

NDSBF: A New Improved Germplasm Source for Early Corn

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The acreage of corn grown for grain in North Dakota has increased significantly during the past decade. Some of the increased acreage has been in southeastern North Dakota where most of the grain corn has been grown in the past several decades. But there have been increases in grain corn acreages in almost all areas of the state.

For reporting purposes, the North Dakota Crop and Livestock Reporting Service divides North Dakota into nine districts (Figure 1) (1). During the five-year period from 1970 to 1974, over 81 percent of the grain corn acreage was located in the southeastern district. During the most recent period for which data were available (the five-year period of 1980 to 1984), grain corn acreage had expanded in all districts until the southeastern district accounted for only 56.5 percent of the total grain corn acreage. The largest percentage changes for these two five-year periods were in the east central, northeastern, and central districts, which increased from 13.9 to 20.1, 1.6 to 7.7, and 0.8 to 6.0 percentages of the total harvested acres, respectively.

There are numerous reasons why grain corn acreages are expanding into areas of the state which have not traditionally grown corn for grain. One reason is the availability of new, early maturing hybrids which are more adapted to these areas. As an example of the improvement in hybrids, the average yield of check hybrid NDB564 for the five-year period 1970-74, was 7.5 bushels per acre (8.9 percent) more than the average of the six commercial hybrids tested at Fargo (2). This same check hybrid for the period 1980-84 yielded 16.7 bushels per acre (17.1 percent) less than the average of the seven commercial hybrids tested at Fargo (5). Although NDB564 averaged lower moisture at harvest in both five-year periods, the difference had narrowed from 4.4 points compared to the older generation of commercial hybrids grown in 1970-74 to 1.9 points versus the new generation of hybrids in 1980-84. NDB564, which was the highest yielding hybrid for the 1970-74 period, was the lowest yielding for the 1980-84 period. The new generation of hybrids are more resistant to stalk breakage than older hybrids. For example, NDC707, a new generation experimental hybrid in the NDSU breeding program, averaged 5.6 percent stalk breakage compared to 25.9 percent for NDB564, an older generation experimental hybrid, for the 1980-84 period at Fargo, yet it yielded 9.4 percent more grain which was 1.7 points drier at harvest than NDB564.

Improved germplasm sources are needed in order for corn breeders to continue developing new, better adapted corn hybrids for use in these districts of rapidly expanding

grain corn acreages. One of the objectives of the corn improvement project at NDSU is the development of such improved germplasms. NDSBF is the newest yellow dent synthetic released by the North Dakota Agricultural Experiment Station for use in early maturity corn breeding programs.

Breeding History

NDSBF was developed by one cycle of full-sib family selection among 78 full-sib families between NDSB(FS)C1 and NDSF(FS)C1. NDSB(FS)C1 and NDSF(FS)C1 were produced by one cycle of reciprocal full-sib selection from NDSB (3) and NDSF (4). The 78 full-sib families were evaluated in three environments, and 20 superior families were identified based on a rank-summation index which weighted yield 40 percent and 20 percent each for low grain moisture, stalk lodging, and root lodging percentages. These 20 families were intercrossed by making sib matings and bulking seed. An additional generation of random mating was practiced and seed was bulked to produce NDSBF.

Agronomic Description and Performance

NDSBF plants are slightly taller than NDSB plants, but are similar in plant and ear height to NDSF plants. NDSBF averaged almost 70 percent higher grain yield and had

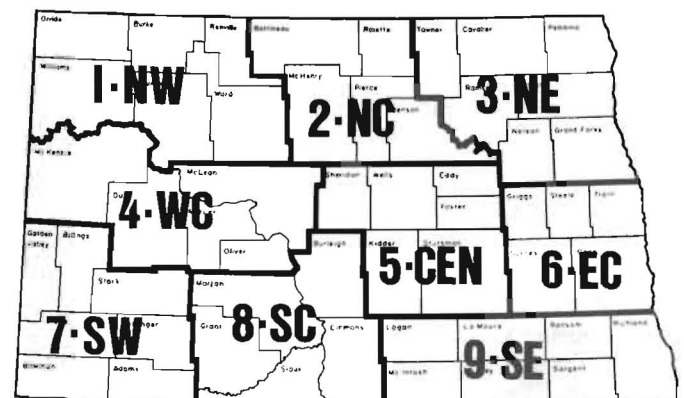


Figure 1. North Dakota crop reporting districts.

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lower ear moisture, stalk lodging, and root lodging percentages than the midparental values for NDSB and NDSF in 1984 tests (Table 1). When averaged over nine environments, NDSBF had improved grain yield, test weight, ear moisture, and root lodging resistance to NDSB. NDSBF had only slightly lower yield than NDSAB, which has been the most consistently high yielding synthetic in previous tests, but NDSBF had lower ear moisture at harvest than NDSAB.

Conclusions

The fact the NDSBF has demonstrated very good yields of high test weight grain having low harvest moisture indicates it should be a good new source of germplasm for corn breeders to use in developing very early, high yielding corn hybrids. Such hybrids, when available for commercial production, should enable growers in areas requiring 70 to 80 RM hybrids (North Dakota areas where corn acreages are rapidly expanding) to produce corn at a lower cost per bushel. Although corn breeders could use previously released germplasm sources (such as NDSF) to develop such hybrids, NDSBF appears to have a higher frequency of desirable genes for several important traits than older germplasm of similar maturity and therefore should be a much more productive source of good parental lines.

Seed Increase and Distribution

Germplasm quantities of breeder seed of NDSBF will be maintained by the Agricultural Experiment Station, North Dakota State University, Fargo. Seed will be distributed in 200-kernel lots to the extent of available supplies. All seed requests should be directed to the author.

REFERENCES

1. Carver, R.F., and W.G. Hamlin. 1986. North Dakota Agricultural Statistics 1986. North Dakota Crop and Livestock Reporting Service, Fargo, ND.

Table 1. Agronomic performance of NDSBF.

Entry	Yield	Ear moist.	Stalk lodg.	Root lodg.	Test wt.
	bu/A	-----%	-----	-----	lb/bu
-----1984 - 4 locations-----					
NDSB	42.96	24.78	9.55	6.76	51.69
NDSBF	91.25	21.03	12.25	0.02	59.19
NDSF	64.51	22.69	16.79	1.81	59.31
NDSAB	91.64	23.42	8.37	2.32	57.90
Pioneer Br. 3978	110.54	25.66	6.61	1.95	58.79
LSD (0.05)	27.33	4.17	NS	NS	NS
-----1985 - 5 locations-----					
NDSB	66.74	43.45	7.46	4.40	52.51
NDSBF	85.17	36.76	10.74	1.40	54.51
NDSAB	98.35	39.58	7.70	1.73	53.21
Pioneer Br. 3978	105.66	40.34	0.14	0.03	53.23
LSD (0.05)	26.84	5.57	NS	NS	2.48
-----Mean - 9 environments-----					
NDSB	56.17	35.15	8.39	5.23	52.15
NDSBF	87.87	29.77	11.41	0.79	56.59
NDSAB	95.37	32.40	8.00	1.99	55.29
Pioneer Br. 3978	107.83	33.82	3.02	0.88	55.70
LSD (0.05)	14.92	2.61	3.87	3.51	1.74

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