Registration of NDSAB(MER-FS)C13
Maize Germplasm

NDSAB(MER-FS)C13 is a yellow-dent maize (Zea mays L.) population (Reg. no. GP-399, PI 636493) that was developed at the North Dakota Agricultural Experiment Station, North Dakota State University (NDSU), Fargo, ND, as a result of long-term germplasm improvement. NDSAB(MER-FS)C13 was released 13 Dec. 2004 for breeding programs developing elite germplasm for short-growing-season areas. NDSAB(MER-FS)C13 was recommended for release because of its unique performance per se, in hybrid combination, and as a source of outstanding inbred lines. It is an improved germplasm source for development of inbred parents for early maturing, high quality, and high yielding corn hybrids.

NDSAB(MER-FS)C13 was developed from NDSAB (GP-125, Cross, 1983) by 12 cycles of modified ear-to-row selection (Carena and Cross, 2003) and one cycle of full-sib recurrent selection (Carena, 2005). For modified ear-to-row selection (Lonnquist, 1964), the proportion of half-sib families selected was 33% each cycle, and selection within families was approximately 15% each cycle. Three North Dakota environments were used to evaluate 60 half-sib families. A rank-summing index identified 20 superior families each cycle. The index gave grain yield a 40% weight, while low grain moisture at harvest, low stalk lodging percentage, and low root lodging percentage were each weighted 20%. Three ears were selected from a crossing block at Fargo within each of the 20 superior families by selection for stalk lodging resistance and large ear size. Selection was performed at a plant density of 75,000 plants per hectare. For full-sib recurrent selection, the proportion of full-sib families selected was 8%. Four North Dakota environments were used to evaluate 196 full-sib families in 2001. Sixteen families were recombined on the basis of a heritability index that included grain yield, grain moisture at harvest, root lodging, and stalk lodging. A bulk-entry method of recombin-ation was used to intermate selected families in the winter of 2001–2002. Selection was performed at a plant density of 60,000 plants per hectare. Paired rows were used to obtain population hybrid seed in 2002. Crosses were made using each male parent to pollinate no more than one ear shoot. The ears obtained were harvested, dried, and shelled individually, and two balanced bulks were obtained for future experimentation.

NDSAB(MER-FS)C13 was identified after testing the population per se in trials across 15 environments in 2002, 2003, and 2004. Environments included mostly eastern North Dakota environments. Hybrid combinations of NDSAB(MER-FS)C13 were tested across 10 eastern and western North Dakota environments in 2003 and 2004. Commercial-check hybrids were included in these trials (2–5). NDSAB(MER-FS)C13 (6.3 Mg ha⁻¹, 10.9%, 661 g kg⁻¹) was top performer of all populations and significantly (P ≤ 0.05) different from unreleased experimental NDSAB(MER-FS)C15 (5.6 Mg ha⁻¹, 17.1%, 660 g kg⁻¹) for grain yield, stalk lodging resistance, and starch content, respectively. It also tended to be drier at harvest (17.8 vs. 19.2%) with higher grain protein content (98 vs. 96 g kg⁻¹), and lower oil content (42 vs. 44 g kg⁻¹). Evaluation was performed at a plant density of 75,000 plants per hectare. With respect to NDSABC0, response to half-sib progeny selection increased (P ≤ 0.05) grain yield (5.9% cycle⁻¹) and reduced (P ≤ 0.01) stalk lodging in NDSAB(MER) after 12 cycles of modified ear-to-row selection at 50,000 plants ha⁻¹ (Carena and Cross, 2003).

Population hybrids including NDSAB(MER-FS)C13 are not statistically different from the top commercial check (Pioneer 39D82) for grain yield performance and lodging percentages. Therefore, this population is only an elite source for inbred line development and a potential alternative to commercial hybrids in agriculture in North Dakota.

NDSAB(MER-FS)C13 seems to differ from heterotic groups (BSSS and Lancaster). However, good combining ability with BS21(R)C7, an improvement that behaves as BSSS. The population hybrid NDSAB(MER-FS)C13 × BS21(R)C7 was the top performer for starch content (665 g kg⁻¹), value that was not statistically different from Pioneer 39D82 (668 g kg⁻¹) but was higher than Hyland 2305 (654 g kg⁻¹).

Early generation testing of NDSAB(MER-FS)C13 has shown that generational gains obtained from S₀ and S₁ lines have shown good combining ability with cross unrelated tester LH176 × LH177 with high performance and test weight, lower grain moisture, and similar lodging resistance than all checks (LH176 LH177, Wensman 5048Bt, and DKC35-51).

NDSAB(MER-FS)C13 is a vigorous improved hybrid with above average emergence percentage. However, NDSAB(MER-FS)C13 typically produces medium ears with medium ears. Each plant develops an average of 7 to 8 ears per plant. Therefore, we suggest the use of NDSAB(MERFS)C13 for reciprocal recurrent selection programs. NDSAB(MER-FS)C13 is similar in days to flowering to Early and early maturity to Hyland 2305, Fargo, ND, and is earlier than previous hybrids (AES 200 maturity).

Breeder seed will be maintained by the North Dakota Agricultural Experiment Station and distributed as kernels on request from the corresponding research project (CSA). Material transfer agreements are available through the North Dakota Research Foundation. Material may be shipped. One set of germplasm lot will be available at cost to breeders from public institutions.

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References


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