Redbanded Stink Bug Research

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The redbanded stink bug (RBSB), *Piezodorus guildinii* Westwood, (Hemiptera: Pentatomidae), is an emerging pest of soybeans in the southern states of the US. Since the 1960s, *P. guildinii* has spread across the US southern region and currently is found in South Carolina, Florida, Georgia, Arkansas, Louisiana, Texas and Missouri. The geographic expansion of this exotic pest has dramatically increased in recent years. For example, since 2000, the RBSB rapidly spread across Louisiana, reaching all soybean growing areas in the state by 2006 (Davis et al. 2011). The RBSB has now emerged as the dominant stink bug species in Louisiana and Texas soybeans.

The research was conducted at the Beaumont Center and outlying commercial soybean fields with the following objectives,

1) To quantify density/damage relationship(s) of RBSB in soybeans considering soybean plant response at particular growth stages to varying densities of stink bugs.

2) To determine the association between RBSB feeding and occurrence of flat pod syndrome in soybeans

3) To determine relative abundance and composition of stink bug species attacking soybean fields along the Upper Gulf Coast of Texas

**Objective 1:** To quantify density/damage relationship(s) of RBSB in soybeans considering soybean plant response at particular growth stages to varying densities of stink bugs.

*Materials and methods:* Experiments were conducted at the Beaumont Center in the field and in pots.

*Pot study:* MG VI soybeans (AG 6730) were planted on May 27, 2011 in 25 gal buckets (16 inch diameter) filled with sandy loam soil found at the Beaumont Center. Buckets were placed outside and watered regularly, so soil moisture was not a limiting factor. Soybeans were thinned to 3 plants per bucket during the seedling stage. Weeds were controlled by hand and with glyphosate (1% concentration by volume). Plants were sprayed with Karate Z at 0.03 lb ai/A and Methyl Parathion 4E at 20 gm/gal of water in order to protect soybean plants from any kind of insect damage prior to infesting with RBSB. When soybeans approached R3, cylindrical, wire mesh cages were placed over plants in selected buckets. Zero, 4 and 8 RBSB adults (collected from the field on the same day of infestation) were placed in selected cages and kept for 3 days. Plants were inspected daily and dead RBSBs replaced. There were four replications for each treatment (each bucket served as a replication for a particular treatment). After 3 days of infestation, cages and insects were removed and plants were sprayed repeatedly with Orthene 90S to insure no further insect activity/damage. These materials and methods were repeated for growth stages R4 and R5. Controls were not infested at any of the plant growth stages. At maturity, plants were...
hand-harvested, threshed and seeds weighed and inspected for damage. In addition, filled and unfilled pods were counted and weighed.

Field study:
Similar materials and methods were employed for the field experiment, except plants were grown directly in the field under irrigation. From different rows of soybeans, 3 plants were selected randomly (3 plants/foot of row) at R5, R6, and R7 stages. Similar cages and stink bug densities were employed as in the pot study. A single cage enclosing 3 plants represented a single replication of a particular treatment. There were 4 replications of each treatment. RBSB densities were 0, 4, and 8 adults/cage.

Results—pot study
Numbers of fully developed pods varied significantly among treatments. Numbers of fully developed pods were significantly reduced when plants at the R4 stage were infested with 4 RBSB/cage. Percentage of fully developed pods was significantly higher in control plants and also in R5 stage plants at a density of 8 RBSB/cage (Fig. 1). Though the number of flat pods was highest when plants were infested at the R4 stage, the differences were not statistically significant among any of the treatments (Fig. 2).

![Bar chart showing percent fully developed pods](image)

For example: R5-8 = R5 infested with 8 RBSB; R3-4 = R3 infested with 4 RBSB
Bars showing same letters are not significantly different at 0.05 (LSD)
Figure 1: Percent fully developed pods
Objective 2: To determine the association between RBSB feeding and occurrence of flat pod syndrome in soybeans

Materials and methods: MG VI soybeans (AG 6730) were planted in the field under irrigation at the Beaumont Center on May 27, 2011. Weeds were controlled by hand and with glyphosate (1% concentration by volume). Plants were sprayed with Karate Z at 0.03 lb ai/A and Methyl Parathion 4E at 20 gm/gal in order to protect the plants from any kind of insect damage prior to infesting with RBSB. About 10 days before infestation, plants were kept free of any insecticide application to avoid any residual effect. When soybeans approached R4-5, plants of uniform height were selected and field-collected RBSB were confined to certain portions of the plants (bottom, top, or both) using specially designed cages isolating these portions of the plants. We wanted to determine if a substance or agent associated with RBSB feeding is translocated through the plant to cause flat pod syndrome. The top 2 internodes of the plant were considered as the top portion and the rest of the plant as the bottom portion. RBSB were restricted to specific portions of the plant with the help of cages. Overall, there were 4 treatments: infestation of only the top portion, infestation of only the bottom portion, infestation of both top and bottom portions, and a control without any infestation. Two field-collected RBSB adults were placed in each cage. Infestation was maintained for 3 days after which cages were removed; plants were then repeatedly sprayed with Orthene 90S to avoid further insect damage/activity. At maturity, pods were harvested separately from each plant portion and flat and fully developed pods were counted.
Results—field study: This experiment produced very interesting results about RBSB feeding and occurrence of flat pod syndrome. There was a relationship between feeding by RBSB at an early stage of pod development and production of flat pods. Flat pods are a result of direct feeding by RBSB and the damage was localized to the area of feeding. When only the top portion of the plant was infested, flat pods were present only in that particular portion (Fig. 3). When the bottom portion of the plant was infested, the number of flat pods was significantly higher in the bottom portion only. Similarly, when both portions of the plant were infested, no significant difference was observed in numbers of flat pods between the top and bottom portions of the plant. On the other hand, total numbers of flat pods were least in the control treatment (uninfested). In the control treatment, no significant difference was observed between the top and bottom portions of the plant in terms of number of flat pods. The presence of a few flat pods in the control treatment shows there may be other factor(s) involved in the production of flat pods (in addition to RBSB feeding). However, RBSB feeding, especially during early pod development, was associated with the production of flat pods in soybeans. Since flat pods were largely restricted to areas of feeding by RBSB, production of flat pods was not associated with an agent or substance introduced by RBSB and translocated through the plant.

*indicates significant difference at 0.05
NS indicates no significant difference at 0.05

Figure 3: Number of flat pods in response to infestation of RBSB on particular plant portions.
Objective 3: To determine relative abundance and composition of stink bug species attacking soybeans in Texas

Materials and methods: Densities of stink bug species were monitored during 2011 in commercial soybean fields along the Upper Gulf Coast of Texas. Soybean fields were sampled at weekly intervals throughout the reproductive stages of the crop. Study fields were located in Jefferson, Matagorda, Colorado, and Liberty Counties. Sampling began in mid-June and continued weekly through early October with 5 sets of 25 sweeps (15 inch diameter sweep net) taken at random locations in each soybean field on each sample date. After collecting, stink bugs were placed in zip-lock bags and brought to the lab where they were separated by species and counted. Only adults were counted.

Results: As noted previously, the geographic distribution of this exotic pest has dramatically increased in recent years. Results of our soybean field survey revealed the RBSB and the green stink bug were the most abundant stink bug species (Fig.4). Out of total number of captured major stink bug species, RBSB and green stink bug accounted for 30% each while southern green and brown stink bugs accounted for 22 and 18%, respectively. Before 2000, RBSB was not present in numbers to be considered a pest, but in recent years, it has increased significantly. Historically, dominant stink bug species were southern green stink bug and green stink bug, but now there is a shift in composition and abundance of stink bug species in soybeans on the Upper Gulf Coast of Texas.

Figure 4: Stink bug species composition in Texas soybeans (Upper Gulf Coast) during 2011