2004

Corn Breeding Research

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Abstract
The Southeast Research Farm (SERF) 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 southern part of Iowa. The SERF is one of our largest test sites in the state. Corn breeding research is conducted at the farm by the Lamkey and Hallauer (ISU) projects, the Pollak (USDAARS) project, and the Blanco (USDA-ARS) project. Our research at the farm is funded primarily by the Raymond F. Baker Center for Plant Breeding located at ISU.

Keywords
Agronomy

Disciplines
Agricultural Science | Agriculture | Agronomy and Crop Sciences

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Introduction

The Southeast Research Farm (SERF) 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 southern part of Iowa. The SERF is one of our largest test sites in the state. Corn breeding research is conducted at the farm by the Lamkey and Hallauer (ISU) projects, the Pollak (USDA-ARS) project, and the Blanco (USDA-ARS) project. Our research at the farm is funded primarily by the Raymond F. Baker Center for Plant Breeding located at ISU.

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 46 replicated experiments totaling nearly 5,000 research plots. The experiments were primarily devoted to evaluating the performance of experimental single crosses, open-pollinated varieties at three plant densities, and progeny from long-term selection programs. A basic research experiment was also conducted by M.S. and Ph.D. students. Our plots were planted on May 17 and harvested on October 6.

Results and Discussion

The data in Table 1 are from our Southern 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. Iowa State University inbreds are either 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. The "/" between two inbreds indicates a cross. For example, the pedigree B116/LH198 is an F_1 hybrid between the inbreds B116 and LH198. Additional information on the inbred can be found at: www.ag.iastate.edu/centers/cad/index.html. The checks were DKC59-08 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 is part of a student's dissertation project and is designed to determine the response to selection for a long-term selection experiment that has been running continuously since 1939. The experiment will tell us the rate of genetic progress we have been making for the traits we have been selecting for. The experiment also provides performance information on topcrosses. Topcrosses are crosses of synthetic varieties (equivalent to open-pollinated varieties except they have been improved) with elite inbred lines. The top yielding entry in this experiment at the SERF in 2003 was the F_1 hybrid, B104 x HX622. B104 is an ISU inbred and HX622 is a commercial inbred line. What is interesting in this experiment is that several of the topcrosses yielded nearly as well as the best F_1 hybrid and they had lower moisture contents at harvest. It is possible that seed of topcrosses could be produced and grown by Iowa farmers.

Acknowledgments

We would like to thank Kevin Van Dee for his assistance and the timely manner in which fields were prepared.

Table 1. Agronomic data for single crosses grown at the Southeast Research Farm in 2003. Only the top 10 hybrids in the trial are shown.

Pedigree	Grain yield	Plants per acre	Yield rank	Grain moisture	Lodging		Ear height
					root	stalk	
	bu/ac	x 1000		%	%	%	in.
LH198/LH287	158.5	26.4	1	23.8	0.0	4.5	43.5
B116/LH198	156.8	27.1	2	27.5	0.0	1.8	52.2
B106/BS13(S)C6)-7884-1-1-1-1-1-1-1-1-1-1-B	147.0	27.1	3	28.0	0.0	1.8	53.3
BSKRL1(HI)C1-128-1-01-01-01-B/B99	146.8	25.9	4	25.6	0.0	2.7	54.9
DKC59-08	146.0	27.1	5	22.9	0.0	2.7	42.9
LH198/LH185	143.5	27.1	6	23.0	0.0	0.0	45.5
BSCB1(R)C12)-0095-1-1-1-2-1-01/LH198	142.8	26.1	7	25.4	0.0	4.6	50.2
B99/BS13(S)C7)-0008-1-1-1-1-1-B	142.5	27.1	8	28.6	2.7	13.4	57.9
B123/B110	141.7	27.1	9	26.0	0.0	8.9	61.4
B104/B116	139.4	27.1	10	31.0	1.8	3.6	56.9
LSD(0.05)	25.7	1.3		3.2	5.4	6.1	7.5

Table 2. Agronomic data for open-pedigreed single crosses, topcrosses (crosses of open-pollinated varieties with an inbred line, and a commercial check hybrid grown at the Southeast Research and Demonstration farm in 2003. Only the top 10 entries are shown.

Pedigree	Yield Rank	Grain yield	Grain moisture	Plant per acre	Lodging		Test weight
					root	stalk	
		bu/ac	%	X 1000	%	%	lbs
B104/HX622	1	159	23	29201	1	7	54
B84/B97	2	154	19	28072	2	2	55
BSSS(HT)C7/HX622	3	149	20	29524	0	4	54
BS13(S)C0/HX622	4	147	21	30008	0	3	54
BS13(S)C9/HX622	5	145	20	28556	0	1	55
B73/HX622	6	145	21	27749	1	8	55
BS13(S)C5/HX622	7	144	21	28556	0	1	54
BS13(S)C7/HX622	8	142	22	30008	0	1	56
BS13(S)C4/HX622	9	141	22	28879	0	4	55
DK537	10	140	16	28879	5	18	56
Exp Mean		96	20	28239	5	11	55