



Mississippi Corn Promotion Board 2015 Progress Report

Project Title: Non-Uniform Stand Assessment

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Project Summary (Issue/Response)

Mississippi's naturally abundant rainfall often drastically limits suitable days acceptable for corn planting during the spring. This often leads to planting in less than desirable conditions. In addition, cool temperatures may also retard corn seeding growth and elevate risk associated with seedling pathogens, insect pests, nematodes and other factors known to inhibit seedling health and survival. In most instances, the corn stand achieved is rarely absolutely perfect and contains issues and variability. Adverse environmental conditions frequently reduce Mississippi's corn stands and create considerable emergence variability, particularly during the past couple of years. Furthermore, numerous factors, such as hail damage, freeze injury, and topical liquid nitrogen application, may defoliate or stress young corn seedlings, which may also create similar disparity in corn plant development and potentially reduce productivity. Stand issues are a substantial problem because corn is very responsive to stand density, uniform spacing and synchronous development. Corn productivity is very dependent upon uniform growth because it possesses a determinant growth habit, which prevents stunted plants from catching up or utilizing resources as efficiently as normal plants. In addition, corn does not possess the compensatory reproductive ability of many other crops, including the ability to tiller, or greatly increase its number of fruit-bearing structures. Despite these well-known issues, most corn stand assessment guidelines are based nearly exclusively on plant population with little or no allowance for these limitations. As corn productivity and management capabilities continue to increase, we believe you must also take into account developmental disparity and other forms of stress which are known to limit plant competitiveness and will likely ultimately reduce productivity, when making replant decisions.



Project Results/Outcomes

Studies were implemented in 2015 to investigate various corn stand issues that frequently challenge Mississippi growers. Studies were conducted at three locations and grown in both irrigated and dryland culture. There are two different objectives of this research project. The first objective is to evaluate the productivity of late-emerging corn plants, compared to other plants. Emergence variability was achieved by hand-planting individual plants at delayed dates relative to normal plants. Four different patterns differing in the number of late-emerging plants were employed to simulate a wide-range of variability which naturally occur in corn fields. Results showed yields of late-emerging plants suffered 10 to 65% yield loss, compared to uniform plants. Yield loss increased with increasing disparity in growth for late-emerging plants. Yield loss of late-emerging plants was more substantial for corn grown in dryland culture, compared to irrigated culture. It is interesting that the late-emerging plants appear to be much more responsive to competition for water, compared to light and nutrients.

Project Results

The second study evaluates different methods of replanting substandard corn stands. Mississippi corn growers normally grow corn on prepared, raised beds which help alleviate detrimental effects of soil saturation which commonly occurs in our high rainfall climate. The presence of these prepared, raised beds restrict our ability to use tillage if we need to destroy a partial, failed corn stand. Thus, the only practical method to kill undesired plants is to use chemical herbicides. Using herbicides to kill failed stands involves an additional field trip, expense, and potential complications associated with areas within the field which produced acceptable stands that they would like to keep. Thus, some growers often replant additional corn seed into partial stands, instead of terminating the failed stand prior to replanting. Thus, we designed this study to evaluate corn productivity using different replanting methods. Treatments included four plant populations planted at a normal time, as well as a replanting time. Corn was also replanted into existing substandard stands using two methods. One series of treatments supplemented the existing stand with enough seed to achieve the original desired plant density, while another series of treatments were replanted with a full stand of seed supplementing the existing stand. Thus, the objective of this study is to evaluate the productivity of corn when grown in a normal, uniform stand, compared to various replanting methods, including supplementing partial, existing stands. Results showed replanting into a clean seedbed produced yields 7% higher than supplementing an existing substandard stand. The replant method used to supplement an existing substandard stand did not influence corn productivity.



Emergence variability is a common corn stand issue in the Mid-South and may limit productivity and competitiveness of late-developing plants.



This project evaluates productivity of late-emerging corn plants, compared to normal plants, so that growers can better assess stand quality and make replant decisions.

Project Impacts/Benefits

Corn growers in the Mid-South region face challenges during the spring which limit their ability to achieve optimal stands. This research will assess the impact that emergence disparity has on corn productivity and relate those findings to replant decisions. Our goal is to also identify a field-based method which growers, crop consultants and other advisory personnel can use to characterize corn developmental disparity they encounter, with research results. Furthermore, this research will also evaluate different replanting methods for corn grown in the South.

Project Deliverables

Professional Presentations and Outreach

Mississippi State University Future of Ag Competition, MSU, MS. 2/4/2016.

Educational Training

Graduate Student Allen Pettit is conducting this research project in conjunction with his training associated with pursuing a Master's degree in Agronomy at Mississippi State University.

Three undergraduate students at Mississippi State University work part time to assist activities in the Corn Verification Program.