ASA, CSSA, and SSSA Virtual Issue Call for Papers:

Advancing Resilient Agricultural Systems: Adapting to and Mitigating Climate Change

Content will focus on resilience to climate change in agricultural systems, exploring the latest research investigating strategies to adapt to and mitigate climate change. Innovation and imagination backed by good science, as well as diverse voices and perspectives are encouraged. Where are we now and how can we address those challenges? Abstracts must reflect original research, reviews and analyses, datasets, or issues and perspectives related to objectives in the topics below. Authors are expected to review papers in their subject area that are submitted to this virtual issue.

Topic Areas

- Emissions and Sequestration
  - Strategies for reducing greenhouse gas emissions, sequestering carbon
- Water Management
  - Evaporation, transpiration, and surface energy balance
- Cropping Systems Modeling
  - Prediction of climate change impacts
  - Physiological changes
- Soil Sustainability
  - Threats to soil sustainability (salinization, contamination, degradation, etc.)
  - Strategies for preventing erosion
- Strategies for Water and Nutrient Management
  - Improved cropping systems
- Plant and Animal Stress
  - Protecting germplasm and crop wild relatives
  - Breeding for climate adaptations
  - Increasing resilience
- Waste Management
  - Reducing or repurposing waste
- Other
  - Agroforestry
  - Perennial crops
  - Specialty crops
  - Wetlands and forest soils

Climate Change Virtual Issue

Submit Now!

Deadlines

Abstract/Proposal Deadline: Ongoing

Submission deadline: 31 Dec. 2022

How to submit

Submit your proposal to manuscripts@sciencesocieties.org

Please contact Jerry Hatfield at jerryhatfield67@gmail.com with any questions.

American Society of Agronomy | Crop Science Society of America | Soil Science Society of America

Published March, 2003

REGISTRATIONS OF CULTIVARS

Registration of 'Ali Dayi' Lentil

'Ali Dayi' lentil (*Lens culinaris* Medik.) (Reg. no. CV-13, PI 631395) was developed at the International Center for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria, and released by the Central Research Institute for Field Crops (CRIFC), Ankara, Turkey, in 2001. Ali Dayi, a high-yielding red cotyledon lentil cultivar with lodging resistance, is recommended for spring cultivation in central Anatolia in Turkey.

Ali Dayi, ICARDA accession number ILL 5722, was developed from a cross of ILL 883 by ILL 470. The female parent, ILL 883, is a landrace from Iran, and ILL 470 is a landrace of Syria. The segregating populations were advanced through the bulk method, and single-plant selection was practiced in the F_4. The F_4:F_5 and F_4:F_6 progenies were evaluated at ICARDA in nonreplicated nurseries. The line was evaluated in replicated preliminary and advanced yield trials in the F_4:F_7 and F_4:F_8, respectively. Because of its excellent yield performance and other agronomic attributes, it was entered into the international testing program with the pedigree number FLIP 85-51 L, and accessed by Genetic Resources Unit of ICARDA as ILL 5722.

The Food Legume Improvement Program of CRIFC, Ankara, Turkey, received ILL 5722 through the Legume International Nursery Network in 1993 in the small-seeded lentil nursery category. It was identified as one of the promising lines for spring planting at Haymana, the main CRIFC research site. Subsequently, the line was evaluated in preliminary and large-plot yield trials at the same location. Because of its higher yield performance, lodging resistance, and desirable seed characteristics, it was selected for multilocation yield evaluations.

From 1997–1998 to 1999–2000, ILL 5722 was evaluated at Haymana, Konya, Yozgot, and Karaman research sites in central Anatolia. On average, seed yield of ILL 5722 was 1490 kg ha^{-1} compared to 1277 kg ha^{-1} for the best check, Emre 20, an increase of 17%. Low yields occurred in 1998–1999 because of severe drought. Significantly higher yields were recorded in all the trials, except 1997–1998 at Haymana and in 1998–1999 at Konya and Yozgot.

ILL 5722 attains a height of 30 cm, with first pod height at about 12 cm from the ground level, and exhibits an erect growth habit with at least three upright primary branches. The compound leaves have light pubescence, medium sized leaflets, and a well-developed tendril. Tendrils intermingle with each other and keep the canopy in an upright position and suitable for mechanical harvest. It flowers after 59 d; its flowers are white. ILL 5722 reaches physiological maturity after 89 d with no pod shedding even at complete maturity. Seeds have a brown testa without any pattern and weigh 4.7 g/100 seed. Cotyledons are bright red. Protein concentration of the seeds is 252 mg g^{-1}.

Breeder seed stock is maintained by Grain Legume Improvement Program, CRIFC, Ankara, Turkey. Small quantities of seed can be obtained on request. However, plant variety protection will be sought for Ali Dayi.

N. Aydin, A. Aydogan, I. Kusmenoglu, A. Sarker,*
H. El Hassan, and W. Erskine

N. Aydin, A. Aydogan, and I. Kusmenoglu, Central Research Institute for Field Crops, Ankara, Turkey; A. Sarker, H. El Hassan, and W. Erskine, International Center for Agricultural Research in the Dry Areas, Aleppo, Syria. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (A.Sarker@cgiar.org).

Published in Crop Sci. 43:728 (2003).

Registration of 'Idlib-2' Lentil

'Idlib-2' lentil (*Lens culinaris* Medik.) (Reg. no. CV-14, PI 631396) was developed at the International Center for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria, and released in 2000 by the Directorate of Agriculture and Scientific Research, Ministry of Agriculture and Agrarian Reform for commercial cultivation in Syria. It is a high yielding red cotyledon lentil cultivar with lodging resistance and resistance to vascular wilt [caused by *Fusarium oxysporum* f. sp. *lentis* (Vasudeva & Srinavasan) Gordon.].

Idlib-2 was developed through single-plant selection from a Jordanian landrace, 74TA14. It was introduced at ICARDA in 1977 and is designated as ILL 16. Considerable heterogeneity was observed among plants, and a single-plant selection (81S 15) was made at ICARDA in 1981. After testing in a nonreplicated preliminary screening nursery and replicated preliminary and advanced yield trials between 1983 and 1985, it was entered into the international testing program in 1986 as one of the promising lines in the small-seeded lentil nursery. The line was entered into the Lentil Germplasm Catalog as accession ILL 5883.

The Syrian national program identified ILL 5883 as a high-yielding line from the Lentil International Nursery (small seed) supplied by ICARDA. It was tested in six contrasting sites in Syria from 1986–1987 to 1988–1989. On average, ILL 5883 gave 1625 kg ha^{-1} seed yield compared to 1286 kg ha^{-1} for the local check, Hurani representing an increase of 26.3%. The line was evaluated under on-farm trials from 1986–1987 to 1996–1997 at 14 sites across the lentil-growing areas in Syria. Averaged over 154 on-farm trials, ILL 5883 produced a mean seed yield of 1365 kg ha^{-1}, compared to 1232 kg ha^{-1} for the check, Hurani. Lentil straw is an important animal feed in Syria. The cultivar produced an average straw yield of 3379 kg ha^{-1}.

Vascular wilt is a devastating disease of lentil in many countries. Yield losses up to 72% have been reported in Syria (Bayaa et al., 1986). ILL 5883 is resistant to vascular wilt as evidenced from plastic house screening in trays (Bayaa and Erskine, 1990) and in wilt-sick plot at Tel Hadya, ICARDA. In screening trials in wilt-sick fields from 1993–1994 to 2000–2001, ILL 5883 had $<5\%$ wilted plants compared to up to 40% wilted plants in the local check, Hurani. In on-farm trials over the years across Syria, 2.7% wilted plants have been observed in ILL 5883.

Hand harvest is a major constraint for lentil production in Syria because of the high cost of manual labor. Local lentil cultivars are susceptible to lodging and not suitable for machine harvest. ILL 5883 has a semierect growth habit with strong stems, thus providing lodging resistance and is suitable for mechanical harvesting. It forms its lowest pod at about 15 cm above soil level, which reduces harvest losses. Plants of ILL 5883 are medium statured (35 cm) with more basal primary branches compared to local cultivars. Leaves are dark green with medium-size leaflets and long tendrils. Intermingling of tendrils keeps the canopy upright at maturity, thus facilitating mechanical harvesting.

ILL 5883 flowers in 115 d and attains physiological maturity in 152 d, which is similar to local cultivars. Most leaflets are retained at 100% maturity leading to higher straw yields. It has bright red cotyledons and reddish testa color without pattern. It has a 100-seed weight of 4.0 g, compared with 3.0 g or less for the local cultivars. Its dehulled seed has a protein content of 263 mg g^{-1} compared with 250 mg g^{-1} protein in Hurani. It takes 37 min to cook. Straw of ILL 5883 contains 69 mg g^{-1} protein, 493 mg g^{-1} dry organic matter digestibility, and 569 mg g^{-1} fiber.

Seed of Idlib-2 is maintained by the Germplasm Program of ICARDA at Aleppo, Syria, and is available in small quantities on written request. Plant variety protection will not be sought for Idlib-2.

F. El-Ashkar, A. Sarker,* N. Haddad, B. Bayaa, H. El-Hassan, and W. Erskine

References

Bayaa, B., W. Erskine, and L. Khoury. 1986. Survey of wilt damage on lentils in northwest Syria. Arab J. Plant Prot. 4(2):118–119.

Bayaa, B., and W. Erskine. 1990. A screening technique for resistance to vascular wilt in lentil. Arab J. Plant Prot. 8:30–33.

F. El-Ashkar, Directorate of Agriculture and Scientific Research, Damascus, Syria; A. Sarker, B. Bayaa, H. El-Hassan, and W. Erskine, International Center for Agricultural Research in the Dry Areas, P.O. Box 5466, Aleppo, Syria; N. Haddad, Jordan University of Science and Technology, Jordan. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (A.Sarker@cgiar.org)

Published in Crop Sci. 43:728–729 (2003).

Registration of 'Meyveci 2001' Lentil

'Meyveci 2001' lentil (*Lens culinaris* Medik.) (Reg. no. CV-15, PI 631397) was developed at the International Center for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria, and released by the Central Research Institute for Field Crops (CRIFC), Ankara, Turkey, for commercial cultivation in the central Anatolian region of Turkey. Meyveci 2001, ICARDA accession number ILL 6972, is a large-seeded, high-yielding green lentil cultivar with lodging resistance and is recommended for spring cultivation.

The Food Legume Improvement Program of CRIFC, Turkey, introduced the line ILL 6972 from ICARDA in 1993 as a part of the Lentil International Screening Nursery. ILL 6972 is a breeding line derived from a cross between ILL 28 and ILL 851. The female parent, ILL 28, is a landrace from Syria, and the male parent, ILL 851, is a germplasm accession from Lebanon. The line was developed following a bulk-pedigree method. It was entered into the international testing program as FLIP 93-3 L and later was designated in ICARDA's Lentil Germplasm Catalog as ILL 6972.

The line ILL 6972 was initially identified at Haymana, Turkey, the main grain legume testing site of CRIFC in 1994, as a promising line for spring planting. It was subsequently evaluated in replicated preliminary (1995–1996) and advanced trials (1996–1997) at Haymana. The line was superior for yield and other agronomic traits compared to a number of test entries including the improved check, Sultan 1. From 1997–1998 to 1999–2000, the line was evaluated at four contrasting locations (Haymana, Konya, Yozgot, and Karaman) in central Anatolia representing the intensive lentil-growing areas in the region.

Over the 3-yr period across four locations, ILL 6972 produced an average yield of 1383 kg ha^{-1} compared to 1290 kg ha^{-1} for check, Sultan 1, an increase of about 7%. It also showed a potential yield of 2960 kg ha^{-1} at Haymana in 1997–1998. In 1998–1999, the crop suffered from severe drought, and average yield was very low compared to previous seasons. However, the National Variety Release Committee of Turkey suggested including the results of 1998–1999 as it provided information on yielding ability under severe drought conditions.

ILL 6972 is an erect and medium-statured line with a mean plant height of 32 cm. The first pod-bearing node is about 14-cm above ground level, which may reduce harvest losses. Its leaves are lightly pubescent with medium leaflet size and ending in a long tendril. Stems are green, flowers are white, and pods are non-pigmented. It bears an average of 22 pods per plant, with an average 1.4 seeds per pod. At maturity, ILL 6972 does not shed pods. Its seed weight is 7.2 g 100^{-1} seed, compared to 5.5 g for Sultan 1. Testa color is green without a pattern, and the cotyledons are yellow. Its dehulled seed average 259 mg g^{-1} protein and cooking time is about 44 min. ILL 6972 flowers after 66 d and matures after 94 d which is comparable to the improved check, Sultan 1, and other Turkish landraces.

The seed of Meyveci 2001 is maintained at CRIFC, Ankara, Turkey, and is available in small quantities on written request. Plant variety protection will be sought for Meyveci 2001.

N. Aydin, A. Aydogan, I. Kusmenoglu, A. Sarker,* H. El Hassan, and W. Erskine

N. Aydin, A. Aydogan, and I. Kusmenoglu, Central Research Institute for Field Crops, Ankara, Turkey; A. Sarker, H El Hassan, and W. Erskine, International Center for Agricultural Research in the Dry Areas, Aleppo, Syria. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (A.Sarker@cgiar.org).

Published in Crop Sci. 43:729 (2003).

Registration of 'Tango' Barley

'Tango' spring barley (*Hordeum vulgare* L.) (Reg. no. CV-306, PI 631439) was developed by the Oregon Agric. Exp. Stn. and released in June 2000. The Univ. of Idaho Agric. Exp. Stn. and the Washington State Agric. Res. Center participated in the release.

Tango, tested as SR58-4, OR2967007, and 'Step-2', is a six-row, spring habit feed barley developed by molecular marker assisted selection for quantitative trait loci (QTL) determining quantitative resistance to barley stripe rust (incited by *Puccinia striiformis* Westend. f. sp. *hordei*). Additional identifiers are long and smooth-awns, white-aleurone, and short rachilla hairs. Two cycles of molecular marker-assisted backcrossing were used to transfer the resistance QTL alleles from 'BSR-41' to 'Steptoe' (Muir and Nilan, 1973), the recurrent parent. Steptoe is a six-row spring feed barley cultivar released by the Washington State Agric. Res. Center. BSR-41 is doubled haploid (DH) line number 47 in a mapping population of 94 DH lines (Chen et al., 1994; Hayes et al., 1996). The pedigree of BSR-41, a sister line of 'Orca' (Hayes et al., 2000), is 'Calicuchima'-sib/'Bowman' (Franckowiak et al., 1985). Toojinda et al. (1998) describe the marker-assisted selection program that led to the development of Tango in detail. Briefly, restriction fragment length polymorphism (RFLP) markers were used to introgress stripe rust resistance QTL in chromosomes 4 (4H) and 7 (5H). *ABG366* and *Bmy1* flanked the resistance QTL in chromosome 4 and *WG530* and *CDO57* flank the resistance QTL in chromosome 7 (5H). According to the Steptoe × Morex linkage map (Kleinhofs et al., 1993), these intervals are 32.7 and 31.4 centimorgans (cM), respectively. The four RFLP markers were used for two cycles of marker-assisted backcrossing. One hundred thirty-three DH lines were produced from BC_2 plants heterozygous for the four RFLP loci. The DH lines were produced by the *Hordeum bulbosum* technique (Chen and Hayes, 1989). SR 58-4 was the fourth DH line produced from BC_2 plant number 54. The 133 DH lines were genotyped with the four RFLP markers used for marker-assisted selection, and with an additional 106 amplified fragment length polymorphisms (AFLPs), eight random amplified polymorphic DNAs (RAPDs), and two morphological markers. After confirmation of stripe rust resistance at Toluca, Mexico, and preliminary agronomic assessment in Oregon in 1995 and 1996, seed of Tango was sent to New Zealand for off-season increase and evaluation. Five hundred spikes were selected from a phenotypically uniform block in New Zealand in 1997 and were grown by the Washington Crop Improvement Association in 1997. This seed was harvested in bulk for Breeder seed, and Foundation seed was produced in Arizona in the winter of 1997–1998.

Tango is resistant to barley stripe rust under field conditions in Mexico, South America, and the Pacific Northwest, USA. Averaged over tests conducted in Bolivia, Mexico, and the USA. (California, Idaho, Montana, Oregon, and Washington) from 1995–1999, the average adult plant stripe rust severity on Tango was 12%. In the same tests, the average adult plant stripe rust severity on Steptoe, the recurrent parent, was 81%. Initially, only race 24 of P. *striiformis* f. sp. *hordei* was thought to be present in the Americas (Dubin and Stubbs, 1985). Recently, more extensive analysis has revealed considerable variation in pathogen isolates collected in the USA (Chen et al., 1995). Barley germplasm developed by the ICARDA/CIMMYT program in Mexico, including Calicuchima-sib (the source of the stripe rust resistance QTL alleles in Tango) allow limited symptom development (i.e., disease severities less than 30%) when exposed to the spectrum of stripe rust virulence encountered in field tests in South America, Mexico, and the USA. The fact that this germplasm has remained resistant for over a decade may be grounds for describing it as having "durable resistance" (Sandoval-Islas et al., 1998). The primary determinants of stripe rust resistance in Tango were mapped as QTL to chromosomes 4 (4H) and 7 (5H) and the resistance alleles at these QTL originated from Calicuchima-sib (Chen et al., 1994; Hayes et al., 1996). This may indicate that Tango has the adult plant, quantitative resistance of the Calicuchima-sib parent.

Tango was tested under both irrigated and dryland conditions in Oregon, Washington, Idaho, and California (1997–1999). It was also tested in the Western Regional Spring Barley Nursery (WRSBN) in 1998 and 1999. In most tests, and on average, Tango was lower yielding than Steptoe, its recurrent parent. Tango would be expected to yield more than Steptoe under conditions where there was severe stripe rust disease pressure. Although commercial scale epidemics of stripe rust have occurred in the Pacific Northwest, the disease has not been present in most of the comparative yield trials on which this report is based. Averaged over 46 station-years of irrigated tests, the yield of Tango was 5842 kg ha^{-1}, 92% of Steptoe and 93% of 'Baronesse' (the most popular feed cultivar in the Pacific Northwest of the USA). Averaged over 65 station-years of dryland tests, the yield of Tango was 3659 kg ha^{-1}, 94% of Steptoe and 82% of Baronesse. Averaged over 23 station-years in the WRSBN, the yield of Tango was 5658 kg ha^{-1}, 92% of the yield of Steptoe.

In 46 station-years of irrigated and 65 station-years of dryland tests, the average test weights of Tango were 62.3 kg hL^{-1} and 59.3 kg hL^{-1}, respectively. These values are comparable to Steptoe and 91% of Baronesse. Averaged over 23 station-years in the WRSBN, the test weights of Tango and Steptoe were the same, 61.3 kg hL^{-1}. Tango is the same height and has the same maturity as Steptoe, and both cultivars are earlier and taller than Baronesse. Lodging values are similar for the three cultivars. In 45 station-years of combined dryland and irrigated tests, the average Julian heading dates of Tango, Steptoe, and Baronesse were 176, 177, and 182 d, respectively. In 9 station-years of testing in the WRSBN, the average day of the year heading date of Tango was 179 d, as compared with 180 d for Steptoe. Averaged over 111 station-years of combined dryland and irrigated tests, the average plant heights of Tango, Steptoe, and Baronesse were 77, 77, and 73 cm, respectively. In 22 station-years of testing in the WRSBN, the plant height of Tango was 85 cm, as compared to 86 cm for Steptoe. Averaged over 38 station-years of combined dryland and irrigated tests, the average lodging percentages (on a plot basis) for Tango, Steptoe, and Baronesse were 39, 37, and 34%, respectively. Because of the yield advantage of Baronesse and the lack of significant stripe rust disease pressure in most barley growing areas of the Pacific Northwest, there was limited commercial production of Tango in 2000 and 2001. We expect this cultivar will be most useful as a genetically characterized source of resistance to barley stripe rust.

Breeder and Foundation seed will be maintained by the Washington State Crop Improvement Association. Seed for experimental purposes may be obtained from the corresponding author.

P.M. Hayes,* A.E. Corey, C. Mundt, T. Toojinda, and H. Vivar

References

Chen, F., and P.M. Hayes. 1989. A comparison of *Hordeum bulbosum*-mediated haploid production efficiency in barley using *in vitro* floret and tiller culture. Theor. Appl. Genet. 77:701–704.

Chen, X., R.F. Line, and H. Leung. 1995. Virulence and polymorphic DNA relationships of *Puccinia striiformis* f. sp. *hordei* to other rusts. Phytopathology 85:1335–1342.

Chen, F., D. Prehn, P.M. Hayes, D. Mulrooney, A. Corey, and H. Vivar. 1994. Mapping genes for resistance to barley stripe rust (*Puccinia striiformis* f. sp. *hordei*). Theor. Appl. Genet. 88:215–219.

Dubin, H.J., and R.W. Stubbs. 1985. Epidemic spread of barley stripe rust in South America. Plant Dis. 70:141–144.

Franckowiak, J.D., A.E. Foster, V.D. Pederson, and R.E. Pyler. 1985. Registration of Bowman barley. Crop Sci. 25:883.

Hayes, P.M., A.E. Corey, R. Dovel, R. Karow, C. Mundt, K. Rhinart, and H. Vivar. 2000. Registration of Orca barley. Crop Sci. 40:849.

Hayes, P.M., D. Prehn, H. Vivar, T. Blake, A. Comeau, I. Henry, M. Johnston, B. Jones, and B. Steffenson. 1996. Multiple disease resistance loci and their relationship to agronomic and quality loci in a spring barley population. J. Quant. Trait Loci [online]. Available at http://probe.nalusda.gov:8000/otherdocs/jqtl/index.htm

Kleinhofs, A., A. Kilian, M. Saghai Maroof, R. Biyashev, P. Hayes, F. Chen, N. Lapitan, A. Fenwick, T. Blake, V. Kanazin, E. Ananiev, L. Dahleen, D. Kudrna, J. Bollinger, S. Knapp, B. Liu, M. Sorrells, M. Heun, J. Franckowiak, D. Hoffman, R. Skadsen, and B. Steffenson. 1993. A molecular, isozyme, and morphological map of the barley (*Hordeum vulgare*) genome. Theor. Appl. Genet. 86:705–712.

Muir, C.E., and R. Nilan. 1973. Registration of Steptoe barley. Crop Sci. 13:770.

Sandoval-Islas, J.S., L.H.M. Broers, H. Vivar, and K.S. Osada. 1998. Evaluation of quantitative resistance to yellow rust (*Puccinia striiformis* f. sp. *hordei*) in the ICARDA/CIMMYT barley breeding program. Plant Breed. 117:127–130.

Toojinda, T., E. Baird, A. Booth, L. Broers, P. Hayes, W. Powell, W. Thomas, H. Vivar, and G. Young. 1998. Introgression of quantitative trait loci (QTLs) determining stripe rust resistance in barley: an example of marker-assisted line development. Theor. Appl. Genet. 96:123–131.

P.M. Hayes, A.E. Corey, Department of Crop and Soil Science, Oregon State University, Corvallis, OR 97731, USA; C. Mundt, Department of Botany and Plant Pathology, Oregon State University, Corvallis, OR 97731, USA; T. Toojinda, DNA Fingerprinting Unit, National Center for Genetic Engineering and Biotechnology, Kasetsart University, Kampangsaen Campus, Nakorn Pathom, Thailand; H. Vivar, ICARDA/CIMMYT, Apdo. 6-641, Mexico 6, D.F., Mexico. Oregon Agricultural Exp. Stn. Manuscript No. 11893. Registration by CSSA. Accepted 31 Aug. 2002. * Corresponding author (patrick.m.hayes@orst.edu).

Published in Crop Sci. 43:729–731 (2003).

Registration of 'HiPal' Cicer Milkvetch

'HiPal' cicer milkvetch (*Astragalus cicer* L.) (Reg. no. CV-202, PI 630975) was released by the Minnesota Agricultural Experiment Station on 1 February 2001. Cicer milkvetch performs well in the North Central region of the USA and Canada. It has many desirable agronomic traits including a rhizomatous growth habit and is bloat-safe, making it exceptionally well adapted to grazing. In addition, cicer milkvetch is extremely winter hardy, persistent, and is highly tolerant of insect pests common on forage legumes (Marten et al., 1987). However, in Minnesota, heifers (*Bos* sp.) grazing pure stands of cicer milkvetch had reduced intake and gains compared with heifers grazing pure stands of alfalfa (*Medicago sativa* L.) or birdsfoot trefoil (*Lotus corniculatus* L.) suggesting poor palatability (Marten et al., 1987).

HiPal is a 16-clone synthetic selected for improved palatability by grazing sheep (*Ovis* ssp.). The 16 clones trace to an evaluation for palatability of the world collection of cicer milkvetch which was supplied by C.E. Townsend, USDA-ARS in 1988. The germplasm consisted of 59 plant introductions primarily from Europe and Russia where cicer milkvetch is native; polycross progeny from seven of the parental clones of 'Monarch' used in a previous grazing trial (Townsend, 1986); open-pollinated seed collected from an old Soil Conservation Service planting at Mandan, ND; and the germplasm C-10 (Townsend, 1987) for a total of 68 entries.

In March 1988, the 68 germplasm sources were planted in the greenhouse in 164-cm^3 plastic cones and transplanted into spaced-planted pastures for grazing by sheep (*Ovis* spp.) at St. Paul, MN in May, 1988 on 1-m centers. The experimental design was a randomized complete block with eight replications, each replicate consisted of six plants per entry for a total of 3264 plants. Appropriate chemical and mechanical weed control practices were employed to keep the pastures free of weeds. The relative palatability (selection when a choice was offered) of the space plants was determined by four mature ewe sheep in June and August 1989 and June and September 1990. Plants were grazed when they were vegetative and about 20 cm tall. Relative palatability was estimated by two trained observers using a 1 (completely consumed) to 10 (completely rejected) scale. Final scores were assigned when the most palatable plants had ratings of 1 or 2. Before grazing, individual plants were scored for vigor on a scale from 1 to 10, where 10 was the most vigorous. Once the grazing period began, plants were rated daily for percent consumption.

Two plants per replicate were selected based on vigorous growth scores and greater than 50% of the biomass consumed during all four grazing periods. The 16 parental clones selected for HiPal averaged 61% consumption by grazing sheep, scored 7.1 for vigor, and traced to nine plant introductions (PI 362233, 362236, 362272, 362249, 362251, 362257, 362259, 362267, and 362269) and three polycross families from the parental clones of Monarch (F3-C3, 16-5 III-C7, and 17-3 I C8). The 16 selected parental clones were vegetatively propagated and transplanted to an isolated crossing block at Rosemount and Roseau, MN. Syn$_1$ seed was produced by compositing equal seed quantities from each of the 16 clones. Syn$_2$ was produced by transplanting approximately 200 plants from syn$_1$ seed into an isolated crossing block at Rosemount, MN, and bulking the seed from the individual plants.

HiPal was evaluated for improved palatability in a small plot grazing trial established in 1993 at St. Paul, MN. The experimental design was a randomized complete block with six replicates and plot size was 1.8×3.0 m. Entries in the trial consisted of HiPal, Monarch, 'Lutana', and four additional experimental populations. The relative palatability of the entries was evaluated by five or six grazing lambs in September 1993, June 1994, and June and August 1995, when cicer milkvetch was at a late vegetative stage. Palatability was estimated daily by evaluating percent consumption as in the original germplasm evaluation. The final palatability score for each plot was assigned when the herbage of several plots had been well consumed (30% or less of the original total forage remaining as residue). Forage yield and quality samples were collected before grazing and analyzed for neutral detergent fiber (NDF), acid detergent fiber (ADF), and crude protein (CP).

Palatability differences between HiPal, Monarch, and Lutana occurred at two of the four grazing periods. In June, 1995, the sheep consumed 25% more of the HiPal forage early in the grazing period and over 50% more of the HiPal forage from 6 to 9 d after being placed on the pasture when compared with Lutana and Monarch. Differences in palatability were also detected during August 1995 with similar results with 21 to 56% more HiPal consumed than Monarch or Lutana. One cycle of selection for improved palatability in cicer milkvetch was successful in producing HiPal, which averaged 19% of the forage biomass remaining at the end of the four grazing periods compared with 29 and 34% for the forage remaining for Monarch and Lutana.

HiPal had similar NDF (305.9 g kg^{-1}) and ADF (272.6 g kg^{-1}) concentrations and higher CP (214.1 vs. 199.8 g kg^{-1} CP) than Monarch and Lutana at three of the four grazings. The entries had similar final stand densities (74%), vigor ratings (6.3; rated on a scale of 1 to 10 = most vigorous), height (58 cm), and dry matter yield (3405 kg ha^{-1}).

Breeder seed will be maintained by the Minnesota Agricultural Experiment Station, St. Paul, MN. An exclusive release of the HiPal marketing rights has been granted to Norfarm Seeds, Inc., Roseau, MN. The following generations will be allowed: Foundation seed may be produced for three consecutive years; there will be no Registered seed class; Certified seed may be produced for five consecutive years. All seed of HiPal will be sold as a Certified seed class. U.S. Plant Variety Protection for HiPal will not be sought

N.J. Ehlke,* C.C. Sheaffer, G.C. Marten, D.J. Vellekson, and E.A. Ristau

References

Marten, G.C., F.R. Ehle, and E.A. Ristau. 1987. Performance and photosensitization of cattle related to forage quality of four legumes. Crop Sci. 27:138–145.

Townsend, C.E. 1986. Evaluation of polycross progenies of cicer milkvetch for palatability by sheep. Crop Sci. 26:377–380.

Townsend, C.E. 1987. Registration of four germplasm lines of cicer milkvetch. Crop Sci. 27:368.

Dep. of Agronomy and Plant Genetics, University of Minnesota, 411 Borlaug Hall, 1991 Upper Buford Circle, St. Paul, MN 55108. Contribution from the Minnesota Agric. Exp. Stn. Registration by

CSSA. Accepted 31 Aug. 2002. *Corresponding author (ehlke001@umn.edu).

Published in Crop Sci. 43:731–732 (2003).

Registration of 'Roseau' Birdsfoot Trefoil

'Roseau' birdsfoot trefoil (*Lotus corniculatus* L.) (Reg. no. CV-10, PI 630977) was released by the Minnesota Agricultural Experiment Station on 1 February 2001. Severe infestations of Canada thistle [*Cirsium arvense* (L.) Scop.], a competitive perennial broadleaf weed, limit birdsfoot trefoil seed production. Chemical or cultural control methods of Canada thistle are not available. Roseau was selected for glyphosate [*N*-(phosphonomethyl)glycine] tolerance to provide seed producers with a weed control method and was tested under the experimental designation of NC3M.

Roseau is a synthetic cultivar developed from the birdsfoot trefoil cultivar Norcen (Miller et al., 1983) by a combination of recurrent half-sib family and mass selection for glyphosate tolerance. In June 1987, 6200 C_0 plants from Norcen were seeded at a density of 130 plants m^{-2} at Rosemount, MN. Eight weeks after seeding when the plants were 8 to 15 cm tall, seedlings were treated with 0.56 kg ae ha^{-1} of glyphosate plus 0.5% (v/v) nonionic surfactant. Four weeks after treatment, 100 surviving plants were transplanted to the greenhouse and intercrossed in a bee cage in the greenhouse with honeybees (*Apis mellifera* L.) as pollinators. The seed was harvested by individual plant and kept separately in half-sib families for continued cycles of selection. The next two cycles of selection [C_2 and C_3] were performed as follows. From each of the 100 half-sib families, 21 plants were grown in 164-cm^3 plastic cones and divided into three replicates of seven plants. Four-week-old seedlings were treated with glyphosate plus surfactant and rated 14 d after treatment for injury. The glyphosate rates for the cycles of selection were: C_1 and C_2, 0.56 kg ae ha^{-1}; C_3, 1.12 kg ae ha^{-1}; C_4, 1.68 kg ae ha^{-1}; C_5 and C_6, 2.24 kg ae ha^{-1}. The seedlings were rated for injury on a scale of 1 to 4 where 1 = uninjured, 2 = injured shoot, 3 = dead shoot with live axillary shoots, and 4 = dead. The injury data was analyzed and a two-stage selection procedure was used. First, the best 25% of the half-sib families were selected on the basis of the half-sib family mean injury rating. Second, the best four or five individual plants from the best 25 half-sib families were selected on the basis of visual assessment and injury rating to produce 100 parents for the next cycle of selection. The 100 plants were intercrossed in a cage in the greenhouse or intercrossed in the field in isolated crossing blocks using honeybees as pollinators and seed was harvested by half-sib family. After the third cycle of selection, the breeding method changed to phenotypic mass selection. The C_3 seed was seeded as above. Four-week-old seedlings were treated with glyphosate plus surfactant and rated 14 d after treatment for injury by the same scale as above and the best 100 plants were selected from the 2100 treated seedlings. The 100 plants were intercrossed in a bee cage in the greenhouse or intercrossed in the field in isolated crossing blocks with honeybees as pollinators. The seed was harvested by individual plant and was composited in equal amounts from each plant to produce the C_4 synthetic population. Mass selection was repeated to produce the C_5 and C_6 synthetic populations following the same protocol as above. Syn_2 seed of the C_6 cycle of selection was produced in the field in isolated crossing blocks with honeybees as pollinators to produce Breeder seed.

Greenhouse evaluations for glyphosate tolerance were similar to the selection protocol, replicated twice in time, and used four rates of glyphosate (0.56, 1.12, 1.68, and 2.24 kg ae ha^{-1}) and an untreated control. When averaged over the two greenhouse experiments and the rates of glyphosate, Roseau birdsfoot trefoil showed 65% less injury (1.7 vs. 2.8), 2.3 times the fresh shoot weight at 14 d after glyphosate application (0.92 vs. 0.40 g) and 2.9 times the fresh shoot regrowth weight 28 d after clipping (0.78 vs. 0.27 g) when compared to Norcen. Roseau has greater tolerance to glyphosate than 'Nueltin' (Ehlke et al., 2003) on the basis of fresh and regrowth shoot weights (0.85 vs. 0.64 g).

Field evaluations were conducted to determine the glyphosate tolerance of Roseau and to develop the appropriate management strategies for controlling Canada thistle in seed production fields. These evaluations were conducted at Roseau and St. Paul, MN, in a randomized complete block design with a split-plot restriction on randomization with four replicates. Whole plots were timing of glyphosate applications and subplots were Norcen C_0 seed and Roseau Syn_2 seed. Canada thistle populations were introduced into each plot as vegetative shoots after seeding and there was a control whole plot with no thistles. Data collected were percent thistle infestation and seed yield. There were four separate seedings of the evaluation each with six whole plot treatments as follows: (i) early glyphosate treatment: mid-May; (ii) intermediate glyphosate treatment: early June; (iii) late glyphosate treatment: mid- to late June; (iv) early + late glyphosate treatment; (v) no glyphosate treatment plus transplanted thistles; and (vi) no glyphosate treatment with no transplanted thistles. A single rate of glyphosate was used [0.84 kg ae ha^{-1} plus 0.5% (v/v) nonionic surfactant] for each application within each of the treatments. Seed yields were consistently higher for Roseau than for Norcen for all but one treatment at Roseau in 1996 and averaged 74% higher across all glyphosate treatments and seedings (378 vs. 218 kg ha^{-1}). The best control of Canada thistle based on visual ratings occurred with the late and the split application treatments. These treatments resulted in Canada thistle stands being reduced to 3% compared with the thistle infestations in the untreated plots averaging 54%. The early and late application treatments were the most successful for control of Canada thistle and resulted in the highest seed production of Roseau when compared to Norcen (419 vs. 139 kg ha^{-1}). The stress of the glyphosate applications on Roseau appeared to enhance the seed production potential by 84% when compared with the seed yields of the untreated control plots (419 vs. 228 kg ha^{-1}).

Roseau is a broad-leaved birdsfoot trefoil cultivar with an intermediate growth habit between 'Viking' and 'Empire' and has a diverse genetic background making it adapted to a breadth of environmental conditions. Roseau is similar in forage yield potential when compared to the currently available cultivars and averaged 8.6 Mg ha^{-1} across three locations and nine harvest years in replicated trials. Roseau produced higher seed yields when compared to Norcen, Leo, and Empire in replicated seed production trials (475 vs. 409 kg ha^{-1}). Roseau can be distinguished from Nueltin on the basis of having a higher level of tolerance to glyphosate. Roseau is less winter hardy than Leo, Nueltin, and, 'Carroll', but more hardy than Empire, 'Fergus', and 'Steadfast'. Roseau is similar in maturity to Norcen, but is later than Viking and earlier than Empire and Carroll.

Breeder seed will be maintained by the Minnesota Agricultural Experiment Station, St. Paul, MN. An exclusive release of the Roseau marketing rights has been granted to Norfarm Seeds, Inc., Roseau, MN. The following generations will be allowed: Foundation seed may be produced for three consecutive years; there will be no Registered seed class; Certified seed may be produced for four consecutive years. All seed of

Roseau will be sold as a Certified seed class. U.S. Plant Variety Protection for Roseau will not be sought.

N.J. Ehlke,* D.L. Wyse, and D.J. Vellekson

References

Miller, D.A., P.R. Bueselinck, I.T. Carlson, and L.J. Elling. 1983. Norcen birdsfoot trefoil. Crop Sci. 23:1010–1011.

Ehlke, N.J., D.L. Wyse, and D.J. Vellekson. 2003. Nuetlin birdsfoot trefoil. Crop Sci. 43:733–734 (this issue).

Dep. of Agronomy and Plant Genetics, University of Minnesota, 411 Borlaug Hall, 1991 Upper Buford Circle, St. Paul, MN 55108. Contribution from the Minnesota Agric. Exp. Stn. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (ehlke001@umn.edu).

Published in Crop Sci. 43:732–733 (2003).

Registration of 'Nueltin' Birdsfoot Trefoil

'Nueltin' birdsfoot trefoil (*Lotus corniculatus* L.) (Reg. no. CV-9, PI 630976) was released by the Minnesota Agricultural Experiment Station on 1 February 2001. Certified birdsfoot trefoil seed production is limited by severe infestations of Canada thistle [*Cirsium arvense* (L.) Scop.], a competitive perennial broadleaf weed. No viable methods of chemical or cultural control for Canada thistle are available to producers. Nueltin was selected for glyphosate [*N*-(phosphonomethyl)-glycine] tolerance to provide seed producers with a weed control strategy and was tested under the experimental designation of LC6F.

Nueltin is a synthetic cultivar developed from the birdsfoot trefoil cultivar Leo (Bubar, 1964) using recurrent half-sib family selection for glyphosate tolerance. In June 1987, 6200 C_0 plants from the cultivar Leo were seeded at Rosemount, MN. Eight weeks after seeding and when the plants were 8 to 15 cm tall, they were treated with 0.56 kg ae ha^{-1} of glyphosate plus 0.5% (v/v) nonionic surfactant. Four weeks after treatment, 19 surviving plants were transplanted to the greenhouse. To increase population numbers, 2000 plants were grown in the greenhouse in 20 blocks of 100 plants in polyethylene tubes. When the plants were 4 to 6 wk old and 8 cm tall, the plants were sprayed with a stationary pot sprayer with 0.84 kg ae ha^{-1} glyphosate plus 0.5% (v/v) nonionic surfactant. Five weeks after treatment, the five most tolerant plants from each of the 20 blocks were selected and the best 100 plants out of the 119 from the field and the greenhouse screen were intercrossed in a bee cage in the greenhouse with honeybees (*Apis mellifera* L.) as pollinators. Seed was harvested by individual plant and kept separately as half-sib families for additional cycles of selection. The remaining five cycles of selection were performed as follows. From each of the 100 half-sib families, 21 plants were seeded into 164-cm^3 plastic cones and divided into three replicates of seven plants for a total of 2100 plants. Four-week-old seedlings were treated with glyphosate plus surfactant and rated 14 d after treatment for injury. The glyphosate rates for the cycles of selection were as follows: C_1 and C_2, 0.56 kg ae ha^{-1}; C_3, 1.12 kg ae ha^{-1}; C_4, 1.68 kg ae ha^{-1}; C_5 and C_6, 2.24 kg ae ha^{-1}. The seedlings were rated for injury on a scale of 1 to 4 where 1 = uninjured, 2 = injured shoot, 3 = dead shoot with live axillary shoots, and 4 = dead. The injury data were analyzed and a two-stage selection procedure was used. First, the best 25% of the half-sib families were selected on the basis of the half-sib family mean injury rating. Second, the best four or five individual plants from the previously identified 25 superior half-sib families were selected on the basis of visual assessment and injury rating to produce 100 parents for the next cycle of selection. The 100 plants were intercrossed in a cage in the greenhouse or intercrossed in the field in isolated crossing blocks with honeybees as pollinators and seed was harvested by half-sib family. After six cycles of selection, equal quantities of seed from each half-sib family was composited to produce the C_6 Syn_1 population. Syn_2 seed of the C_6 cycle of selection was produced in the field in isolated crossing blocks with honeybees as pollinators to produce Breeder seed.

Greenhouse evaluation trials for glyphosate tolerance were conducted in a manner consistent with the selection protocol, replicated twice in time, and used four rates of glyphosate (0.56, 1.12, 1.68, and 2.24 kg ae ha^{-1}) and an untreated control. When averaged over the two greenhouse experiments and the four rates of glyphosate, Nueltin birdsfoot trefoil showed 60% less injury (1.8 vs. 2.9), 2.5 times the fresh shoot weight at 14 d after glyphosate application (0.69 g vs. 0.28 g) and 2.3 times the fresh shoot regrowth weight 28 d after the initial clipping (0.58 g vs. 0. 26 g) when compared with Leo.

The field evaluation was conducted to determine the glyphosate tolerance of Nueltin and to develop the appropriate management strategies for controlling Canada thistle in seed production fields. The research was conducted at Roseau and St. Paul, MN. The field evaluation was conducted as a randomized complete block design with a split-plot restriction on randomization with four replicates. Whole plots were timing of glyphosate applications and subplots were the unselected Leo C_0 seed and Nueltin Syn_2 seed. Canada thistle populations were introduced into each plot using vegetative shoots after seeding and there was a control whole plot with no thistles. Data collected were percent thistle infestation and seed yield. There were four separate seedings of the evaluation each with six whole plot treatments as follows: (i) early glyphosate treatment: mid-May; (ii) intermediate glyphosate treatment: early June; (iii) late glyphosate treatment: mid- to late June; (iv) early + late glyphosate treatment; (v) no glyphosate treatment plus transplanted thistles; and (vi) no glyphosate treatment with no transplanted thistles. A single rate of glyphosate was applied at 0.84 kg ae ha^{-1} plus 0.5% (v/v) nonionic surfactant for each of the treatments. Seed yields were consistently higher for Nueltin than for Leo for all but one treatment at Roseau in 1996 and averaged twice the seed yield of Leo across all glyphosate treatments and seedings (377 vs. 198 kg ha^{-1}). The best control of Canada thistle based on visual ratings occurred with the late and the split application treatments. These treatments resulted in Canada thistle stands being reduced to 2% compared with the thistle infestations in the untreated plots averaging 63%. The early and late application treatment was the most successful for control of Canada thistle and resulted in the highest seed production of Nueltin (435 vs. 130 kg ha^{-1} for Leo). The stress of the glyphosate applications on Nueltin appeared to enhance the seed production potential by over 50% when compared with the seed yields of the untreated control plots (435 vs. 294 kg ha^{-1}).

Nueltin is a broad-leaved birdsfoot trefoil cultivar with good spring vigor and excellent winter hardiness. Nueltin is similar in forage yield potential when compared to the currently available cultivars and averaged 8.3 Mg ha^{-1} across three locations and nine harvest years in replicated trials. Nueltin is similar in seed and forage yield potential when compared to 'Norcen', Leo, and 'Carroll'. Nueltin should be widely adapted to the northern United States and adjacent areas of Canada.

Breeder seed will be maintained by the Minnesota Agricultural Experiment Station, St. Paul, MN. An exclusive release of the Nueltin marketing rights has been granted to Norfarm Seeds, Inc., Roseau, MN. The following generations will be allowed: Foundation seed may be produced for three consecutive years; there will be no Registered seed class; Certified seed may be produced for four consecutive years. All seed of Nueltin has to be sold as a Certified seed class. U.S. Plant Variety Protection for Nueltin will not be sought.

N.J. Ehlke,* D.L. Wyse, and D.J. Vellekson

References

Bubar, J.S. 1964. Leo birdsfoot trefoil. Can. J. Plant Sci. 44:219–220.

Dep. of Agronomy and Plant Genetics, University of Minnesota, 411 Borlaug Hall, 1991 Upper Buford Circle, St. Paul, MN 55108. Contribution from the Minnesota Agric. Exp. Stn. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (ehlke001@umn.edu).

Published in Crop Sci. 43:733–734 (2003).

Registration of 'Jubilee' Wheat

'Jubilee' soft white spring wheat (*Triticum aestivum* L.) (Reg. no. CV-922, PI 614839) was developed by the Idaho, Oregon, and Washington Agricultural Experiment Stations for use by grain producers in the Pacific Northwest of the USA. Jubilee is a semidwarf wheat, with excellent grain yield potential and end-use quality, that is adapted to rain-fed and irrigated production at elevations above 1000 m.

Jubilee was derived from the cross A8854S, made in 1988, with the pedigree IDO184/IDO159//'Tonichi' sib/2*'Sterling'. Sterling (CItr 17859) (Sunderman et al., 1984) is a soft white spring wheat developed at Aberdeen, ID, by the USDA-ARS and released by the Colorado Agricultural Experiment Station. Tonichi (PI 471922) is a spring wheat developed at the International Center for Maize and Wheat Improvement (CIMMYT) and was used as a donor source for stripe rust resistance (caused by *Puccinia striiformis* Westend.). IDO184 and IDO159 are soft white spring breeding lines with the respective pedigrees: 'Lemhi 66'/3/'Yaktana 54A'*4//'Norin 10'/'Brevor'/4/Yaktana 54A*4//Norin 10/Brevor/3/'Nugaines' and Yaktana 54A*4//Norin 10/Brevor/3/Nugaines/4/'Fielder'. A8854S was advanced by the bulk method without intentional selection in the F_2 generation. In the F_3 generation, heads were selected from short plants and planted as $F_{3:4}$ headrows in 1991. From these headrows, the selection A8854S-12 was advanced to testing yield trials in southeastern Idaho for 5 yr. In 1997, A8854S-12 was designated IDO525 and entered into the Tri-State Spring Wheat Nursery. IDO525 was advanced the next year into the Western Regional Spring Wheat Nursery for 3 yr of testing (1998–2000). In 1999, IDO525 was evaluated in the Pacific Northwest Wheat Quality Council and in Idaho on-farm extension trials. In 1999, 200 $F_{3:12}$ head selections were grown at Aberdeen, ID, and selected for uniform plant type. Seed from headrows that were true-to-type were harvested and planted at the University of Idaho, Tetonia Research and Extension Center in 2000 to generate Breeder seed.

Jubilee is most similar in appearance to 'Whitebird' (PI 592982) soft white spring wheat (Souza et al., 1997). Jubilee has an unpigmented coleoptile and erect juvenile growth. Jubilee has a recurved, twisted flag leaf and an awned, erect, lax head, which is white-chaffed at maturity. Jubilee is 86 cm tall, equal to 'Vanna' and 3 cm shorter than Whitebird. Jubilee is similar in heading date to Whitebird and 'Penawawa' (PI 495916), heading approximately 2 d later than 'Centennial' (PI 537303) and 4 d earlier than 'Treasure' (PI 468962). Seed of Jubilee is soft, white, elliptical, and plump, with a kernel type similar to 'Centennial', but approximately 1.5 mg per kernel heavier than Whitebird. On the basis of field evaluations in Washington and Idaho, Jubilee has adult plant resistance to stripe rust. In 1998 and 1999 in replicated field trials at Pullman and Mt. Vernon, WA, Jubilee had type 2 to type 5 reactions to *P. striiformis* infection with up to 20% of the leaf area occluded by chlorosis or pustules. By comparison, Penawawa, which has moderate adult plant resistance, had reaction types from 5 to 8 with up to 40% of the leaf area occluded. Jubilee is susceptible to Hessian fly [*Mayetiola destructor* (Say)] biotypes common in the Pacific Northwest on the basis of observations of infested field trials in northern Idaho from 1999 to 2001.

In 20 site-years of southeastern Idaho replicated trials from 1995 to 1999, Jubilee had a grain yield of 6200 kg ha^{-1} compared with 6200 kg ha^{-1} for Penawawa, 5990 kg ha^{-1} for Whitebird, 5930 kg ha^{-1} for Vanna, and 5870 kg ha^{-1} for Treasure. In the same trials, Jubilee, Penawawa, Whitebird, Vanna, and Treasure had grain volume weights of 766, 753, 768, 744, and 746 kg m^{-3}, respectively. In irrigated trials, Jubilee lodged less than Treasure, but was similar to Penawawa and Whitebird. Jubilee has a high milling yield. In 18 site-years of test milling with a Quadrumat Senior Mill (Brabender Instruments Inc., S. Hackensack, NJ) by the University of Idaho Wheat Quality Laboratory, Jubilee had a total flour yield of 685 g kg^{-1}, similar to Treasure (676 g kg^{-1}) and Whitebird (678 g kg^{-1}), yet higher than Penawawa (633 g kg^{-1}) and Vanna (660 g kg^{-1}). In the same quality evaluations, Jubilee had a cookie diameter of 8.97 cm, greater than other cultivars evaluated, including Treasure, Whitebird, Penawawa, and Vanna (8.80, 8.84, 8.45, and 8.70 cm, respectively). The superior soft wheat quality of Jubilee appears to be due in part to reduced levels in the flour of damaged starch and pentosans as measured by the Solvent Retention Capacity test (Guttieri et al., 2001). In 6 site-years of irrigated, southern Idaho trials, the sodium carbonate flour-solvent absorptions (correlated to damaged starch in flour) for Jubilee, Treasure, Whitebird, Penawawa, and Vanna were 599, 602, 615, 654, and 661 g kg^{-1}, respectively (LSD0.05, 12 g kg^{-1}). In the same evaluations, Jubilee, Treasure, Whitebird, Penawawa, and Vanna had sucrose flour-solvent absorptions (correlated to total pentosan content) of 895, 928, 908, 1023, 1018 g kg^{-1}, respectively (LSD0.05, 21 g kg^{-1}). On the basis of these evaluations, Jubilee has similar levels of water absorption due to damaged starch as the quality standard Treasure and less water absorption because of pentosans than Treasure.

Seed of Jubilee will be maintained by the Idaho Agricultural Experiment Station. Foundation seed may be obtained by contacting the corresponding author. U.S. Plant Variety Protection has been requested for Jubilee.

E. Souza,* M. Guttieri, and K. O'Brien

References

Guttieri, M.J., D. Bowen, D. Gannon, K. O'Brien, and E. Souza. 2001. Solvent retention capacities of irrigated soft white spring wheat flours. Crop Sci. 41:1054–1061.
Souza, E., J.M. Windes, D.W. Sunderman, and K. O'Brien. 1997. Registration of Whitebird wheat. Crop Sci. 37:1009.
Sunderman, D.W., G.H. Ellis, and B. O'Connell. 1984. Registration of Sterling wheat. Crop Sci. 24:621.

Plant, Soils, and Entomological Sci. Dep., Univ. of Idaho, Aberdeen Research and Extension Ctr., P.O. Box AA, Aberdeen, ID 83210. Manuscript No. 98710 of research funded in part by Idaho Agric. Exper. Stn. Hatch Project IDA 1222. Contribution from the Minnesota Agric. Exp. Stn. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (esouza@uidaho.edu).

Published in Crop Sci. 43:734 (2003).

Registration of 'Lolo' Wheat

'Lolo' hard white spring wheat (*Triticum aestivum* L.) (Reg. no. CV-923, PI 614840) was developed by the Idaho Agricultural Experiment Station. Lolo is a semidwarf wheat adapted to rain-fed and irrigated production in the intermountain West of the USWA. It has excellent grain yield and end-use quality for alkaline and Chinese style noodles.

Lolo was derived from the 1991 cross A9158S with the pedigree 'Oasis 86'/IDO377. Oasis is a semidwarf hard white spring wheat developed by the International Center for Maize and Wheat Improvement (CIMMYT) with the pedigree 'Yecora'*3/'Agatha'. IDO377 was the original heterogeneous population from which 'Idaho 377s' was selected (Souza et al., 1997a). A9158S was advanced in bulk through the F_2 generation to the F_3 generation in field plantings at Aberdeen, ID. In the F_3 generation, heads were selected and planted as $F_{3:4}$ headrows in 1994. From these headrows, the selection A9158S-8 was advanced to yield trials in southeastern Idaho for 2 yr. In 1997, A9158S-8 was designated IDO533 and entered into the Tri-State Spring Wheat Nursery for one year. IDO533 was tested in the Western Regional Spring Wheat Nursery in 1998 and 1999 and the Uniform Regional Performance Nursery in 1999. On-farm trials were conducted by the Idaho Cooperative Extension Service in 1998 and 1999, with similar evaluations in Oregon and Washington for the same years. In 1998, 200 $F_{3:8}$ head selections were grown at University of Idaho, Tetonia Research and Extension Center and selected for uniform plant type. Seed from headrows that were true-to-type were harvested and planted at El Centro, CA to form breeder seed of Lolo.

Lolo is most similar in appearance to the cultivar Idaho 377s. Lolo is most readily distinguished from Idaho 377s by its uniformity of plant height and slightly delayed heading date (average day of the year heading date in southern Idaho yield trials is 181 for Lolo and 180 for Idaho 377s). Lolo has an unpigmented coleoptile and erect juvenile growth habit. Lolo has an erect flag leaf and an awned, curved mid-dense head that is white-chaffed at maturity. Lolo is 90 cm tall, 10 cm taller than 'Westbred 936', and 8 cm shorter than 'Amidon'. Seed of Lolo is hard white, ovate, and plump. The kernel shape is similar to Idaho 377s only slightly less elongated. On the basis of field evaluations in Washington and Idaho, Lolo has resistance to stripe rust (caused by *Puccinia striiformis* Westend.), predominantly races CDL37, CDL43, and CDL-45]. In 1998 and 1999, Lolo and Idaho 377s had type 0 reactions to *P. striiformis* in all Idaho and Washington trials compared with the type 5, 20% reaction, which was the most severe reaction observed for 'Whitebird' (Souza et al., 1997b), a cultivar with moderate adult plant resistance. Lolo has seedling susceptibility to *P. triticina* Eriks. races MCRJ, MCDS, MDBJ, MCBH, and TLGP (Ratings by USDA-ARS Cereal Disease Laboratory of Western Regional Spring Wheat Nursery). Yet, Lolo has resistance as an adult plant to natural infection with *P. triticina* based on 1998 field trials at Pullman, WA, when Lolo had 0% leaf area occluded by pustules and the susceptible check cultivar Treasure had a 20% occlusion. Field trials at Aberdeen, ID, 1998 to 2000, resulted in 0% reaction for Lolo when Treasure had ratings from trace to 5%. Lolo is susceptible to the Hessian fly [*Mayetiola destructor* (Say)] biotypes common in the Pacific Northwest based on observation of field infestations in north Idaho yield trials, 1998 to 2000.

In 99 research and extension trials conducted in Idaho, Montana, Oregon, Utah, and Washington, Lolo had average grain yield of 4972 kg ha^{-1} compared to 4770 kg ha^{-1} for Idaho 377s. In research and extension testing from 1997 to 2000 in Idaho, Oregon, Washington, Utah, and Montana, Lolo had an average grain volume weight of 778 kg m^{-3} compared with 770 kg m^{-3} for Idaho 377s. In irrigated trials, Lolo is less prone to lodging than Idaho 377s. In Pacific Northwest research and extension trials since 1997, where significant lodging occurred, Lolo had 27% lodging compared with 41% lodging for Idaho 377s. In three years of southeastern Idaho trials, Lolo had a flour protein content of 108 g kg^{-1}, lower than the 116 g kg^{-1} for Idaho 377s. In three years of milling and baking evaluations by the University of Idaho Wheat Quality Laboratory, Lolo had a higher milling yield (663 g kg^{-1} at 3.77 g kg^{-1} flour ash) than did Idaho 377s (647 g kg^{-1} at 3.90 g kg^{-1} flour ash). In evaluations of the milled flour, Lolo and Idaho 377s are similar for bread and noodle characteristics with the exception that Lolo produces a slightly less yellow noodle than Idaho 377s (CIE *b**: 19.7 for Lolo and 21.6 for Idaho 377s).

Seed of Lolo will be maintained by the Idaho Agricultural Experiment Station. Seed may be obtained by contacting the corresponding author.

E. Souza,* M. Guttieri, and R. Mclean

References

Souza, E., J.M. Windes, S.O. Guy, L. Robertson, D.W. Sunderman, and K. O'Brien. 1997a. Registration of Idaho 377s wheat. Crop Sci. 37:1393.

Souza, E., J.M. Windes, D.W. Sunderman, and K. O'Brien. 1997b. Registration of Whitebird wheat. Crop Sci. 37:1009.

E. Souza and M. Guttieri: Plant, Soils, and Entomological Sci. Dep., Univ. of Idaho, Aberdeen Research and Extension Ctr., P.O. Box AA, Aberdeen, ID 83210. R. McLean former graduate assistant, University of Idaho, present address: Pendleton Flour Mills, Blackfoot, ID 83221. Research funded in part by Idaho Agric. Exper. Stn. Hatch Project IDA 1222 and USDA-NRI Fund for Rural America Project IDA0114-FRA. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (esouza@uidaho.edu).

Published in Crop Sci. 43:734–735 (2003).

Registration of 'BigSky' Wheat

'BigSky' (Reg. no. CV-924, PI 619166) is a hard red winter wheat (*Triticum aestivum* L.) developed and released by the Montana Agricultural Experiment Station in September 2001. BigSky was derived from the cross 'NuWest'/'Tiber' (Bruckner et al., 1996; Kisha et al., 1992) made in 1985. BigSky was released for its broad adaptation to winter wheat growing regions of Montana and its superior combination of high yield potential, high test weight, and high grain protein content. BigSky is a potential replacement for Tiber, the second leading winter wheat cultivar in Montana from 1990 to 2000 on the basis of planted acreage.

BigSky was developed by means of the bulk breeding method. BigSky was derived as an $F_{4:5}$ head row selected by E. A. Hockett in 1990. BigSky was evaluated as MT9432 in the Montana Preliminary Yield nursery in 1994, in the Montana Intrastate Yield nursery from 1995 to 2001, in the Montana Off-station Yield nursery from 1997 to 2001, and in the Northern Regional Performance Nursery and Western Uniform Hard Winter Wheat Nursery in 2000. Breeder seed of BigSky originated from a composite of 93 $F_{11:13}$ line-rows selected in 1998 on the basis of visual uniformity.

BigSky exhibits a prostrate juvenile growth habit and is similar in vegetative appearance to Tiber. The foliage is blue-green with a pronounced waxy bloom at anthesis. The flag leaf is recurved and nontwisted at the boot stage. The spikes are awned, mid-dense, oblong, and erect with white glumes. Kernels of BigSky are red colored, hard textured, and ovate with rounded cheeks and a shallow crease.

BigSky is a conventional height cultivar with excellent straw strength similar to Tiber. Plant height of BigSky (82 cm) has averaged 3 to 4 cm more than 'Judith', NuWest, and 'Neeley', and 1 cm less than Tiber. BigSky has a long coleoptile (102 mm), similar to Tiber and 'Harding'. Winterhardiness of BigSky is acceptable for most growing environments of Montana with mean survival of 67% in 15 environments with differential winter kill, compared to 'Morgan' (71%), NuWest (65%), Judith (62%), Tiber (61%), and Neeley (61%). BigSky is medium in maturity (163 d from 1 January), heading 3 d later than Judith and 1 to 2 d earlier than Tiber, Neeley, and Morgan.

In Montana dryland performance trials from 1996 to 2001 (91 site-years), average grain yields of BigSky, Tiber, and Neeley were 3830, 3793, and 3928 kg ha^{-1}, respectively. Grain volume weight of BigSky (791 kg m^{-3}) was superior to that of Tiber (786 kg m^{-3}) and Neeley (775 kg m^{-3}). Wheat protein of BigSky (136 g kg^{-1}) was similar to that of Tiber (135 g kg^{-1}), and greater than that of Neeley (128 g kg^{-1}).

BigSky is resistant to stem rust (caused by *Puccinia graminis* Pers:Pers. f. sp. *tritici* Eriks & E. Henn.) race *Pgt*-TPMK and is postulated to contain *Sr*6. BigSky is susceptible to leaf rust (caused by *Puccinia triticinia* Eriks.), *Wheat streak mosaic virus*, wheat stem sawfly (*Cephus cinctus* Nort.), the Great Plains biotype of Hessian fly [*Mayetiola destructor* (Say)], and Russian wheat aphid [*Diuraphis noxia* (Mordvilko)].

On the basis of 5 yr (20 site-years) of cereal quality evaluation at Montana State University, BigSky meets domestic quality criteria for high-quality bread wheat production. Flour yield of BigSky (658 g kg^{-1}) was similar to that of Tiber (659 g kg^{-1}) and Neeley (664 g kg^{-1}). Flour ash content of BigSky (3.3 g kg^{-1}) was similar to that of Tiber (3.2 g kg^{-1}) and lower than that of Neeley (3.5 g kg^{-1}). Bake water absorption of BigSky (744 g kg^{-1}) was significantly higher than that of Neeley (730 g kg^{-1}) and Tiber (726 g kg^{-1}). Loaf volumes were similar for BigSky, Neeley, and Tiber (991 to 997 cm^3). Based on 16 site-years of evaluation at Montana State University, raw Chinese noodle quality of BigSky is inferior to NuWest, similar to that of Neeley, and superior to that of Tiber. Mean noodle score, calculated from combined criteria of noodle color stability and noodle machining properties, was highest for NuWest (348), intermediate for Neeley (334) and BigSky (331), and lowest for Tiber (309). Noodle firmness 0 and 5 min after cooking was significantly greater for BigSky than NuWest, Neeley, and Tiber.

Breeder and Foundation classes of seed of BigSky will be maintained by the Montana Agricultural Experiment Station. Application will be made for U.S. Plant Variety Protection under the Title V option of P.L. 91-577. Small quantities of seed for research purposes may be obtained from the corresponding author for at least 5 yr from the date of publication.

P.L. Bruckner,* J.E. Berg, G.R. Carlson, D.M. Wichman, N. Riveland, K.D. Kephart, R.N. Stougaard, G.D. Kushnak, J.L. Eckhoff, E.A. Hockett, and D.K. Habernicht

References

Bruckner, P.L., G.A. Taylor, R.N. Stougaard, G.D. Jackson, G.R. Carlson, J.L. Eckhoff, G.D. Kushnak, G.F. Stallknecht, D.M. Wichman, H.F. Bowman, D.E. Mathre, E.A. Hockett, and C.F. McGuire. 1996. Registration of 'Nuwest' wheat. Crop Sci. 36:209.

Kisha, T.J., G.A. Taylor, H.F. Bowman, L.E. Weisner, G.D. Jackson, G.R. Carlson, J.W. Bergman, G.D. Kushnak, G.F. Stallknecht, V.R. Stewart, and C.F. McGuire. 1992. Registration of 'Tiber' hard red winter wheat. Crop Sci. 32:1292–1293.

P.L. Bruckner, J.E. Berg, E.A. Hockett, and D.K. Habernicht, Dep. of Plant Sciences & Plant Pathology, Montana State Univ., Bozeman, MT 59717-3140; G.R. Carlson, Northern Agricultural Research Center, Star Route #36, Box 43, Havre, MT 59501; D.M. Wichman, Central Agricultural Research Center, HC90-Box 20, Moccasin, MT 59462; N. Riveland, Williston Research Extension Center, 14120 Highway 2, Williston, ND 58801; K.D. Kephart, Southern Agricultural Research Center, 748 Railroad Highway, Huntley, MT 59037; R.N. Stougaard, Northwestern Agricultural Research Center, 4570 Montana 35, Kalispell, MT 59901; G.D. Kushnak, Western Triangle Agricultural Research Center, P.O. Box 974, Conrad, MT 59425, and J.L. Eckhoff, Eastern Agricultural Research Center, 1501 N. Central, Sidney, MT 59270. Journal Series No. 2001-61, Montana Agricultural Experiment Station, Montana State Univ.-Bozeman. BigSky was developed with financial support from the Montana Wheat & Barley Committee and the Montana Agricultural Experiment Station. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (bruckner@montana.edu).

Published in Crop Sci. 43:735–736 (2003).

Registration of 'NuSky' Wheat

'NuSky' (Reg. no. CV-925, PI 619167) is a hard white winter wheat (*Triticum aestivum* L.) developed and released by the Montana Agricultural Experiment Station in September, 2001. NuSky was derived from the cross 'NuWest'/'Tiber' (Bruckner et al., 1996; Kisha et al., 1992) made in 1985 and is a sib selection of hard red winter wheat cultivar BigSky, also released in 2001. NuSky was released for its superior adaptation and field performance combined with excellent end-use qualities for bread and Asian noodle products.

NuSky was developed by means of the bulk breeding method. NuSky was derived as an $F_{4:5}$ head row selected by E. A. Hockett in 1990. NuSky was evaluated as MTW9441 in the Montana Preliminary Yield and Advanced Yield nurseries in 1994 and 1995, respectively, in the Montana Intrastate Yield nursery from 1996 to 2001, and in the Montana Off-station Yield nursery from 1998 to 2001. NuSky was evaluated in the Northern Regional Performance Nursery and Western Uniform Hard Winter Wheat Nursery in 2000 and in the Asian Products Collaborative program coordinated by U.S. Wheat Associates, Portland, OR and the Wheat Marketing Center, Portland, OR, from 1999 to 2001. Breeder seed of NuSky originated from a composite of 43 $F_{11:13}$ line-rows selected in 2000 on the basis of visual uniformity and white kernel color purity. Breeder seed of NuSky contains approximately 1 red kernel per 3500 kernels.

NuSky exhibits a prostrate juvenile growth habit and is similar in vegetative appearance to NuWest. The foliage is green with a pronounced waxy bloom at anthesis. The flag leaf is recurved and nontwisted at the boot stage. NuSky spikes are awned, mid-dense, fusiform, and inclined with white glumes. Kernels of NuSky are white colored, hard textured, and ovate with rounded cheeks and a shallow crease.

NuSky is an intermediate height cultivar with average straw strength similar to NuWest. Plant height of NuSky (79 cm) is similar to NuWest, and 'Neeley', and 4 cm less than Tiber. NuSky has a short coleoptile (75 mm), similar to NuWest and 'Windstar'. Winter hardiness of NuSky is acceptable for most growing environments in Montana with a mean survival rate of 72% for 13 site-years where differential winter kill occurred, compared with NuWest (68%), Neeley (65%), and Tiber (64%). NuSky is medium to late in maturity (164 d from 1 January), heading 1 d earlier than NuWest and 5 d later than 'Judith'. Like both of its parents, NuSky is resistant to preharvest sprouting with high transient post-harvest dormancy.

In Montana dryland performance trials from 1996 to 2001 (83 site-years), average grain yields of NuSky, NuWest, Tiber, and Neeley were 3940, 3958, 3893, and 4046 kg ha^{-1}, respectively. Grain volume weight of NuSky (779 kg m^{-3}) was similar to that of NuWest (780 kg m^{-3}) and superior to that of Neeley (775 kg m^{-3}).

NuSky is resistant to stem rust (caused by *Puccinia graminis* Pers:Pers. f. sp. *tritici* Eriks & E. Henn.) race *Pgt*-TPMK and is postulated to contain *Sr*6. NuSky is susceptible to leaf rust (caused by *Puccinia triticinia* Eriks.), *Wheat streak mosaic virus*, wheat stem sawfly (*Cephus cinctus* Nort.), the Great Plains biotype of Hessian fly [*Mayetiola destructor* (Say)], and Russian wheat aphid [*Diuraphis noxia* (Mordvilko)].

On the basis of 5 yr (20 site-years) of cereal quality evaluation at Montana State University, NuSky meets domestic quality criteria for high-quality bread wheat production. NuSky is similar to NuWest for all quality criteria. Wheat protein of NuSky (134 g kg^{-1}) was similar to that of NuWest (133 g kg^{-1}) and Tiber (136 g kg^{-1}), and greater than that of Neeley (129 g kg^{-1}). On the basis of experimental milling using a Brabender Automat Mill (South Hackensack, NJ), flour yield of NuSky (672 g kg^{-1}) was greater than that of Tiber (659 g kg^{-1}) and Neeley (664 g kg^{-1}). Flour ash content of NuSky (3.5 g kg^{-1}) was greater than that of Tiber (3.2 g kg^{-1}) and similar to that of Neeley (3.5 g kg^{-1}). Bake water absorption of NuSky (731 g kg^{-1}) was similar to that of Neeley (730 g kg^{-1}) and Tiber (726 g kg^{-1}). Loaf volumes were similar for NuSky (1005 cm^3), NuWest (1008 cm^3), Neeley (991 cm^3), and Tiber (991 cm^3).

On the basis of evaluation in the Asian Products Collaborative program, laboratory evaluation at Montana State University, and numerous sensory evaluations conducted at Bozeman, MT, by Asian wheat trade teams, NuSky is acceptable for making raw Chinese noodle products. NuSky has a low level of polyphenol oxidase (PPO) activity as judged by both tyrosine and L-DOPA (L-3,4-dihydroxyphenyl alanine) assays (Anderson and Morris, 2001), with good noodle color stability. Mean noodle score, calculated from combined criteria of noodle color stability and noodle machining properties, was highest for NuSky (348) and NuWest (348), intermediate for Neeley (334), and lowest for Tiber (309) based on 16 site-years of data. Quantitative differences in noodle texture parameters were not detected between NuSky and NuWest using TA-XT2 Texture analysis (Texture Technologies Corp., Scarsdale, NY). Noodle firmness of NuSky 5 min after cooking was significantly greater than in Neeley and Tiber.

Breeder and foundation seed of NuSky will be maintained by the Montana Agricultural Experiment Station. Application will be made for U.S. Plant Variety Protection under the Title V option of P.L. 91-577. Small quantities of seed for research purposes may be obtained from the corresponding author for at least 5 yr from the date of publication.

J.E. Berg, P.L. Bruckner,* K.D. Kephart, R.N. Stougaard, G.D. Kushnak, J.L. Eckhoff, G.R. Carlson, D.M. Wichman, N. Riveland, E.A. Hockett, and D.K. Habernicht

References

Anderson, J.V., and C.F. Morris. 2001. An improved whole-seed assay for screening wheat germplasm for polyphenol oxidase activity. Crop Sci. 41:1697–1705.

Bruckner, P.L., G.A. Taylor, R.N. Stougaard, G.D. Jackson, G.R. Carlson, J.L. Eckhoff, G.D. Kushnak, G.F. Stallknecht, D.M. Wichman, H.F. Bowman, D.E. Mathre, E.A. Hockett, and C.F. McGuire. 1996. Registration of 'Nuwest' wheat. Crop Sci. 36:209.

Kisha, T.J., G.A. Taylor, H.F. Bowman, L.E. Weisner, G.D. Jackson, G.R. Carlson, J.W. Bergman, G.D. Kushnak, G.F. Stallknecht, V.R. Stewart, and C.F. McGuire. 1992. Registration of 'Tiber' hard red winter wheat. Crop Sci. 32:1292–1293.

J.E. Berg, P.L. Bruckner, E.A. Hockett, and D.K. Habernicht, Dep. of Plant Sciences & Plant Pathology, Montana State Univ., Bozeman, MT 59717-3140; K.D. Kephart, Southern Agricultural Research Center, 748 Railroad Highway, Huntley, MT 59037; R.N. Stougaard, Northwestern Agricultural Research Center, 4570 Montana 35, Kalispell, MT 59901; G.D. Kushnak, Western Triangle Agricultural Research Center, P.O. Box 974, Conrad, MT 59425; J.L. Eckhoff, Eastern Agricultural Research Center, 1501 N. Central, Sidney, MT 59270; G.R. Carlson, Northern Agricultural Research Center, Star Route #36, Box 43, Havre, MT 59501; D.M. Wichman, Central Agricultural Research Center, HC90-Box 20, Moccasin, MT 59462; and N. Riveland, Williston Research Extension Center, 14120 Highway 2, Williston, ND 58801. Journal Series No. 2002-2, Montana Agricultural Experiment Station, Montana State Univ.-Bozeman. NuSky was developed with financial support from the Montana Wheat & Barley Committee and the Montana Agricultural Experiment Station. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (bruckner@montana.edu).

Published in Crop Sci. 43:736–737 (2003).

Registration of 'Alert' Great Northern Common Bean

'Alert' (Reg. no. CV-203, PI 631353), a medium erect great northern common bean (*Phaseolus vulgaris* L.), was developed at the Agriculture and Agri-Food Canada (AAFC) Research Centre, Lethbridge, Alberta, in cooperation with the AAFC Research Station, Morden, Manitoba, and released in 2002. It is a high yielding cultivar with semi-erect growth habit and moderate resistance to white mold [caused by *Sclerotinia sclerotiorum* (Lib.) De Bary]. It is particularly adapted to high heat unit areas of southern Manitoba of western Canada. Registration number 5402 was issued for Alert on 11 February 2002 by the Variety Section, Plant Products Division, Canadian Food Inspection Agency.

Alert, tested as L96E109, was derived from a double-cross made in 1993, 94CT362 = LE93-7/XAN 51//LE93-8/DOR 391. This cross, including the same parents as for AC Black Diamond (Mündel et al., 2001), was performed under contract with AAFC at the Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia, and consisted of crossing the upright Lethbridge line, LE93-7, with XAN 51 from CIAT; LE93-8, with the CIAT line DOR 391, and crossing the two resulting single-cross F_1s to obtain a double-cross. Both LE93-7 and LE93-8 are elite great northern sister lines from AAFC Lethbridge and are upright, early maturing, with red kidney, small red, navy, and great northern bean parents. Line XAN 51 was derived from population SEL10/BAT 946 (Rodriguez et al., 1995). It is a small (23 g 100^{-1} seed weight $^{-1}$) white-seeded line with indeterminate Type II growth habit (Singh 1982). It has *I* gene resistance to *Bean common mosaic virus* (BCMV, a potyvirus) and is tolerant to common bacterial blight (CBB) [caused by *Xanthomonas axonopodis* pv. *phaseoli* Starr & Garces 1950 emend. (Vauterin et al., 1995); syn. *X. campestris* pv. *phaseoli* (Smith) Dye]. Line DOR391 was derived from population DOR376//DOR364/LM30649 (Rodriguez et al., 1995). It has small red colored seeds and an upright indeterminate Type II growth habit. In addition to *I* gene resistance to BCMV, it is tolerant to Bean golden yellow mosaic virus (a geminivirus).

The double-cross F_1 was space-planted at CIAT-Palmira (soil was a fine silty, mixed isohypothermic, Aquic Hapludoll, with a pH of 7.5; 24°C mean growing temperature), Colombia. The F_1-derived F_2, F_3, and F_4 families were advanced and the F_5 seed multiplied at CIAT-Palmira. The F_4 nursery was grown in a relatively dry season (December to February) and periodically sprayed with pesticides against diseases and insect pests. The single-pod bulk method was used to advance generations from F_2 to F_4. Some selection was practiced in F_2 and F_3 for plant type, maturity, seed characteristics, and resistance to BCMV and CBB. The harvested F_5 bulk was sent to Canada for multilocation yield testing as line L96E109. A series of yield tests followed from 1996 to 1998. These included tests in 1996 at Lethbridge and Vauxhall, Alberta, where L96E109 exceeded the yield of the check, US1140, by almost 40%, but with 4 d later maturity. The subsequent tests were performed in southern Manitoba, a region of greater heat units during the growing period, including one test at Morden in 1997 and two in southern Manitoba in 1998. Line L96E109 was entered in the official Cooperative Registration trials in Manitoba in 1999 and 2000 at four locations each year. From greenhouse-grown single plants, 118 progeny-rows were increased at Othello, WA, in 2001. After rouging in the field and visual inspection of the seed, 94 of these progeny rows were bulked to form the first breeder seed.

Alert yielded significantly higher than the check, 'US1140'. When averaged over eight trials, Alert matured in 102 d and yielded 2830 kg ha^{-1} compared with 102 d and 2170 kg ha^{-1}, respectively, for US1140.

Alert has an indeterminate growth habit Type IIa with semi-erect stems and short or no vines (Singh 1982) compared with US1140, which has a prostrate growth habit Type IIIb, with long vines. Lodging (scored on a 1 to 5 scale where 1 = upright and 5 = prostrate) at maturity, averaged over eight trials was 2.2 and 4.1 for Alert and US1140, respectively. Dry seeds of Alert and US1140 are great northern type with the seed coat color of Alert being white with a medium luster, while the seed coat color of US1140 is white to grayish, with a medium luster. The seed mass of Alert (at 140 g kg^{-1} moisture) averaged 34.0 g 100^{-1} seed weight over eight sites, which is greater than that of US1140, which averaged 31.2 g 100^{-1} seed. The seed shape of the median longitudinal section is broad elliptical for Alert in contrast to narrow ovate for US1140. Flower color of Alert and US1140 is white. The pod texture of Alert is medium rough compared with smooth for US1140, and maturing pods of Alert have light purple flecks or stripes, while those of US1140 do not.

On the basis of greenhouse inoculation tests at Harrow, Ontario, Alert is resistant to the BCMV strains 1 and 15 and moderately resistant to white mold, based on tests in a disease nursery at Lethbridge, Alberta, for both disease incidence and severity in 1999 and 2000. In greenhouse inoculation tests at AAFC Morden, Alert was susceptible to the α and α Brazil races and resistant to the delta race of *Colletotrichum lindemuthianum* (Sacc. & Magnus) Lams.-Scrib., while US1140 is susceptible to all three races and to BCMV and white mold.

Alert has been released on an exclusive basis through a licensing arrangement with the Agricore–Bean Business Unit (2802- 5th Avenue North, Lethbridge, Alberta, Canada T1H 0P1), where pedigreed seed may be purchased. Small samples of seed of Alert may be obtained from the corresponding author for at least 5 yr. Application for U.S. Plant Variety Protection is not expected.

H.-H MÜNDEL,* F.A. KIEHN, G. SAINDON, H.C. HUANG, R.L. CONNER, AND S.P. SINGH

Acknowledgments

The technical support of J. Braun, C. Chelle, C.R. Daniels, R.S. Erickson, and M. David at Lethbridge and V.Penner and L. Yager at Morden, is gratefully acknowledged; as is the help of the Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia, where the crosses were made and the initial early generations grown by Shree Singh and his team; as well as the relevant personnel at all cooperating research centers in Canada who conducted the official Prairie Bean Coop Registration trials. A special thanks to S. Park and T. Rupert of the Greenhouse and Processing Crops Research Centre (Harrow) of AAFC for screening for disease reactions to BCMV and for providing the anthracnose isolates. The financial support of the Agricore-Bean Business Unit, Alberta Agricultural Research Institute Matching Grant (94M682), Alberta Pulse Growers Commission (95-B1), and of the Agriculture and Agri-Food Canada Matching Investment Initiative is gratefully acknowledged.

References

Mündel, H.-H., G. Saindon, H.C. Huang, F.A. Kiehn, and S.P. Singh. 2001. Registration of 'AC Black Diamond' black dry bean. Crop Sci. 41:1999–2001.

Rodriguez, M.A., H.F. Ramirez, M.C. Valencia, O. Voysest, and J.W. White. 1995. Catalog of advanced bean lines from CIAT. Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia.

Singh, S.P. 1982. A key for the identification of different growth habits of *Phaseolus vulgaris*. L. Annu. Rep. Bean Improv. Coop. 25:92–94.

Vauterin, L., B. Hoste, K. Kersters, and J. Swings. 1995. Reclassification of *Xanthomonas.* Int. J. Syst. Bacteriol. 45:472–489.

H.-H. Mündel and H.C. Huang, Agriculture and Agri-Food Canada, Lethbridge Research Centre, P.O. Box 3000, Lethbridge, AB, Canada T1J 4B1; G. Saindon, Agriculture and Agri-Food Canada, Southern Crop Protection and Food Research Centre, 1391 Sandford Street, London, ON, Canada N5V 4T3; F.A. Kiehn and R.L. Conner, Agriculture and Agri-Food Canada, Morden Research Station, Unit 100- 101 Route 100, Morden, MB, Canada R6M 1Y5; and S. P. Singh, Kimberly Research and Extension, University of Idaho, 3793 North 3600 East Kimberly, ID 83341, USA (formerly of CIAT, Cali, Colombia). LRC Contribution No. 387-02049. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (muendel@em.agr.ca).

Published in Crop Sci. 43:737–738 (2003).

Registration of 'Jefferson' Kentucky Bluegrass

'Jefferson' Kentucky bluegrass (*Poa pratensis* L.) (Reg. no. CV-66, PI 602961) originated from a single, highly apomictic plant, A84-811-4, selected from the open-pollinated progeny of Warren's A20-6A Kentucky bluegrass. It was evaluated and released by Cascade International Seed Co., Aumsville, OR, in 1995. The highly apomictic plant selected for release as Jefferson was obtained from the New Jersey Agricultural Experiment Station (NJAES). A85-162 was the experimental designation of Jefferson. The first Certified seed was produced in 1995.

Plants of Warren's A20-6A and selections from old turfs collected and evaluated by the NJAES breeding program were transferred from spaced-plant nurseries to a greenhouse located on the Cook College Campus of Rutgers University, New Brunswick, NJ, during the late winter of 1984. Conditions within this greenhouse were maintained to increase the percentage of sexual reproduction of facultatively apomictic plants of Kentucky bluegrass (Hintzen and vanWijk, 1985; Pepin and Funk, 1971). Pollen from approximately 10 Kentucky bluegrass selections from Tennessee, Alabama, South Carolina, California, and New Jersey was dusted on the stigmas of Warren's A20-6A as soon as they were exposed, normally from 0200 to 0400 h over about an 8-d period. A total of 8920 seedlings from the open-pollinated maternal progeny of Warren's A20-6A were transferred to a spaced-plant field nursery at the Plant Biology and Pathology Research and Extension Farm at Adelphia, NJ, during the late summer of 1984. Seed from 253 attractive sexual variants that differed from the maternal parent were selected from this nursery and harvested during June 1985. These selections were planted in single-plant progeny turf trials in September 1985. A85-162 was selected on the basis of turf plot evaluations, including summer performance. Remnant seed of plant A84-811-4 used to establish this plot was sent to Cascade International Seed Co. in 1988 to establish turf and spaced-plant evaluation trials in Oregon. Seed from these spaced-plants was used to establish a 0.4-ha Breeder seed nursery at Aumsville, OR, in 1990. A Foundation seed field was established on the Rathdrum Prairie in northern Idaho in the spring of 1992.

Jefferson has a medium growth habit, medium-fine leaf width, bright medium-green color, medium-high shoot density, and good turf quality under medium-high maintenance in the National Turfgrass Evaluation Program (NTEP) Kentucky bluegrass tests established in 1995 (Morris, 2000). Jefferson exhibited good seedling vigor, spring green-up, and above average winter color. Jefferson exhibited good resistance to stem rust (caused by *Puccinia graminis* Pers.:Pers. subsp. *graminicola* Urban) and stripe smut [caused by *Ustilago striiformis* (Westend.) Niessl], good resistance to dollar spot (caused by *Sclerotinia homoeocarpa* F.T. Bennet), and moderate resistance to leaf spot [caused by *Drechslera poae* (Baudys) Shoemaker]. Jefferson also exhibited good tolerance to drought stress and billbug (*Sphenophorus* spp.) feeding. Jefferson showed good sod strength and competed well against *Poa annua* L.

Jefferson was developed for turf uses including lawns, athletic fields, and recreation areas. It should perform well in regions where Kentucky bluegrass is adapted, as a monostand or in blends with other Kentucky bluegrass cultivars. Jefferson maintained good turf quality at a 1.3 to 2.5 cm mowing height and exhibited satisfactory wear tolerance in Iowa, indicating its potential for use on athletic fields (Morris, 2000). Jefferson Kentucky bluegrass may also be used in mixtures with perennial ryegrass (*Lolium perenne* L.) and fine-leafed fescues (*Festuca* spp.).

Cascade International Seeds, Inc. maintains Breeder seed of Jefferson in Oregon. Seed production is limited to two cycles of increase from Breeder seed, one each of Foundation and Certified classes. U.S. Plant Variety Protection for Jefferson Kentucky bluegrass has been applied for (PVP Application no. 9800135).

S.A. Bonos,* W.A. Meyer, T.J. Molnar, and C.R. Funk

Acknowledgments

Appreciation is expressed to Raymond Schaaf, George Zieminski, Michael Reynolds, James Schumacher, Ronald Bara, Dirk Smith, Melissa Mohr, and all participants involved in the National Turfgrass Evaluation Program for their assistance.

References

Hintzen, J.J., and A.J.P. vanWijk. 1985. Ecotype breeding and hybridization in Kentucky bluegrass (*Poa pratensis* L.) p. 213–219. *In* F. Lemaire (ed.) Proc. 5th Int. Turfgrass Res. Conf. Avignon, France. INRA Publications, Versailles, France.

Morris, K.N. 2000. National Kentucky bluegrass Test- 1995 medium/high input. Final report 1996–2000. NTEP No. 01–12. National Turfgrass Evaluation Program. USDA-ARS, Beltsville, MD.

Pepin, G.W., and C.R. Funk. 1971. Intraspecific hybridization as a method of breeding Kentucky bluegrass for turf. Crop Sci. 11:445–448.

Dep. of Plant Biology and Pathology, New Jersey Agric. Exp. Stn., Cook College, Rutgers Univ., 59 Dudley Rd., Foran Hall, New Brunswick, NJ 08901. Publication no. D–12180-15-02. Some of this work was conducted as part of the NJAES Project no. 12180, 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 New Jersey Turfgrass Association. Registration by CSSA. Accepted 30 Sep. 2002. *Corresponding author (bonos@aesop.rutgers.edu).

Published in Crop Sci. 43:738–739 (2003).

Registration of 'Perry' Peanut

'Perry' (Reg. no. CV-73, PI 613600) is a large-seeded Virginia-type peanut (*Arachis hypogaea* L. subsp. *hypogaea* var. *hypogaea*) cultivar with resistance to Cylindrocladium black rot [CBR; caused by *Cylindrocladium parasiticum* Crous, Wingfield & Alfenas syn. *C. crotalariae* (Loos) D.K. Bell & Sobers]. Perry was tested under the experimental designation N93112C and was released by the North Carolina Agricultural Research Service (NCARS) in 2000. Perry was tested by the NCARS, by the Virginia Agricultural Experiment Station, and five other state agricultural experiment stations participating in the Uniform Peanut Performance Tests. Perry is named in honor of Mr. Astor Perry, former peanut extension specialist at North Carolina State University (NCSU), and Mr. Thomas E. "Tommy" Perry, former supervisor at the North Carolina Dep. of Agriculture Peanut Belt Research Station at Lewiston, NC.

Perry is a Virginia market-type cultivar possessing alternate branching pattern, runner growth habit, large seeds (about 93 g 100 seed^{-1}) with pink testa, and resistance to CBR comparable to that of resistant germplasm NC 3033 (Beute et al., 1976). Perry is an F_4-derived line selected from cross X89140, which was made in 1989 at Raleigh, NC. The female parent was an unnumbered F_5-derived selection from a cross between 'NC 7' (Wynne et al., 1979) and 'Florigiant' (Carver, 1969). The male parent was CBR-resistant line N90021. N90021 was selected as a single F_7 plant from a cross between NC Ac 18229A and 'NC 2' (Gregory, 1970). NC Ac 18229A was selected from a cross of NC 2 with NC 3033. F_1 plants of cross X89140 were grown at a nursery in Puerto Rico in the winter of 1989–1990. F_2 progeny were selected for large pod size, desirable pod shape, and CBR resistance in 1990. $F_{2:3}$ progenies were grown at the winter nursery in Puerto Rico, and selection was applied among and within $F_{2:4}$ families on CBR-infested soil in 1991. CBR resistance of selected $F_{4:5}$ families was evaluated in a replicated test on CBR-infested soil in 1992. Selected $F_{4:6}$ families, including N93112C, were then assigned accession numbers. Seed has been maintained in bulk since the last single-plant selection. Agronomic performance of Perry has been evaluated in 23 trials conducted by the NCARS breeding program over seven years and 32 trials (considering early and late diggings as separate trials) in the joint VAES-NCARS Peanut Variety and Quality Evaluation (PVQE) program over four years (Mozingo, 1999, 2000). The following comparisons are based on results from the PVQE program except as noted. Compared with 'NC 12C' (Isleib et al., 1997a), the most commonly grown CBR-resistant cultivar available to growers, Perry has similar sound mature kernel content (69%) and meat content (74%), but significantly fewer jumbo pods (30 vs. 56%), more fancy size pods (49 vs. 32%), fewer extra large kernels (46 vs. 53%), and higher pod yield (5271 vs. 4826 kg ha^{-1}). The ratio of oleic to linoleic fatty acid of Perry was lower than that of NC 12C (1.59 vs. 1.83). In the NCSU trials, pods of Perry were significantly brighter in color than those of NC 12C [46.2 vs. 45.7 Hunter L score (Isleib et al., 1997b) for jumbo pods, 44.9 vs. 42.8 Hunter L score for fancy pods], an important trait for peanuts marketed as in-shell products. Flavor attributes of roasted samples from eight NCSU trials were evaluated by a trained sensory panel under the direction of USDA personnel. Adjusted to common values of roast color and fruity attribute (Pattee and Giesbrecht, 1990), the flavor of Perry was comparable to NC 12C in the sweet, bitter, and roasted peanut flavor attributes. Resistance of Perry to CBR was evaluated by the NCSU breeding project in seven replicated tests on naturally infested soils. CBR incidence in Perry was not significantly less than that in NC 12C (13 vs. 14% of all plants exhibiting symptoms by late September). In three other yield trials performed on infested soils with and without metam sodium (sodium *N*-methyldithiocarbamate) fumigant, the most common treatment used to suppress infection by *C. parasiticum*, Perry had less disease (2 vs. 26% of plants exhibiting symptoms) and produced significantly greater yield than NC 12C (5001 vs. 3278 kg ha^{-1}) averaged across fumigation treatments. Perry did not exhibit a positive response of pod yield to metam sodium application in any test.

Perry was evaluated for resistance to other diseases common to the Virginia–Carolina region. Perry is similar to 'VA 98R' (Mozingo et al., 2000) in being partially resistant to Sclerotinia blight (caused by *Sclerotinia minor* Jagger). Forty-two percent of Perry plants were infected in five trials conducted in fields infested with *S. minor*, compared with 62% of plants of the susceptible cultivar NC 7, and 41% of the partially resistant cultivars VA 98R and 'VA 93B' (Coffelt et al., 1994). Perry expresses a low level of resistance to early leaf spot (caused by *Cercospora arachidicola* S. Hori). In three trials performed without chemical control of leaf spot, Perry's yield and defoliation [3374 kg ha^{-1} and 6.45 defoliation score on a scale of 1 (no defoliation) to 9 (complete defoliation)] were similar to those of NC 12C (3466 kg ha^{-1} and 6.32 defoliation score), the most resistant Virginia-type peanut cultivar currently available to growers. In 13 trials conducted without any application of insecticides and at 25 or 51 cm seed spacing to promote feeding by the thrips vector of *Tomato spotted wilt virus* (TSWV), incidence of TSWV in Perry was 28% compared with 22% in NC-V 11 (Wynne et al., 1991) and 40% in NC 9 (Wynne et al., 1986). The general level of TSWV incidence in these trials ranged from light to heavy. Under heavy disease incidence, Perry was found to be susceptible to TSWV.

Perry is adapted to the Virginia-Carolina peanut production area but also has performed well in the southeastern USA production area including Georgia, Florida, and Alabama. Breeder seed of Perry will be maintained by the N.C. Agricultural Research Service, Box 7643, N.C. State University, Raleigh, NC 27695-7643. Foundation seed will be distributed by the N.C. Foundation Seed Producers, Inc., 8220 Riley Hill Rd., Zebulon, NC 27597. The N.C. Agricultural Research Service will provide small (50–100 seed) samples to research organizations for research purposes. Perry is protected under the U.S. Plant Variety Protection Act as amended in 1994 and may be sold only as a class of Certified seed.

T.G. Isleib,* P.W. Rice, R.W. Mozingo, II, J.E. Bailey, R.W. Mozingo, and H.E. Pattee

References

Beute, M.K., J.C. Wynne, and D.A. Emery. 1976. Registration of NC 3033 peanut germplasm (Reg. No. GP 9). Crop Sci. 16:887.

Carver, W.A. 1969. Registration of Florigiant peanuts (Reg. No. 1). Crop Sci. 9:849–850.

Coffelt, T.A., D.M. Porter, and R.W. Mozingo. 1994. Registration of 'VA 93B' peanut. Crop Sci. 34:1126.

Gregory, W.C. 1970. Registration of NC 2 peanuts (Reg. No. 5). Crop Sci. 10:459–460.

Isleib, T.G., P.W. Rice, J.E. Bailey, R.W. Mozingo, and H.E. Pattee. 1997a. Registration of 'NC 12C' peanut. Crop Sci. 37:1976.

Isleib, T.G., H.E. Pattee, and P.W. Rice. 1997b. Use of a laboratory colorimeter to measure pod brightness in virginia-type peanuts. Peanut Sci. 24:81–84.

Mozingo, R.W. 1999. Peanut variety and quality evaluation results, 1999. I. Agronomic and grade data. Virginia Polytech. Inst. and State Univ. Inf. Ser. No. 422.

Mozingo, R.W. 2000. Peanut variety and quality evaluation results, 1999. II. Quality data. Virginia Polytech. Inst. and State Univ. Inf. Ser. No. 423.

Mozingo, R.W., T.A. Coffelt, and T.G. Isleib. 2000. Registration of VA 98R peanut. Crop Sci. 40:1202–1203.

Pattee, H.E., and F.G. Giesbrecht. 1990. Adjusting roast peanut scores for fruity attribute and non-optimum CIELAB L* values. J. Sens. Stud. 9:353–363.

Wynne, J.C., T.A. Coffelt, R.W. Mozingo, and W.F. Anderson. 1991. Registration of 'NC-V11' peanut. Crop Sci. 31:484–485.

Wynne, J.C., R.W. Mozingo, and D.A. Emery. 1979. Registration of NC 7 peanut (Reg. No. 22). Crop Sci. 19:563.

Wynne, J.C., R.W. Mozingo, and D.A. Emery. 1986. Registration of 'NC 9' peanut. Crop Sci. 26:197.

T.G. Isleib, P.W. Rice, and R.W. Mozingo, II, Dep. of Crop Science, Box 7629, N.C. State Univ., Raleigh, NC 27695-7629; J.E. Bailey, Dep. of Plant Pathology, Box 7616, N.C. State Univ., Raleigh, NC 27695-7616; R.W. Mozingo, Dep. of Soil and Environ. Sciences, Tidewater Agric. Res. Ext. Center, 6321 Holland Rd., Suffolk, VA 23437; and H.E. Pattee, USDA-ARS, Box 7625, N.C. State Univ., Raleigh, NC 27695-7625. Partial support for the development of NC 12C was provided by the N.C. Peanut Growers' Association, Inc., the N.C. Crop Improvement Association, the N.C. Foundation Seed Producers, Inc., and the USAID Peanut Collaborative Research Support Program. Registration by CSSA. Accepted 30 Sept. 2002. *Corresponding author (tom_isleib@ncsu.edu).

Published in Crop Sci. 43:739–740 (2003).

REGISTRATIONS OF GERMPLASMS

Registration of D96-1217 Soybean Germplasm Line Resistant to Phytophthora Rot and Soybean Cyst Nematode Races 3 and 14

Soybean [*Glycine max* (L.) Merr.] germplasm line D96-1217 (Reg. no. GP-278, PI 631157) was developed by the USDA-ARS, Stoneville, MS, in cooperation with the Mississippi Agricultural and Forestry Experiment Station, Stoneville, MS, and released in October 2000. This line has value as a parent because of its resistance to Phytophthora rot (caused by *Phytophthora sojae* M.J. Kaufmann & J.W. Gerdemann) and races 3 and 14 of the soybean cyst nematode (*Heterodera glycines* Ichinohe).

D96-1217 was developed by backcrossing the gene *Rpsl-c* from Centennial (Hartwig and Epps, 1977) into the cultivar Bedford (Hartwig and Epps, 1978). *Rpsl-c* confers resistance to races 1-3, 6-11, 13, 15, 17, 21, 23, and 26 of *P. sojae* (Schmittenner et al., 1994). Race 1 or 2 of the pathogen was used to identify resistance in F_3 lines. The reaction of 12 F_3 seedlings, inoculated by the hypocotyl puncture method (Morgan and Hartwig, 1965), was used to identify lines uniformly resistant to Phytophthora rot. Selected resistant lines were used as pollen parents for each crossing cycle. After the fourth backcross, several Bedford^5 × Centennial $F_{2:3}$ lines were inoculated with race 2 of *P. sojae*. Remnant seeds were sent to Jackson, TN, and evaluated for resistance to soybean cyst nematode (SCN) races 3 and 14 (Young, 1990). Remnant seeds of several F_2 plants whose progeny were uniformly resistant to *P. sojae* and SCN were planted in single rows on Sharkey clay soil (very-fine, montmorillonitic, nonacid, thermic Vertic Haplaquept), and evaluated for agronomic characteristics. Ten F_5 lines, including D96-1217, were selected for testing in replicated plots for seed yield. Before yield testing, progeny of the 10 lines were retested for resistance to *P. sojae* and SCN to verify earlier results. D96-1217 was selected for increase and release after 2 yr of replicated testing for seed yield.

D96-1217 is of Maturity Group V and is similar to its recurrent parent Bedford for all other observable traits. In a replicated yield test on clay soil at Stoneville, MS, in 1998, D96-1217 yielded 3370 kg ha^{-1}, compared to 3202 kg ha^{-1} for Bedford. In 1999, seed yields were 3847 kg ha^{-1} for D96-1217 and 3753 kg ha^{-1} for Bedford. A susceptible breeding line that was included in the tests, showed visible symptoms of disease injury from *P. sojae* both years.

A sample of 50 seeds will be available for at least 5 yr for research purposes by writing to either author.

T.C. Kilen* and L.D. Young

References

Hartwig, E.E., and J.M. Epps. 1977. Registration of Centennial soybeans. Crop Sci. 17:979.

Hartwig, E.E., and J.M. Epps. 1978. Registration of Bedford soybeans. Crop Sci. 18:915.

Morgan, F.L., and E.E. Hartwig. 1965. Physiologic specialization in *Phytophthora megasperma* var. *sojae.* Pytopathology 55:1277–1279.

Schmittenner, A.F., M. Hobe, and R.G. Bhat. 1994. *Phytophthora sojae* races in Ohio over a 10-year interval. Plant Dis. 78:269–276.

Young, L.D. 1990. Soybean germplasm evaluated for resistance to races 3, 5, 14 of soybean cyst nematode. Crop Sci. 30:735–736.

USDA-ARS, P.O. Box 345, Stoneville, MS 38776. Cooperative investigation of the USDA-ARS and Mississippi Agric. and For. Exp. Sta. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (tkilen@ars.usda.gov).

Published in Crop Sci. 43:740–741 (2003).

Registration of Eleven Multi-Adversity Resistant (MAR-7A) Germplasm Lines of Upland Cotton

Eleven multi-adversity resistant (MAR) germplasm lines of upland cotton (*Gossypium hirsutum* L.) from the MAR-7A germplasm pool were released by the Texas Agricultural Experiment Station (TAES) in 2002. These lines, designated as CD3HG2CABS-1-91, CD3HGCBU8S-1-91, LBCBHGDPIS1-91, CUBQHGRPIS-1-92, PD23CD3HGS-1-93, CBD3HGDPIH-1-91, LBCHUD3HGH-1-91, CD3HGCULBH-1-91, CDRCIQCUBH-2-92, CDARCILBCH-1-92, and CUBQHGRPIH-1-92 (Reg. no. GP-762 through GP-772, PI 631181 through PI 631191) were developed by the TAES-MAR cotton genetic improvement program utilizing techniques and procedures for the simultaneous genetic improvement of resistance to plant pathogens (Bird, 1982; El-Zik and Thaxton, 1989). These germplasm lines combine enhanced fiber quality, resistance to certain diseases, and higher yield potential, along with adaptation to central and southern Texas.

Field evaluations were conducted over 2 to 4 yr (1992–1996) at eight locations in Texas (Weslaco, Corpus Christi, College Station, Temple, McGregor, Munday, Chillicothe, and Halfway) for earliness, yield, boll size, lint fraction, and fiber properties by high volume instrument analyses (unpublished data, 1996). Resistance to bacterial blight [caused by *Xanthomonas campestris* pv. *malvacearum* (Smith 1901) Dye 1978b] was evaluated with greenhouse and field inoculations. Resistance to Fusarium wilt [caused by *Fusarium oxysporum* Schlechtend.:Fr. f. sp. *vasinfectum* (Atk.) W.C. Snyd. & H.N. Hans.] was determined at the Regional Cotton Fusarium Wilt Nursery, Tallassee, AL (Glass and Gazaway, 1993, 1994). Resistance to other diseases described below was estimated by comparisons with cotton germplasm lines and cultivars having known levels of resistance and susceptibility to diseases under natural field infestation.

These new MAR-7A lines have improved levels of resistance to pathogens causing seed-seedling diseases (caused by *Pythium ultimum* Trow and *Rhizoctonia solani* Kühn), Verticillium wilt (caused by *Verticillium dahliae* Kleb.), Fusarium wilt-root-knot nematode complex [caused by *F. oxysporum* f. sp. *vasinfectum* and *Meloidogyne incognita* (Kofoid & White)-Chitwood], Phymatotrichum root rot (caused by *Phymatotrichum omnivorum* Duggar), and leaf spots (caused by *Alternaria*, *Aschochyta*, and *Phomopsis*, spp. and other genera) when compared with previously released MAR germplasm. All 11 MAR-7A lines were resistant to bacterial blight. CD3HG2CABS-1-91, CD3HGCBU8S-1-91, LBCBHGDPIS-1-91, CBD3HGDPIH-1-91, LBCHUD3HGH-1-91, CD3HGCULBH-1-91, CDRCIQCUBH-2-92, and CDARCILBCH-1-92 have the $B_2B_3B_6B_7$ genes for bacterial blight resistance, and CUBQHGRPIS-1-92, PD23CD3HGS-1-93, and CUBQHGRPIH-1-92 have the $B_2B_3B_7$ bacterial blight resistance genes. CD3HG2CABS-1-91, CD3HGCBU8S-1-91, LBCBHGDPIS-1-91, CUBQHGRPIS-1-92, and PD23CD3HGS-1-93 are glabrous, while CBD3HGDPIH-1-91, LBCHUD3HGH-1-91, CD3HGCULBH-1-91, CDRCIQCUBH-2-92, CDARCILBCH-1-92, and CUBQHGRPIH-1-92 are pubescent. The five glabrous lines have longer and stronger fiber than 'Tamcot CAB-CS' (Bird et al., 1986). All lines have normal leaf and bract types, and are glanded and nectaried.

CD3HG2CABS-1-91 was developed by pedigree selection following the cross of CD3HCAHUGH-2-88 (El-Zik and Thaxton, 1998) and CABUCAHUGS-1-88. CABUCAHUGS-1-88 is an unreleased breeding line with the parentage of CABUCS-2-1-83/CAHUGS-2-85, both unreleased breeding lines. On the basis of 21 field tests in 1993 and 1994, lint yield and maturity of CD3HG2CABS-1-91 was similar to 'Tamcot HQ95' (El-Zik and Thaxton, 1990) and Tamcot CAB-CS, but CD3HG2CABS-1-91 had 10% stronger fiber bundle strength than Tamcot CAB-CS.

CD3HGCBU8S-1-91 was derived from the cross of CD3-HCAHUGH-2-88/CABUCAG8US- 1-88. CABUCAG8US-1-88 resulted from the cross between CABUCS-2-1-83 (sister line of Tamcot CAB-CS) and CABCHUS-2-86 (El-Zik and Thaxton, 1997). On the basis of percent first pick yield, CD3-HGCBU8S-1-91 is earlier maturing than 'Tamcot Sphinx' (El-Zik and Thaxton, 1996). Averaged over 21 field tests in Texas in 1993 and 1994, CD3HGCBU8S-1-91 produced 5% higher lint yield than Tamcot HQ95, and 10% higher lint yield than Tamcot CAB-CS. CD3HGCBU8S-1-91 averages 2% longer upper half mean (UHM) fiber length, and 6.5% stronger fiber bundle strength than Tamcot CAB-CS.

LBCBHGDPIS-1-91 originated from the cross of LBBC-ABCHUS-1-87 (El-Zik and Thaxton, 1997)/CHUGCD3PIS-1-88. CHUGCD3PIS-1-88 resulted from a cross between CA-HUGS-2-85/CDP37HPIH-1-1-86 (El-Zik and Thaxton, 1997). Averaged over 22 field tests in 1994 and 1995, lint yield was 9% higher than Tamcot CAB-CS and Tamcot HQ95, but 7% less than Tamcot Sphinx. LBCBHGDPIS-1-91 was similar to Tamcot CAB-CS, Tamcot HQ95, and Tamcot Sphinx for UHM length, uniformity index, and micronaire reading. Fiber bundle strength was 6% stronger than Tamcot CAB-CS, but 10% less than Tamcot Sphinx.

CUBQHGRPIS-1-92 was selected from the cross of CHUB-CABD3S-1-89/CAHUGARPIH-1-88 (El-Zik and Thaxton, 1998). CHUBCABD3S-1-89 is derived from the cross between an unreleased germplasm line CHUL2BS-1-85 and Tamcot HQ95. On the basis of 35 field tests over 4 yr, boll size of CUBQHGRPIS-1-92 was 10% larger than Tamcot CAB-CS and Tamcot Sphinx. CUBQHGRPIS-1-92 produced lint yield similar to Tamcot Sphinx, but 11% higher than that of Tamcot CAB-CS, and 17% higher than Tamcot HQ95 or 'Deltapine 50'. CUBQHGRPIS-1-92 had 13% stronger fiber bundle strength and 4.8% higher micronaire value than Tamcot CAB-CS. As measured by percent first pick yield, CUBQHGRPIS-1-92 was similar in maturity compared with Tamcot CAB-CS and Tamcot Sphinx, but matured slightly later than Tamcot HQ95.

PD23CD3HGS-1-93 originated from the cross of MAR 5PD208S-4-90 (El-Zik and Thaxton, 1998)/CD3HCAHUGH-2-88. MAR5PD208S-4-90 was a selection from PD6208 (Culp et al., 1985), a high fiber quality line developed by the USDA-ARS, Florence, South Carolina. Lint yield and maturity of PD23CD3HGS-1-93 were similar to Tamcot Sphinx. Fiber bundle strength was 4% stronger, micronaire value 7% higher, and lint fraction 2.3% higher than those of Tamcot CAB-CS.

CBD3HGDPIH-1-91 originated from the cross of Tamcot HQ95/CHUGCD3PIS-1-88. CBD3HGDPIH-1-91 had lint yield similar to Tamcot Sphinx, but was earlier maturing. Based on 15 yield trials conducted from 1993 to 1995, lint fraction of CBD3HGDPIH-1-91 (38%) exceeded that of Tamcot CAB-CS (36%) and Deltapine 50 (35%), but was similar to that of Tamcot Sphinx (38%) and Tamcot HQ95 (38%). CBD3HGDPIH-1-91 had a lower micronaire reading compared with Tamcot Sphinx or Deltapine 50.

LBCHUD3HGH-1-91 was derived from the cross of LBBCABCHUS-1-87/CD3HCAHUGH-2-88. Averaged over 11 yield trials in 1993 and 1994, the lint yield of LBCHUD 3HGH-1-91 was similar to Tamcot Sphinx, but LBCHUD 3HGH-1-91 was earlier maturing. The fiber quality of LBCHUD3HGH-1-91 was similar to Tamcot CAB-CS. Boll size of LBCHUD3HGH-1-91 was 6% larger than that of Tamcot Sphinx and Deltapine 50.

CD3HGCULBH-1-91 resulted from the cross CD3HCA HUGH-2-88/CD3HCHULBH-1-88 (El-Zik and Thaxton, 1998). Averaged over 25 field trials between 1992 and 1994, CD3HGCULBH-1-91 had lint yield, earliness, and fiber strength similar to Tamcot HQ95, but boll size was 7% larger than that of Tamcot Sphinx or Deltapine 50.

CDRCIQCUBH-2-92 was derived from the cross CD3 HHARCIH-1-88 (El-Zik and Thaxton, 1998)/CHUBCAB D3S-1-89. Averaged over 34 yield trials between 1993 and 1996, CDRCIQCUBH-2-92 produced lint yield similar to Tamcot HQ95 and Tamcot CAB-CS, but was earlier maturing than either Tamcot HQ95 or Tamcot CAB-CS. Fiber bundle strength of CDRCIQCUBH-2-92 was 10% stronger than that of Tamcot HQ95 and Deltapine 50, and 3% stronger than Tamcot Sphinx.

CDARCILBCH-1-92 was developed from a cross of CD3 HHARCIH-1-88/LBBCC4HUGS-1-89 (El-Zik and Thaxton, 1998). Averaged over 35 yield trials from 1993 to 1996, CDAR CILBCH-1-92 produced lint yield similar to Tamcot HQ95 and Deltapine 50. The UHM fiber length of CDARCILBCH-1-92 was 4% longer than that of Tamcot Sphinx and Tamcot HQ95. Fiber bundle strength was 11% stronger than Tamcot HQ95, but was similar to that of Tamcot Sphinx.

CUBQHGRPIH-1-92 was selected from the cross between CHUBCABD3S-1-89/CAHUGARPIH-1-88, and is a full-sib line to CUBQHGRPIS-1-92. On the basis of 35 yield trials between 1993 and 1996, lint yield of CUBQHGRPIH-1-92 was similar to Tamcot CAB-CS and Tamcot HQ95, but CUBQHGRPIH-1-92 yielded 12% less lint than Tamcot Sphinx. Average UHM fiber length of CUBQHGRPIH-1-92 was 6% longer than Tamcot Sphinx, Tamcot CAB-CS, or Tamcot HQ95. Fiber bundle strength was 2% less than Tamcot Sphinx, but 5% stronger than Tamcot HQ95 and Deltapine 50.

These germplasm lines should be valuable in the development of cultivars that are glabrous or pubescent, and with broad and higher levels of resistance to certain diseases, improved yield potential, and fiber quality. Research leading to the development of these germplasm lines was supported in part by the Texas Food and Fibers Commission and the Cotton Incorporated State Support Program. Small quantities of seed (25 g) of these germplasm lines are available for distribution on written request to the corresponding author. Recipients of seed are asked to make appropriate recognition of the source of the germplasm if it is used in the development of a new cultivar, germplasm, parental line, or genetic stock.

P.M. Thaxton* and K.M. El-Zik

Acknowledgments

We acknowledge with appreciation the efforts of the MAR Cotton Genetic Improvement Program staff and the cooperation of Texas Agric. Exp. Stn. and Coop. Extension staff in the testing of these lines at their locations.

References

Bird, L.S. 1982. The MAR (multi-adversity resistance) system for genetic improvement of cotton. Plant Dis. 66:172–176.
Bird, L.S., K.M. El-Zik, and P.M. Thaxton. 1986. Registration of 'Tamcot CAB-CS' upland cotton. Crop Sci. 26:384–385.
Culp, T.W., R.F. Moore, and J.B. Pitner. 1985. Registration of seven cotton germplasm lines. Crop Sci. 25:201–202.
El-Zik, K.M., and P.M. Thaxton. 1989. Genetic improvement for resistance to pests and stresses in cotton. p. 191–224. *In* R.E. Frisbie et al. (ed.) Integrated pest management systems and cotton production. John Wiley & Sons, New York.
El-Zik, K.M., and P.M. Thaxton. 1990. Registration of 'Tamcot HQ95' cotton. Crop Sci. 30:1359–1360.
El-Zik, K.M., and P.M. Thaxton. 1996. Registration of 'Tamcot Sphinx' cotton. Crop Sci. 36:1074.
El-Zik, K.M., and P.M. Thaxton. 1997. Registration of seven multi-adversity resistant (MAR-5) germplasm lines of upland cotton. Crop Sci. 37:1394–1395.
El-Zik, K.M., and P.M. Thaxton. 1998. Registration of seven pubescent multi-adversity resistant (MAR-6) germplasm lines of upland cotton. Crop Sci. 38:1730.
Glass, K.M., and W.S. Gazaway. 1993. Regional cotton fusarium wilt report. Alabama and Soils Departmental Series 173. Auburn Univ. Auburn, AL.
Glass, K.M., and W.S. Gazaway. 1994. Regional cotton fusarium wilt report. Alabama and Soils Departmental Series 183. Auburn Univ. Auburn, AL.

Dep. of Soil and Crop Sciences, Texas Agric. Exp. Stn., Texas A&M Univ. System, College Station, TX 77843-2474. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (pthaxton@ag.tamu.edu).

Published in Crop Sci. 43:741–742 (2003).

Registration of TAM 94L-25 and TAM 94J-3 Germplasm Lines of Upland Cotton with Improved Fiber Length

TAM 94L-25 and TAM 94J-3 (Reg. no. GP-773 through GP-774; PI 631440 through PI 631441), upland cotton, *Gossypium hirsutum* L., germplasm lines were released in 2002 by the Cotton Improvement Laboratory, Department of Soil and Crop Sciences, Texas Agricultural Experiment Station. These lines were developed as part of an ongoing effort to develop germplasm lines with improved fiber quality, especially fiber length and bundle strength, that are adapted to central and south Texas.

TAM 94L-25 and TAM 94J-3 were derived by hybridization and pedigree selection at College Station, TX. Individual F_3 plants were selected on the basis of apparent agronomic fitness and high volume instrument fiber properties. TAM 94L-25 was derived from the hybridization of TAM 87G^3–27 (Smith and Niles, 1994) and 87O^3–37, a breeding line developed by G.A. Niles at Texas A&M University. TAM 87G^3–27 resulted from the cross of PD 6992 (Reg. no. GP 254; Culp et al., 1985) and a breeding line of complex pedigree that includes several obsolete cultivars adapted to Texas, and Acala and *G. barbadense* genotypes. TAM 94J-3 resulted from the cross of TAM 87G^3–27 and DES 333-31, an unreleased breeding line developed by Dr. R.R. Bridge of the Mississippi Agricultural and Forestry Experiment Station and derived from the hybridization of 'DES56' (Reg. no. 70; Bridge and Chism, 1978) and 'Deltapine 50' (R.R. Bridge, personal communication, 1990).

TAM 94L-25 and TAM 94J-3 were evaluated at multiple locations throughout Texas and at one site in Oklahoma from 1996 through 1998. TAM 94L-25 and 'Tamcot Sphinx' (El-Zik and Thaxton, 1996) were included in 19 performance trials grown with supplemental irrigation and 18 trials grown without supplemental irrigation. TAM 94L-25 yielded equal to Tamcot Sphinx under both production regimes and was not different than Tamcot Sphinx in lint percentage. TAM 94L-25 exhibited a lower average micronaire reading than Tamcot Sphinx (4.4 versus 4.8) under irrigated conditions but was not different under dryland conditions. TAM 94L-25 was equal or better than Tamcot Sphinx in fiber bundle strength regardless of production strategy. Under irrigated production, TAM 94L-25 produced fibers with upper half mean length (UHM) of 31 mm while Tamcot Sphinx fibers averaged 28 mm in UHM length. Under dryland conditions, TAM 94L-25 averaged 29 mm UHM length while Tamcot Sphinx averaged only 26 mm. Thus, TAM 94L-25 averaged longer UHM length fibers (29 mm) in 18 location-year nonirrigated performance trials than did Tamcot Sphinx (28 mm) when grown in 19 location-year irrigated performance trials.

The same trend was observed when TAM 94L-25 was compared with Deltapine 50 under irrigated (12 location-year) and nonirrigated conditions (16 location-year), except that TAM 94L-25 averaged 3% higher lint percent and 38 kN m kg^{-1} greater fiber bundle strength across production strategies. The UHM fiber length of TAM 94L-25 was 31 and 29 mm when grown with and without supplemental irrigation, respectively, compared with 29 and 27 mm for Deltapine 50 grown with and without irrigation, respectively. Again, the UHM length of TAM 94L-25 when grown without supplemental irrigation in 16 performance trials from 1996 through 1998 was equal to the average UHM length of Deltapine 50 when grown in 12 performance trials with supplemental irrigation.

Similar data were obtained when comparing TAM 94J-3, a half sib line of TAM 94L-25. TAM 94J-3 was comparable in yield, lint percent, and micronaire reading with Tamcot Sphinx and Deltapine 50 under irrigated and non-irrigated culture. TAM 94J-3 exhibited greater fiber bundle strength than Tamcot Sphinx in seven irrigated performance trials (292 versus 276 kN m kg^{-1}), and greater fiber bundle strength than Deltapine 50 in eight nonirrigated performance trials (286 versus 252 kN m kg^{-1}). TAM 94J-3 had an UHM fiber length of 30 mm when grown with supplemental irrigation compared with 29 mm for Deltapine 50 and 28 mm for Tamcot Sphinx. In performance trials without irrigation, the UHM length of TAM 94J-3 averaged 29 mm, compared with 27 mm for Deltapine 50 and 26 mm for Tamcot Sphinx. As with TAM 94L-25, the UHM length of TAM 94J-3 produced without supplemental irrigation was equal to that of Deltapine 50 and Tamcot Sphinx when produced with supplemental irrigation.

These germplasm lines will be valuable to plant breeders interested in developing cultivars of upland cotton having improved UHM fiber length. Small quantities of seed will be available from the corresponding author for distribution until supplies are exhausted. Recipients of seed are asked to make appropriate recognition of the source of the germplasm if it is used in the development of a new cultivar, germplasm, parental line, or genetic stock.

Research leading to the development of these improved fiber length germplasm lines was supported in part by the Cotton Incorporated Core Research Program, the Cotton Incorporated Texas State Support Committee, and the Texas Food and Fibers Commission.

C. Wayne Smith*

References

Bridge, R.R., and J.F. Chism. 1978. Registration of DES 56 Cotton. Crop Sci. 18:524.

Culp, T.W., R.F. Moore, and J.B. Pitner. 1985. Registration of seven cotton germplasm lines. Crop Sci. 25:201–202.

El-Zik, K.M., and P.M. Thaxton. 1996. Registration of 'Tamcot Sphinx' cotton. Crop Sci. 36:1074.

Smith, C.W., and G.A. Niles. 1994. Registration of four upland cotton germplasm lines having improved fiber quality: TAM 86G^3–30, TAM 87D^3–24, TAM 87D^3–2527, and TAM 87G^3–27. Crop Sci. 34: 1413–1414.

Dep. of Soil and Crop Sci., Texas A&M Univ., College Station, TX 77843-2474. Registration by CSSA. Accepted 30 Sept. 2002. *Corresponding author (cwsmith@tamu.edu).

Published in Crop Sci. 43:742–743 (2003).

Registration of TAM 94WE-37s Smooth-Leaf Germplasm Line of Upland Cotton with Improved Fiber Length

TAM 94WE-37s (Reg. no. GP-775, PI 631442), upland cotton, *Gossypium hirsutum* L., germplasm line was released in 2002 by the Cotton Improvement Laboratory, Department of Soil and Crop Sciences, Texas Agricultural Experiment Station. This line was developed as part of an ongoing effort to develop upland cotton germplasm with improved fiber quality, especially fiber length and bundle strength, in a smooth stem and leaf phenotype adapted to central and south Texas.

TAM 94WE-37s was derived by hybridization and pedigree selection at Weslaco, TX. A single $F_{2:3}$ plant was selected on the basis of the absence of stem and leaf trichomes, apparent agronomic fitness, and high volume instrument fiber properties. TAM 94WE-37s was developed from the cross of a smooth-leaf breeding line of complex pedigree developed by G.A. Niles of the Texas Agricultural Experiment Station and a smooth-leaf and smooth-stem breeding line developed by Dr. R.R. Bridge from the cross of 'DES56' (Reg. no. 70; Bridge and Chism, 1978) and 'Deltapine 50' (R.R. Bridge, personal communication, 1990).

TAM 94WE-37s yielded equal to or better than Tamcot 'Sphinx' (El-Zik and Thaxton, 1996) and Deltapine 50 when grown from 1996 through 1998 under irrigated culture at Weslaco, TX and under dryland culture at Corpus Christi, TX. Lint percentage of TAM 94WE-37s was equal to Deltapine 50 at both locations but was lower than Tamcot Sphinx under irrigated culture at Weslaco. Micronaire reading of TAM-94WE-37s was not different from that of Deltapine 50 under either production strategy or Tamcot Sphinx when grown with supplemental irrigation at Weslaco. However, TAM 94WE-37s averaged lower micronaire reading than Tamcot Sphinx (4.0 versus 4.5) under dryland production at Corpus Christi. TAM 94WE-37s averaged greater fiber bundle strength (284 kN m kg^{-1}) than Deltapine 50 (257 kN m kg^{-1}) but was not different from Tamcot Sphinx (280 kN m kg^{-1}). Upper half mean fiber length of TAM 94WE-37s averaged 30 mm under irrigated culture at Weslaco compared with 29 mm for Deltapine 50 and 27 mm for Tamcot Sphinx. Under dryland culture at Corpus Christi from 1996 through 1998, TAM 94WE-

37s averaged 28 mm UHM length while Deltapine 50 averaged 26 mm and Tamcot Sphinx averaged 25 mm.

This germplasm line will be valuable to plant breeders interested in developing cultivars of upland cotton having improved UHM fiber length, smooth leaves and stems, and yield potential in central and south Texas. Small quantities of seed will be available from the corresponding author for distribution until supplies are exhausted. Recipients of seed are asked to make appropriate recognition of the source of the germplasm if it is used in the development of a new cultivar, germplasm, parental line, or genetic stock.

Research leading to the development of this improved germplasm line was supported in part by the Cotton Incorporated Core Research Program, the Cotton Incorporated Texas State Support Committee, and the Texas Food and Fibers Commission.

C. Wayne Smith*

References

Bridge, R.R., and J.F. Chism. 1978. Registration of 'DES 56' Cotton. Crop Sci. 18:524.

El-Zik, K.M., and P.M. Thaxton. 1996. Registration of 'Tamcot Sphinx' cotton. Crop Sci. 36:1074.

C.W. Smith. Dep. of Soil and Crop Sci., Texas A&M Univ., College Station, TX 77843-2474. Registration by CSSA. Accepted 30 Sept. 2002. *Corresponding author (cwsmith@tamu.edu).

Published in Crop Sci. 43:743–744 (2003).

Registration of EL52 and EL48 Sugarbeet Germplasm

Sugar beet (*Beta vulgaris* L.) germplasm EL52 (Reg. no. GP-222, PI 628274) and EL48 (Reg. no. GP-223, PI 607897) were developed by the USDA-ARS and the Michigan Agricultural Experiment Station, in cooperation with the Beet Sugar Development Foundation, Denver, CO. EL52 was released in March 2000; EL48 was released in June 1984 (by G.J. Hogaboam and C.L. Schneider). Both germplasms share common ancestry through monogerm, O-type lines selected during the 1960s by USDA-ARS at East Lansing (Doney 1995, Coe and Hogaboam, 1971). East Lansing germplasm combines resistance to seedling disease (caused by *Aphanomyces cochlioides* Drechs.) with resistance to Cercospora leafspot disease (caused by *Cercospora beticola* Sacc.), two destructive fungal diseases in humid production regions. EL52 has undergone further selection for resistance to crown and root rot (caused by *Rhizoctonia solani* Kühn), a disease of increasing severity in the Great Lakes region.

EL52 is monogerm and predominantly self-sterile with good resistance to *Aphanomyces* and *Cercospora*, and moderate resistance to *Rhizoctonia*. One in 20 plants tested for self-fertility set seed in the greenhouse, presumably due to pseudo self-compatibility. EL52 is a bulk of predominantly half-sib seed from 13 inter-pollinated plants that had been selected for freedom from disease in the 1997 East Lansing Rhizoctonia crown and root rot nursery. These 13 plants were selected from the most resistant half-sib families originating from 85B1-R26. 85B1-R26 was one of 25 half-sib families produced in 1985. 85B1-R26 was derived from O-type or near O-type individuals selected from Rhizoctonia and Cercospora nurseries at East Lansing between 1978 and 1983. A plant is classified as O-type or near O-type if, after crossing to a cytoplasmic-nuclear male sterile tester, its progeny are all, or almost all, respectively, male sterile. Type-O plants have normal (N) cytoplasm and the double homozygous recessive genotype *xx zz* conditioning male sterility in the S-cytoplasm.

EL52 is moderately resistant to Rhizoctonia crown and root rot, with an overall disease index (DI) rating of 3.0 in the 2001 USDA-ARS evaluation at Fort Collins, CO, (compared with 4.6 for the susceptible check FC901/C817 and 2.6 for the resistant check FC703; DI of 0 = no root rot, and 9 = all plants dead). EL52 has good resistance to Cercospora leaf spot, receiving an overall 2.50 disease index compared with 2.33 for the resistant hybrid FC504cms/FC502-2//SP6322-0 and 5.70 for the susceptible SP351069-0 checks (DI of 0 = no leaf spots and 10 = all plants dead), in the 1999 USDA-ARS evaluation at Fort Collins, CO. For Aphanomyces, EL52 was not significantly different from SR87 (Saunders et al., 2000) and the two resistant checks (2.4 compared with 2.9, 2.1, and 2.5, DI of 1 = full healthy stand and 9 = all plants dead) in the 1998 Betaseed, Inc., nursery at Shakopee, MN.

EL48 is a monogerm, self-sterile, O-type line with resistance to *Aphanomyces* and *Cercospora*. The Breeder seed for this line, designated 82B10-00, was derived from three O-type, or near O-type, plants after indexing in 1977. These three plants were selected for *Aphanomyces* resistance from three different populations. EL48 has a relatively narrow germplasm base (McGrath et al., 1999). Recent agronomic tests used seed increased in Oregon (seed lot WC980434).

EL48 is less resistant to Rhizoctonia crown and root rot than EL52, with an overall disease index rating of 3.9 in the 2001 USDA-ARS evaluation at Fort Collins, CO, (compared with 4.6 for the susceptible check FC901/C817 and 2.6 for the resistant check FC703). EL48 has good resistance to Cercospora leaf spot, receiving a 3.83 disease index compared with 3.17 and 6.50 for the resistant and susceptible checks (as above), respectively in the 1998 USDA-ARS evaluation at Fort Collins, CO. EL48 has not been tested recently for reaction to Aphanomyces.

EL52 was tested under the number 98J26-052 where its sucrose concentrations and root yield were 105 and 88% of the means, respectively, of the two cultivars ACH555 (ACH Seeds, Eden Prairie, MN) and E17 (Hilleshög-Syngenta, Longmont, CO) in 1998 agronomic trials at Saginaw, MI. EL48 and EL52 had similar sucrose concentrations (151 and 157 g kg^{-1}, respectively). EL48 sucrose concentrations were 89, 86, and 86% of hybrids USH20 (Coe and Hogaboam 1971), ACH555, and E17, respectively. Root yield of EL48 at Saginaw in 2001 was 90, 106, and 91% of the same hybrids, respectively. Root yields of EL52 and EL48 were similar (52.2 vs. 52.4 Mg ha^{-1}, respectively).

Both EL52 and EL48 provide enhanced germplasm for development of monogerm parental lines to be used in improved hybrids adapted to the humid conditions of the eastern United States. Seed will be maintained by USDA-ARS for five years, and is available by writing to J. Mitchell McGrath, USDA-ARS, 494 PSSB, Michigan State University, East Lansing, MI, 48824-1325. Seed of EL48 and EL52 has been deposited in the National Plant Germplasm System. It is requested that appropriate recognition be made if this germplasm contributes to the development of breeding lines or cultivars. U.S. Plant Variety Protection will not be requested for EL48 and EL52.

J.W. Saunders, J.M. Halloin, and J.M. Mcgrath*

Acknowledgments

We are indebted to Lee Panella and Linda Hanson (USDA-ARS, Fort Collins, CO) and Jay Miller and Margaret Rekoske (Betaseed, Inc., Shakopee, MN) for assistance with disease indexing. We also thank Robert Sims, Rick Kitchen, and Tim

Duckert for technical assistance, and Drs. Larry Campbell and J.R. Stander for valuable suggestions.

References

Coe, G.E., and G.J. Hogaboam. 1971. Registration of US H20 sugarbeet. Crop Sci. 11:942.

Doney, D.L. 1995. USDA-ARS sugar beet releases. J. Sugar Beet Res. 32:229–257.

McGrath, J.M., C.A. Derrico, and Y. Yu. 1999. Genetic diversity in selected, historical USDA sugarbeet germplasm releases and *Beta vulgaris* ssp. *maritima*. Theor. Appl. Genet. 98: 968–976.

Saunders, J.W., J.M. McGrath, J.C. Theurer, and J.M. Halloin. 2000. Registration of'SR87' sugarbeet germplasm with low soil tare and resistances to *Cercospora* and *Aphanomyces.* Crop Sci. 40:1833–1834.

J.W. Saunders (deceased), J.M. Halloin, and J.M. McGrath, USDA-ARS, Sugarbeet and Bean Research Unit, 494 PSSB, Department of Crop and Soil Sciences, Michigan State University, East Lansing, MI 48824-1325. Cooperative investigations by the USDA-ARS, the Michigan Agricultural Experiment Station, and the Beet Sugar Development Foundation. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (mitchmcg@.msu.edu).

Published in Crop Sci. 43:744–745 (2003).

Registration of Q4188 and Q4205, Sexual Tetraploid Germplasm Lines of Bahiagrass

Q4188 (Reg. no. GP-1, PI 619631) and Q4205 (Reg. no. GP-2, PI 619632) sexual tetraploid germplasm lines of bahiagrass (*Paspalum notatum* Flugge) were developed by the Universidad Nacional del Nordeste, Corrientes, Argentina, and released by the Universidad Nacional del Nordeste and the University of Florida Agricultural Experiment Station in 2002.

Tetraploid bahiagrass plants are generally obligate apomicts, and improvement has been hampered by the lack of stable, sexual tetraploid types. Research at the Facultad de Ciencias Agrarias, Universidad Nacional del Nordeste (FCA-UNNE), Corrientes, Argentina, in cooperation with USDA-ARS, Coastal Plain Experiment Station has led to the development of two tetraploid lines, Q4188 and Q4205, which exhibit sexual behavior.

Q4188 was derived from the cross Q3664/Q3853. Parent Q3664 originated from a cross between a sexual tetraploid plant (PT-2), induced by colchicine treatment of the sexual diploid Pensacola bahiagrass biotype (*P. notatum* var. *saurae*), and a white-stigma bahiagrass strain (WSB). The original cross was made by Burton and Forbes (1961). In 1979, the Q3664 plant was given to FCA-UNNE, Argentina, where they showed by embryological analyses that Q3664 is facultatively apomictic with a high level (>70%) of sexual reproduction (Quarin et al., 1984). Parent Q3853 was introduced to FCA-UNNE by pieces of rhizomes from Brazil collected by J.F. Valls and coworkers (accession no. 4751, found near Osorio and Capivari, state of Rio Grande do Sul). Embryological analyses showed that this plant is obligately apomictic.

Plant Q4188 reproduces sexually. A total of 472 ovaries, fixed at monthly intervals throughout a complete flowering season, showed over 76% of the mature ovules bearing one meiotic embryo sac. The remaining ovules had immature or aborted embryo sacs, but aposporous sacs were not observed. Genetic fingerprinting done by means of restriction fragment length polymorphisms (RFLPs) and random amplified polymorphic DNAs (RAPDs) indicated that self-pollinated progenies of plant Q4188 (experimental number F131) originated exclusively by sexual means (Ortiz et al., 1997). The plant has short, stout, ascending rhizomes; erect growth habit; red-purple basal leaf sheaths; and purple anthers and stigmas.

Plant Q4205 is a selected, selfed progeny of plant Q3664. A total of 76 plants from self-pollination of Q3664 were established in a space-planted field nursery. At flowering, 20 to 70 ovaries from each plant were cleared (Herr, 1971) and observed with a differential contrast microscope. Forty-nine plants (64.4%) formed some aposporous embryo sacs in addition to the normal meiotic sac, and the remaining 27 plants were free of apospory. Plant Q4205 was selected from among these 27 sexual plants. It appeared visually to be the most vigorous plant. A total of 265 ovaries were observed and all were free of aposporous embryo sac formation. The selected clone has short rhizomes, upright growth habit, red-purple leaf sheaths, white stigmas, and is 100% sexual. It has a visually recessive marker for white stigmas.

Confirmation of ploidy and sexual reproduction was done by examination of 40 root tips and ovules from each germplasm line at the USDA-ARS Coastal Plain Experiment Station, Tifton, GA, and at the University of Florida in 2001. While limited in scope by the number of root tip cells and flowers surveyed, the plants appeared to be tetraploid and to reproduce sexually. Chromosome number ($2n = 4x = 40$) was determined by microscopic observation of root tips that had been pretreated for 2 h in a saturated aqueous solution of α-bromonaphthalene, transferred to 5 *M* HCl for 2 min, then stained in basic fuchsin (1%, v/v) for several hours and squashed in acetic orcein (1%, v/v). Using clarified ovaries fixed in FAA at anthesis (Herr, 1971), we observed the method of reproduction of the florets of both lines for evidence of meiotic embryo sacs and any indication of aposorous development. Cleared ovaries were observed with differential interference contrast and phase contrast microscopy. Phenotypic variability of Q4188 and Q4205 was observed for plant height and flowering habit among greenhouse-grown plants at Gainesville, FL.

Because cultivated bahiagrass tetraploid grasses are considered to be obligate, or highly obligate apomicts, these 100% sexual tetraploid lines should have practical value when used as female parents in plant improvement programs. They should produce fertile tetraploid progenies when crossed with pollen from apomictic strains. Line Q4205 has an additional advantage for hybridization because of its visual recessive marker for white stigmas.

Vegetative stocks of lines Q4188 and Q4205 will be maintained at the Facultad de Ciencias Agrarias, Universidad Nacional del Nordeste, c.c. 209, 3400 Corrientes, Argentina, and at the North Florida Research and Education Center, Marianna, FL. Limited quantities of open-pollinated seed of Q4188 and Q4205 will be made available for research on request to the Florida Agric. Exp. Stn. Recipients of vegetative stocks or seed are asked to make appropriate recognition of the source of these germplasm if used in the development of a new cultivar, germplasm, parental line, or genetic stock.

C.L. Quarin, M.H. Urbani, A.R. Blount,* E.J. Martinez, C.M. Hack, G.W. Burton, and K.H. Quesenberry

References

Burton, G.W., and I. Forbes. 1961. The genetics and manipulation of obligate apomixis in common bahiagrass (*Paspalum notatum* Flugge). p. 66–71. *In* C.L. Skidmore et al. (ed.) Proc. 8th Internatl. Grassl. Congr. Reading, England. 11–21 July 1960. Alden Press, Oxford, England.

Herr, J.M. 1971. A new clearing-squash technique for the study of ovule development in angiosperms. Am. J. Bot. 58:785–790.

Ortiz, J.P., S.C. Pessino, O. Leblanc, M.D. Hayward, and C.L. Quarín. 1997. Genetic fingerprinting for determining the mode of reproduction in *Paspalum notatum*, a subtropical apomictic forage grass. Theor. Appl. Genet. 95:850–856.

Quarin, C.L., B.L. Burson, and G.W. Burton. 1984. Cytology of intra- and interspecific hybrids between two cytotypes of *Paspalum notatum* and *P. cromyorrhizon.* Bot. Gaz. (Chicago)145:420–426.

C.L. Quarin, M.H. Urbani, E.J. Martinez, and C.M. Hack, Facultad de Ciencias Agrarias, Universidad Nacional del Nordeste, c.c. 308, 3400 Corrientes, Argentina; A.R. Blount, North Florida Research and Education Center, 3925 Highway 71, Marianna, FL 32446-7906; G.W. Burton, P.O. Box 748, USDA-ARS, Crop Genetics and Breeding Research Unit, Coastal Plain Experiment Station, Tifton, GA 31794-0748; K.H. Quesenberry, Agronomy Dep. University of Florida, Gainesville, FL 32611. Contribution from the Florida Agric. Exp. Stn., Journal Paper no. R-08489. This research was supported by state and Hatch funds allocated to the Florida Agric. Exp. Stn. and the Universidad Nacional del Nordeste, Corrientes, Argentina. Registration by CSSA. Accepted 31 Aug. 2002. *Corresponding author (ablount@mail.ifas.ufl.edu).

Published in Crop Sci. 43:745–746 (2003).

Registration of W4909 and W4910 Bread Wheat Germplasm Lines with High Salinity Tolerance

Two spring habit bread wheat (*Triticum aestivum* L.) germplasm lines W4909 and W4910 (Reg. no. GP-730 and GP-731, PI 631164 and PI 631165) with high salinity tolerance were developed at USDA-ARS Forage and Range Research Laboratory, Utah State University, Logan, UT. They were jointly released by USDA-ARS and Utah Agricultural Experiment Station on 10 April 2002.

The germplasm lines W4909 and W4910 were derived from hybrids between a disomic addition line AJDAj5 ($2n = 44$; $21''$ **AABBDD** + $1''$ $\mathbf{E^b}$) having a pair of $\mathbf{E^b}$-genome chromosomes from *Thinopyrum junceum* (L.) A. Löve ($2n = 42$; $\mathbf{E^bE^bE^bE^bE^eE^e}$) and the wheat line Ph^I carrying Ph^I, the inhibitor gene dominant to the *Ph* allele. The disomic addition line, developed by Charpentier (1992), is a derivative of backcrosses of 'Chinese Spring' (CI*tr* 14108) to the Chinese Spring × *Th. junceum* partial amphidiploid ($2n = 56$; **AABBDDEE**). It was found to possess higher salt tolerance than Chinese Spring in a greenhouse test at USDA-ARS Forage and Range Research Laboratory in 1995. The wheat line Ph^I, originated from a hybrid of Chinese Spring and *Aegilops speltoides* Tausch. (Chen et al., 1994), and was used in the cross to suppress the *Ph* gene for promoting homoeologous pairing between the *Th. junceum* chromosome and wheat chromosomes in the F_1 hybrids.

The F_2 plants of original hybrids were screened for salt tolerance with Chinese Spring as the control, because both parental lines are in a Chinese Spring background that has a moderate salt tolerance. F_3 families of the survived F_2 plants were screened again in 1997. Three F_3 families had survival rates greater than 90%, indicating that they were not progeny of monosomic addition lines. The plants in one family were sterile, whereas the other two families (W2407 and W2457) produced seeds. All F_4 plants of the two families (W3574 and W3586) were euploids with $2n = 42$ (Li et al., 1997). Fluorescent genomic in situ hybridization (F-GISH) and molecular studies on these two lines indicated that they had a very small interstitial translocation of *Th. junceum* chromatin in a metacentric wheat chromosome whose homoeologous relationship has not been determined (Wang et al., 2003). Three F_5 families derived from the cross were tested at the USDA-ARS U.S. Salinity Laboratory, Riverside, CA, in 2000. Grown in a greenhouse under regular irrigation with salt solution up to the EC = 22 dS/m, two lines (W4909 and W4910) were more salt tolerant than AJDAj5 and Ph^I (the two parental lines), both of which were more salt tolerant than Chinese Spring, the common genetic background (Wang et al., 2003). This conclusion was substantiated by 2-yr observations at CIMMYT's field plots in La Paz, Baja California Sur, Mexico. Irrigated with diluted sea water at EC = 12 dS/m, the salt-tolerance in lines W4909 and W4910 was better than that in Chinese Spring and close to that in 'Kharchia 65' (from India), the most salt-tolerant landrace of wheat in the world (A. Mujeeb-Kazi, personal communication). Analyses of shoot ion contents indicate that W4909, W4910, and Ph^I have the true tolerance to high internal Na^+ concentrations, in contrast to the sodium exclusion mechanism in Chinese Spring and Yecora Rojo (CI*tr* 17414) that kept the Na^+ concentrations lower (C. M. Grieve, personal communication).

W4909 and W4910 are morphologically similar to Chinese Spring, except that they are later in maturity. W4910 is more similar to AJDAj5 in plant height and heading date, whereas W4909 is closer to the Ph^I line, which is taller and earlier than AJDAj5. W4909 and W4910 are also different from each other by a few molecular markers originated from the two parental lines (Wang et al., 2003), suggesting that they have different genomic organizations arising from different recombination events. These germplasm lines should be of interest to breeders who may pyramid QTLs for salt tolerance from W4909 or W4910 with those from other sources such as Kharchia 65 and Yecora Rojo. Seed (F_6) of W4909 and W4910 will be available at 10 seeds per written request by bone fide wheat researchers. The seed request should be addressed to the corresponding author. Appropriate recognition of the source should be noted if these germplasm lines contribute to the development of molecular tools, new breeding lines, or cultivars.

R.R.-C. Wang,* S.R. Larson, W.H. Horton, N.J. Chatterton

Acknowledgments

We thank Drs. A. Charpentier and B. S. Gill for providing seed of AJDAj5 and Ph^I, and Drs. A. Mujeeb-Kazi (CIMMYT, Mexico), C. M. Grieve and M. C. Shannon (USDA-ARS U.S. Salinity Laboratory, Riverside, California) for testing the salt tolerance of W4909 and W4910 in the field and greenhouse, respectively.

References

Charpentier, A. 1992. Production of disomic addition lines and partial amphiploids of *Thinopyrum junceum* on wheat. C.R. Acad. Sci. Paris 315(III):551–557.

Chen, P.D., H. Tsujimoto, and B.S. Gill. 1994. Transfer of Ph^I gene promoting homoeologous pairing from *Triticum speltoides* into common wheat and their utilization in alien genetic introgression. Theor. Appl. Genet. 88:97–101.

Li, X.M., C. Jaussi, R.R.-C. Wang, and S. Naimov. 1997. Salt-tolerant Triticeae germplasm from plant introductions and wide hybridization. p. 77. *In* Agronomy Abstracts. ASA, Madison, WI.

Wang, R.R.-C., X.-M. Li, Z.-M. Hu, J.-Y. Zhang, S.R. Larson, X.-Y. Zhang, C.M. Grieve, and M.C. Shannon. 2003. Development of salinity-tolerant wheat recombinant lines from a wheat disomic addition line carrying a *Thinopyrum junceum* chromosome. International J. Plant Sci. 164(1):25–33.

USDA-ARS Forage and Range Research Laboratory, Utah State University, Logan, UT 84322-6300. Registration by CSSA. Accepted 30 Sep. 2002. *Corresponding author (rrcwang@cc.usu.edu)

Published in Crop Sci. 43:746 (2003).

Registration of TTU-LRC Castor Germplasm with Reduced Levels of Ricin and RCA_{120}

An open-pollinated germplasm population of castor (*Ricinus communis* L.) TTU-LRC (Reg. no. GP-3, PI 631156) was developed at Texas Tech University and released in 2002. The eight F_6 parental lines of TTU-LRC were selected for reduced levels of two toxins found in castor seeds, ricin and *R. communis* agglutinin (RCA_{120}), as well as dwarf-internode growth habit. The toxins found in castor meal residue after oil extraction must be denatured before it can be fed to livestock (Roetheli et al., 1991, p. 36). Ricin is extremely toxic and may have potential for use in chemical warfare (Cope et al., 1945), as well as cancer immunotherapy (Ghetie and Vitetta, 1994; Vitetta and Thorpe, 1991). The TTU-LRC germplasm population was released to provide germplasm for breeding programs developing cultivars for mechanized harvesting.

TTU-LRC is an open-pollinated population obtained by randomly intercrossing eight F_6 parental lines. Three of the F_6 lines originated from crosses made in 1994 between PI 257654 and 'Hale', while five of the F_6 lines originated from a cross between PI 258368 and Hale. Hale is a high yielding, dwarf-internode cultivar released by USDA-ARS and Texas A&M University in 1961 (Brigham, 1970). Both PI 257654 and PI 258368 were developed in the former Soviet Union where they were selected for low levels of seed toxins (Moshkin, 1986, p. 81–92). Open-pollinated F_3, F_4, and F_5 seeds of these crosses were screened for reduced levels of ricin and RCA_{120} by means of a radial immunodiffusion (RID) assay (Pinkerton et al., 1999). Plants were also simultaneously selected for dwarf-internode growth habit.

Approximately 50 F_7 plants from each of the eight F_6 parental lines were randomly intercrossed in an isolated field nursery during the 2000 growing season at Lubbock, TX. Approximately 40 plants, which did not exhibit dwarf-internode growth habit, were removed before pollination. Phenotypic analyses conducted on a sample of 118 F_6 plants showed that plant height ranged from 33 to 119 cm. Limited cross-pollination had occurred during selfing as indicated by traits not present in the base population. Spineless capsules occurred in less than 10% of plants and red stems or leaves occurred in less then 5% of the plants. The RID assay was used to determine the combined ricin and RCA_{120} contents of 30 open-pollinated seeds harvested from the 2000 crossing block. These seeds ranged from 0.10 to 5.60 mg of ricin and RCA_{120} g^{-1} and averaged 1.86 mg ricin and RCA_{120} g^{-1}. This compares to an average 12.2 mg ricin and RCA_{120} g^{-1} in the cultivar Hale in an earlier study (Pinkerton et al., 1999). Seeds of PI 257654 and PI 258368 averaged 1.5 and 2.9 mg ricin and RCA_{120} g^{-1} seed in this study, respectively.

This heterogenous population should provide a source of valuable breeding lines which combine reduced levels of toxins with the dwarf-internode growth habit (0.3–1.25 m) necessary for mechanized harvest. The Plant and Soil Science Department at Texas Tech University will maintain seed stocks. Approximately 100 seeds will be made available to researchers on request to the corresponding author. Appropriate recognition should be made if this germplasm contributes to the development of new breeding lines or cultivars. U.S. Plant Variety Protection for TTU-LRC will not be applied for.

D.L. Auld,* S.D. Pinkerton, E. Boroda, K.A. Lombard, C.K. Murphy, K.E. Kenworthy, W.D. Becker, R.D. Rolfe, and V. Ghetie

Acknowledgments

Funding for this research was provided by the Texas Tech University Plant Science Research Item, by the USDA-CSRS (CSREES), by the Advanced Technology Program- Texas Higher Education Coordination Board, and by the USDA-Initiative for Future Agriculture and Food Systems (IFAFS). Raymond Brigham (TAMU-TAES, Lubbock, TX), Harry Parker (TTU), and Brenda Lauterbach (TAMU-TAES, Lubbock, TX) contributed to the development of this germplasm population.

References

Brigham, R.D. 1970. Registration of castor variety Hale (Reg. No. 3). Crop Sci. 10:457.

Cope, A.C., J. Dee, R.K. Cannan, B. Renshaw, and S. Moore. 1945. Ricin. Chapter 12. p. 179–203. *In* Chemical warfare agents and related chemical problems- Part I. Summary Technical Report, Div. 9, National Defense Research Committee. (Declassified Secret)

Ghetie, V., and E. Vitetta. 1994. Immunotoxins in the therapy of cancer: From bench to clinic. Pharm. Ther. 64:209–234.

Moshkin, V.A. (ed.) 1986. Castor. Amerind Publishing Co. PVT Ltd. New Delhi.

Pinkerton, S.D., R.D. Rolfe, D.L. Auld, V. Ghetie, and B.F. Lauterback. 1999. Selection of castor with divergent concentrations of ricin and *Ricinus communis* agglutinin. Crop Sci. 39:353–357.

Roetheli, J.C., L.K. Glaser, and R.D. Brigham. 1991. Castor: Assessing the feasibility of U.S. production. USDA-CSRS, Office of Agricultural Materials. Washington, DC.

Vitetta, E.S., and P.E. Thorpe. 1991. Immunotoxins containing ricin or it's A chain. Cell Biol. 2:42–58.

D.L. Auld, S.D. Pinkerton, E. Boroda, K.A. Lombard, C.K. Murphy, W.D. Becker, Dep. of Plant and Soil Science, Texas Tech Univ., Lubbock, TX 79409-2122; K.E. Kenworthy, Agribusiness, Agronomy, Horticulture, and Range Management, Tarleton State Univ., Stephenville, TX 76402; R.D. Rolfe, Department of Microbiology and Immunology, Texas Tech Univ. Health Science Center, Lubbock, TX 79430; V. Ghetie, Cancer Immunology Center and Department of Microbiology, Univ. of Texas Southwestern Medical Center, Dallas, TX 75235-8576. This is contribution number T- 4-522 of the College of Agricultural Science and Natural Resources, Texas Tech University. Registration by CSSA. Accepted 30 Sep. 2002. *Corresponding author (dick.auld@ttu.edu).

Published in Crop Sci. 43:746–747 (2003).

GENETIC STOCKS

Registration of Two Sunflower Genetic Stocks with Reduced Palmitic and Stearic Acids

Two sunflower (*Helianthus annuus* L.) genetic stocks, RS1 (Reg. no. GS-26, PI 616494) and RS2 (Reg. no. GS-27, PI 616495), having reduced levels of palmitic and stearic acids, were developed and released by the USDA-ARS and the North Dakota Agricultural Experiment Station, Fargo, ND, in June 2001. These genetic stocks were derived from PI 250542, providing a source of low saturated fatty acids for sunflower improvement. Germplasm in which palmitic and stearic acids are simultaneously reduced has not been previously available in sunflower.

In recent years, consumers have become concerned with reducing the saturated fat content of their diet. High levels of saturated fat consumption are correlated with increased risk of coronary heart disease. The total saturated fat content of RS1 and RS2, including C16 to C24 saturated fatty acids, was less than 80 g kg^{-1} when grown at Fargo, ND, during the summer of 2000. This is almost 40% less than the total saturated fat content in the oil of current commercial sunflower hybrids which average about 130 g kg^{-1}.

Bulk seed samples of 884 cultivated sunflower accessions from the USDA-ARS North Central Regional Plant Introduction Station, Ames, IA, were screened for fatty acid composition by gas chromatography (Vick et al., 1998). PI 250542, a cultivar collected in Egypt by Paul Knowles and deposited into the National Plant Germplasm System in 1958, was identified as an accession with reduced saturated fatty acid content. The fatty acid composition of 26 half-seeds of PI 250542, in which the embryo half of the seed is saved for planting and the distal half is analyzed for fatty acids, was determined by transesterification with tetramethylammonium hydroxide (Metcalfe and Wang, 1981) and analysis by gas chromatography. The seed with the lowest saturated fatty acids was grown in the greenhouse and used to pollinate NMS HA 89. The F_1 seed was grown in the field and self-pollinated. One F_2 seed with reduced palmitic acid was selected by half-seed analysis of 40 F_2 seeds and identified as RP13 (RP = reduced palmitic). The RP13 plant was grown in the greenhouse and backcrossed with pollen from HA 89. The BC_1F_1 seed from this cross was planted in the field and the BC_1F_2 seed was screened for low palmitic and low stearic acids. BC_1F_2 seeds with low saturated fatty acid composition were grown in the greenhouse, and the BC_1F_3 seeds from the self-pollinated plants were screened by half-seed analysis for both low palmitic and stearic acid content. Two seeds of different colors were chosen for further breeding, and these became the origin of the two reduced-saturated fatty acid genetic stocks RS1 and RS2 (RS = reduced saturated) for this release.

RS1 was alternately planted in the greenhouse and field, self-pollinated, and continually screened for both low palmitic and stearic acid content through the BC_1F_8 generation. RS1 has a striped black and dark gray seed. The total saturated fatty acid composition of RS1, including C16 to C24 fatty acids, was 77 g kg^{-1} when grown in the field at Fargo, ND, in 2000. The palmitic acid (C16) concentration averaged 37 g kg^{-1}, while the stearic acid (C18) concentration averaged 32 g kg^{-1}. RS1 plants had 80% seed set when sib-pollinated in the greenhouse, and occasional bicephalism, with the two heads sometimes completely separated and sometimes fused. Plant height was 98 cm, days to flowering was 67 d, and the 1000-seed weight was 90 g. When RS1 was crossed with HA 821 (Roath et al., 1986) and grown in the greenhouse, the saturated fatty acid content of the resulting F_1 seed was 74.2 g kg^{-1}, compared with 58.3 g kg^{-1} for RS1 control plants. In contrast, the HA 821 parent grown at the same time in the greenhouse had a saturated fatty acid content of 115 g kg^{-1}. The results suggested that the low saturated fatty acid trait was partially dominant.

RS2, as with RS1, was alternately planted in the greenhouse and field, self-pollinated, and screened for both low palmitic and stearic acid content through the BC_1F_8 generation. RS2 has a light gray seed which often bleaches to white when grown in the field. The total saturated fatty acid composition of RS2, including C16 to C24 fatty acids, was 76 g kg^{-1} when grown in the field at Fargo, ND, during 2000. The palmitic acid concentration averaged 37 g kg^{-1}, while the stearic acid concentration averaged 30 g kg^{-1}. RS2 plants had 30% seed set when sib-pollinated in the greenhouse, and frequent bicephalism, with the two heads sometimes completely separated and sometimes fused. The bicephalism trait is not genetically linked to the low saturated fatty acid trait in RS2 because all RS2 plants, whether monocephalic or bicephalic, have the same reduced level of saturated fatty acids. Plant height was 93 cm, days to flowering was 67 d, and the 1000-seed weight was 89 g. RS2 was crossed with HA 821 and grown in the greenhouse, and the resulting seed was analyzed for fatty acid composition. The total saturated fatty acid content of the F_1 seed of a cross of RS2 with HA 821 was 66.8 g kg^{-1}. This compared with 62.8 g kg^{-1} for the RS2 parent and 115 g kg^{-1} for the HA 821 parent, both grown at the same time in the greenhouse. The results suggested partial dominance for the low saturated fatty acid trait.

Seed of these genetic stocks will be maintained by the authors and small quantities of seed are available on request. We ask that appropriate recognition be made if these genetic stocks are used in genetic studies or contribute to the development of new germplasm. U.S. Plant Variety Protection will not be requested for RS1 and RS2.

B.A. Vick,* C.C. Jan, and J.F. Miller

References

Metcalfe, L.D., and C.N. Wang. 1981. Rapid preparation of fatty acid methyl esters using organic base-catalyzed transesterification. J. Chromatogr. Sci. 19:530–535.

Roath, W.W., J.F. Miller, and T.J. Gulya. 1986. Registration of sunflower parental lines HA 821 and HA 822. Crop Sci. 26:217.

Vick, B.A., C.C. Jan, and J.F. Miller. 1998. Development of sunflower germplasm with reduced saturated fatty acids. p. 138–141. *In* Proc. 20th Sunflower Res. Workshop, Fargo, ND. 15–16 Jan. 1998. Natl. Sunflower Assoc., Bismarck, ND.

USDA-ARS, Northern Crop Science Laboratory, Box 5677, Fargo, ND 58105-5677. Registration by CSSA. Accepted 30 Sep. 2002. *Corresponding author (vickb@fargo.ars.usda.gov).

Published in Crop Sci. 43:747–748 (2003).