

Corn Breeding Research

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Introduction

The Northeast Research and Demonstration Farm is an invaluable facility for the cooperative federal-state corn breeding project at ISU. We rely on the facility as one of our main testing locations in the northern part of Iowa. One of our long-term goals is to increase our efforts in developing shorter season inbred lines, hybrids, and germplasm pools. Our research at the farm is funded primarily by the Raymond F. Baker Center for Plant Breeding.

Materials and Methods

All of our research is conducted in small plots consisting of 2 rows that are 18 feet long. We can grow approximately 454 plots/acre. The corn breeding project plants and harvests the plots using special small plot equipment. All other field activities are conducted by the farm staff. In 2003, we planted 12 experiments totaling 1,070 research plots. The experiments were primarily devoted to evaluating the performance of experimental single crosses and open-pollinated varieties at three plant densities. One experiment was designed to determine if we need to treat seed in small plot research. Our plots were planted on April 25 and harvested on October 8.

Results and Discussion

The data in Table 1 are from our Northern Single Cross experiment. We use this experiment to evaluate the performance of our most elite coded inbred lines and our most advanced experimental inbred lines. The inbreds can be crossed to other public inbred lines or to proprietary inbred lines. Inbreds in Table 1 that begin with the letter “B” were developed at Iowa State University, and the inbred that

begins with the letter “N” was developed at the University of Nebraska. The pedigree B109/B114 is an F₁ hybrid between the inbreds B109 and B114. Additional information on the inbreds can be found at:

www.ag.iastate.edu/centers/cad/index.html. The checks were DK537 and the two hybrids with the inbreds beginning with LH. Overall, the hybrids made with public inbred lines performed quite well when compared with the checks. The major deficiency of the public line hybrids was that they were slightly wetter at harvest. Complete data on the single cross experiment are published yearly and are available on the web at:

www.agron.iastate.edu/corn/Data/default.html.

The experiment in Table 2 was designed to compare elite commercial hybrids with hybrids produced with public lines and with open-pollinated varieties and crosses between open-pollinated varieties (population crosses). The experiment provides information for those farmers who may wish to produce their own seed or who wish to grow open-pollinated varieties. This experiment was grown using four row plots with data collected from the center two rows of the plot to eliminate competition between the entries in the test. The two commercial checks (LH244/LH295 and HC33/LH295) yielded over 150 bushels/acre. The public line hybrids yield substantially lower than this, but they do not represent our best material in this maturity group. There was no significant difference in yield among the top yielding, open-pollinated varieties or population crosses. It is interesting to note that the open-pollinated populations have higher protein content than the single-cross hybrids.

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Table 1. Agronomic data for single crosses grown at the Northeast Research and Demonstration farm in 2003. Only the top 10 hybrids in the trial are shown.

| Pedigree | Grain yield bu/ac | Plants per acre x 1000 | Yield rank | Grain moisture % | Lodging | | Ear height in. |
|-----------------|-------------------------|------------------------------|---------------|------------------------|-----------|------------|----------------------|
| | | | | | root % | stalk % | |
| B109/B114 | 150.2 | 26.8 | 1 | 19.3 | 0.0 | 5.4 | 48.8 |
| B103/B110 | 140.0 | 23.7 | 2 | 16.2 | 0.0 | 8.0 | 43.3 |
| HC33/LH295 | 137.5 | 25.4 | 3 | 14.3 | 0.0 | 1.9 | 40.9 |
| B97/N196 | 137.3 | 27.1 | 4 | 17.3 | 0.9 | 23.2 | 53.7 |
| DK537 | 135.0 | 27.1 | 5 | 13.9 | 0.0 | 0.9 | 42.7 |
| B114/B105 | 133.6 | 27.1 | 6 | 17.7 | 0.9 | 0.0 | 44.1 |
| B103/B111 | 133.3 | 27.1 | 7 | 16.8 | 0.0 | 1.8 | 44.3 |
| LH244/LH295 | 128.7 | 23.7 | 8 | 16.0 | 0.0 | 4.2 | 36.8 |
| B97/N196 | 128.0 | 23.5 | 9 | 16.4 | 0.0 | 18.1 | 50.6 |
| B114/B111 | 127.5 | 22.7 | 10 | 17.0 | 1.8 | 10.2 | 53.7 |
| Experiment Mean | 101.8 | 24.4 | | 16.0 | 0.7 | 10.5 | 44.9 |
| LSD(0.05) | 22.4 | 5.4 | | 2.0 | 3.1 | 12.1 | 7.4 |

Table 2. Agronomic data for single crosses, open-pollinated varieties, and population crosses grown averaged over locations at Nashua, Kanawha, Calumet, and Ames in 2003.

| Pedigree | Yield rank | Grain yield bu/ac | Grain moisture % | Lodging | | Protein % | Oil % | Starch % |
|---------------------|---------------|-------------------------|------------------------|-----------|------------|--------------|----------|-------------|
| | | | | root % | stalk % | | | |
| LH244/LH295 | 1 | 159.4 | 15.3 | 0.2 | 2.8 | 7.6 | 3.9 | 60.6 |
| HC33/LH295 | 2 | 152.4 | 14.3 | 0.0 | 3.0 | 8.1 | 3.8 | 60.3 |
| B125/B102 | 3 | 122.7 | 16.0 | 0.0 | 7.3 | 8.6 | 3.9 | 59.8 |
| B125/B100 | 4 | 121.1 | 15.3 | 0.0 | 8.6 | 8.8 | 4.0 | 59.8 |
| HPAL C #2 | 5 | 116.0 | 13.5 | 1.3 | 4.5 | 9.2 | 4.1 | 59.2 |
| BS22(R)C7/BS33(S)C5 | 6 | 115.7 | 15.4 | 1.9 | 8.7 | 9.2 | 4.2 | 59.1 |
| TEPR-EC6/BS33(S)C5 | 7 | 115.6 | 14.6 | 3.0 | 7.4 | 9.1 | 4.5 | 59.1 |
| HPAL C #10 | 8 | 115.3 | 13.4 | 0.9 | 4.6 | 9.5 | 4.2 | 59.0 |
| HPAL C #7 | 9 | 113.9 | 13.3 | 1.2 | 5.0 | 9.2 | 4.0 | 59.4 |
| BS22(R)C7/BS21(R)C7 | 10 | 113.3 | 16.4 | 1.0 | 6.2 | 9.6 | 4.3 | 58.8 |
| EXPERIMENT MEAN | | 106.8 | 14.4 | 2.5 | 11.5 | 9.3 | 4.2 | 59.2 |
| LSD(0.05) | | 10.5 | 1 | 4.9 | 13.4 | 0.4 | 0.3 | 0.5 |