INSECTICIDE EFFICACY TEST AND EVALUATION OF DAMAGE BY RICE STINK BUG ON BARLEY

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INTRODUCTION

The rice stink bug, *Oebalus pugnax* (Hemiptera: Pentatomidae), is an important rice pest in the southern United States, but it is well distributed from Gulf Coast states and many northern states including Kentucky. Both adults and nymphs feed on developing grains of rice but are known to attack wheat and other small grains in the USA and Brazil. Adults are straw colored, shield-shaped with two sharply pointed shoulder spines which project forward. Males live for 30 days. Females for up to 40 days, while laying 70 to 80 eggs per female (Pathak, 1968).

By Mid-May of 2017 a high number of rice stink bug were observed in an experimental field of barley at the University of Kentucky's Research and Education Center in Princeton, KY. Two studies were designed to evaluate the impact of this insect on barley. The first was to assess the insecticide efficacy of Mustang Max, Warrior and Lorsban; the second study was conducted to evaluate the damage of this insect on the grains.

Figure 1. Rice stink bug on barley heads

MATERIAL AND METHODS

1. Insecticide efficacy test.

The insecticides were applied at the rates indicated in Table 1. Solutions were applied with a CO2 backpack sprayer on May 16, 2017. Rice stink bug counts were done before the insecticide application (17 June), and on 18, 19, 22, 25, 26, 30 May and 6 June (3, 6, 7, 10, 14 and 21 days after the application [DAA], respectively). Counts were done making 10 net sweeps in each plot. The experimental design was a randomized complete block arranged with four replicates per treatments. Data were evaluated with an ANOVA followed by a Fishers's LSD test to find if there were significant differences among treatments.

Table 1. Names, and rates of insecticides used to control rice stink bug		
Commercial name	**Active ingredient**	**Rate**
Mustang max	zeta-cypermethrin	3.0 oz/A
Warrior 1 CS	lambda-cyhalothrin	3.2 oz/A
Lorsban 4E	chlorpyrifos	0.75 pint/A

2. Evaluating feeding of rice stink bug on Barley.

Rice stink bug was collected from untreated small grain plots located at the UKREC farm in Princeton, Kentucky; and stored in a cooler for 24 h. before the day of the assay. The barley heads were selected based on the lack of prior visible damage. Awns of the barley were trimmed to about half a centimeter long (see Figure 1) to allow their placement in 6x8 cm organza bags (Dollar Tree, Chesapeake, Virginia). A barley head containing two unsexed rice stink bugs were enclosed in the organza bags placed and knotted to prevent rice stink bug escape (Figure 2). Stink bugs were held in bags for 24 or 72 h. In addition, barley head without stink bugs also were enclosed in an organza bag for 72 h to serve a one level of control. Similar barley heads were flagged to be later collected as a negative control for bagging itself. For each of these treatments there were five replicates in which stink bugs remained in the bags along with the control for the times mentioned above. After each time interval, stink bugs were removed from the bags. Once stink bugs were removed, the organza bags remained on the barley head until harvest to avoid damage from other herbivores. Grains from each head were removed, counted and weighted. Using a dissecting microscope, punctures caused by feeding of the rice stink bug were examined.

Figure 2. Rice stink bug in an organza bag and layout of barley heads enclosed in organza bags in the field.

RESULTS AND DISCUSSION

1. Insecticide efficacy test.

Post insecticides application reduction on the numbers of rice stink bug across all treatments including the control plots were observed (Figure 3). It may be possible that spray drift had occurred contaminating the control plots, although the winds were below the recommended speeds during the day of the application. Six days after the application there was a complete reduction of the stink bugs although 7 DAA increased but by day 21 all the rice stink bug populations were completely reduced. It appears that each of the insecticides tested were effective and can be used for control of this pest base on this study. Significant differences (p>0.05) were not found across treatments on daily rice stink bug counts.

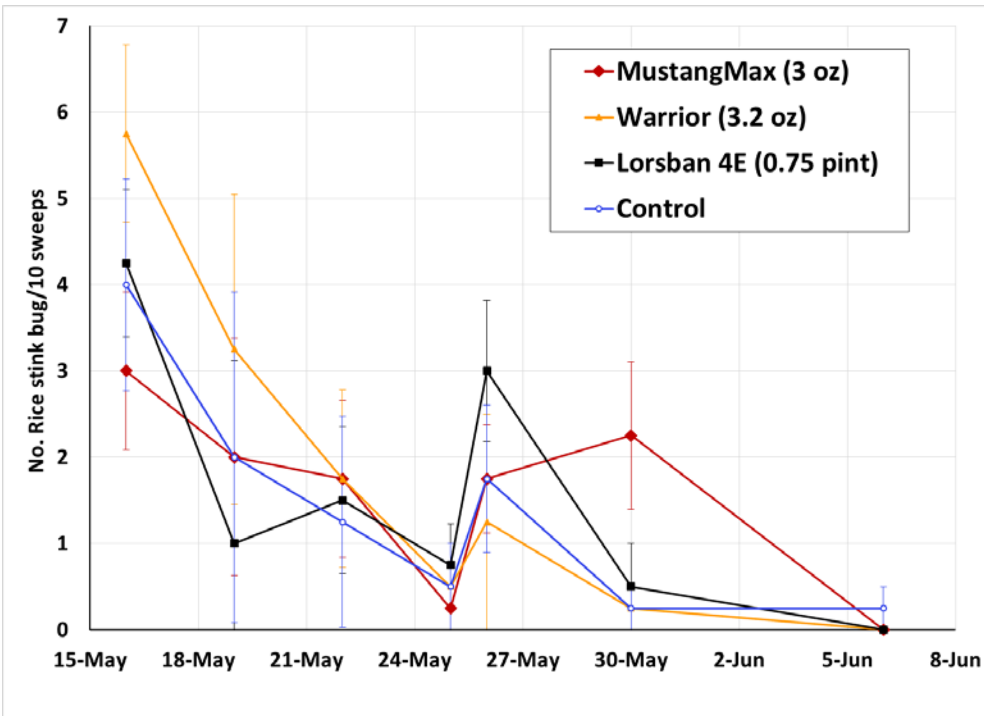


Figure 3. Mean numbers (±SEM) of rice stink bug collected with 10 net sweeps on a field of barley in Princeton KY

2. Evaluating feeding of rice stink bug on Barley.

Each of the barley heads were weighted and grains were separated manually. As heads were of different sizes we evaluated damage on a subsample of 10 seeds per head. To do this each seed was carefully inspected using a dissecting scope. Seed puncture percentages are shown in Figure 4. Although the heads with and without the organza nets had lower number of punctures compared with the heads that contained stink bugs for 1 or 3 days; these were not significant differences (p>0.05). Stink bug punctures were very difficult to see and identify as shown in Figure 5.

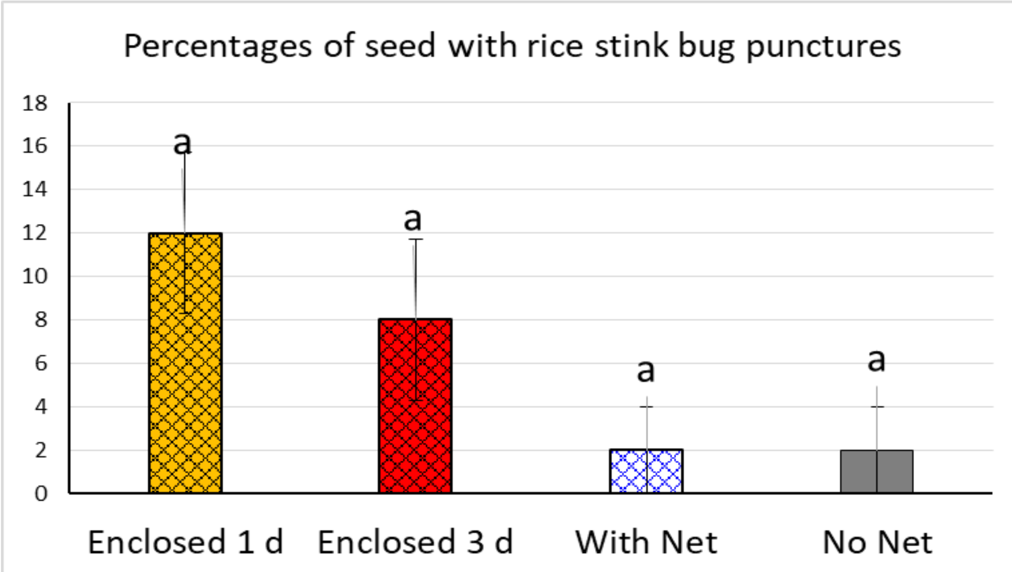


Figure 4. Mean numbers (±SEM) of seeds with rice stink bug punctures.
Two rice stink bugs were held 1 or 3 days in organza bags.
No net implies that heads were not covered.

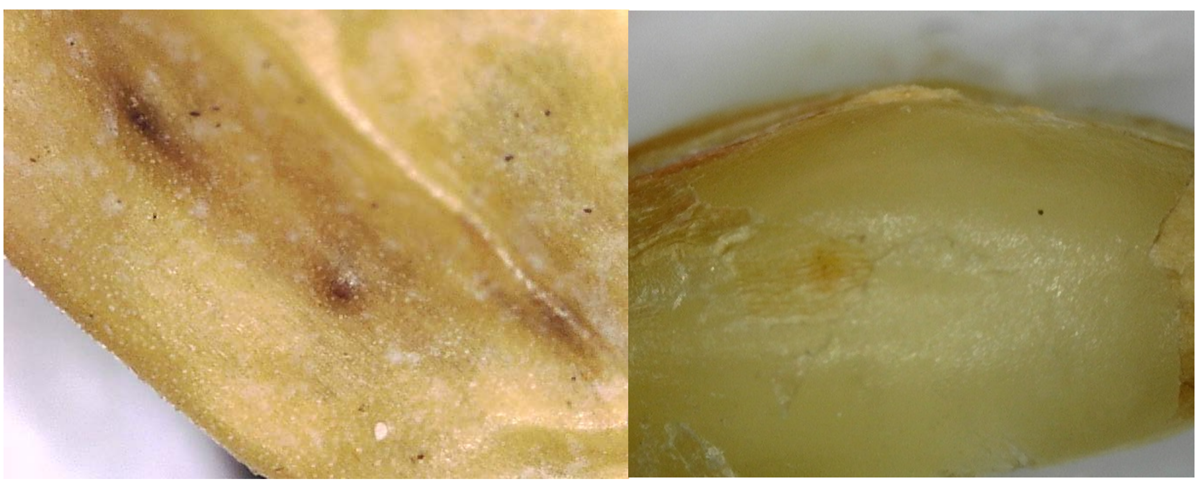
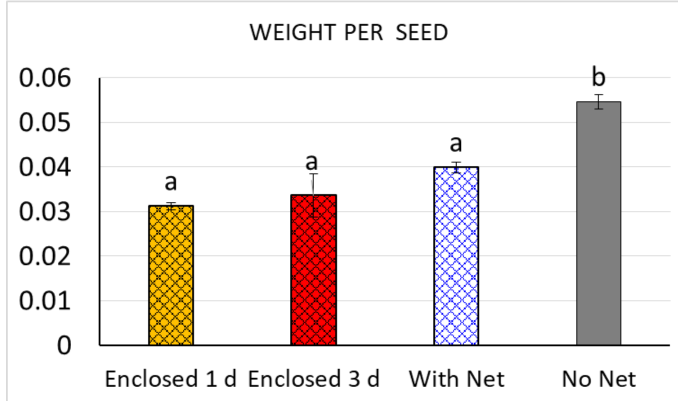


Figure 5. Punctures caused by rice stink bug to barley seeds.
Picture on the right shows the seed with the hull and pericarp removed.

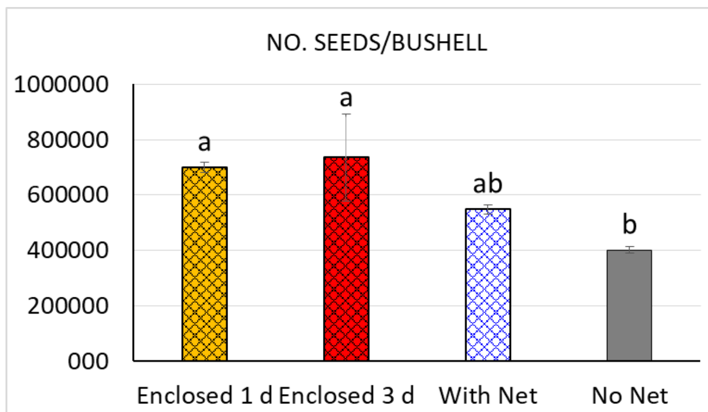
Although it was hard to detect the direct impact of the feeding of the rice stink bug, the mean numbers of the seed on caged heads were significantly different than the heads without any cover. The negative control (No net) in Figure 6 shows that the seeds produced under this condition have more weight compared with the rest of the treatments. The organza net can be factor to consider by this study as it can increase the temperatures and thus reduce the weight of the enclosed seed. So this weight reduction can be separated from the damage caused by the insect.

Figure 6. Mean weight (±SEM) of seeds (g) from heads with rice stink bug enclosed in organza bags for 1, and 3 days; and heads with and without organza bags net and without rice stink bug.



Similarly, if -for practical purposes- we transform the seed weight on numbers of seeds to produce a bushel of barley (48 lbs) (Figure 7), we notice that there may be some effect on the presence of the rice stink bug. Although there were not significant differently, 1.34 to 1.27 times more seeds are required to fill a bushel of barley with the presence of the rice stink bug for 1 or three days, respectively. Likewise the effects of using enclosures (organza nets or cages) with studies may affect the yields of small grains.

Figure 7. Mean numbers (±SEM) of seed (g) required to complete a bushel of barley from heads that have rice stink bug enclosed in organza bags for 1, and 3 days; and heads with and without organza bags net and without rice stink bug.



In a study conducted in Louisiana (Viator et al. 1983) showed that rice stink bug prefers to feed when the kernels were in the milk stage rather than the soft stage. The latter was the developmental stage of barley when we conducted the feeding experiment.

REFERENCES

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ACKNOWLEDGEMENT

We want to express our gratitude to Drs. Ric Bessin and Doug Johnson for their critical advice that improved the contents of this paper. These studies were possible thanks to the partial support provided by the Kentucky Small Grain Growers' Association.