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Published September, 2000

REGISTRATION OF CULTIVARS

Registration of 'Princeton P-105' Kentucky Bluegrass

'Princeton P-105' Kentucky Bluegrass (*Poa pratensis* L.) (Reg. no. CV-54, PI594361) is a turf-type cultivar released in August 1995 by Lofts Seed, Inc., Winston-Salem, NC. It was developed from germplasm obtained from the New Jersey Agricultural Experiment Station. The experimental designations of Princeton P-105 were A84-567 PT and P-105.

'Princeton P-105' Kentucky Bluegrass originated as a single, highly apomictic plant selected from the open-pollinated progeny of Warren's A-25 Kentucky bluegrass. Warren's A-25 is a vigorous, aggressive selection with medium-green color, medium leaf texture, high density, and good turf performance. It was selected from an old golf course near Chicago, IL. Warren's A-25 is highly sexual and is reported to have 37 ± 1 somatic chromosomes (1).

Warren's A-25 was pollinated by plants selected from old turfs during the winter of 1975 in a greenhouse located on the Cook College campus of Rutgers University (2,3,4). Seedlings from these crosses were established in a spaced-plant nursery at Adelphia, NJ, during August and Spetember 1975. An attractive F_1 hybrid was selected from the progeny of Warren's A-25 on 27 June 1976. Seed from this plant was used to establish turf trials at Adelphia, NJ, in September 1977. Princeton P-105 has been included in various turf performance tests at either North Brunswick or Adelphia, NJ, and was included in the National Turfgrass Evaluation Program Kentucky bluegrass test (medium-high maintenance) in 1995. It has exhibited a high level of apomictic reproduction as observed in spaced-plant nurseries in New Jersey and seed production fields in Oregon. The first certified seed was harvested in 1995.

Princeton P-105 is a turf-type Kentucky bluegrass with an attractive medium-dark green color during the growing season. It produces a persistent, aggressive turf with medium leaf texture, a medium-low growth profile, medium-high density, and good overall turf performance. Princeton P-105 has shown good resistance to leaf spot and melting-out [caused by *Drechslera poae* (Baudys) Shoem.], stripe smut [caused by *Eyrsiphe graminis* DC.) and moderate resistance to dollar spot (caused by *Sclerotinia homoeocarpa* F.T. Bennett). It shows promise of higher seed yield than Princeton P-104. Princeton P-105 produces extensive rhizomes, giving it good spreading and recuperative ability.

Princeton P-105 is recommended for lawns and sports turfs in regions where Kentucky bluegrass is well adapted. It is compatible in blends with most other Kentucky bluegrasses and in mixtures with turf-type perennial ryegrasses (*Lolium perenne* L.) and strong creeping red fescues (*Festuca rubra* L. subsp. *rubra*). However, the aggressiveness and density of Princeton P-105 may cause it to dominate many blends and mixtures.

Breeders seed will be produced and maintained by Lofts Seed. Inc. Seed propagation is restricted to three cycles of increase, Breeder, Foundation, and Certified. U.S. plant variety protection of Princeton P-105 has been applied for (PVP Certificate no. 9600228).

R.H. Hurley,* V.G. Lehman, R.F. Bara, and C.R. Funk

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Appreciation is expressed to Kevin Morris, Robert Shearman, and other participants in the National Tufrgrass Evaluation Program for their contributions to the evaluation of Princeton P-105. *Corresponding author (HURLRICH@aol.com).

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Registration of 'Kaskaskia' Wheat

'Kaskaskia' soft red winter wheat (*Triticum aestivum* L.) (Reg. no. CV-883, PI 611137) was developed by the Illinois Agricultural Experiment Station of the University of Illinois and was released in 1998. Kaskaskia, named for the Kaskaskia River which flows through a major wheat producing region of Illinois, has excellent winter hardiness and high grain volume weight with a moderate level of tolerance to head scab (caused by *Fusarium graminearum* Schwabe). Kaskaskia is adapted to the Upper Midwest in the soft red winter wheat region of the United States.

Kaskaskia was developed from the cross: IL77-2933/IL77-3956//'Pike'/'Caldwell'. The pedigree of IL77-2933 is IL70-2255/CItr 13855//'McNair 48-23', the pedigree of IL77-3956 is 'Arthur'/'Blueboy'//TN 1571, and the pedigree of IL70-2255 is IL61U-213/CItr 13855. Kaskaskia was evaluated as experimental breeding line IL90-7514. After the final cross, the F_2 and F_3 generations were grown in the field as bulk populations. Heads were selected from the F_3 population, and the experimental breeding line IL90-7514 was selected in 1990 as an F_4 headrow. A single F_5 plot was grown and evaluated in 1991. Heads were selected from a single F_6 plot of IL90-7514 in 1992. A single F_7 headrow selected in 1993 was advanced to the F_8 in 1994, and individual heads were again selected. Forty-eight F_9 headrows were grown in 1995. Ten headrows that differed from the majority in appearance, maturity, or height were removed, and the remaining 38 headrows that were uniform in appearance were harvested in bulk to produce F_{10} Breeder seed in 1996.

The performance of Kaskaskia was evaluated in breeding nursery trials in Illinois from 1992 to 1998, in variety testing trials in Illinois from 1995 to 1999, and for 2 yr in the Uniform Eastern Soft Red Winter Wheat Nursery from 1996 to 1997. Kaskaskia averaged 4703 kg ha^{-1} over 57 tests in the 1996 and 1997 Uniform Eastern Soft Red Winter Wheat Nursery

compared with 4367 kg ha^{-1} for 'Cardinal'. Grain volume weight for Kaskaskia in the same tests was 752 kg m^{-3} compared with 714 kg m^{-3} for Cardinal. Averaged across 35 tests in Illinois from 1994 to 1999, Kaskaskia yielded 4952 kg ha^{-1} compared with 4179 kg ha^{-1} for Cardinal. Grain volume weight of Kaskaskia averaged 749 kg m^{-3} in 30 tests in Illinois from 1994 to 1999, compared with 698 kg m^{-3} for Cardinal in the same tests. On the basis of data from 48 locations in the 1996 and 1997 Uniform Eastern Soft Red Winter Wheat Nursery Kaskaskia is 2 cm taller than Cardinal (99 and 97 cm, respectively) and heads 1 d earlier than Cardinal.

Kaskaskia is moderately resistant to soil–borne wheat mosaic virus and wheat spindle streak mosaic virus (data collected at Urbana, IL). Kaskaskia is resistant to some races of leaf rust (caused by *Puccinia triticina* Eriks), but is susceptible to stem rust (caused by *Puccinia graminis, Pers.* f. sp. *tritici* Eriks. & Henn.) (data collected by the USDA-ARS Cereal Disease Lab at St. Paul, MN). Kaskaskia is also susceptible to most isolates of powdery mildew (caused by *Erysiphe graminis* DC. f. sp. *tritici* E. Marchal; syn. *Bluminia graminis*) (data collected by Steven Leath, USDA-ARS, Raleigh, NC). Tests conducted by the USDA-ARS Hessian Fly Laboratory at Lafayette, IN, indicated that Kaskaskia is susceptible to biotypes B, C, D, E, GP and L of the Hessian fly [*Mayetiola destructor* (Say)]. It has not been evaluated with other biotypes of Hessian fly.

Milling and baking quality data from the USDA-ARS Soft Wheat Quality Lab at Wooster, OH, indicate that the milling and baking quality of Kaskaskia is acceptable and, in general, is similar to Cardinal. Milling and baking quality of Kaskaskia was analyzed on samples from Illinois trials from 1991 to 1997 and on samples from the 1996 and 1997 Uniform Eastern Soft Red Winter Wheat Nursery (a total of 12 analyses). Flour yield of Kaskaskia has been low in some cases, but averaged 70.4% for Kaskaskia compared with 71.1% for Cardinal. Kaskaskia had an average flour protein of 8.6% compared with 9.6% for Cardinal. Alkaline water retention capacity averaged 57.7% for Kaskaskia compared with 54.9% for Cardinal. Softness equivalents of Kaskaskia averaged 56.8% compared with 56.1% for Cardinal, indicating that the hardness of Kaskaskia is similar to Cardinal. Cookie diameter (based on 10 analyses) averaged 17.7 cm for Kaskaskia compared with 17.6 cm for Cardinal.

Kaskaskia is an awned, white-chaffed, soft red winter wheat cultivar and is easily distinguished from many other awned soft red winter wheat varieties by a unique twisting of the flag leaves. The flag leaves of Kaskaskia are erect and twist and curl lengthwise. This curling is not a response to drought or heat stress; it occurs in the absence of heat and drought stress. Coleoptiles of Kaskaskia are white, and juvenile plant growth is prostrate. The stems of Kaskaskia do not have anthocyanin, but a waxy bloom is present. Stems are glabrous except that a few hairs may be present on the last internode. Anthers of Kaskaskia are yellow. Kaskaskia has mid-dense, strap heads. The glumes are long and wide and have oblique shoulders and acuminate beaks. Kernels of Kaskaskia are ovate with rounded cheeks and a medium length brush.

Kaskaskia is protected under the U.S. Plant Variety Protection Act (PVP Certificate no. 9800145). The generation sequence for seed production is restricted to the Foundation and Certified classes of seed; there is no Registered class of seed. Up to 0.5% variants, including tall variants, are allowed in Kaskaskia. Breeder seed of Kaskaskia will be maintained by the Illinois Agricultural Experiment Station, Urbana, Illinois 61801. Limited quantities of seed are available upon request from the corresponding author. Recipients are asked to make appropriate recognition of the source if Kaskaskia is used in the development of a new cultivar, germplasm, parental line, or genetic stock.

F.L. Kolb* and N.J. Smith (1)

References and Notes

1. F.L. Kolb and N.J. Smith, Department of Crop Sciences, University of Illinois, 1102 S. Goodwin Ave. Urbana, IL 61801. Registration by CSSA. Accepted 6 January 2000. Corresponding author (f-kolb@uiuc.edu).

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Registration of 'KY 86C-61-8' Wheat

'KY 86C-61-8' (Reg. no. CV- 884, PI 610260) is a soft red winter wheat (*Triticum aestivum* L. subsp. *aestivum*) developed by the Kentucky Agricultural Experiment Station. KY 86C-61-8 was released in 1998 for its excellent grain yield potential, early maturity, excellent winter hardiness, and high flour yield. KY 86C-61-8 was developed through a combination of pedigree and bulk breeding methods from the cross KY 84-65-3/KY 84-64-1. The respective pedigrees of these parental lines are: VA 66-24-10/'Bajio 66'//'Pontiac'/3/VA 68-22-7/'Coker 747' and Ark 39-3//'Coker 68-15'/VA 72-54-14. KY 86C-61-8 traces back to the selection of a single F_2 head, seeds from which were planted in an $F_{2:3}$ headrow. Individual $F_{2:3}$ heads were selected and grown as $F_{3:4}$ headrows. One of these headrows was harvested in bulk and advanced as a bulk until the F_7 generation. Approximately 100 heads were selected in the F_7, and planted back as $F_{7:8}$ headrows. Four $F_{7:9}$ progeny plots were evaluated in 1995, and one was selected to increase in the $F_{7:10}$ generation to produce Breeder Seed. KY 86C-61-8 was tested in Kentucky from 1991 to 1997 and in the USDA-ARS Uniform Eastern Soft Red Winter Wheat Nursery (UESRWWN) in 1996 and 1997.

KY 86C-61-8 is a white-chaffed, awnletted soft red winter wheat with midlong spikes and intermediate size kernels. It is early maturing, with a heading date similar to that of 'Patterson', ≈120 d after 1 January. KY 86C-61-8 is of intermediate height (≈91 cm), slightly taller than 'Foster' (≈88 cm). Winterhardiness of KY 86C-61-8 is similar to that of Patterson. In 4 yr of testing in the seven location Kentucky state variety trial, grain yield of KY 86C-61-8 averaged 4250 kg ha^{-1}, ≈113% of 'Clark', and 117% of 'Ernie'. Test weight of KY 86C-61-8 was 747 kg m^{-3}, slightly higher than that of 'Madison' (737 kg m^{-3}). In testing at the USDA Soft Wheat Quality Lab in Wooster, OH, KY 86C-61-8 has demonstrated outstanding flour yield. In the milling quality analyses of the 1996 and 1997 UESRWWN, average straight grade flour yield of KY 86C-61-8 was 72.6% compared with 69.7% for 'Caldwell', the long-term standard cultivar used by the lab.

In nursery trials throughout Kentucky, KY 86C-61-8 has shown moderate resistance to powdery mildew (caused by *Erysiphe graminis* DC. f. sp. *tritici* Ém. Marchal), Septoria leaf blotch (caused by *Septoria tritici* Roberge in Desmaz.), and glume blotch [caused by *Stagnospora nodorum* (Berk.) Castellani & E.G. Germano]. KY 86C-61-8 is resistant to some races of leaf rust (caused by *Puccinia triticina* Eriks.), in that it possesses *Lr3* and additional leaf rust resistance genes whose identity has not been resolved (D. Long, 1996 and 1997 UESRWWN summaries). KY 86C-61-8 is susceptible to barley yellow dwarf virus and to all biotypes of the Hessian fly [*Mayetiola destructor* (Say)].

The breeding research that generated this cultivar was supported in part by the Kentucky Small Grain Growers Association–Kentucky Small Grain Promotion Council. Seed classes of KY 86C-61-8 will be Breeder, Foundation, Registered, and Certified. Breeder Seed will be maintained by the Foundation Seed Project, Dep. of Agronomy, University of Kentucky, Lexington, KY 40546-0091. Small quantities of seed may be obtained from the corresponding author.

D.A. Van Sanford,* C.S. Swanson, B. Mijatovic, and C.R. Tutt (1)

References and Notes

1. D.A. Van Sanford, C.S. Swanson, B. Mijatovic, and C.R. Tutt, Dep. of Agronomy, Univ. of Kentucky, Lexington, KY 40546-0091. The investigation reported in this paper is in connection with a project of the Kentucky Agric. Exp. Stn. and is published with the approval of the director. Registration by CSSA. Accepted 29 Feb. 2000. *Corresponding author (agr038@pop.uky.edu).

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Registration of 'Kuell' Soybean

'Kuell' soybean [*Glycine max* (L.) Merr.] (Reg. no. CV-411, PI 608033) was developed by the Alabama Agricultural Experiment Station. It was released in 1999 because of its high yield potential in late-planted cropping systems and multiple pest resistance. Prior to release, Kuell was designated Au91-13.

Kuell originated as an F_5 single-plant selection from the cross N85-492/Co85-483. N85-492 is a selection from the cross N77-179/'Johnston' (2) and is of the same parentage as 'Holladay' (3). Co85-483 is a selection from the cross 'Coker 368'/'Coker 317'//D77-6103. D77-6103 is from the cross 'Centennial' (4)/J74-47 and is of the same parentage as 'Leflore' (5). The population was advanced by single-seed descent to the F_5 generation in Belize and Alabama.

Kuell was tested in the Uniform Soybean Tests, Southern States from 1994 through 1997 (7) and in Alabama tests from 1993 through 1997. Kuell is Maturity Group VIII averaging ≈3 d later than 'Maxcy' (6) and 5 d later than 'Cook' (1), and is adapted from approximately 30 to 33° north latitude. Kuell has determinate stem termination, purple flowers, gray pubescence, and brown pod walls. Seeds are yellow with light buff hila and dull seed coats. Seed quality score is equal to Cook, seed size is 8 mg less, protein content is 15 g kg^{-1} less, and oil content is 9 g kg^{-1} more than Cook. Plant height is ≈8 cm taller than Cook, and lodging score for Kuell is 2.2, compared with 1.9 for Cook.

Kuell is resistant to races 3 and 14 of the soybean cyst nematode (*Heterodera glycines* Ichinohe), resistant to southern root-knot nematode [*Meloidogyne incognita* (Kofoid and White) Chitwood], and resistant to frogeye leaf spot (caused by *Cercospora sojina* K. Hara) and is moderately susceptible to stem canker (caused by *Diaporthe phaseolorum* (Cooke and Ellis) Sacc. f. sp. *meridionalis* Morgan-Jones). In the Uniform Soybean Tests, Kuell yielded 0.8% more than Cook. In the late-planted Uniform Soybean Tests (eight environments), Kuell yielded 6.7% more than Cook. At least part of this yield advantage can be attributed to greater vegetative growth of Kuell. Lack of vegetative growth has been identified as a major yield-limiting factor in late-planted soybean.

The South Carolina Agric. Exp. Stn. participated in the release of Kuell. Breeder Seed will be maintained by the Alabama Agric. Exp. Stn. A small sample of Kuell seed will be available upon written request to the corresponding author for at least 5 yr. Application for U. S. Plant Variety Protection has not been made for Kuell.

D.B. Weaver,* R. Rodriguez-Kabana, and R.R. Sharpe (8)

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Registration of 'Musen' Soybean

'Musen' soybean [*Glycine max* (L.) Merr.] (Reg. no. CV-409, PI 599333) was developed by the South Carolina Agriculture and Forestry Research System (SCAFRS) and cooperatively released by the SCAFRS and North Carolina and Oklahoma Agricultural Experiment Stations in March 1997 because of its multiple pest resistance traits and excellent seed yields. The cultivar is named in honor of retired Clemson University agronomist, Dr. Harold L. Musen.

Musen was derived from an F_4 plant selection composited in the F_5 from the cross 'Hutcheson'/'Leflore' (3,4) made at Clemson, SC, in 1986. The F_1 plants were grown at Isabela, PR, in the winter of 1986, and the F_2 to F_4 generations were advanced by single-seed descent (pod-bulk method) in South Carolina and Puerto Rico during 1987 and 1988. Preliminary evaluations of agronomic traits, nematode resistance, and seed yield were conducted in South Carolina in 1990 and 1991. Musen, previously identified as SC89-181, has been evaluated in South Carolina Official Variety Tests from 1992 to 1998 and in the USDA Southern Uniform Regional Tests for nematode and disease resistance and agronomic performance from 1992 to 1995 (5,8). Single plants were harvested in 1993 and F_9 (F_8-derived) plant rows were evaluated in 1994 for uniformity for flower color, pubescence color, maturity, and plant appearance. Seed from 119 rows that appeared uniform and true to type was bulked and increased to produce Breeder Seed.

Musen is a late, Maturity Group VI cultivar that matures 3 to 5 d later than 'Brim' (2,8). It is adapted to the southern USA where Maturity Group VI cultivars are normally grown. In USDA tests, it averaged 5 cm shorter than Brim and has a similar rating for lodging resistance (8). Musen has white flowers, gray pubescence, tan pod walls, and determinate growth habit. Seeds are yellow with buff hila that vary in intensity from light to dark. Seed size of Musen is relatively small and averages 12.1 g 100^{-1} seed compared with 12.8 g 100^{-1} seed for Brim. Seed quality is good and seed protein and oil average 411 and 201 g kg^{-1}, respectively, compared with 427 and 202 g kg^{-1} for Brim (dry wt. basis), (8). Musen is resistant to races 3 and 14, soybean cyst nematode (*Heterodera*

glycines Ichinohe), southern root-knot nematode [*Meloidogyne incognita* (Kofoid & White) Chitwood], and stem canker disease [caused by *Diaporthe phaseolorum* (Cooke and Ellis) Sacc. f. sp. *meridionalis* Morgan-Jones] (8). It is susceptible to frogeye leaf spot disease (caused by *Cercospora sojina* K. Hara) (6).

Musen combines multiple pest resistance traits with excellent seed yields. In USDA Uniform Regional Tests, it has performed best in the Southeast, East Coast, and West Regions. Across 23 environments in the Southeast Region, during 1993 to 1995, mean seed yield of Musen (2923 kg ha^{-1}) exceeded that of Brim (2815 kg ha^{-1}) by 4% (8). In South Carolina Official Variety Tests (1993–1995), Musen averaged 3124 kg ha^{-1} across two Coastal Plain locations, slightly exceeded the yield of Brim, and ranked second only to 'Dillon' (7) (3171 kg ha^{-1}) among 14 entries (1).

Breeder Seed was released to the South Carolina Foundation Seed Association for planting in 1996. The South Carolina Agriculture and Forestry Research System will be responsible for the maintenance of Breeder Seed. A small quantity of seed for research purposes is available for at least five years from the corresponding author. U.S. plant variety protection of Musen has been granted (PVP Certificate no. 9700396), Title V option, permitting only Foundation and Certified classes beyond Breeder Seed.

E.R. Shipe,* J.D. Mueller, S.A. Lewis, P.F. Williams, Jr., and J.P. Tomkins (9)

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Registration of 'Motte' Soybean

'Motte' soybean [*Glycine max* (L.) Merr.] (Reg. no. CV-410, PI 603953) was developed and released by the South Carolina Agriculture and Forestry Research System in April 1998 because of its multiple pest resistance traits and improved seed yield compared with other cultivars of similar maturity.

Motte traces to a single-plant selection in the F_4 generation from the cross 'A6785'/'Coker 6738' (previously tested as Co82-645) (5,6). The cross was made at Clemson, SC, in 1986. The F_1 generation was grown in Puerto Rico in the winter, 1986-1987. The F_2 to F_4 generations were advanced by single-seed descent (pod-bulk method) in South Carolina and Puerto Rico during 1987 and 1988. The strain was composited in the F_5 generation in 1989. Preliminary evaluations of agronomic traits and resistance to nematodes were conducted in South Carolina in 1990 and 1991. Motte, previously identified as SC89-551, has been evaluated in South Carolina Official Variety Tests from 1992 to 1998 (1) and in the USDA Southern Uniform Regional Tests for nematode and disease resistance and agronomic performance from 1992 to 1995 (8). One hundred twenty-five single plants were harvested in 1994 and F_{10} (F_9-derived) plant rows were evaluated in 1995 for uniformity for flower color, pubescence color, maturity, and plant appearance. Seed from 82 rows that appeared uniform and true to type for agronomic traits and resistance to soybean cyst nematode (SCN) race 3 (*Heterodera glycines* Ichinohe) was bulked and increased to produce Breeder Seed.

Motte is a Maturity Group VIII strain and matures 2 to 4 d later than 'Maxcy' (7,8). It has determinate growth habit and is adapted to the southern USA where Maturity Group VIII cultivars are normally grown. In USDA tests, it averaged 5 cm taller than Maxcy and has a slightly higher rating for lodging resistance (8). Plants have purple flowers, tawny pubescence, and tan pod walls. Seeds are yellow with black hila that vary in intensity from light to dark. Seed size of Motte averages 14.3 g 100 seed^{-1} compared with 14.7 and 15.8 g 100 seed^{-1} for Maxcy and 'Cook' (4), respectively (8). Seed quality ratings are similar to Maxcy, but seed mottling may occur in some years. Seed protein and oil average 412 and 207 g kg^{-1} seed, respectively, compared with a corresponding 420 and 205 g kg^{-1} seed for Maxcy (dry wt. basis). Seed yields of Motte were comparable with Cook and exceeded Maxcy by 4% in USDA Southern Uniform Regional Tests (1993–1995) (8). In South Carolina Official Variety Tests (1994–1996), Motte exceeded the yield of Maxcy by 7% and Cook by 10% and was the highest yielding Group VIII entry, averaging 2889 kg ha^{-1} across two Coastal Plain locations (2). In a field where soybean cyst nematode and southern root- knot nematode [*Meloidogyne incognita* (Kofoid & White) Chitwood] are yield limiting factors, Motte averaged 46% higher in yield than 'Braxton' (PI 548659) (3), which is susceptible to SCN. Motte averaged 36% higher in yield (5-yr mean) than highly intolerant Braxton in a field infested with Columbia lance nematode (*Hoplolaimus columbus* Sher).

Motte is resistant to southern root-knot nematode, SCN race 3, reniform nematode (*Rotylenchulus reniformis* Linford & Oliveira), and stem canker [caused by *Diaporthe phaseolorum* (Cooke and Ellis) Sacc. f. sp. *meridionalis* Morgan-Jones] (8). It has a moderate level of resistance to peanut root-knot nematode [*Meloidogyne arenaria* (Neal) Chitwood] (8). It is susceptible to soybean mosaic virus.

Breeder Seed was released to the South Carolina Foundation Seed Association for planting in 1997. The South Carolina Agriculture and Forestry Research System will be responsible for the maintenance of Breeder Seed. A small quantity of seed for research purposes is available for at least 5 yr from the corresponding author. U.S. plant variety protection of Motte has been applied for (PVP Certificate no. 9800254), Title V option, permitting only Foundation and Certified classes beyond Breeder Seed.

E.R. Shipe,* J.D. Mueller, S.A. Lewis, P.F. Williams, Jr., and J.P. Tomkins (9)

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Registration of 'CP 89-1509' Sugarcane

'CP 89-1509' sugarcane (a complex hybrid of *Saccharum officinarum* L., *S. barberi* Jeswiet, *S. Spontaneum* L., and *S. sinense* Roxb. emend. Jeswiet) (Reg. no. CV-111, PI 612672) was selected from progeny of a polycross that had 'CP 80-1827' (1) as the female parent and was made at Canal Point, FL, in December 1986. CP 89-1509 was developed through cooperative research by the USDA-ARS, the Institute of Food and Agricultural Sciences of the University of Florida, and the Florida Sugar Cane League, Inc., and was released in the fall of 1998.

CP 89-1509 stalks, when exposed to the sun, are brownish, but light green under the leaf sheath. It has a prominent wax ring immediately below the node, and the bud does not extend above the growth ring. Average stalk weight of CP 89-1509 was 1.12 kg compared with 1.03 kg for CP 70-1133(2) and 1.30 kg for CP 73-1547(3).

CP 89-1509 is being released for production on sand soils only and was not evaluated on organic soils. CP 89-1509 had 10% higher average cane yields than CP 70-1133 and was similar to the cane yield of CP 73-1547, when evaluated across three crops at two locations. Average sugar content of CP 89-1509 was 4% higher than CP 70-1133 and 7% higher than CP 73-1547. Average sugar yields for CP 89-1509 were 26% higher than CP 70-1133 but were only 9% higher than CP 73-1547. The economic index (4) for CP 89-1509 was 1107 compared with 894 for CP 70-1133 and 917 for CP 73-1547.

CP 89-1509 has shown resistance in Florida to sugarcane mosaic virus; eye spot [caused by *Bipolaris sacchari* (E.J. Butler) Shoemaker]; and rust (caused by *Puccinia melanocephala* Syd. & P. Syd.). CP 89-1509 has shown moderate susceptibility to leaf scald [caused by *Xanthomonas albilineans* (Ashby) Dowson] in commercial plantings. Preliminary surveys indicate that CP 89-1509 has lower incidence of sugarcane yellow leaf virus than most commercial cultivars. CP 89-1509 is susceptible to ratoon stunting disease (caused by *Clavibacter xyli* subsp. *xyli* Davis et al.). The fiber content of CP 89-1509 was 10.16%, compared with 10.37% for CP 70-1133 and 9.44% for CP 73-1547.

Seedcane of CP 89-1509 will be maintained by the USDA-ARS at the Sugarcane Field Station, Canal Point, FL, for 5 yr. U.S. plant variety protection of CP 89-1509 will not be applied for.

P.Y.P. Tai, B. Glaz, J.D. Miller,* J.M. Shine, Jr., J.E. Follis, and J.C. Comstock (5)

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Registration of 'Maier' Durum Wheat

'Maier' (Reg. no. CV-885, PI 607531), spring durum wheat [*Triticum turgidum* L. var. *durum* (Desf.) Husn.] was developed by the North Dakota Agricultural Experiment Station in cooperation with USDA-ARS and officially released on 5 Nov. 1998. Maier was tested as D89135 and was selected from the cross D8193/D8335 made in 1985 by R.G. Cantrell. The parent D8193 was derived from the cross D68111/'Rugby'//'Crosby'/3/'Vic'. D68111 was derived from the cross D65150/'Leeds'. D65150 was derived from the cross Pi//'Tomclair'//2* 'Tehuacan'/3/ 'Zenati Bouteille'/'Wells'. The pedigree of D8335 is 'Wascana'/'Rolette'//Vic. Maier was developed using the pedigree method and was bulked in the F_5 generation as an F_4-derived line in 1989. Maier was named in honor of the late Mel Maier, North Dakota State Wheat Commission Administrator. Maier was tested for agronomic and quality traits at 52 location–years from 1993 to 1997. Maier was released because of its high protein concentration, large kernels, very strong gluten, and for maintaining as high a level of grain yield as 'Ben' (4) and 'Renville' (1).

Maier is a daylength-sensitive durum wheat that is similar in heading date to Ben (60.4 d) and 3 d later than 'Monroe' (2). Maier's plant height averages 85.5 cm, which is 4.1 cm shorter than Ben and 17.7 cm taller than the semidwarf cultivar Lloyd (3). The culms are white and the peduncle is slightly recurved. Maier's spikes are midlong, awned, oblong, laxative, and erect. The awns are white and 14 to 16 cm in length. The glumes are glabrous, white, long, and wide. The kernels are amber, hard, long, and elliptical; the germ is midsized; the crease is midwide and shallow; and the brush is absent.

Grain yield of Maier (3467.0 kg ha^{-1}) was similar to Ben and Renville, based on 52 location–years of testing in the Uniform Regional Durum Nursery from 1993 to 1997. Maier had a 3.5% lower yield than Ben (3090.7 kg ha^{-1}) and similar yield to Renville (2983.2 kg ha^{-1}), based on 26 location–years in the North Dakota Research Extension Centers' varietal trials from 1993 to 1997. Maier had 753.5 kg m^{-3} grain volume weight and 38.2-mg kernel weight when tested at 52 location–years in the Uniform Regional Durum Nursery. Maier has 12.9 kg m^{-3} grain volume weight and 2.5-mg kernel weight lower than Ben.

Based on 23 location–years in North Dakota field plots (1993–1996), the semolina extraction rate of Maier (60.4%) on the Buhler-Miag laboratory mill at the Department of Cereal Sciences, North Dakota State University, is similar to Ben and Renville. Other milling characteristics and spaghetti color were favorable. Maier has very strong gluten mixing characteristics (classification: 6.6) as estimated by mixograph, stronger than Ben and Renville (classification: 6.2 and 5.7, respectively). Semolina protein of Maier was 141 g kg^{-1}, which is higher than Ben (136 g kg^{-1}) and Renville (135 g kg^{-1}).

Maier was evaluated at the USDA-ARS, Northern Crop Science Laboratory, Fargo, ND, for wheat stem rust (caused by *Puccinia graminis* Pers.:Pers. f. sp. *tritici* Eriks. & E. Henn) and was found to be highly resistant to pathotypes Pgt-QCC, -QTH, -RTQ, -RCR, -TML, -TPM, and -HPH. Maier's adult plant resistance in the field to leaf rust (caused by *P. triticina* Eriks.) is high (10R) and is similar to Vic and Renville. Maier has a moderate level of resistance to tan spot [caused by *Pyrenophora tritici-repentis* (Died.) Drechs]. Maier is moderately susceptible to Fusarium head blight [caused by *Fusarium graminearum* Schwabe; teleomorph *Gibberella zeae* (Schwein.) Petch].

Breeder seed will be maintained by the Seedstocks Project, Agricultural Experiment Station, North Dakota State Univ., Fargo, ND 58105-5051. U.S. plant variety protecton of Maier has been applied for (PVP Certificate no. 9900265) for Foundation, Registered, and Certified seed.

E.M. Elias* and J.D. Miller (5)

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Registration of 'Mountrail' Durum Wheat

'Mountrail' (Reg. no. CV-886, PI 607530), spring durum wheat [*Triticum turgidum* L. var. *durum* (Desf.) Husn.] was developed by the North Dakota Agricultural Experiment Station in cooperation with USDA-ARS and officially released on 5 Nov.1998. Mountrail was tested as D901313 and was selected from the cross D8479/'Renville' (1) made in 1987 by R.G. Cantrell. The parent D8479 was derived from the cross D7984/D7926//D7982/D79155. D7982 and D7984 were derived from the cross D6973/'Ward'//D74110. D6973 was derived from the cross D65150/D65151. D65150 was derived from the cross Pi//'Tomclair'//2* 'Tehuacan'/3/'Zenati Bouteille'/'Wells'. The pedigree of D65151 is 'Stewart'//ld 379/ld357/3/Dw F_4/'Langdon'/4/'Leeds'. D74110 was derived from the cross 'Edmore'/Ward. The pedigree of D7926 is D7456/'Vic'. D7456 was derived from the cross D6771/'Rugby'. The pedigree of D6771 is 'Stewart 63'//ld 393/Stewart. D79155 was derived from the cross D7224/'Calvin'. The pedigree of D7224 is D6530/D6654. D6530 was derived from the cross 561/'Cappelli'. D6654 was derived from the cross D61130/Leeds. D61130 was derived from the cross 'Lakota'//Dw F4/Langdon. Mountrail was developed using the pedigree method and was bulked in the F_5 generation as an F_4-derived line in 1990. Mountrail was named after the largest durum-producing county in North Dakota.

Mountrail was tested for agronomic and quality traits at 39 location–years from 1994 to 1997. Mountrail was released because of its high yield and good quality. Mountrail is a daylength-sensitive durum wheat that is 1.1 d later in heading date than 'Ben' (3) (57.3 d). Mountrail's plant height averages 84.2 cm and is 3.8 cm shorter than Ben and 14.1 cm taller than the semidwarf cultivar Lloyd (2). The culms are white and the peduncle is slightly recurved. Mountrail's spikes are midlong, awned, oblong, middense, and erect. The awns are white and 12 to 13 cm in length. The glumes are glabrous, white, long, and wide. The kernels are amber, hard, long, and elliptical; the germ is midsized; the crease is midwide and shallow; and the brush is absent.

Grain yield of Mountrail (3796 kg ha^{-1}) was 7.4 and 6.6% higher than Ben and Renville, respectively, based on 39 location–years of testing in the Uniform Regional Durum Nursery from 1994 to 1997. Mountrail had a 6.3% higher mean yield than Ben and Renville (3003 kg ha^{-1}) based on 25 location–years in the North Dakota Research Extension Centers' varietal trials from 1994 to 1997. Mountrail had 765.1 kg m^{-3} grain volume weight and 38.1-mg kernel weight when tested at 39 location–years in the Uniform Regional Durum Nursery. Mountrail has 11.6 kg m^{-3} grain volume weight and 2.7-mg kernel weight lower than Ben.

Based on 18 location–years in North Dakota field plots (1994–1996), the semolina extraction rate of Mountrail (60.1%) on the Buhler-Miag laboratory mill at the Department of Cereal Sciences, North Dakota State University, is similar to Ben and Renville. Other milling characteristics and spaghetti color were favorable. Mountrail has strong gluten mixing characteristics (classification: 5.4) as estimated by mixograph, weaker than Ben and Renville (classification: 6.3 and 5.6, respectively). Semolina protein of Mountrail was 136 g kg^{-1}, which is similar to Ben and Renville.

Mountrail was evaluated at the USDA-ARS, Northern Crop Science Laboratory, Fargo, ND, for wheat stem rust (caused by *Puccinia graminis* Pers.:Pers. f. sp. *tritici* Eriks. & E. Henn) and was found to be highly resistant to pathotypes Pgt-QCC, -QTH, -RTQ, -RCR, -TML, -TPM, and -HPH. Mountrail's adult plant resistance in the field to leaf rust (caused by *P. triticina* Eriks.) is high (10R) and is similar to Ben and Renville. Mountrail has a moderate level of resistance to tan spot [caused by *Pyrenophora tritici-repentis* (Died.) Drechs]. Mountrail is moderately susceptible to Fusarium head blight [caused by *Fusarium graminearum* Schwabe; teleomorph *Gibberella zeae* (Schwein.) Petch].

Breeder seed will be maintained by the Seedstocks Project, Agricultural Experiment Station, North Dakota State Univ., Fargo, ND 58105-5051. U.S. plant variety protection of Mountrail has been applied for (PVP Certificate no. 9900266) for Foundation, Registered, and Certified seed.

E.M. Elias* and J.D. Miller (4)

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Registration of 'Harding' Wheat

'Harding' hard red winter wheat (*Triticum aestivum* L. subsp. *aestivum*) (Reg. no. CV-887, PI 608049) was developed by the South Dakota Agricultural Experiment Station and released to seed producers in the fall of 1999. Harding has excellent winter survival ability, a very broad disease resistance package, and superior yield performance compared with available cultivars in its maturity range. Harding was named after a county in northwest South Dakota where winter survival ability is especially important for successful winter wheat production.

Harding was selected as an $F_{5:6}$ line from the cross 'Brule'// 'Bennett'/'Chisholm'/3/'Arapahoe' made in 1986 by Dr. Jeffrey L. Gellner. The cross X86209 was advanced without deliberate selection to the F_5 generation by bulking successive generations. Breeder seed originated from a composite of approximately 600 F_{10}-derived head-rows selected for glume color uniformity in 1996-1997. Harding was identified as experimental line SD92107 in 1992 and has been tested in the South Dakota Crop Performance Testing (CPT) Variety Trial since 1996 and the Northern Regional Performance Nursery (NRPN) from 1996 to 1998.

Harding is an awned, red-glumed, medium-late maturity, standard-height hard red winter wheat. Harding is a medium-late maturity wheat (152 d to heading from 1 Jan.), ≈3 d earlier than Seward, 1 d earlier than Roughrider, 2 d later than Arapahoe, and 5 d later than Nekota. Plant height of Harding is tall (97 cm), 5 cm shorter than Roughrider, 5 cm taller than Arapahoe, and 13 cm taller than Nekota. Harding is resistant or moderately resistant to prevalent races (TPM, QFB, QFC, RKQ, RTQ) of stem rust (caused by *Puccinia graminis* Pers.:Pers. f. sp. *tritici* Eriks & E. Henn.), leaf rust (caused by *Puccinia triticina* Eriks.; syn *Puccinia recondita* Roberge ex Desmaz.), tan spot [caused by *Pyrenophora tritici-repentis* (Died.) Drechs.], septoria leaf blotch (caused by *Septoria tritici* Roberge in Desmaz.), and wheat streak mosaic virus. In 1998 and 1999, field ratings of reaction to common root rot [caused by *Fusarium* spp. and *Bipolaris sorokiniana* (Sacc.) Shoemaker] and head scab (caused by *Fusarium graminearum* Schwabe) suggested some degree of tolerance to both of these pathogens. Harding is heterogeneous for resistance to the Great Plains biotype of Hessian fly [*Mayetiola destructor* (Say)] (data provided by USDA-ARS Plant Science and Entomology Research Unit, Manhattan, KS). The coleoptile length of Harding is average (similar to Arapahoe) and the straw strength is fair (slightly less than Arapahoe).

Table 1. Mean milling and breadmaking characteristics of Harding, Scout 66, and Arapahoe across four composite quality evaluations from the South Dakota Advanced Yield Trial, 1995 to 1998.

Trait	Harding	Scott 66	Arapahoe
Grain volume weight, kg m^{-3}	755.5	764.5	749.0
Percent large kernels, %†	55.6	62.7	53.0
Kernel weight, mg	31.7	31.8	29.1
SKCS kernel hardness‡	67.5	59.0	61.0
Flour ash, g kg^{-1}	4.5	4.3	4.4
Flour extraction, g kg^{-1}	639	684	679
Flour protein content, g kg^{-1}	116	115	113
Water absorption, g kg^{-1}	661	667	650
Bake mix time, min	5.4	4.3	5.8
Mixograph tolerance§	3.8	3.8	4.0
Loaf volume, L	0.93	0.92	0.85
Crumb grain score¶	3.3	3.4	3.4

† Percentage of kernels that do not pass through a Tyler #7 Sieve (2.92–mm openings).
‡ Single kernel characterization system (SKCS) hardness index value.
§ Mixograph tolerance score: 6 = outstanding, 0 = unsatisfactory.
¶ Crumb grain score: 6 = outstanding, 0 = unsatisfactory.

In 4 yr of statewide testing in the South Dakota CPT (1996–1999; 39 environments), Harding (3903 kg ha^{-1}) was lower yielding than '2137' (4193 kg ha^{-1}), 'Alliance' (4065 kg ha^{-1}), and Arapahoe (4065 kg ha^{-1}), similar in yield to 'Nekota' (3923 kg ha^{-1}), but higher yielding than cultivars with similar maturity and winter survival ability, including 'Crimson' (3837 kg ha^{-1}), 'Seward' (3675 kg ha^{-1}), 'Elkhorn' (3467 kg ha^{-1}), and 'Roughrider' (3286 kg ha^{-1}). For this same testing period, at locations where winter injury was an important consideration for yield performance (13 sites), Harding (4267 kg ha^{-1}) was the highest yielding entry, greater than Crimson (3790 kg ha^{-1}), Elkhorn (3750 kg ha^{-1}), Roughrider (3682 kg ha^{-1}), and Seward (3548 kg ha^{-1}). Winter survival estimates from replicated trials at seven locations in 1995-1996 and 1996-1997 suggest that the winter survival ability of Harding (73% survival) is very good, similar to Roughrider (75% survival) and Elkhorn (75% survival) and superior to 'Scout 66' (59% survival), 'TAM 107' (54% survival), and 'Jagger' (36% survival).

Composite milling and breadmaking data (Table 1) (provided by the USDA-ARS Hard Winter Wheat Quality Laboratory, Manhattan, KS) from the South Dakota Advanced Yield Trial (1995–1998) identified Harding as a wheat with overall below-average milling characteristics, including average grain volume weight, above-average kernel weight, average kernel hardness scores, above-average flour ash, and below-average flour extraction. Bread-baking tests from these nurseries identified Harding as a wheat with overall above-average baking characteristics, including above-average flour protein content, above-average water absorption, average mixing time, above-average mixing tolerance, and above-average loaf volume. Crumb grain characteristics from experimental and commercial baking tests have been rated as good.

The South Dakota Foundation Seed Division (Plant Science Department, South Dakota State University, Brookings, SD 57007) had Foundation seed of Harding available to seed producers for planting in fall 1999. The seed classes will be Breeder, Foundation, Registered, and Certified. Harding will be submitted for plant variety protection under P.L. 910577 with the certification option. Small quantities of seed for research purposes may be obtained from the corresponding author for at least 5 yr from the date of this publication.

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Kalsbeck, C. Stymiest, J. Rickertsen, R. Little, B.E. Ruden, Plant Science Dep., South Dakota State Univ., Brookings, SD 57007; O.K. Chung and B.W. Seabourn, USDA/ARS/Grain Marketing and Production Research Center/Hard Winter Wheat Quality Laboratory, 1515 College Ave., Manhattan, KS 66502; D.V. McVey, USDA-ARS and Dep. of Plant Pathology, Univ. of Minnesota, St. Paul, MN 55108; J. H. Hatchett, USDA-ARS and Dep. of Entomology, Kansas State Univ., Manhattan, KS 66506. Harding was developed with partial financial support from the South Dakota Wheat Commission and South Dakota Crop Improvement Association. Contribution no. 3158 from the South Dakota Agricultural Experiment Station. Registration by CSSA. Accepted 30 Apr. 2000. *Corresponding author (shaley@lamar.colostate.edu).

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Registration of 'Burton' Oat

'Burton' spring oat (*Avena sativa* L.) (Reg. no. CV-363, PI 610257) was developed at the Ohio Agricultural Research and Development Center (OARDC), The Ohio State Univ., and released in 1996. Burton was developed from the cross 'Random'/ 'Jaycee' // 'Orbit' / 'Noble'. It originated in 1984 as a single panicle selection from an F_6 bulk population acquired from the USDA-ARS oat breeding and research program located at The Pennsylvania State University. Burton traces to 35 uniform panicles reselected from the F_{13} generation at the OARDC in 1991. Seed from progeny rows, selected for uniformity of plant type in 1992 and 1993 and bulked following the 1993 harvest, comprised Breeder seed. Burton was released because of its high grain yield potential and improved grain volume weight relative to 'Ogle' and 'Armor', two popular oat cultivars in Ohio.

Burton was evaluated under the designation OH1055 in statewide yield trials in Ohio from 1992 through 1996 and was evaluated in the Uniform Midseason Oat Performance Nursery (UMOPN) in 1992 through 1994. Summarized across the 3 yr, the yield for Burton exceeded Ogle by an average of 6% in the UMOPN. In 25 yield trials throughout Ohio, the yield of Burton was similar to Armor, but exceeded Ogle by 13% and 'Noble' by 20%. Burton is midseason in maturity. In Ohio, it was equal to Armor in maturity, but averaged 2 d later than Ogle and Noble. In 26 tests across 5 yr, the plant height of Burton averaged 90 cm, and was 4 cm taller than Ogle and 3 cm taller than Armor. Burton exceeds Ogle and Armor in grain volume weight by 4.0% and 4.6%, respectively. Straw strength (as measured by lodging percentage) is acceptable, with an average lodging score in Ohio of 13.3%, compared with 10.7% for Ogle and 8.2% for Armor.

Based on Barley Yellow Dwarf Virus (BYDV) tolerance evaluations from 1992 through 1994 at Urbana, IL; Wooster, OH; West Lafayette, IN; and Columbia, MO, Burton was more tolerant to BYDV than Noble and similar to Ogle and Armor for that trait. Burton has shown resistance to loose smut [caused by *Ustalago avenae* (Pers.) Rostr.] in tests conducted at Urbana, IL; St. Paul, MN; Madison, WI; and Winnipeg, Manitoba, in 1992 and 1993. It is susceptible to prevalent races of crown rust (caused by *Puccinia coronata* Corda var. *avenae* W.P. Fraser & Ledingham), showing reactions similar to Ogle for this disease. Based on performance in the UMOPN, Burton will perform best in areas with low crown rust incidence.

Burton's juvenile growth habit is semiprostrate. Culms are medium in diameter, and culm and leaf margins are glabrous. Ligules are present. Panicles are equilateral with ascending branches. Spikelet separation is by fracture, and floret separation is by abscission. Lemmas are yellow and glabrous. Basal hairs are absent. Secondary floret rachilla segments are glabrous and midlong. The seed is nonfluorescent under ultraviolet light, with fluorescent variants occurring at <1.5%. Awns are nontwisted and average 20 mm in length when present. Kernels are bright yellow, medium-sized, plump, and finely tapered at the tips.

Limited quantities of seed for research are available upon request from the senior author. Recipients of seed are asked to make appropriate recognition of the source of Burton if it is used in the development of a new cultivar, germplasm, parental line, or genetic stock. Production of Foundation, Registered, and Certified seed will be permitted beyond Breeder seed. Breeder seed of Burton will be maintained by The Ohio State University, Ohio Agricultural Research and Development Center, 1680 Madison Avenue, Wooster, OH 44691-4096. U.S. plant variety protection for Burton will not be applied for.

R.W. Gooding,* L.D. Herald, and H.G. Marshall (1)

References and Notes

1. R.W. Gooding and L.D. Herald, Dep. of Horticulture and Crop Science, Ohio Agric. Res. and Development Ctr., The Ohio State Univ., Wooster, OH 44691-4096; H.G. Marshall, Adjunct Professor of Plant Breeding, USDA-ARS (retired) and The Pennsylvania State University, University Park, PA 16802. Salaries and research support were provided by state and federal funds appropriated to The Ohio State Univ., Ohio Agric. Res. and Development Ctr. Registration by CSSA. Accepted 30 Apr. 2000. *Corresponding author (gooding.1@osu.edu).

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Registration of 'Heera' Chickpea

'Heera' chickpea (*Cicer arietinum* L.) (Reg. no. CV-177, PI 612246) was developed by Agriculture Western Australia's chickpea breeding team. It is a widely adapted desi chickpea cultivar suitable for medium to high rainfall areas in Australia. It was released by Agriculture Western Australia in July 1997.

Heera originated from ICC 14880, an accession received from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, India, in 1992. Single plants were selected for uniformity, flowering time, seed coat color, and seed size in 1994 from field plots. Seed from individual plants were planted in separate rows in a summer nursery at Manjimup in Western Australia (WA) in 1995. Nonuniform plants were removed from plots. Seed from uniform plants were bulked and planted in 1995 and 1996 in seed production nurseries at Kununurra in WA.

Heera was tested in more than 30 trials between 1993 and 1998 at various sites in WA. It produces 10 to 15% greater yield when compared with 'Tyson' in the medium (350–450 mm) and low rainfall (<350 mm) areas of WA, with a greater yield potential in areas of medium rainfall (1). The plant has an early branching habit, is semi-erect and is medium to tall in height (665 mm). The primary branches are erect and average about four per plant. The stem is woody and anthocyanin pigmentation is absent to weak.

Leaves are large (23 mm long by 7.5 mm wide) and light to medium green. The plant produces purplish pink (0.7% white) flowers, which have medium to long peduncles. Pods are medium to large, have a short beak, are medium green, and average 1.6 ovules. Seeds are medium to large (17–20 g 100 seed^{-1}), have an angular shape and medium ribbing. Seed coat color at maturity is dark beige. The intensity of color fades with age. Heera starts to flower ≈95 d after sowing in WA compared with 107 and 109 d for Tyson and 'Dooen', respectively. It is susceptible to ascochyta blight, caused by *Ascochyta rabiei* (Pass.) Labr.

Seed of Heera is maintained and can be obtained for re-

search programs through the Pulse Improvement Program, Agriculture Western Australia, Baron-Hay Court, South Perth, Western Australia.

T.N. Khan* and K.H.M. Siddique (2)

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2. T.N. Khan and K.H.M. Siddique, Crop Improvement Institute, Agriculture Western Australia, Locked Bag 4, Bentley Delivery Centre, WA, 6983, Australia. Registration by CSSA. Accepted 30 Apr. 2000. *Corresponding author (tkhan@agric.wa.gov.au).

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Registration of 'Picasso' Tall Fescue

'Picasso' tall fescue (*Festuca arundinacea* Schreb.) (Reg. no. CV-82, PI 610190) was developed by Lebanon Seaboard, Inc., Lebanon, PA, using germplasm obtained from the New Jersey Agricultural Experiment Station of Rutgers University. Picasso was released in September 1998 by Lebanon Seaboard. It was evaluated under the experiment designation LTP-501.

Picasso is an advanced generation synthetic cultivar selected from the maternal progenies of 96 clones. Many clones with similar phenotype served as additional pollen parents. Its parental germplasm traces to plants selected from old turfs in the USA beginning in 1962 and to plants selected from or related to 'Rebel' (1). Attractive plants were selected from old turfs in Birmingham, AL; Athens, Atlanta, and Milledgeville, GA; Preston, ID; Lexington, KY; Baltimore, MD; northern Mississippi; eastern North Carolina; Cincinnati, OH; Philadelphia, PA; Dallas, TX; and eastern Virginia. All produced large patches of turf in stressful environments, indicating that they had developed and persisted for a period of many years. The best selections were very different from any tall fescue in commercial use at the time of collection. They produced lower-growing turfs with finer leaves, greater density, darker color, and better persistence under frequent close mowing.

Plants were evaluated in spaced-plant nurseries, mowed clonal evaluation tests, and single-plant progeny trials maintained as turf. Intercrosses of the best performing plants were subjected to varying numbers of cycles of phenotypic and genotypic selection. Plants related to Rebel and plants from a continuing collection program were added to this breeding program as appropriate. Each cycle of selection showed progress in producing lower-growing, darker green, more attractive plants with improved turf performance scores, finer leaves, increased shoot density, and increased persistence under close mowing.

Maternal progenies of 41 clones showed excellent performance and good resistance to net blotch [caused by *Drechslera dictyoides* (Drechs.) Shoemaker] in turf trials at Rutgers University. A total of 3616 plants were selected from turf plots seeded to these progenies during the late winter of 1996. From this population, 3008 plants were subsequently selected for transplanting in a spaced-plant nursery at the Plant Science Research Farm at Adelphia, NJ. Approximately 25% of the plants were removed from this nursery prior to anthesis in late May. Selection was based on an attractive dark-green color, medium-low growth, medium reproductive maturity at anthesis, relative freedom from disease, large spikelets, and a high number of reproductive tillers. Seed was harvested from 96 plants showing excellent floret fertility. This seed was bulked and used for turf performance tests and to establish an experimental seed increase field in western Oregon. Plants that were tall, light colored, or showed excessive disease were removed. Foundation seed was harvested from the remaining plants.

Picasso is an attractive, dark-green, low-growing, uniform, turf-type tall fescue. It has shown excellent performance in turf trials in New Jersey (2).

Picasso was developed for use on home lawns, sports fields, conservation areas, school grounds, and industrial sites in regions where tall fescue is adapted for turf use. It can be used in blends with other lower-growing, dark-green cultivars of tall fescues or in mixtures with Kentucky bluegrasses (*Poa pratensis* L.) that perform well under low maintenance.

Certified seed production of Picasso is restricted to three generations of increase from Breeder seed; one each of Foundation, Registered, and Certified. Breeder seed will be produced and maintained by Lebanon Seaboard. Small amounts of seed for research uses are available from the corresponding author. U.S. plant variety protection has been applied for (PVP Certificate no. 9900390).

Timothy M. Ford,* Dirk A. Smith, Ronald F. Bara, W.A. Meyer, and C.R. Funk (3)

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3. T.M. Ford, Lebanon Seaboard Corporation, P.O. Box 10, Huntsville, UT 84317; and D.A. Smith, R.F. Bara, W.A. Meyer, and C.R. Funk, Plant Science Dep., Cook College, New Jersey Agric. Exp. Stn. (NJAES), Rutgers Univ., New Brunswick, NJ 08901. Publication no. D-12155-4-00, NJAES. Some of this work was conducted as part of NJAES Project no. 12155, supported by NJAES funds, other grants, and gifts. Additional support was received from the U.S. Golf Association–Golf Course Superintendents Association of America Research Fund, and from the New Jersey Turfgrass Association. Registration by CSSA. Accepted 30 Apr. 2000. *Corresponding author.

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Registration of 'Masterpiece' Tall Fescue

'Masterpiece' tall fescue (*Festuca arundinacea* Schreb.) (Reg. no. CV-85, PI 608027) was released by Lebanon Seaboard, Inc., Lebanon, PA, in September 1998. Germplasm from the New Jersey Agricultural Experiment Station was used in the development of Masterpiece. LTP-SD-TF was the experimental designation. The first Certified seed was produced in 1998.

Masterpiece was selected from the maternal progenies of 79 clones. Two hundred twenty-four clones with similar phenotype served as additional pollen parents in an isolated crossing block. These 303 clones were selected from among 7560 plants in spaced-plant nurseries at the Rutgers Plant Science Research Farm at Adelphia, NJ, and were transferred to the crossing block immediately prior to pollination in the spring of 1995. Seed was subsequently harvested from the 79 clones containing a *Neotyphodium* endophyte and showing good floret fertility. Bulked seed was sent to western Oregon to establish an experimental increase field during the late summer of 1995. Coarse, lighter-colored plants and plants showing stem rust (caused by *Pucinia graminis* Pers.:Pers. subsp. *graminicola* Z. Urban) were rogued prior to a 1996 harvest of Breeder seed.

The parental germplasm of Masterpiece tall fescue traces its origin to plants selected from old turfs in the USA in a germplasm collection program initiated in 1962 and to plants selected from or related to 'Rebel' (2). Attractive clones were selected from old turfs in Birmingham, AL; Athens, Atlanta, and Milledgeville, GA; Preston, ID; Baltimore, MD; Bayonne, Princeton, and Cape May, NJ; eastern North Carolina; Philadelphia, PA; Nashville, TN; Lexington, KY; Cincinnati, OH; Dallas, TX; and northern Mississippi. All selected plants had produced large patches of turf in stressful environments.

Plants selected from old turfs and the Rebel breeding program were evaluated in spaced-plant nurseries, mowed clonal tests, and single-plant progeny trials conducted under frequent close mowing. Intercrosses of the best performing plants were subjected to numerous cycles of phenotypic and genotypic selection. Each cycle showed continuous progress in producing lower-growing, darker green plants with finer leaves, increased persistence under close mowing, greater density, enhanced mowing characteristics, and improved turf performance scores.

Masterpiece is an attractive, medium-low-growing, turf-type tall fescue. It is capable of producing a medium-dense, persistent, medium-fine-textured turf with a dark-green color. Masterpiece exhibited very good overall turf performance in the National Tall Fescue Test established in 1996 at 27 locations (5). It also showed moderately good resistance to the large brown patch disease (caused by *Rhizoctonia solani* Kühn).

Masterpiece is recommended for lawns, parks, sports fields, and conservation use in areas where tall fescue is adapted. It is often mixed with Kentucky bluegrass (*Poa pratensis* L.) cultivars that perform well under low maintenance for these uses.

Turfs of Masterpiece established with seed containing viable *Neotyphodium* endophyte should show enhanced resistance to a number of harmful insect pests as well as increased persistence and improved performance under some conditions (3,4). However, seed containing viable endophyte should not be used for pastures or production of hay. Forage containing this endophyte will adversely affect animal health and performance under some conditions. Animal health problems generally occur in the summer when animals are under heat stress (1,3,4).

Breeder seed of Masterpiece is produced and maintained by Lebanon Seaboard with the cooperation of the New Jersey Agricultural Experiment Station. Seed classes will be restricted to one generation each of Foundation, Registered, and Certified. U.S. plant variety protection of Masterpiece has been applied for (PVP Certificate no. 9900388).

Timothy M. Ford,* Dirk A. Smith, Ronald F. Bara, William A. Meyer, and C.R. Funk (6)

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Registration of 'Millennium' Tall Fescue

'Millennium' tall fescue (*Festuca arundinacea* Schreb.) (Reg. no. CV-84, PI 611124) was released by Turf Merchants, Inc., Tangent, OR, in September 1998. Germplasm developed by the New Jersey Agricultural Experiment Station (NJAES) of Rutgers University was used in the breeding of Millennium. The first Certified seed was produced in 1998. TMI-RBR was the experimental designation for Millennium.

The parental germplasm of Millennium originates from plants selected from old turfs of Georgia, Alabama, Mississippi, Missouri, Texas, Kentucky, Tennessee, Ohio, North Carolina, Pennsylvania, New Jersey, Maryland, Kansas, Idaho, and Virginia in a germplasm collection program started in 1962. The origin of collected plants is unknown. The size, appearance, and locations of each plant indicated that it had persisted for many decades. Plants related to 'Rebel' tall fescue (1) were also used. Selected plants were evaluated in spaced-plant nurseries and clonal evaluation trials conducted under conditions of frequent, close mowing. This was followed by single-plant progeny tests in New Jersey conducted as turf trials in stress environments with frequent, close mowing, often as close as 2 cm. After subjecting these progenies to the added stresses of intense interplant competition, attractive plants were selected from the best performing progenies. These plants were also evaluated in spaced-plant nurseries during each of many cycles of phenotypic and genotypic recurrent selection for improved stress tolerance, disease resistance, seed yield, and appearance. Selected plants were separated into groups with similar phenotypes and reproductive maturities prior to moving to isolated crossing blocks. Progenies of plants with the best floret fertility were seeded in closely mowed turf trials to initiate additional cycles of selection.

Following varying numbers of selection cycles, progenies of the components of many breeding populations were seeded in turf trials at Adelphia, NJ, in 1989, 1990, and 1991. During late summer of 1994, a total of 1400 plants were selected from 33 of the most attractive single-plant progeny plots in the above turf trials. Selection was based on improved stress tolerance, disease resistance, and overall turf performance records. All selections had medium-high density, a rich dark-green color, and a medium-low growth profile. Plants were established in an isolated spaced-plant nursery at Adelphia, NJ, during the fall of 1994. Progressive roguing of this nursery during the 1995 growing season and prior to anthesis in the spring of 1996 resulted in the removal of 1042 of the 1400 plants. Breeder seed was harvested from 162 of the remaining plants showing the best floret fertility during the summer of 1996. Selected plants originated from 13 separate but related

breeding populations, each of which originated from many cycles of phenotypic and genotypic recurrent selection from the original collections from old turfs and plants related to Rebel. This seed was entered in the National Turfgrass Evaluation Program and was also used to establish a Foundation seed increase field in Oregon in the early fall of 1996.

Millennium is a turf-type tall fescue with a rich, dark-green color, medium-fine leaf texture, and the ability to produce an attractive, medium-dense turf. It has performed well in trials established in 1996 in the National Turfgrass Evaluation Program (2,3). During the 1997 season, Millennium tied for first place in mean turfgrass quality averaged across 27 locations evaluated throughout the USA. It performed well in both the cool-humid and transition zones. It exhibited early spring green up, good color retention during winter, and improved resistance to large brown patch disease (caused by *Rhizoctonia solani* Kühn).

Millennium is recommended for turfs on home grounds, roadsides, parks, playgrounds, and sports fields where turf-type tall fescues are well adapted. It can be used as a monostand or in mixtures with Kentucky bluegrass (*Poa pratensis* L.) cultivars adapted to the low maintenance and summer stress conditions tolerated by tall fescues.

Certified seed production of Millennium is restricted to three generations of increase from Breeder seed: one each of Foundation, Registered, and Certified. U.S. plant variety protection for Millennium has been applied for (PVP Certificate no. 9900368).

Ronald F. Bara, Michael Richardson, William A. Meyer, Rachael Bara, Dirk A. Smith, Steve Tubbs, and C.R. Funk* (4)

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Some of this work was conducted as part of NJAES Project no. 12155, supported by NJAES funds, other grants, and gifts. Additional support was obtained from the New Jersey Turfgrass Association, the Center for Turfgrass Science, and the U.S. Golf Association–Golf Course Superintendents Association of America Research Fund. Appreciation is expressed to Kevin N. Morris, Robert Shearman, and all other participants in, and supporters of, the National Turfgrass Evaluation Program for their assistance in the evaluation of Millennium. The assistance of Melissa Mohr, Barbara Smith, Karen Plumley, Michael Reynolds, and George Ziemienski is also acknowledged.

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Registration of 'Metacomet' Tobacco

'Metacomet' Connecticut shade tobacco (*Nicotiana tabacum* L.) (Reg no. CV-120, PI 612391) was developed by the Connecticut Agricultural Experiment Station and released in 1999. This cultivar was developed with resistance to the tobacco cyst nematode [*Globodera tabacum tabacum* (Lownsbery & Lownsbery) Behrens] to allow shade tobacco production in cyst nematode-infested soils without the use of fumigant nematicides. Yield and sorting qualities are equal to or better than the nematode-susceptible shade cultivar O-40.

The tobacco cyst nematode was first described from Hazardville, CT, in the early 1950s (1) and is now widely distributed in shade production areas in the Connecticut River Valley of Connecticut and Massachusetts. All previous Connecticut shade and broadleaf cultivars tested were susceptible to *G. t. tabacum* (2). Nematode infection of roots can cause dramatic stunting, reduced leaf weight, and also reduced leaf quality. Losses can exceed 40% at high nematode densities (3). Flue-cured tobacco lines with resistance to *G. t. solanacearum* (Miller and Gray) were identified as resistant to *G. t. tabacum* (4) and crosses to Connecticut shade tobacco were first made in 1987.

Metacomet is an inbred derived from a cross between the nematode-susceptible Connecticut shade tobacco cultivar O-30, which was developed as a commercial production line by Windsor Shade Tobacco, Inc., and the *G. t. solanacearum* resistant flue-cured line VA 81. Cyst nematode resistance in VA 81 was most likely derived from TL 106. Resistance to *G. t. tabacum* is conferred by a single dominant gene (2). Resistance to *G. t. tabacum* and *G. t. solanacearum* may be linked to wildfire [caused by *Pseudomonas syringae* pv. *tabaci* (Wolf & Foster) Young et al.] resistance (5), transferred from *N. longiflora* Cavanilles to the breeding line TL 106 (6). *Nicotiana longiflora* was resistant to *G. t. solanacearum* in pot experiments (7).

The pedigree breeding system was used. The experimental designation of CT 21-2A was used during cultivar development. Metacomet was selected as a selfed inbred over 12 generations of field evaluation for agronomic characteristics and greenhouse evaluation for *G. t. tabacum* resistance. Individual plants in the F_4 and F_6 generations were selected with cyst nematode resistance using a greenhouse seedling assay (2). Progeny testing was performed in 1993 to select plants homozygous for *G. t. tabacum* resistance.

Metacomet was selected under field conditions for growth and yield characteristics in the presence of damaging population levels of *G. t. tabacum* to avoid severe intolerance to nematode infection. Metacomet was also selected for the hypersensitive gene for resistance to tobacco mosaic virus derived from *N. glutinosa* L. and for reduced sensitivity to weather fleck.

The effects of nematode resistance on *G. t. tabacum* populations were determined in field plots in a cloth-covered shade tent at the Experiment Station Valley Laboratory in Windsor in 1993, 1994, and 1997. Nematode population densities were reduced by 83, 74, and 72%, respectively, at the same time that the susceptible cultivar increased populations by more than 200%. The population reduction resulting from the season-long production of a resistant cultivar is comparable with growing a nematode-susceptible cultivar with soil fumigation.

Leaf yield and quality of Metacomet and the nematode-susceptible O-40 were compared in field plots infested with 120 to 250 infective *G. t. tabacum* juveniles per cubic centimeter of soil. Fresh weight yields were 759.6 and 614.7 g plant^{-1} for Metacomet and O-40, respectively. Cured leaf quality was determined by industry evaluation. Economic value, determined by percentage weight in each grade and percentage weight in each cured leaf grade in 1993, was \$42.27 kg^{-1} for Metacomet and \$24.20 for the O-40 standard. Metacomet demonstrated higher leaf yields per plant than another cyst nematode resistant cultivar, 'Poquonock', averaging 753 and 732 g plant^{-1}, respectively. While not significantly different, Metaco-

met also had a greater impact on tobacco cyst nematode populations than Poquonock, averaging 76.3 and 65.0% population reductions per year, respectively.

Metacomet shade tobacco will allow the production of high quality shade tobacco in fields infested with *G. t. tabacum*. This cultivar allows growers to produce a tobacco crop while reducing cyst nematode populations in a manner comparable with a fumigant nematicide.

Breeder seed of Metacomet will be maintained and distributed by the Connecticut Agricultural Experiment Station Valley Laboratory, 153 Cook Hill Rd., Windsor, CT 06095. U.S. plant variety protection for Metacomet will not be applied for.

J.A. LaMondia* (8)

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Registration of 'Poquonock' Tobacco

'Poquonock' Connecticut shade tobacco (*Nicotiana tabacum* L.) (Reg no. CV-121, PI 612392) was developed by the Connecticut Agricultural Experiment Station and released in 1999. It was released because of it's resistance to the tobacco cyst nematode [*Globodera tabacum tabacum* (Lownsbery & Lownsbery) Behrens], which will allow shade tobacco production in cyst nematode-infested soils without the application of fumigant nematicides. Yield and sorting qualities are equal to or better than the nematode-susceptible shade cultivar O-40.

The tobacco cyst nematode is widely distributed in shade production areas in Connecticut and Massachusetts. All previous Connecticut shade cultivars evaluated were suseptible to *G. t. tabacum* (1). Cyst nematode infection may cause leaf quality reduction, dramatic early season stunting, and fresh leaf weight losses exceeding 40% at high nematode densities (2). Flue-cured tobacco lines with resistance to *G. t. solanacearum* (Miller & Gray) Behrens were also resistant to *G. t. tabacum* (3). Resistance to *G. t. tabacum* is conferred by a single dominant gene (1). Resistance to *G. t. tabacum* and *G. t. solanacearum* may be linked to wildfire [*Pseudomonas syringae* pv. *tabaci* (Wolf & Foster) Young et al.] resistance (4). Wildfire resistance was transferred from *N. longiflora* Cavanilles to the breeding line TL 106, which had a pair of chromosomes from the wild species (5), and eventually to VA 81. *Nicotiana longiflora* was resistant to *G. t. solanacearum* in pot experiments (6).

Poquonock is an inbred derived from an initial cross made in 1987 between the nematode-susceptible Connecticut shade tobacco cultivar O-30 and the *G. t. solanacearum* resistant flue-cured line VA 81. The pedigree system of breeding was used. Poquonock was selected from the F_2 generation of the O-30 and VA 81 cross, back-crossed to O-30 twice, then to the nematode-susceptible shade cultivar O-40 twice, then crossed again to a selfed inbred (three generations) from the cross of O-30 by VA 81. Both O-30 and O-40 were developed and commercially grown by Windsor Shade Tobacco, Inc. Resulting selections were selfed to homogeneity for six generations. Individual plants in the second and fourth selfed generations were selected with cyst nematode resistance using a greenhouse seedling assay (1). Progeny testing was performed in 1993 to identify plants homozygous for *G. t. tabacum* resistance. The experimental designation CT-107 was used during development.

Poquonock was selected for growth and yield characteristics under field conditions. Selection was done in the presence of damaging population levels of *G. t. tabacum* to avoid severe intolerance to nematode infection. Poquonock was also selected for the dominant hypersensitive gene for resistance to tobacco mosaic virus derived from *Nicotiana glutinosa* L. and for reduced sensitivity to weather fleck, caused by ozone.

Poquonock reduced cyst nematode population densities by 67% in 1994 and 63% in 1997 in field plots in a cloth-covered shade tent at the Experiment Station Valley Laboratory in Windsor. In comparison, the susceptible cultivar O-40 increased *G. t. tabacum* populations by more than 200% annually. Production of Poquonock shade tobacco reduced cyst nematode populations in a manner similar to soil fumigation after production of a susceptible cultivar.

Leaf yield and quality of Poquonock and the nematode-susceptible O-40 were compared in field plots infested with 120 to 250 infective *G. t. tabacum* juveniles per cubic centimeter soil. Yields were similar or greater for Poquonock than the O-40 standard. Average fresh weight leaf yield of Poquonock and the susceptible O-40 was 731.9 and 614.7 g plant^{-1}, respectively. Cured leaf quality was determined by industry evaluation. Economic value, determined by leaf yields and percentage weight in each cured leaf quality grade in 1993, was \$44.00 kg^{-1} for Poquonock and \$24.20 kg^{-1} for the nematode-susceptible O-40 standard. Poquonock produces higher quality leaf grades than 'Metacomet', which has the advantage of higher leaf weights (6).

Poquonock shade tobacco will allow the production of high-quality shade tobacco in fields infested with damaging populations of *G. t. tabacum*. This cultivar allows growers a nonchemical nematode control tactic that can reduce nematode populations comparable with a fumigant nematicide.

Breeder seed of Poquonock will be maintained and distributed by the Connecticut Agricultural Experiment Station Valley Laboratory, 153 Cook Hill Rd. Windsor, CT 06095. U.S. plant variety protection for Poquonock will not be applied for.

J.A. LaMondia* (8)

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Registration of 'HoCP 91-555' Sugarcane

'HoCP 91-555' sugarcane (a complex hybrid of *Saccharum officinarum* L., *S. barberi* Jeswiet, *S. spontaneum* L., and *S. sinense* Roxb. amend. Jeswiet) (Reg. no. CV-112, PI 612671) was selected from progeny of the cross CP 83-644/LCP 82-94 made at Canal Point (CP), FL, in 1986, and selected in the seedling stage at Houma (Ho), LA, in 1988. HoCP 91-555 is a product of cooperative research by the Agricultural Research Service of the United States Department of Agriculture, the Louisiana Agricultural Experiment Station of the Louisiana State University Agricultural Center, and the American Sugar Cane League of the U.S.A., Inc., and was released in the fall of 1999.

Yield data from a total of 44 mechanically harvested, replicated trials on both light- and heavy-textured soils indicate that HoCP 91-555 was comparable to 'LCP 85-384' (1), the commercial check and principal cultivar grown in Louisiana in 1999, in yields per hectare of total recoverable sugar (kg ha^{-1}) and megagrams cane (Mg ha^{-1}) in the first-ratoon crop but significantly lower than LCP 85-384 in the plant-cane and second-ratoon crops. HoCP 91-555 exceeded all other commercial checks in yields per hectare of total recoverable sugar and megagrams cane in the plant-cane crop. HoCP 91-555 was comparable to 'CP 70-321' (2), another commercial check and the second principal cultivar grown in Louisiana in 1999, in yields per hectare of both recoverable sugar and megagrams cane in the second-ratoon crop. HoCP 91-555 is an early maturing, high sucrose cultivar similar in recoverable sugar per megagram (kg Mg^{-1}) to CP 70-321 at the start of the harvest season. Unlike CP 70-321, its level of recoverable sugar per megagram continues to increase throughout the harvest season or until the occurrence of a killing freeze (≈28°C); however, the ultimate effect of the freeze on sucrose accumulation is temperature and time dependent.

HoCP 91-555 produces a high population of small diameter, green stalks, but internodes become maroon to brown following exposure to the sun. Its stalk weight, averaged across the three crops (plant-cane and two ratoon crops), was 0.91 kg, compared with 0.93 kg for LCP 85-384 and 1.16 kg for CP 70-321. Desirable attributes of this cultivar are its moderate fiber content (13.6%), its good milling factor (1.009), its lack of brittleness, and its erect growth habit. The latter two attributes are conducive to mechanical harvesting. Yield losses (scrap) associated with mechanical harvesting are lower than LCP 85-384 and similar to 'HoCP 85-845' (3).

HoCP 91-555 is resistant to sugarcane mosaic virus (strains A, B, and D) and sorghum mosaic virus (strains H, I, and M). The cultivar is resistant to smut (caused by *Ustilago scitaminea* Syd. & P. Syd.) and is resistant to rust (caused by *Puccinia melanocephala* Syd. & P. Syd.) under field conditions. The cultivar is susceptible to leaf scald [caused by *Xanthomonas albilineans* (Ashby) Dowson] by artificial inoculation, but has shown adequate field resistance to natural infection. Ratoon stunting disease (caused by *Clavibacter xyli* subsp. *xyli* Davis et al.) has caused significant reductions in yields per hectare of cane and total recoverable sugar in the ratoon crops. For HoCP 91-555 to yield to its full potential, it is essential that seed cane be free or nearly free of this disease. HoCP 91-555 is considered susceptible to the sugarcane borer [*Diatraea saccharalis* (Fabricius)] and should not be grown in areas where insecticides cannot be applied.

Seed cane of HoCP 91-555 will be maintained at the Sugarcane Research Unit, USDA-ARS, Southern Regional Research Center, Houma, LA, for 5 yr. U.S. plant variety protectioin of HoCP 91-555 will not be applied for.

B.L. Legendre,* W.H. White, M.P. Grisham, E.O. Dufrene, D.D. Garrison, and J.D. Miller (4)

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Registration of 'Century' Barley

'Century' spring barley (*Hordeum vulgare* L.) (Reg. no. CV-281, PI 603073) was developed at the Utah Agricultural Experiment Station and released in 1997. It was initially selected at Logan, UT, in 1987, as an F_5 line derived from a single F_5 head selected in 1986, from a cross of WA641566/'Bracken', made in 1982. WA641566 (a sib to 'Steptoe') is a six-row breeding line from the cross WA Selection 3564/'Unitan'. The breeding history of Bracken has been described (1). F_1 plants were grown in the greenhouse during the winter of 1982-1983. Segregating generations (F_2–F_5) were grown at Logan, UT, as space-planted modified bulk populations, and agronomically desirable plants were selected each year from 1983 through 1986. Individual heads from 265 F_5 plants were selected in 1986, based on agronomic appearance, and were evaluated as head rows in 1987. The original F_5-derived line from which Century originated was yield-tested in Utah as UT87B604-1705 beginning in 1988 and in the Western Regional Spring Barley Nursery in 1990 and 1991 as UT1705. It was reselected in 1991 for both lax and dense head types. The reselections resulted in the development and release of two cultivars (Century and 'Statehood') from the same original UT87B604-1705 line (2). Two-hundred lax-type heads (from which Century originated) were selected from the original line and were produced as F_{10}-derived head rows in the greenhouse during the winter of 1991-1992. Off-type rows were rogued out and remaining rows were harvested in bulk. The reselected line was yield-tested at four irrigated sites and two nonirrigated sites annually in Utah as UT87B604-1705-L beginning in 1992 and in the Western Regional Spring Barley Nursery (1993–1995) as UT1705L. Breeder seed was produced in a 1994-1995 winter increase at Yuma, AZ, from 250 F_{13}-derived head rows selected in 1994. Off-type rows were rogued out and remaining rows were harvested in bulk. Foundation seed was produced at Logan, UT, in 1995. Registered and Certified seed were produced in 1996 and 1997, respectively.

Century is a six-rowed, midseason, erect-growing, spring feed barley. It has a strap shaped, lax head with little overlap of lateral kernels at the tip of the head and short hairs on the rachis edges. It has waxy leaves and heads. Glumes are long, with short hairs confined to a band, and have medium-length, semi-smooth glume awns. Lemma awns are long and rough. Stigmas are heavily feathered. The seed is covered, midlong-to-long, semi-wrinkled, with numerous long rachilla hairs, and a transverse crease at the base. Aleurone color is white and

1000-kernel weight averages 42 g. The base of most spikes is marked by a closed collar.

Century is recommended for growing under irrigation or where annual precipitation is 400 mm or more. In 5 yr (1992–1996, $n = 80$) of Utah irrigated tests, average yield of Century (7231 kg ha^{-1}) exceeded ($P < 0.05$) that of Steptoe (6387 kg ha^{-1}), 'Rollo' (6793 kg ha^{-1}), and 'Walker' (6777 kg ha^{-1}), by 13.2, 6.4, and 6.7%, respectively. It was not significantly different from that of Statehood (7316 kg ha^{-1}). In 3 yr (1993–1995, $n = 42$) of Western Regional Spring Barley tests, Century's yield (6390 kg ha^{-1}) was superior ($P < 0.05$) to that of Steptoe (5824 kg ha^{-1}), by 9.7%. It was not significantly different from that of Statehood (6238 kg ha^{-1}).

Century heads the same time as Steptoe (166 d after 1 January in Utah tests and 175 d in regional tests). It heads 1 d earlier than Statehood (175 vs. 176 d) in regional tests ($P < 0.05$) and (166 vs. 167 d) in Utah tests. Century averaged 2.1 cm taller (94.0) than Steptoe (91.9) and 5.6 cm taller than Statehood (88.4) in 5 yr of Utah tests; it averaged 5.4 cm taller (86.1) than Steptoe (80.7) and 7.1 cm taller than Statehood (79.0) in 3 yr of Western Regional Spring Barley tests ($P < 0.05$). Average lodging readings for Century were 20.3 percentage points lower than those for Steptoe (17.7 vs. 38.0%) and 6.3 percentage points higher than those for Statehood (11.4%) in Utah irrigated tests ($P < 0.05$). Average test weight for Century was 14.1 kg m^{-3} higher than that of Steptoe (629.5 vs. 615.4 kg m^{-3}) in Western Regional Spring Barley tests ($P < 0.05$) and 16.0 kg m^{-3} higher (672.6 vs. 656.6) in Utah tests. Century had 21.6 and 15.3 kg m^{-3} higher test weight than Statehood in Utah tests (672.6 vs. 651.0 kg m^{-3}) and in regional barley tests (629.5 vs. 614.2 kg m^{-3}), respectively ($P < 0.05$). Average percentage protein for Century (13.7) was higher ($P < 0.05$) than that for Steptoe, Walker, or Rollo in Utah tests. It was not significantly different from that of Statehood.

Century has shown field resistance to covered smut [caused by *Ustilago hordei* (Pers.) Lagerh.], but has shown less resistance to loose smut [caused by *Ustilago nuda* (Jens.) Rostr.], than have Steptoe, Rollo, Walker, or Statehood. Century has shown moderate resistance to powdery mildew (caused by *Erysphe graminis* DC. f. sp. *hordei* Em. marchal). Preliminary tests have shown Century to be susceptible to barley stripe rust (caused by *Puccinia striiformis* Westend). Its reaction to other diseases is not known.

The generation sequence of seed production of Century is Breeder, Foundation, Registered, and Certified. Breeder seed is maintained by the Utah Agricultural Experiment Station, Department of Plants, Soils, and Biometeorology, Utah State University, Logan, UT 84322-4820. Foundation seed is available from the Utah Crop Improvement Association, Utah State University, Logan, UT 84322-4855. U.S. plant variety protection of Century has been applied for (PVP Certificate no. 9800158).

R.S. Albrechtsen* and D.J. Hole (3)

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Registration of 'Statehood' Barley

'Statehood' spring barley (*Hordeum vulgare* L.) (Reg. no. CV-282, PI 603074) was developed at the Utah Agricultural Experiment Station and released in 1997. It was initially selected at Logan, UT, in 1987, as an F_5 line derived from a single F_5 head selected in 1986, from a cross of WA641566/'Bracken', made in 1982. WA641566 (a sib to 'Steptoe') is a six-row breeding line from the cross WA Selection 3564/'Unitan'. The breeding history of Bracken has been described (1). F_1 plants were grown in the greenhouse during the winter of 1982-1983. Segregating generations (F_2–F_5) were grown at Logan, UT, as space-planted modified bulk populations, and agronomically desirable plants were selected each year from 1983 through 1986. Individual heads from 265 F_5 plants were selected in 1986, based on agronomic appearance, and were evaluated as head rows in 1987. The original F_5-derived line from which Statehood originated was yield-tested in Utah as UT87B604-1705 beginning in 1988 and in the Western Regional Spring Barley Nursery in 1990 and 1991 as UT1705. It was reselected in 1991 for both dense and lax head types. The reselections resulted in the development and release of two cultivars (Statehood and 'Century') from the same original UT87B604-1705 line (2). Two-hundred dense-type heads (from which statehood originated) were selected from the original line and were produced as F_{10}-derived head rows in the greenhouse during the winter of 1991-1992. Off-type rows were rogued out and remaining rows were harvested in bulk. The reselected line was yield-tested at four irrigated sites and two nonirrigated sites annually in Utah as UT87B604-1705-D beginning in 1992 and in the Western Regional Spring Barley Nursery (1993–1995) as UT1705D. Breeder seed was produced in a 1994-1995 winter increase at Yuma, AZ, from 250 F_{13}-derived head rows selected in 1994. Off-type rows were rogued out and remaining rows were harvested in bulk. Foundation seed was produced at Logan, UT, in 1995. Registered and Certified seed were produced in 1996 and 1997, respectively.

Statehood is a six-rowed, midseason, erect-growing, spring feed barley. It has a tapering, dense head with no overlap of lateral kernels, and short hairs on the rachis edges. It has waxy leaves and heads. Glumes are long, with short hairs restricted to the middle, and have long, semi-smooth glume awns. Lemma awns are long and rough. Stigmas are heavily feathered. The seed is covered, midlong-to-long, semi-wrinkled, with numerous long rachilla hairs, and a transverse crease at the base. Aleurone color is white, and 1000-kernel weight averages 43 g. The base of most spikes is marked by a closed collar.

Statehood is recommended for growing under irrigation or where annual precipitation is 400 mm or more. In 5 yr (1992–1996, $n = 80$) of Utah irrigated tests, average yield of Statehood (7316 kg ha^{-1}) exceeded ($P < 0.05$) that of Steptoe (6387 kg ha^{-1}), 'Rollo' (6793 kg ha^{-1}), and 'Walker' (6777 kg ha^{-1}), by 14.5, 7.7, and 8.0%, respectively. It was not significantly different from that of Century (7231 kg ha^{-1}). In 3 yr (1993–1995, $n = 42$) of Western Regional Spring Barley tests, Statehood's yield (6238 kg ha^{-1}) was superior ($P < 0.05$) to that of Steptoe (5824 kg ha^{-1}), by 7.1%. It was not significantly different from that of Century (6390 kg ha^{-1}).

Statehood heads 1 d later than Steptoe and Century (176 vs. 175 d after 1 January) in regional tests ($P < 0.05$) and (167 vs. 166 d) in Utah tests). Statehood averaged 3.5 cm shorter (88.4) than Steptoe (91.9) and 5.6 cm shorter than Century (94.0) in 5 yr of Utah tests; it averaged 1.7 cm shorter (79.0) than Steptoe (80.7) and 7.1 cm shorter than Century (86.1) in

three years of Western Regional Spring Barley tests ($P < 0.05$). Average lodging readings for Statehood were 26.6 and 11.4 percentage points lower than those for Steptoe and Century (11.4 vs. 38.0 and 17.7%), respectively, in Utah irrigated tests ($P < 0.05$). Average test weight for Statehood was not significantly different from that of Steptoe in Utah tests (651.0 vs. 656.6 kg m^{-3}) or in Western Regional Spring Barley tests (614.2 vs. 615.4 kg m^{-3}). Statehood had 21.6 and 15.3 kg m^{-3} lower test weight than Century in Utah tests (651.0 vs. 672.6 kg m^{-3}) and in regional barley tests (614.2 vs. 629.5 kg m^{-3}), respectively ($P < 0.05$). Average percentage protein for Statehood (13.5) was higher ($P < 0.05$) than that for Steptoe, Walker, or Rollo in Utah tests. It was not significantly different from that of Century.

Statehood has shown field resistance to barley loose smut [caused by *Ustilago nuda* (Jens.) Rostr.] and covered smut [caused by *Ustilago hordei* (Pers.) Lagerh.], and moderate resistance to powdery mildew (caused by *Erysphe graminis* DC. f. sp. *hordei* Em. marchal). Preliminary tests have shown Statehood to be susceptible to barley stripe rust (caused by *Puccinia striiformis* Westend). Its reaction to other diseases is not known.

The generation sequence of seed production of Statehood is Breeder, Foundation, Registered, and Certified. Breeder seed is maintained by the Utah Agricultural Experiment Station, Department of Plants, Soils, and Biometeorology, Utah State University, Logan, UT 84322-4820. Foundation seed is available from the Utah Crop Improvement Association, Utah State University, Logan, UT 84322-4855. U.S. plant variety protection of Statehood has been applied for (PVP Certificate no. 9800159).

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REGISTRATION OF GERMPLASM

Registration of NC97BGTAB9 and NC97BGTAB10 Wheat Germplasm Lines Resistant to Powdery Mildew

Soft red winter wheat (*Triticum aestivum* L. subsp. *aestivum*) germplasm lines NC97BGTAB9 (Reg. no. GP-616, PI 604035) and NC97BGTAB10 (Reg. no. GP-617, PI 604036) were developed and released by the North Carolina Agricultural Research Service and the USDA-ARS in 1998. The germplasms were released because of their potential to broaden the genetic base of resistance to powdery mildew [caused by *Blumeria graminis* (DC.) E.O. Spear f. sp. *tritici* Em. Marchal; syn. *Erysiphe graminis* DC. f. sp. *tritici* Em. Marchal] with resistance factors transferred from AABB genome wild emmer [*T. turgidum* L. subsp. *dicoccoides* (Korn. ex Asch. & Graebn.) Thell.]. Both germplasms consistently displayed resistance to all genotypes of the fungus in field evaluations in North Carolina from 1995 to 1999.

NC97BGTAB9 is an F_6-derived line with the pedigree 'Saluda'*2//'Cando'/PI 471735. Saluda (PI 480474) is a soft red winter wheat developed and released by Virginia Polytechnic Institute and State University (5). Cando (CI 17438) is a spring-sown durum wheat developed and released by North Dakota State University (3). NC97BGTAB10 is an F_5-derived line with the pedigree Saluda*3//'Ward'/PI 471746. Ward (CI 15892) is a spring-sown durum wheat developed and released by North Dakota State University (4). Both PI 471735 and PI 471746 are winter growth habit wild emmer accessions collected in central Israel (31°31′ N, 34°45′ E) by Z. Geracter-Amitai, Agricultural Research Organization, Volcani Center, Bet Dagan. They were entered into the U.S. National Plant Germplasm System in September 1982.

Dr. John Moseman (USDA-ARS) provided the tetraploid F_1 hybrid seed, and the subsequent interploidy crossing and backcrossing were conducted during the 1988 and 1989 greenhouse seasons at North Carolina State University. Field selection using the pedigree breeding method was initiated with BCF_2 populations in the 1991-1992 season. Natural powdery mildew epidemics occurred each year. Selection was primarily for mildew resistance at Feekes (1) growth stages 8 to 10.5, but whenever possible additional selection for heading date, plant height, and straw strength was conducted using the Sa-

Table 1. Virulence formulas for 17 isolates of powdery mildew used to characterize resistance and evaluate intraline homogeneity in NC97BGTAB9 and NC97BGTAB10 in detached leaf tests.

Isolate	Effective/ineffective host genes
$E_3$14	***Pm1a, 1b, 1c, 2, 3a, 3b, 3c, 6, 12, 13, 16, 19, 20, 21, 25 / Pm4a, 4b, 5, 7, 8, 17***
$E_3$25	***Pm1c, 2, 3a, 3b, 12, 13, 16, 20, 21, 25 / Pm1a, 1b, 3c, 4a, 4b, 5, 6, 7, 8, 17, 19***
#8	***Pm1c, 2, 3a, 3b, 12, 13, 16, 20, 21, 25 / Pm1a, 1b, 4a, 4b, 5, 6, 7, 17, 19***
WKin91	***Pm1c, 3b, 4a, 4b, 8, 12, 13, 17, 20, 21, 25 / Pm1a, 1b, 2, 3a, 3c, 5, 6, 7, 9, 16, 19***
209a2	***Pm1a, 1b, 1c, 2, 3b, 3c, 4b, 8, 9, 12, 13, 16, 17, 20, 21, 25 / Pm3a, 4a, 5, 6, 7, 19***
153a2	***Pm3b, 4a, 8 / Pm1a, 1b, 2, 3a, 3c, 5, 6, 7, MA***
#9	***Pm1a, 1b, 17 / Pm2, 3a, 3b, 3c, 4a, 4b, 5, 6, 7, 8, MA***
Mo10	***Pm1a, 1b, 2, 3b, 4b / Pm3a, 3c, 4a, 5, 6, 7, MA***
W72-27	***Pm2, 3a, 3b, 4a, 4b, 6, 7, 8, 17 / Pm1a, 1b, 3c, 5, MA***
Flat7-12	***Pm1a, 1b, 2, 3b, 4b, 6, 8 / Pm3a, 3c, 4a, 5, 7, MA***
121a2	***Pm3b, 4a / Pm1a, 1b, 2, 3a, 3c, 5, 6, 7, 8, MA***
156b1	***Pm1a, 1b, 4b / Pm2, 3a, 3b, 3c, 4a, 5, 6, 7, 17, MA***
E2-15	***Pm1a, 1b, 2, 3a, 3b, 4a, 4b, 6, 17 / Pm3c, 5, 7, 8***
6	***Pm1a, 1b, 2, 4b, 8 / Pm3a, 3b, 3c, 4a, 5, 6, 7, MA***
3a	***Pm1a, 1b, 2, 4b, 17 / Pm3a, 3b, 3c, 4a, 5, 7, MA***
Yuma	***Pm1a, 1b, 3b, 4b, 8, 17 / Pm2, 3a, 5, 6, 7, MA***
137a	***Pm1a, 1b, 4b, 8, 17 / Pm2, 3a, 3b, 3c, 4a, 5, 6, 7, MA***