boll injury (Bundy et al. 1999, Greene et al. 2001, Bagwell et al. 2002). In Louisiana during 2002, ca. 46% of cotton acres were treated for stink bugs, which accounted for a loss of 2,692 bales (Williams 2003). Stink bugs are becoming a more common occurrence in cotton fields, with an annual increase in insecticides applications for their control. Prior to the release of Bollgard cotton varieties in 1996, stink bugs were minor pests in cotton, infesting less than 10,000 acres in Louisiana (MSU 2003a). However, in 2001, stink bugs infested over 700,000 acres accounting for a loss of over 26,000 bales (MSU 2003b).

The objective of this study was to record the temporal occurrence of common stink bug species in selected Louisiana row crops. Further, this study will provide insight for initiating sampling protocols for stink bugs.

Materials and Methods

Surveys were conducted at four locations throughout the state (Louisiana) to evaluate the temporal occurrence of a complex of stink bugs (green, southern green, and brown) occurring in cotton, soybean, and grain sorghum for the 2002 and 2003 growing seasons. Monitoring sites represent different cotton production areas throughout the state and were established with the assistance of county agents, crop consultants, producers, and cotton industry personnel. Sampling was initiated in June during the early vegetative stages of each crop, and continued until the host crop reached physiological maturity. Ten random sites consisting of ten feet of row, for a total of 100 row-feet were sampled in the representative crop. In cotton and soybean, shake sheets (five feet x three feet) were used to make counts. Grain sorghum was evaluated by vigorously shaking developing panicles into a three gallon plastic bucket, and counting the number of stink bugs.

Summary data were transformed and expressed as total no. stink bugs/acre. Nymphs and adults were combined for all species. Data were compared across crops within each site and across sample sites.

Results

Stink bug populations in soybean and cotton fields consisted primarily of BSB, GSB and SGSB nymphs and adults. Grain sorghum supported an additional species, rice stink bug, *Oebalus pugnax* (F.). Total densities observed in cotton (all locations, both years) were lower than those in soybean and grain sorghum. Densities in soybean and grain sorghum generally peaked at a level higher and earlier in the season than those in cotton.

Richland Parish

In soybean, stink bug densities peaked at 5,489 and 1,437 stink bugs/acre on 30 Aug (2002) and 18 Aug (2003), respectively. In grain sorghum fields, densities peaked on 20 Aug at 2,875 stink bugs/acre (2002) and 4,182 stink bugs/acre on 21 Jul (2003). Cotton fields supported a relatively low population of stink bugs reaching a level of only 392 stink bugs/acre on 6 Aug (2002). No stink bugs were observed in cotton in 2003. Stink bugs were observed in cotton was from 10 Jul to 13 Sep (2002). The phenological stage at peak density in cotton was 7 NAWF (2002).

Rapides Parish

Densities in soybean peaked at ca. 2,875 and 27,312 stink bugs/acre on 24 Jul (2002) and 12 Aug (2003), respectively. In grain sorghum, populations peaked at 21,693 and 21,432 stink bugs/acre on 5 Jul (2002) and 23 Jul (2003), respectively. Populations in cotton fields peaked at a relatively low density of 261 and 1,045 stink bugs/acre on 17 Jul (2002) and 24 Jun (2003), respectively. Temporal occurrence in cotton ranged from 17 Jul to 31 Jul (2002) and 24 Jun to 30 Jul (2003). The phenological stage of cotton at peak densities was 7 NAWF (2002) and 17 total main stem nodes (2003).

Concordia Parish

Densities in soybean reached peak levels of 3,659 and 4,704 stink bugs/acre on 16 Jul (2002) and 12 Aug (2003), respectively. Populations in grain sorghum reached their highest levels of at 2,875 and 3,267 stink bugs/acre on 5 Jul (2002) and 5 Aug (2003), respectively. Densities in cotton fields peaked at 261 stink bugs/acre on 12 Aug (2002) and 392 stink bugs/acre on 3 Sep (2003). Occurrence in cotton was on 12 Aug (2002) and from 30 Jun to 26 Aug (2003). Densities peaked at cotton growth stages of 3 NAWF in 2002 and 8 NAWF in 2003.

Tensas Parish

In soybean, stink bug densities peaked at levels of 1,960 stink bugs/acre on 1 Jul (2002) and 653 stink bugs/acre on 15 Jul (2003). Levels in grain sorghum peaked on 18 Jul at 1,699 stink bugs/acre (2002) and 3,136 stink bugs/acre on 15 Jul (2003). Peak densities in cotton fields were relatively low at 131 and 261 stink bugs/acre on 1 Jul (2002) and 1 Jul (2003), respectively. Stink bugs were observed in cotton on 1 Jul (2002) and from 1 Jul to 13 Aug (2003). Peak densities occurred at the cotton phenological stage of 19 total main stem nodes (2002) and 6 NAWF (2003).

Discussion

In 2002, stink bugs were the fourth most damaging cotton insect pest infesting over 5.6 million acres across the Cotton Belt causing a loss of 118,346 bales (Williams 2003). These species of stink bugs typically overwinter as adults in a variety of habitats including leaf litter and field crop residue. Beginning in early spring, stink bugs immigrate from over wintering habitats to a variety of non-cultivated hosts (McPherson et al. 1994). Stink bugs then migrate to available crop hosts, including field corn, soybean, grain sorghum, and cotton. Stink bug damage to host crops occurs during the seed filling or developing stages. In soybean, stink bug damage may provide entrance for various diseases and can contribute to delayed maturity (Tynes and Boethel 1999), especially for the R3-R6 growth stages (McPherson and McPherson 2000). Damage occurring in grain sorghum fields occurs primarily when kernels are present (during the milk, soft, and hard dough stages). Injury is exhibited as undeveloped kernels and can promote disease development (McPherson and McPherson 2000). Damage to corn occurs mainly when reproductive structures are present and can result in ears that are either totally destroyed or have less length and kernel weight (Negron and Riley 1987). Stink bugs primarily damage cotton during flowering stages and boll development, and can reduce fiber quality and seed germination (Barbour et al 1990).

In general, stink bugs were more easily detected in soybean and grain sorghum than they were in cotton. Therefore, higher densities were usually easily recorded in soybean and grain sorghum at most locations. These crops are preferred over cotton during their seed filling phenological stages. Producers in all locations were primarily field corn and cotton farmers, and may have placed less importance on grain sorghum and soybean integrated pest management.

In non-Bollgard cotton fields, relatively low stink bug densities were recorded during both years. Sampling for stink bugs in dense cotton canopies does not always represent an accurate sample. In addition these fields served as a refuge for Bollgard cotton. Because the refuges did not express the *Bacillus thuringiensis* (*Bt)* toxin, fields were routinely sprayed with supplemental foliar insecticides for control of bollworm and tobacco budworm. Stink bugs could have been controlled with these applications.

Other crops such as corn, soybean, and grain sorghum are harvested prior to cotton (leaving cotton as the only attractive crop) and may serve as a source for subsequent populations immigrating to cotton. More efficient management of earlier generations in other crops may help to suppress subsequent generations in nearby cotton fields and reduce the number of supplemental foliar insecticide applications targeting stink bug populations.

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