Eleven Ornamental Corn Inbreds: Lines OC1 through OC11

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In 1979, we began a breeding program in Minnesota to develop cultivars of ornamental corn with improved decorative quality and resistance to common diseases and insects (Widrechner and Dragula, 1981). Work in Minnesota continued through 1983, when the breeding program was moved to Ames, Iowa. We announce a formal germplasm release of 11 inbred lines selected for decorative purposes, as part of this ongoing program.

Origin

OC1 through OC11 (PI 553054 through 553064) resulted from an inbreeding and selection program established in 1979. Plants from diverse base populations were selfed, and selfed ears were selected from the S_0 through S_5 generations on the basis of a complex index score, combining ratings for factors related to ornamental merit, productivity, and general field resistance to insects and diseases, with overall emphasis on desirable ear characteristics and reduced ear damage. Inbred populations were selected on the basis of ear-to-row performance in the S_4 and S_5 generations. Seeds from selected S_4 and S_5 lines, produced by bulk-sib pollinations, serve as the basis for these releases and were provided to the North Central Regional Plant Introduction Station, Ames, for maintenance and distribution.

OC1 was selfed from the commercial cultivar Seedway Elite and OC8 from the commercial cultivar Strawberry, both purchased from Seedway, Inc., Hall, N.Y., in 1979. OC2, OC9, and OC10 were developed from tripsacoid, recovered maize populations bred by J.R. Harlan and J.M.J. de Wet at the Univ. of Illinois (de Wet, 1979). Tripsacoid, recovered maize resulted from a backcrossing program to introduce genes of *Tripsacum dactyloides* (L.) L. into corn. These populations contain genes for resistance to leaf anthracnose and stalk rot caused by *Colletotrichum graminicola* (Ces.) G.W. Wils., northern corn leaf blight [*Exserohilum turcicum* (Pass.) Leonard & Suggs], southern corn leaf blight [*Cochliobolus heterostrophus* (Drechs.) Drechs.], corn rust (*Puccinia sorghi* Schwein.), and Stewart's wilt [*Erwinia stewartii* (Smith) Dye] (Bergquist, 1979), which may have been contributed by *Tripsacum*. OC2 was selfed directly from recovered maize, but OC9 and OC10 were selfed from open-pollinated progenies of recovered maize.

OC3 and OC6 were selfed from the progeny of an attractive ear of flint corn purchased in a florist's shop in St. Paul, Minn., in 1979. OC4 was selfed from PI 213756, a traditional corn of the Osage Tribe collected in Oklahoma. PI 213756 was obtained from the North Central Regional Plant Introduction Station in 1979. OC5 was selfed from the commercial cultivar Ornamental Corn-Brown and OC7 from the commercial cultivar Ornamental Corn-Indian Blue, both purchased from Herbst Seedsmen, Brewster, N.Y., in 1979. OC11 was selfed from the

progeny of an ear of decorative popcorn purchased at the St. Paul Farmers' Market in 1980.

Description

These 11 lines were increased and evaluated in 1990 at the North Central Regional Plant Introduction Station. Descriptive data were measured from the increase plots. Plantings were made in unreplicated, four-row plots, each 10 m long. Rows were spaced 90 cm apart within plots and 180 cm apart between plots. Plots were overseeded, and plants were thinned to a 15-cm spacing within rows.

The 11 inbreds include four popcorns, OC5, OC7, OC8, and OC11; two flint corns, OC3 and OC6; one dent corn, OC10; and four intermediate types, OC1, OC2, OC4, and OC9 (Table 1). Variation in the endosperms of the intermediate lines resulted from slight plant-to-plant differences in ear maturity and the effects of diseases and other stresses, rather than from genetic segregation. Ear lengths and kernel-row numbers are typical of small-eared decorative corn cultivars (Table 1). Ears were sufficiently covered by husks in the eight lines that were evaluated for that trait (Table 1).

Seed and plant colors representing many common types found in decorative corns occur in these inbreds (Table 2). The kernels of OC4 are an unusual purple-brown. Three

Table 1. Seed and ear characteristics of released lines.

Line	Ear length* (cm)	Kernel rows (no.)	Husk covering* (cm past ear tip)	Endosperm type*	100-seed wt (g)
OC1 (PI 553054)	11-14	8	1-20	75% SF, 25% FT	11.1
OC2 (PI 553055)	7-14	12-16	9-15	90% FT, 10% SF	17.8
OC3 (PI 553056)	11-16	8-14	3-9	100% FT	15.1
OC4 (PI 553057)	8-16	8-12	6-17	75% SA, 15% SD 5% AM, 5% SF	12.5
OC5 (PI 553058)	8-13	16-20	10-18	100% PP	12.8
OC6 (PI 553059)	8-15	12	---	100% FT	11.2
OC7 (PI 553060)	7-15	14-16	---	100% PP	16.3
OC8 (PI 553061)	4-7	20-24	7	100% PP	6.4
OC9 (PI 553062)	7-12	12	10	55% SD, 45% SF	16.5
OC10 (PI 553063)	11-15	12-18	5-10	100% DT	18.4
OC11 (PI 553064)	5-10	14-16	---	100% PP	7.1

*Range of all normal ears produced in 1990.

*Range of 10 randomly chosen plants.

*AM = amylaceous (floury), DT = dent, FT = flint, PP = pop, SA = semi-amylaceous, SD = semi-dent, SF = semi-flint.

*Data not collected.

Table 2. Kernel, plant, and ear color characteristics of released lines.

Line	Color					Leaf striping
	Pericarp*	Aleurone	Endosperm	Glume	Husk	
OC1	None	Blue	White	White	White	None
OC2	None	Blue : white	Lemon : yellow	White	White	Thin white
OC3	HS	White	Yellow	Purple	Purple	Yellow
OC4	BO	Clay red	White	Red	White	None
OC5	Brown	White	Yellow	White	White	None
OC6	RC	White	Yellow	White	White	Yellow
OC7	None	Blue	Yellow	White	White	None
OC8	Red	White	White	Red	White	None
OC9	RO	White	Yellow	Red	White	None
OC10	HS	White	Yellow	Purple	Purple	None
OC11	None	White	Yellow	White	White	None

*BO = brown orange, HS = purple husk and glume staining, RC = red calico, RO = red orange.

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Table 3. Average severity of disease and lodging of released lines and inbred controls in 1990.²

Line	Corn rust	Northern corn leaf blight	Corn smut	Root lodging	Stalk lodging
OC1	2	1.5	1.5	0	3
OC2	5.5	1	1.5	0-1	5-7
OC3	5	1	2	0-1	5-7
OC4	6	1	1	0-1	5
OC5	1	2	0.5	0	1
OC6	6	3	0	0-1	7-9
OC7	6	2	2	0-1	7-9
OC8	5	1	2	1-3	5
OC9	3	1	3	0	5-7
OC10	5	0	0	1	5-7
OC11	2	1	1	7-9	7-9
W117Ht	1	1	0	0	1
A632Ht	3	0	0	0	1
B73Ht	1	0	0	0	1

²Rating of disease severity with 0 = no incidence and 10 = all plants severely infected (Desaynard, 1968); rating of severity of lodging follows a linear scale with 0 < 10% lodging and 9 ≥ 90% lodging.

Table 4. Plant characteristics of released lines and inbred controls in 1990.²

Line	Ear ht (cm)	Total plant ht (cm)	Ears/stalk	Tillers	Days to peak silk
OC1	30-65	160-200	1-3	2-5	67
OC2	30-70	190-220	1-2	0-1	64
OC3	55-90	160-220	1	0	66
OC4	50-60	150-190	1-2	0-3	70
OC5	80-105	180-205	1-2	0-2	72
OC6	70-105	190-220	1-2	0-2	73
OC7	70-90	170-210	1	0-2	71
OC8	50-75	100-145	1-2	0-2	68
OC9	40-80	140-170	1-2	1-3	63
OC10	80-100	210-240	1-2	0	69
OC11	80-120	180-230	1-3	0-5	73
W117Ht	35-50	120-155	1	0-1	62
A632Ht	60-90	200-220	1-2	0-2	66
B73Ht	70-105	190-250	1	0	69

²Ranges based on 10-plant samples.

inbreds, OC1, OC2, and OC7, have blue seeds and may be useful in developing blue corn hybrids for food use. Variation in aleurone and endosperm color in OC2 resulted from genetic segregation. We repeatedly selected plants heterozygous for both of these characteristics during the development of this line.

The severity of disease and insect damage and lodging in the 11 inbreds was evaluated in comparison with three yellow dent, inbred control cultivars, W117 Ht, A632 Ht, and B73 Ht (Table 3). These are standard inbred controls used in all field evaluations at the Plant Introduction Station. In general, OC1 through OC11 are not as disease resistant as the controls. They showed few symptoms of northern corn leaf blight or corn smut [*Ustilago zeae* (Beckm.) Unger], but only OC1, OC5, and OC11 showed good field resis-

tance to corn rust (Table 3). Root lodging (stalk tipping or breakage near the root zone) was a problem only in OC11 (Table 3). The most serious problem with these inbreds was stalk lodging. OC5, a popcorn, was the only line to score as well as the controls for stalk lodging (Table 3). To minimize ear losses, plants should be harvested as soon as husks dry.

Plant size and peak pollination dates for these inbreds and the controls were also measured (Table 4). Ear and plant heights are convenient for hand pollination, and pollen shed usually coincides well with silking. Silking dates for the 11 inbreds are similar to those of the controls, which are early to midseason field corns in Iowa and nearby areas. In lower-density plantings than those used for this evaluation, all inbreds except OC2, OC3, OC6, and OC10 increased till-

ering, and such tillers often produced additional ears.

In addition to the data presented in the tables, S. McClurg and R. Wilson of the North Central Regional Plant Introduction Station have included OC1 through OC11 in a silk-feeding trial to test for resistance to corn earworm [*Ostrinia nubilalis* (Hubner)]. Preliminary results indicate that OC9 may have silks that inhibit the growth of corn earworm larvae.

Potential use

These diverse inbred lines are among the first to be selected for use in the development of superior cultivars of ornamental corn. They should be useful as parents of synthetic populations for ornamental use and in hybrid combination with commercial popcorn and field corn inbreds to develop colored popcorn and field corn cultivars for human consumption. On the basis of preliminary test-cross data and our knowledge of the pedigrees of these inbreds, we are currently using them to develop two broad-based, synthetic populations for future release as decorative cultivars.

These lines are not closely related to any commonly available inbred lines adapted to the midwestern United States and may be useful in studies of genetic polymorphisms and heterotic patterns. OC2, OC9, and OC10 may also have novel genes for insect and disease resistance derived from *Tripsacum dactyloides*, expanding the germplasm base of ornamental corn.

Availability

Hundred-seed samples of these inbreds are available for distribution at no charge upon written request to M. Millard, Plant Introduction Station, Iowa State Univ., Ames, IA 50011.

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