



Mississippi Corn Promotion Board 2016 Progress Report

Project Title: Impact of Whorl Feeding Caterpillars on Yield of Field Corn

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Project Summary (Issue/Response)



As much as 80% of the corn acres in Mississippi are planted to Bt hybrids (based on refuge requirements for multi-trait Bt corn technologies), with the remainder planted to non-Bt hybrids which are susceptible to infestations of caterpillar pests such as fall armyworm and corn earworm. Also, there is increased interest among growers in planting non-Bt corn in addition to that required for refuge. The current threshold in Mississippi for whorl feeding caterpillars is 100% infestation. This threshold was established many years ago. However, corn production in Mississippi has changed substantially over the last 20-30 years. One major change is the dramatic increase in yield potential, and these thresholds were established when yield potential was much lower than current levels.

The majority of previous research has focused on screening for resistance (non-GMO) to caterpillar pests. While research on treatment thresholds and economic injury levels for whorl feeding caterpillars infesting field corn is limited. Yield reductions from whorl stage infestations of fall armyworm have been reported. One study reported a 20.9% yield reduction when 63% of plants were infested (natural infestations). The next lowest infestation level (6%) did not result in significant yield reductions. While another study reported significant yield reductions at much lower levels of infestation (7.7% yield reduction when 15% of plants were infested with egg masses and 15.5% yield reduction when 20% of plants were infested). These studies reported yield reductions at infestation levels that are much lower than the current action threshold for Mississippi, and preliminary data included above also demonstrates that yield reductions can occur in Mississippi. Also, the University of Georgia recommends treatment when 30% of plants are infested. With the changes in corn production that have occurred in Mississippi and the increased interest in non-Bt corn, thresholds for whorl feeding caterpillars need to be validated/refined for the current production environment.



Project Results/Outcomes

During 2016 12 experiments were conducted to evaluate the impact of fall armyworm infestations occurring during the vegetative growth stages on field corn yield. Six experiments (3 at V5 and 3 at V10) were conducted that utilized hand removal of plant tissue from the whorl to simulated fall armyworm damage. At the two respective growth stages all plant tissue at and above the upper most fully expanded leaf collar was removed from 0, 25, 50, 75, or 100 percent of plants. The amount of tissue removed represented 45.6% and 39.3% of the above ground biomass at V5 and V10, respectively. For the V5 experiments there were no significant differences among treatments (percentage of plants damaged) for grain yield (Figure 1), but there was a trend for lower yields as the percentage of damaged plants increased. For the V10 experiments, plots with 25, 75, or 100% damaged plants produced significantly lower yields compared to the non-damaged control plots (Figure 2).

Six experiments (3 at V5 and 3 at V10) were conducted that utilized artificial infestations of fall armyworm larvae. At each of the respective growth stages 0, 25, 50, 75, or 100% of plants within a plot were infested with ca. 15 neonate fall

Project Results

armyworm larvae. Plots were rated for fall armyworm damage at 14 days after infestation. At the V5 growth stage, plots with $\geq 50\%$ of plants infested had significantly higher damage ratings than plots with 0 or 25% of plants infested. However, the highest mean damage rating was only 4 which less than the mid-point of the rating scale used in these studies. Although differences in damage were observed, no significant differences in yield were observed (Figure 3). At the V10 growth stage, all of the infested plots had significantly higher damage ratings than the non-infested plots, with the plots that received the 100% infestation treatment having significantly higher damage ratings compared to the plots that received the 25 and 50% infestation treatments. However, the highest mean damage rating was only 4 which less than the mid-point of the rating scale used in these studies. Although differences in damage were observed, no significant differences in yield were observed (Figure 4). The fall armyworm colony available for use in these experiments was a laboratory colony. For 2017 plans are being made to secure a field collected colony for infestation experiments. These studies will be repeated in 2017 along with the addition of another manual damage study to determine which vegetative growth stage is most sensitive to defoliation.

Project Impacts/Benefits

The impacts/ benefits of this project will be a refined/validated treatment threshold for fall armyworm infesting vegetative stage non-Bt corn. Additionally the growth stage(s) most sensitive to damage will be identified. With the current increase in non-Bt corn production this information will allow growers and consultants to make more informed economic decisions with regard to insect management in corn.

Project Deliverables

Transfer of this information will be accomplished through numerous presentations by the student working on this project at professional meetings, numerous presentations at producer meetings by MSU entomology faculty, and newsletters based on finding throughout the course of the project. Currently, this information has already been presented at least two professional meetings. Expected deliverables of these studies will include peer reviewed publication(s), Extension publication(s), one graduate professional to enter the work force in either a university role or with private industry.



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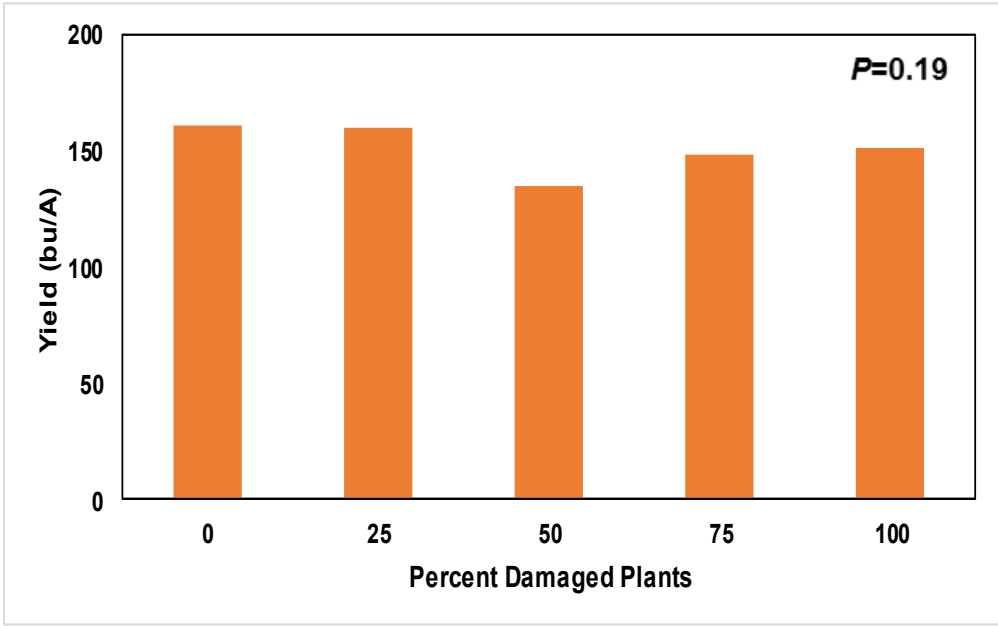


Figure 1. Impact of plant tissue removal at the V5 growth stage of corn yield.

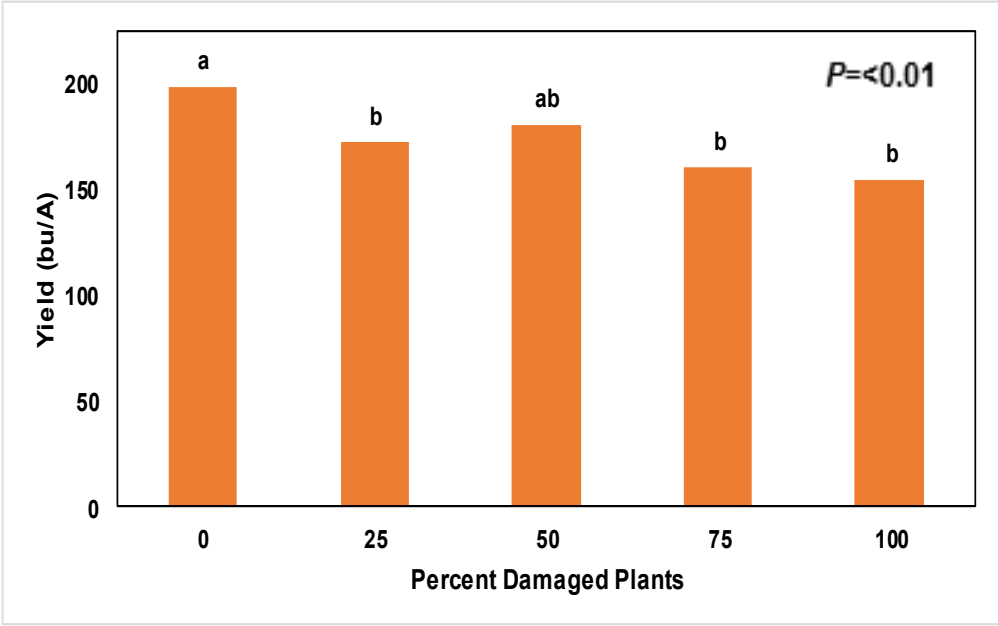


Figure 2. Impact of plant tissue removal at the V10 growth stage of corn yield.

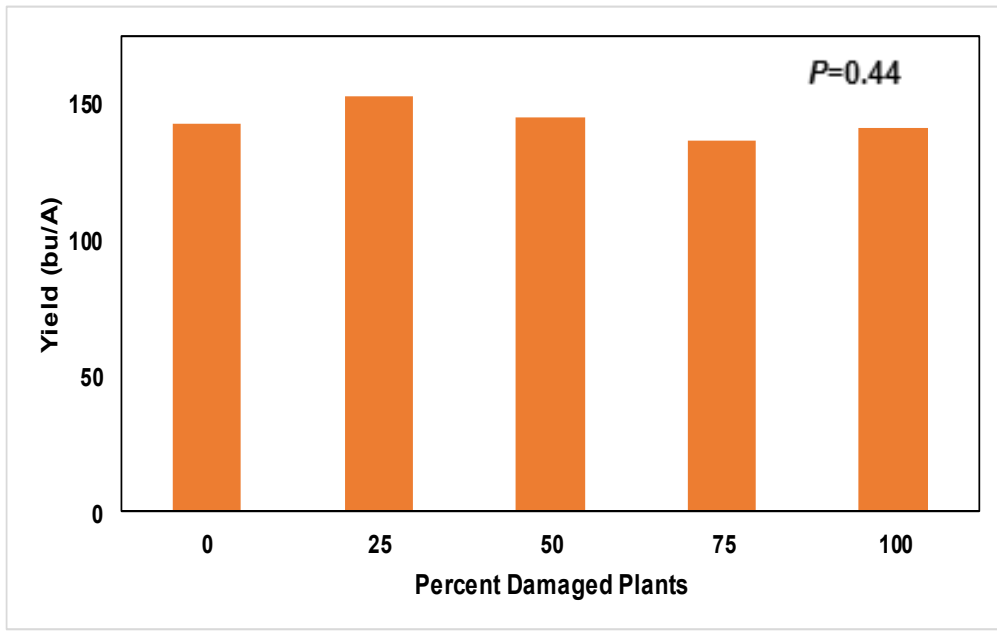


Figure 3. Impact of fall armyworm infestations at the V5 growth stage on corn yield.

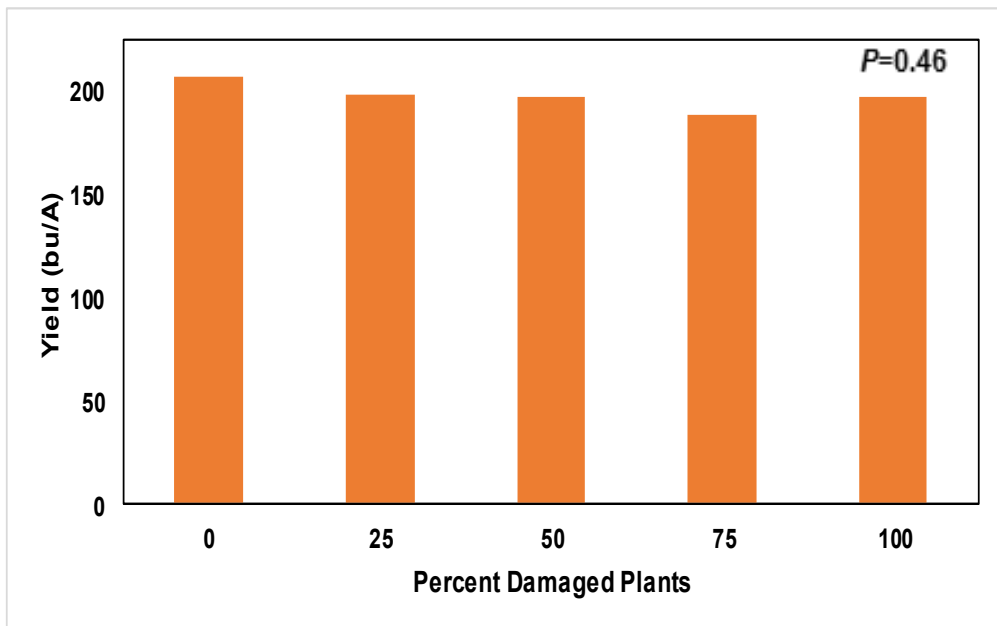


Figure 4. Impact of fall armyworm infestations at the V10 growth stage on corn yield.