Influence of Hybrid, Seeding Rate, and Nitrogen Fertilizer On Yield Performance of Two Corn Hybrids Differing in Ear Flex on Mississippi River Alluvial Soils

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Abstract

Higher seeding rates and nitrogen (N) rates are generally needed at higher yield potentials. Seed companies are developing hybrids with higher yield potential that may require higher N fertilizer and seeding rates. Fixed-ear hybrids (determinate) may respond more to higher seeding rates than flex-ear hybrids (indeterminate). This may also affect optimum N rates. Field experiments were conducted on two Mississippi River alluvial soils. Two hybrids, a fixed- and flex-ear hybrid; four seeding rates, 26,400, 30,800, 35,200, and 39,600 seed/acre; and four N rates, 100, 150, 200, and 250 lb/acre on Commerce silt loam and 200, 250, 300, and 350 lb/acre on Sharkey silty clay. The flex-ear hybrid did not increase in yield as seeding rates increased. Whereas, yields increased as seeding rates increased for the fixed-ear hybrid. Optimum seeding rate was 26,400 seed/acre for the flex-ear hybrid and 30,800 seed/acre for the fixed-ear hybrid. There was no interaction between hybrid and seeding rate for yield. Optimum N rate was about 250 lb/acre on Sharkey and 200 lb/acre on Commerce. Ear size (kernels/ear) decreased for both hybrids as seeding rates increased. In all trials, there was a large difference in ear size between hybrids at the lower seeding rates but these differences narrowed as seeding rates increased. At the lower seeding rates, ear size was larger for the flex-ear hybrid. Data suggests that the flex-ear hybrid required a lower optimum seeding rate than the fixed-ear hybrid at yield potentials evaluated in this study.

Introduction

The cost of producing corn has increased dramatically over the last few years. Much of this increased cost has been associated with higher nitrogen (N) fertilizer and seed costs. Optimum N and seeding rate depends on many factors including hybrid, yield potential, soil type, and soil moisture status. Higher seeding and N rates are generally needed for higher yield potentials. Another important factor is hybrid genetics. Seed companies are developing hybrids with higher and higher yield potential that may require higher N fertilizer and seeding rates. Fixed-ear type hybrids (determinate) may respond more to higher seeding rates than flex-ear hybrids (indeterminate). Indeterminate or flex-ear hybrids have the ability to adjust ear size depending on growing conditions. Therefore, fewer plants are required for maximum yield compared to fixed-ear hybrids. More importantly, fewer plants need less water. This is important in dry years, particularly on drought-prone soils, where yield potential and seed quality may be reduced. This may also affect optimum N rates. To maximize yield potential and profitability, more information is needed on optimum seeding rates and N requirements for the commercial hybrids currently being marketed.

Materials and Methods

Field experiments were conducted in 2013-2015 on Sharkey silty clay and Commerce silt loam at the Northeast Research Station (NERS) NEAR St. Joseph, LA to evaluate the influence of seeding rate and N rate on two corn hybrids differing in ear developmental traits. Two hybrids, four seeding rates, and four N rates were evaluated. Hybrids were Dekalb DKC 66-97, a fixed-ear hybrid, and REV®28HR20™, a flex-ear hybrid. Seeding rates were 26,400, 30,800, 35,200, and 39,600 seed/acre. Seeding rate treatments were planted with a John Deere 1700 vacuum planter. Nitrogen rates evaluated were 100, 150, 200, and 250 lb/acre on Commerce and 200, 250, 300, and 350 lb/acre on Sharkey. Nitrogen was injected using 30-0-0-2 at approximately the two-leaf growth stage. Treatments on Sharkey were evaluated under dryland and irrigated conditions, except in 2014 when only an irrigated trial was evaluated. Commerce trials were dryland. Trials were planted in mid to late March. Cotton was the previous crop and cultural practices as recommended by the LSU AgCenter were followed.

Experimental design was a randomized complete block with a split plot arrangement of treatments with three or four replications. Main plot was hybrid and split plots were seeding rate and N rate factorially arranged within each soil moisture regime. Measurements included grain yield, which is reported at 15.5%, and yield components, ears/acre, kernel weight, and kernels/ear. Kernels/ear were calculated based on yield, ears/acre, and kernel weight. Statistical analyses were performed using the GLM procedure of SAS.

Results and Discussion

In Sharkey silty clay trials, non-irrigated trials averaged 194 bu/acre in 2013, and 158 bu/acre in 2015 and irrigated trials averaged 200 bu/acre in 2013, 131 bu/acre in 2014, and 182 bu/ace in 2015. In Commerce silt loam trials, average yields were 190 bu/acre, 159 bu/acre, and 164 bu/acre in 2013, 2014, and 2015, respectively. Yields were similar between hybrids. Data in Tables 1-4 are averaged across years. In Sharkey trials, yileds were similar regardless of irrigation (Table 1). The flex-ear hybrid (REV 28HR20) did not increase in yield as seeding rates increased. Whereas, yields increased as seeding rates increased for the fixed-ear hybrid, DKC 66-97. Optimum seeding rate was 26,400 seed/acre for the flex-ear hybrid and 30,800 seed/acre for the fixed-ear hybrid. A similar yield response occurred on Commerce silt loam (Table 3), with an optimum seeding rate of 26,400 seed/acre for the flex-ear hybrid and 35,200 seed/acre for the fixed-ear hybrid. There was no interaction between hybrid and seeding rate and N rate for yield. Optimum N rate was about 250 lb/acre on Sharkey and 200 lb/acre on Commerce.

Ear size (kernels/ear) decreased for both hybrids as seeding rates increased (Tables 2 and 4). In all trials, there was a large difference in ear size between hybrids at the lower seeding rates but these differences narrowed as seeding rates increased. At the lower seeding rates, ear size was larger for the flex-ear hybrid.

In summary, data suggests that the flex-ear hybrid required a lower optimum seeding rate than the fixed-ear hybrid at yield potentials evaluated in this study.

Table 1. Influence of seeding rate, averaged across N rates, on grain yield for two corn hybrids on Sharkey silty clay at the NERS, 2013-2015.

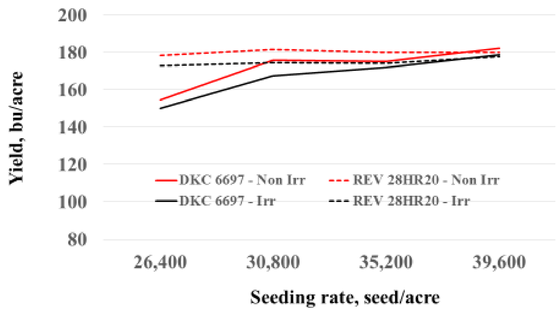

Table 2. Influence of seeding rate, averaged across N rates, on ear size (kernels/ear) for two corn hybrids on Sharkey silty clay at the NERS, 2013-2015.

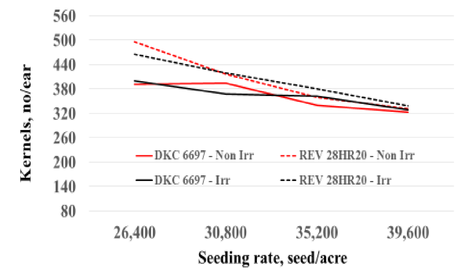

Table 3. Influence of seeding rate, averaged across N rates, on grain yield for two corn hybrids on Commerce silt loam at the NERS, 2013-2015.

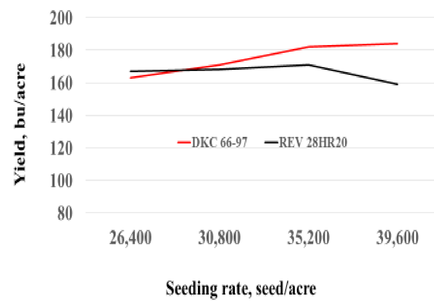

Table 4. Influence of seeding rate, averaged across N rates, on ear size (kernels/ear) for two corn hybrids on Commerce silt loam at the NERS, 2013-2015.