Eight Ornamental Corn Inbreds: Lines OC12 through OC19

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Since 1979, we have conducted a breeding project to develop ornamental corn cultivars with improved decorative quality and resistance to diseases and insects common in the U.S. Corn Belt. From its inception until about 1990, the project emphasized the production and evaluation of inbred lines. Eleven lines, designated OC1 through OC11, were developed in the 1980s and formally released in 1992 (Widrechner and Dragula, 1992). Eight additional inbred lines were developed before we discontinued this aspect of the project after the 1992 harvest. Here we announce a formal germplasm release of these eight inbred lines selected for decorative purposes.

Origin

OC12 through OC19 resulted from an inbreeding and selection program conducted in St. Paul, Minn., from 1979 to 1983 and in Ames, Iowa, from 1984 to 1992. Plants from genetically diverse base populations were self-pollinated, and progeny were selected from the S_0 through the S_3 generations by using an index score calculated on an individual-plant basis. The selection index combined ratings for factors related to ornamental merit (45%), including endosperm type, seed and plant color, and ear shape and fill; productivity (18%), including number of marketable ears, harvest date, and lodging; and general field resistance to insects (12%), especially European corn borer [*Ostrinia nubilalis* (Hübner)] and corn earworm [*Helicoverpa zea* (Boddie)], and pathogens (25%), focusing on corn smut [*Ustilago zeae* (Beckm.) Unger], corn rust (*Puccinia sorghi* Schwein.), wilt-causing organisms, and fungi that infect ears. The index was weighted by the level of inbreeding. In the S_4 and S_5 generations, lines were selected on the basis of performance of lines rather than of individual plants. Seeds multiplied by bulk-sib pollinations from advanced-generation lines served as the basis for these releases. Between 1990 and 1992, these samples were provided

to the U.S. Dept. of Agriculture, Agricultural Research Service (USDA/ARS), North Central Regional Plant Introduction Station (NCRPIS), Ames, Iowa, for maintenance and distribution.

These eight lines were first increased at the NCRPIS between 1991 and 1994. Data on kernel characteristics were collected from these and subsequent seed increases. An unreplicated agronomic and disease evaluation was conducted at the NCRPIS in 1996. The 1996 plantings were made on 18 June in single-row plots, each 7.6 m long, spaced 0.9 m apart. Plots were overseeded and seedlings thinned to ≈ 26 -cm spacing within rows. Phenology and the severity of corn smut, corn rust, and gray leaf spot in these eight inbreds were evaluated in comparison with the yellow dent inbreds, W117, A632, and B73. Lines OC1 through OC11 were also included in this evaluation. A comparison of ratings conducted in 1990 (Widrechner and Dragula, 1992) with the 1996 ratings (data not presented herein for OC1 through 11) indicated that disease pressure and reactions in these 2 years were very similar for corn rust, but that disease pressure for corn smut was greater in 1996. In contrast with 1990, northern corn leaf blight [*Exserohilum turcicum* (Pass.) Leonard & Suggs] was not observed in the 1996 plot. Reaction to a light to moderate level of field infection by gray leaf spot (*Cercospora zeae-maydis* Tehon & Daniels), a pathogen becoming increasingly prevalent in areas where conservation tillage is employed (de Nazareno et al., 1993), was also scored in the 1996 evaluation.

Racial-type designations for dent, flint, and flour populations follow the general descriptions of Goodman and Brown (1988).

Description

OC12 (= PI 596499) is an S_6 -derived line self-pollinated from a well-formed, multicolored ear of flint corn (Racial type—Northern Flint) purchased in 1979 from a florist's shop in St. Paul, Minn. It shares this parentage with OC3 and OC6 (Widrechner and Dragula, 1992). Ears of OC12 average 10 ± 0.7 cm in length (± 1 SD), have 10 to 14 (mostly 10) kernel rows, red glumes, and green husks extending an average of 12 cm beyond the ears' tips. Seed is medium-sized (20.6 g/100 kernels), with flinty white endosperm, dark red calico pericarp, and colorless aleurone. Plant height averages 200 ± 20 cm, and ear

height, 65 ± 20 cm. Plants generally have one ear and few tillers. Silking date is similar to that of B73. No corn smut was observed in the 1996 planting, but the line is moderately susceptible to corn rust. A moderate degree of gray leaf spot infection was also noted.

OC13 (= PI 596500) is an S_6 -derived line self-pollinated from an F_1 hybrid population resulting from the 1983 pollination of PI 214288, the white dent population Cottrell's Best (Racial type—Derived Southern Dent), with bulked pollen of early-maturing flints. Ears of OC13 average 13 ± 2.5 cm in length, have 14 to 20 (mostly 14) kernel rows, red glumes, and green husks extending an average of 4.5 cm beyond the ears' tips. Seed is small (13.3 g/100 kernels), with semi-flinty white endosperm, brown-orange pericarp, and colorless aleurone. Plant height averages 140 ± 10 cm, and ear height, 55 ± 10 cm. Plants generally have one ear and one to three tillers. Silking date is slightly later than that of B73. The line is susceptible to corn rust and corn smut. Slight gray leaf spot infection was also noted.

OC14 (= PI 596501) is an S_6 -derived line self-pollinated from a decorative flint population (Racial type—Northern Flint) selected by Anna L. Rouf, Wahoo, Nebr., and received from her in 1983. Ears of OC14 average 11.5 ± 0.7 cm in length, have eight to 12 kernel rows, white glumes, and green-tipped purple husks extending an average of 9.5 cm beyond the ears' tips. Seed is medium-sized (15.9 g/100 kernels), with semi-flinty white endosperm, colorless pericarp, and purple aleurone. Plant height averages 175 ± 15 cm, and height of the lowest ear, 70 ± 5 cm. Plants generally have one to three ears and few tillers. Silking date is slightly later than that of B73. No corn smut was observed in the 1996 planting, but the line is moderately susceptible to corn rust. Only a trace amount of gray leaf spot infection was noted.

OC15 (= PI 596502) is an S_6 -derived line self-pollinated from an accidental outcross observed in an S_3 line derived from the commercial cultivar Seedway Elite (Racial type—Northern Flint), purchased from Seedway, Hall, N.Y., in 1979. A true-to-type plant in this same S_3 line (as determined by plant and ear size and color markers) was selfed for three more generations to become OC1 (Widrechner and Dragula, 1992). Ears of OC15 average 13.5 ± 1.1 cm in length, have eight to 12 kernel rows, white glumes, and green husks; the latter are marked with red where exposed to sunlight, and extend an average of 9 cm beyond the ears' tips. Seed is medium-large (22.8 g/100 kernels), with flinty pale yellow endosperm, colorless pericarp, and purple aleurone. Plant height averages 200 ± 25 cm, and height of the lowest ear, 45 ± 10 cm. Plants generally have one to three ears and no tillers. Silking date is similar to W117. No corn smut was observed in the 1996 planting, and the line is evidently only slightly susceptible to corn rust. Slight gray leaf spot infection was also noted.

OC16 (= PI 596503), an S_6 -derived line, and OC18 (= PI 596505), a full-sib S_6 -derived

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line, were both self-pollinated from an F_2 population donated by Gail E. Wagner, Kettering, Ohio (now of Columbia, S.C.), in 1982. The parental population is a colorful, large-seeded flour corn, which originally resulted from the hybridization of a traditional Pawnee landrace (Racial type—Great Plains Flour) by Tamaroa Flint (Racial type—Northern Flint) (developed by John White, Michael, Ill.).

Ears of OC16 average 12.5 ± 2.5 cm in length, have eight to 10 kernel rows, white glumes, and green husks extending an average of 6 cm beyond the ears' tips. Seed is medium-large in size (22.9 g/100 kernels), with floury white endosperm, colorless pericarp, and blue aleurone. Plant height averages 160 ± 20 cm, and height of the lowest ear, 50 ± 15 cm. Plants generally have one or two ears and many tillers. Silking date is similar to B73. The line is somewhat susceptible to corn rust and moderately susceptible to corn smut. Slight gray leaf spot infection was also noted.

Ears of OC18 average 14 ± 2.3 cm in length, have eight to 12 kernel rows, white glumes, and green husks extending an average of 11.5 cm beyond the ears' tips. Seed is medium-large in size (23.4 g/100 kernels), with floury white endosperm, colorless pericarp, and a mottled rose aleurone. Plant height averages 210 ± 25 cm, and height of the lowest ear, 70 ± 10 cm. Plants generally have one to three ears and one to four tillers. Silking date is slightly later than that of B73. No corn smut and only trace amounts of corn rust were observed in the 1996 planting. Slight gray leaf spot infection was also noted.

OC17 (= PI 596504) is an S_6 -derived line self-pollinated from an F_1 hybrid population resulting from the 1983 pollination of line 3910 (of unknown racial type) in the late Charles Burnham's nursery at the Univ. of Minnesota, St. Paul. The pollen source was PI 452064, a pink, rice-kernel popcorn donated

by the late E.H. Strubbe, Alberta, Minn., which he originally obtained from the Oscar H. Will Co. (Whealy, 1986). Ears of OC17 average 11.5 ± 0.9 cm in length, have 14 to 20 (mostly 16) kernel rows, white glumes, and green husks extending an average of 9 cm beyond the ears' tips. Seed is small (7.7 g/100 kernels), with hard, white endosperm resembling a pearl popcorn, colorless pericarp, and purple aleurone. Plant height averages 145 ± 10 cm, and height of the lowest ear, 30 ± 5 cm. Plants generally have two or three ears and no tillers. Silking date is similar to B73. No corn smut was observed in the 1996 planting, but the line is moderately susceptible to corn rust. Slight gray leaf spot infection was also noted.

OC19 (= PI 596506) is an S_5 -derived line self-pollinated from an F_1 hybrid population resulting from the 1983 pollination of line A B PI 3, a flint inbred (Racial type—Northern Flint) used as a parent for red-plant border rows, provided by Robert H. Peterson, Univ. of Minnesota. The pollen source was Rainbow Flint, of unknown origin and racial type. The leaves of OC19 are striped with dark red and white. Ears of OC19 average 11.5 ± 0.8 cm in length, have 12 to 14 kernel rows, purple glumes, and purple husks extending an average of 7 cm beyond the ears' tips. Seed is medium-sized (15.3 g/100 kernels), with semi-flinty yellow endosperm, dark purplish-red pericarp, and a colorless aleurone. Plant height averages 160 ± 10 cm, and ear height, 50 ± 5 cm. Plants generally have one ear and few tillers. This line's silking date is similar to B73. No corn smut and only trace amounts of corn rust were observed in the 1996 planting. Slight gray leaf spot infection was also noted.

Potential uses

These diverse inbred lines are among the first to be selected for developing superior cultivars of ornamental corn. They should be

useful as parents of synthetic ornamental populations and in hybrid combinations with commercial popcorn and field corn inbreds to develop colored corns for human consumption. More specifically, OC16 and OC18 have both colored aleurone and floury endosperm, traits that may be valuable in hybrid combination with other floury inbreds to produce colored flour corns. In addition, lines OC14 and OC16 through OC19 are not closely related to any widely available inbred lines, and thus may be valuable for genetic studies. Based on test crosses and pedigree analyses, we have incorporated these eight lines into the parentage of two broad-based, synthetic populations now undergoing recurrent selection for eventual cultivar release.

Availability

One-hundred-seed samples of these inbreds are available for research purposes at no charge upon written request to Mark Millard, North Central Regional Plant Introduction Station, Iowa State Univ., Ames, IA 50011 (e-mail: mjmiller@iastate.edu).

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