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explant types (B.D. Singh et al.). The second examines genetic fidelity issues in micropropagation systems and how molecular markers can be used to avoid variants (V. Rani and S.N. Raina). The prospects of pollen biotechnology for crop improvement are examined in Chapter 25 (K.R. Shivanna), including long-term storage of pollen, the potential for using pollen for screening, techniques for overcoming pre- and post-fertilization barriers, and generating instant inbreds. The final chapter (R. Varghese et al.) is a bit of an oddity for a crop improvement book, in that it discusses molecular characterization of the Actinomycete *Frankia* aimed at identifying and isolating more suitable strains.

The book is unique in that it examines improvement in crops that, with the exception of wheat, are not common to North American agriculture. The book contains a mix of very useful, informative chapters thrown in with chapters that at best gloss over the subject matter. As with any book in a rapidly evolving field, this book's shelf life is extremely short. However, it does provide an interesting ''snap-shot'' of where the field was in early 1997.

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REGISTRATIONS OF CULTIVARS

Registration of 'AC Bacon' Barley

'AC Bacon' (*Hordeum vulgare* subsp. *vulgare*), (Reg. no. CV-277, PI 608020), is a hulless six-row feed spring barley developed at the Agriculture and Agri-Food Canada (AAFC) Research Centre, Brandon, MB, Canada, which was registered on 21 Apr. 1998, by the Canadian Food Inspection Agency, Ottawa, Canada. AC Bacon was tested at Brandon (and eastern prairie locations - from 1991) and in the Western Hulless Barley Cooperative Test (1995–1997) under the experimental numbers H85-9 and HB 105, respectively. AC Bacon was selected from the cross 'Tupper'/'Johnston'//'Conquest'/3/'Abee'/4/'Ellice'/'Bedford'. Tupper is the source of the hulless character. Only hulless progeny were retained.

The hybrid population (Brandon no. H85) was developed by hand crossing in controlled-environment facilities at the Brandon Research Centre, AAFC, and the final cross was completed in 1988. Seventy F_1 seed were planted in the greenhouse and F_2 seed were harvested in bulk. F_2 seed were planted in the field in a single 3 m long row and F_3 seed were bulk harvested. The procedure was repeated for the F_3 generation using two rows 3 m long. From the F_3 bulk, 1500 seeds were chosen at random and were grown as F_4 spaced plants with 1 m spacing between plants and rows. AC Bacon originated from a single plant selected from the F_4 population based on visual assessment for spike size and conformity, number of fertile tillers, vigour, and relative absence of disease. The selected plant (the origin of AC Bacon) was grown, along with other F_4 selections, as 3 m long and 1 m wide plots in a nearest-neighbour design with the check cultivar 'CDC Buck' repeated every 20 plots. A single plot (H85-9) was selected from this F_5 population on the basis of superior agronomic performance relative to CDC Buck, including yield, straw strength, test weight, maturity, and percent hull retention. H85-9 was first tested in a replicated field trial in Brandon in 1991. H85-9 was also screened for reaction to 15 foliar and spike pathogens in the laboratory. H85-9 was then tested at two locations in 1992 (Brandon, MB and Oak River, MB) and advanced to the Eastern Prairie Barley Test (EPBT) in 1994 on the basis of merit in yield, straw strength, and overall agronomic performance. The EPBT was grown at seven locations in Manitoba and Saskatchewan. H85-9 was then advanced as HB 105 to the Western Cooperative Hulless Barley Registration Test (HBCOOP) in 1995 based on merit for yield and agronomic performance.

Over three years of evaluation in the HBCOOP, AC Bacon was higher yielding ($P < 0.05$) than 'Falcon' (the high-yielding six-row hulless check) in eastern Black Soils (18%), Brown Soils (18.7%), western Black Soils (10.6%) and Grey Wooded Soils (17.3%) zones of western Canada.

AC Bacon heads two days earlier than Falcon and is one day earlier in maturity. Straw strength (3.9) is less than Falcon (1.7) and equal to the two-row hulless check 'Condor' (3.4), on a scale of 1 to 9, where 1 = no lodging and 9 = completely lodged. AC Bacon is short (non-semidwarf), averaging 7 cm taller than Falcon (semi-dwarf), and averages 83 cm across western Canada. The six-row spike is semi-compact (avg. 12 cm), semi-erect, decumbent, with deciduous hulls upon threshing. Kernels are large and wide with yellow (white) aleurone. Lemma awns are smooth. AC Bacon is similar in thousand kernel weight to Falcon (34.6 vs. 33.9 g), as well as in test weight (62.2 vs. 61.8 kg hl^{-1}).

Based on both laboratory and field evaluations, AC Bacon is resistant to scald [caused by *Rhynchosporium secalis* (Oudem) J.J. Davis]; moderately resistant to common root rot [caused by *Cochliobolus sativus* (Ito and Kuribayashi) Dreschs. and Dastur]; susceptible to net blotch (caused by *Pyrenophora teres* Dreschs.); all forms of smuts (caused by *Ustilago* spp); and septoria leaf blotch (caused by *Septoria passerinii* Sacc.).

Seed from 300 uniform F_{11} head rows were bulked to constitute the Breeder seed of AC Bacon. Breeder seed is being maintained by AAFC at the Indian Head Research Farm, Indian Head, SK., Canada. The Canadian distributor for AC Bacon is SeCan Association, 200-57 Auriga Drive, Nepean, ON, Canada, K2E 8B2.

M.C. Therrien* (1)

References and Notes

1. AAFC, Brandon Research Centre, Box 1000A, R.R. #3, Brandon, MB, Canada, R7A 5Y3. Registration by CSSA. Accepted 31 Oct. 1999. *Corresponding author (MTherrien@em.agr.ca).

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Registration of 'Orca' Barley

'Orca' is a spring barley (*Hordeum vulgare* L.), (Reg. no. CV-278, PI 607936), developed by the Oregon Agricultural Experiment Station and released in 1998. The University of Idaho Agricultural Experiment Station and the Washington State Agricultural Research Center participated in the release.

Orca, tested as BSR45 and Icaro (unofficial pre-release name), was derived from the cross of 'Calicuchima'-sib × 'Bowman'-derivative made in 1990. Calicuchima-sib is a six-row spring barley germplasm line developed by the International Center for Agricultural Research in the Dry Areas (ICARDA) barley breeding program based in Mexico. The pedigree of Calicuchima-sib is 'LBIran'/UNA8271//'Gloria'/'Comanche'. In 11 years of multi-location tests in Mexico and the Andean region of South America (1988–1998), Calicuchima-sib was resistant to stripe rust (caused by *Puccinia striiformis* f.sp. *hordei*), leaf rust (caused by *Puccinia hordei* G. Otth) and scald [caused by *Rhynchosporium secalis* (Oudem.) J.J. Davis] (H. Vivar, personal communication). Bowman (Reg. no. CV-197, PI 483237) (1) is a two-row spring barley released by the North Dakota State University Experiment Station in 1984. The pedigree of Bowman is ND2685/ND1156//'Hector'. The Bowman-derivative (ND586/CI*ho* 2376//ND4880)/4*Bowman) carries the *Ryd2* gene for resistance to Barley Yellow Dwarf Virus (BYDV) from CI*ho* 2376 and was generously provided by Dr. Jerry Franckowiak of North Dakota State Univ. Orca is one of 110 doubled haploid lines (BSR45) derived from the F_1 of Calicuchima-sib/Bowman-derivative. The doubled haploids were developed in 1992 using a modified *Hordeum bulbosum* technique (2). The doubled haploid population was used to map genes conferring resistance to barley stripe rust and other diseases (3, 4). Five hundred heads of Orca were selected from a phenotypically uniform block in New Zealand in 1997 and were grown in head rows by the Washington State Crop Improvement Association in 1997. This seed was harvested in bulk for Breeder seed.

Orca is a two-row, long and rough-awned, white-aleurone spring barley with short rachilla hair. Additional genotype identifiers are 35 Restriction Fragment Length Polymorphisms (RFLPs) and 15 Simple Sequence Repeats (SSRs) (4, 5).

Orca is resistant to barley stripe rust under field conditions in Mexico, South America, and the Pacific Northwest, U.S.A. Averaged over tests conducted in Bolivia, Chile, Ecuador, Peru, Mexico, and the U.S.A. (California, Idaho, Montana, Oregon, and Washington), from 1993–1998, the average adult plant stripe rust severity on Orca was 10%. Initially, only race 24 of *P. striiformis* f.sp. *hordei* was thought to be present in the Americas (6). Recently, more extensive analysis has revealed considerable variation in pathogen isolates collected in the U.S.A. (7, 8). Barley germplasm developed by the ICARDA/CIMMYT program in Mexico, including Calicuchima-sib, allows limited symptom development when exposed to the spectrum of stripe rust virulence encountered in field tests in South America, Mexico, and the U.S.A. The fact that this germplasm has remained resistant over an 11-year period may be grounds for describing it as having "durable resistance" (9). The primary determinants of stripe rust resistance in Orca were mapped as Quantitative Trait Loci (QTLs) to chromosomes 4 (4H) and 7 (5H) and the resistance alleles at these QTLs originated from Calicuchima-sib (3, 4). This may indicate that Orca has the adult plant, quantitative resistance of the Calicuchima-sib parent. Orca is also resistant to a Canadian PAV strain of Barley Yellow Dwarf Virus (BYDV). On a 1–9 scale (1 = resistant, 9 = susceptible) Orca received a mean symptom score of 1.7 in a test involving a PAV strain isolate of BYDV (4). In the same test, the resistant parent (Bowman-derivative) received a score of 1.3 and the susceptible parent (Calicuchima-sib) a score of 8.2. BYDV resistance mapped to chromosome 3 (3H) (4). The *Ryd2* locus maps to this same chromosome location (10).

Orca was tested under both irrigated and dryland conditions in Oregon, Washington, and Idaho (1994–1998). It was also tested in the Western Regional Spring Barley Nursery (WRSBN) in 1997 and 1998. The yield of Orca was 5814 kg ha^{-1}, 107% of 'Harrington' (the North American two-row malting barley standard) and 96% of 'Baronesse' (the most popular feed variety in the Pacific Northwest of the U.S.A.) in 21 station-years of irrigated tests. Averaged over 30 station-years of dryland tests, the yield of Orca was 4369 kg ha^{-1}, which was similar to Harrington and 17% lower than Baronesse. Averaged over 23 station-years in the WRSBN, the yield of Orca was 5168 kg ha^{-1}, 99% of the yield of 'Steptoe' (the feed barley check in the WRSBN) and 104% of the yield of Harrington.

Orca has large, plump seeds and high test weight. In 10 station-years of dryland and 12 station-years of irrigated tests, the average percentages of plump seed (seeds remaining on a 2.4 mm slotted sieve) were 97 and 96, respectively. These represent advantages over Harrington of 22% (dryland) and 10% (irrigated). The advantages over Baronesse were 20% (dryland) and 9% (irrigated). The percentage of plump seed of Orca was 93%, a 13% advantage over Steptoe and a 20% advantage over Harrington, averaged over 17 station-years in the WRSBN. In 30 station-years of dryland and 19 station-years of irrigated tests, respectively, the average test weight of Orca was 67 kg hL^{-1}. This represents a 3% advantage over Harrington and a value comparable to Baronesse. Averaged over 21 station-years in the WRSBN, the test weight of Orca was 66 kg hL^{-1}, a 10% advantage over Steptoe and a 2% advantage over Harrington.

Orca is earlier and about the same height, but more lodging-resistant, than Harrington and Baronesse under irrigated and dryland conditions. In 16 station-years of dryland and irrigated tests, the average Julian heading dates of Orca, Harrington, and Baronesse were 173, 179, and 179 d respectively. In 19 station-years of testing in the WRSBN, the average Julian heading date of Orca was 175 d, as compared to 176 d for Steptoe and 180 d for Harrington. Averaged over 29 station-years of dryland and irrigated tests, the average plant heights of Orca, Harrington, and Baronesse were 86, 85, and 83 cm, respectively. In 20 station-years of testing in the WRSBN, the plant height of Orca was 87 cm, as compared to 85 cm for Steptoe and 87 cm for Harrington. Averaged over 13 station-years of dryland and irrigated tests, the average lodging percentages (on a plot basis) for Orca, Harrington, and Baronesse were 25, 48, and 41%, respectively.

Averaged over 14 station-years (1993–1998), the grain protein of Orca was 13.1%, the malt extract was 79.5%, the diastatic power was 144° (ASBC) and the alpha amylase activity was 51.7 20° units. Orca was tested for two years (1997–1998) in the American Malting Barley Association (AMBA) Pilot Scale program. Due to high grain protein and enzyme activity, Orca did not receive approval for release as a malting variety.

Breeder and Foundation seed will be maintained by the Washington State Crop Improvement Association. U.S. plant variety protection will not be applied for. Seed for experimental purposes may be obtained from the corresponding author.

P.M. Hayes,* A.E. Corey, R. Dovel, R. Karow, C. Mundt, K. Rhinart, and H. Vivar (11)

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Registration of 'Garnet' Barley

'Garnet', a two-rowed spring feed barley (*Hordeum vulgare* L.) (Reg. no. CV-279, PI 605472), was developed cooperatively by the USDA-ARS and the Idaho Agricultural Experiment Station. It was formally released by these agencies in May 1999. Garnet was released as a feed barley, but it is a potential malting barley.

Garnet was selected from a cross of 'Harrington'/78Ab6871 made in 1983. The parent Harrington, a two-rowed malting barley, was developed by the University of Saskatchewan at Saskatoon, Saskatchewan from the cross 'Klages'/3/'Gazelle'/ 'Betzes'// 'Centennial'. The parent 78Ab6871 was released in 1989 as 'Crystal'. Crystal is a two-rowed malting barley developed by ARS at Aberdeen, Idaho from the cross 'Columba'/Klages. Garnet originated at Aberdeen as a F_4 spike selection, subsequently harvested as a F_5 row in 1986, and designated as 86Ab2317. Breeder seed of Garnet originated as a F_9 bulk seed increase, derived without further selection from the original F_5 head row, grown at the Aberdeen Research and Extension Center. Garnet is midseason in maturity with medium-lax spikes and rough awns. Kernels are covered and have white aleurone, rachilla hairs are long, barbs on lateral veins are absent, lemmas are typically wrinkled, glumes are covered with long hairs or in a band, and rachis edges have numerous hairs.

Garnet was first tested in replicated trials in Idaho in 1988. It was tested in the regional Western Spring Barley Nursery from 1991 to 1994 and in the Western Dryland Spring Barley Nursery from 1991 to 1995. It has been widely tested in both irrigated and dryland trials in Idaho and other western states since 1991. In eight station-yr of testing in irrigated trials at Aberdeen, from 1990 to 1994 and 1996 to 1998, Garnet's grain yield was 7643 kg ha^{-1} or 94% of Crystal, 100% of Harrington, and 104% of Klages. No data were obtained in this series of trials at Aberdeen in 1995. In these same trials, Garnet exhibited good kernel plumpness, averaging 95% over a 2.4 by 19.1 mm screen vs. 92% for Crystal, 89% for Harrington, and 85% for Klages. Garnet averaged 685 kg m^{-3} in test weight in Aberdeen trials which was slightly lower than the check varieties, averaging 21 kg m^{-3} less than Crystal, 8 kg m^{-3} less than Harrington, and 6 kg m^{-3} less than Klages. Garnet is similar to these varieties in heading date and height at Aberdeen. It is similar to Crystal in straw strength, and superior to Harrington and Klages in trials at Aberdeen.

In nine station-yr of testing in irrigated trials at Tetonia, Idaho, from 1990 to 1998, Garnet averaged 5187 kg ha^{-1} or 97% of Crystal, 103% of Harrington and 105% of Klages. Garnet has an excellent kernel plumpness record under irrigation at Tetonia, averaging 94% over a 2.4 by 19.1 mm screen and exceeding all check varieties for this trait. In six station-yr of testing in dryland trials at Tetonia, from 1990 to 1995, Garnet averaged 3720 kg ha^{-1} or 96% of Crystal, 98% of Gallatin, 95% of Harrington and 85% of Hector. In these dryland trials Garnet was superior to all of these check varieties in kernel plumpness, averaging 87% over a 2.4 by 19.1 mm screen vs. 71% for Crystal, 82% for Gallatin, 79% for Harrington, and 78% for Hector. In 16 station-yr of testing in dryland trials at Bonners Ferry, Craigmont, Potlatch, and Tammany in northern Idaho, from 1995 to 1998, Garnet averaged 4531 kg ha^{-1} or 88% of 'Baronesse', 94% of 'Chinook', 106% of 'Crest', 98% of Crystal, and 102% of Harrington. Garnet was superior to all of these check varieties in kernel plumpness in these trials, averaging 91% over a 2.4 by 19.1 mm screen vs. 84% for Baronesse, 86% for Chinook, 81% for Crest, 84% for Crystal, and 76% for Harrington.

Garnet has been relatively free of disease when grown in Idaho, but it is susceptible to barley stripe rust [caused by *Puccinia striiformis* West. f. sp. *hordei*]. Garnet is susceptible to Russian wheat aphid [*Diuraphis noxia* (Mordvilko)]. Garnet has good malting quality characteristics and is currently being evaluated in plant-scale tests for malting and brewing quality. Garnet is expected to compete favorably with existing two-rowed spring barley cultivars in irrigated and many non-irrigated or dryland environments in Idaho and other western states. Breeder and Foundation seed of Garnet will be maintained by the Idaho Agricultural Experiment Station, Foundation Seed Program. Requests for seed should be directed to the Coordinator, Foundation Seed Program, College of Agriculture, Kimberly Research and Extension Center, 3793 N 3600 E, Kimberly, Idaho 83341. Seed is available in small quantities for research purposes from the corresponding author. U.S. plant variety protection will not be applied for.

D.M. Wesenberg,* D.E. Burrup, J.C. Whitmore, and C.T. Liu (1)

References and Notes

1. D.M. Wesenberg and D.E. Burrup, USDA-ARS, Univ. of Idaho Aberdeen Res. & Ext. Ctr., USDA-ARS, Natl. Small Grains Germplasm Res. Facility, P.O. Box 307, Aberdeen, ID 83210; J.C. Whitmore, Univ. of Idaho Tetonia Res. & Ext. Ctr., 888 West Highway 33, Newdale, ID 83436; and C.T. Liu, Dep. of Plant, Soil, and Entomological Sciences, University of Idaho, Moscow, Idaho 83843. Cooperative investigations of the USDA-ARS and the Idaho Agric. Exp. Stn. Idaho Agric. Exp. Stn. Manuscript no. 00709. Registration by CSSA. Accepted 31 Oct. 1999. *Corresponding author (dwesenb@uidaho.edu).

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Registration of 'Jaeger' Barley

'Jaeger' is a six-row hulless feed spring barley (*Hordeum vulgare* L.), (Reg. no. CV-280, PI 608012), released in 1999

by the Field Crop Development Centre, Alberta Agriculture, Food and Rural Development, Lacombe, Alberta, Canada (Canadian Reg. no. 4873). Jaeger was selected from the cross 'Nopal'/'Ager'/5/F10.14/3/'Mona'/'Emir'//Bco.Mr/'Godiva'/4/'Api'/'CM67'//'Ore'. An F_2 bulk from this cross was introduced to the Alberta breeding program from the International Maize and Wheat Improvement Center (CIMMYT), Mexico and grown out for observation at Lacombe, AB, in 1983. Using a modified bulk breeding method, the F_3 bulk was planted in California in the fall of 1983 and harvested in the spring of 1984. Subsequent bulk populations of the cross were grown alternately at Lacombe and El Centro, CA. Head selections were made in the F_9 generation to produce F_{10} head-rows and planted in 1990 at Lacombe. A single F_{10} head-row was selected at Lacombe and was entered in yield trials from 1991 to 1997. In 1995, F_{14} heads were selected and grown out as single head-rows. Selection was based on test results for yield, test weight, protein content, straw strength, threshability and leaf disease resistance. Breeder seed of Jaeger was derived from a bulk of 171 F_{17} head-rows.

Jaeger is a midseason, short-statured cultivar, with a green coleoptile and a semi-erect juvenile growth habit. Leaves are dark green, wide and long with glabrous green sheaths and blades. The flag leaves are dark green, wide, medium long and erect. The auricle is white with a waxy sheath. Stems are green and waxy, with an average thickness of 2–3 mm. Culms generally have 4 nodes, a closed collar shape, an undulated neck, and an exsertion above the base of the flag leaf blade of 3–10 cm. Jaeger's 6-row spikes are dense, semi-erect and short in length. Lemma awns are rough and long with slight purplish tips. The basal marking of the lemma is a slight crease. The lemmas have many barbs on the lateral veins. Glume awns are rough and half the length of the lemma. Rachillas are medium long with short hairs. Kernels are hulless, short and medium wide, with an amber aleurone.

Jaeger was tested as M82037021N in Alberta yield trials from 1991 to 1994 and as HB608 in the Western Cooperative Hulless Barley Test (WCHBT) of the Canadian Prairie Registration Recommending Committee from 1995 to 1997. In 39 station-years of the WCHBT grown in Manitoba, Saskatchewan, and Alberta production areas, Jaeger had an average yield of 5346 kg ha^{-1}, which was 106% of the six-row hulless check 'Falcon', and 110% of the predominant two-row hulless check 'Condor'. In the same test, Jaeger had a mean test weight of 73.7 kg hL^{-1} compared with 74.2 kg hL^{-1} for Falcon and 77.2 kg hL^{-1} for Condor. The mean 1000 kernel weight of Jaeger was 32.0 g, compared with 33.7 g for Falcon and 37.1 mg for Condor. In this same test, in 29 trials, Jaeger was 2 d later than Falcon and 1 d later than Condor. Its plant height was 74.7 cm, compared with 70.3 cm for Falcon and 80.4 cm for Condor. Jaeger has shown excellent resistance to lodging. In 22 station-years of the WCHBT, Jaeger had a lodging resistance score of 1.8 on a scale of 0–9 (where 0 = erect, 9 = fully lodged), compared with 2.0 for Falcon and 3.2 for Condor. Jaeger is well adapted to the brown soils of Saskatchewan and to the brown soils and irrigated areas of Alberta.

Jaeger has good field resistance to barley leaf scald [caused by *Rhynchosporium secalis* (Oudem.) J.J. Davis]. In six trials of the WCHBT where scald ratings were taken, Jaeger averaged 2.7 (on a scale of 0 to 9, where 0 = least affected), compared with 3.4 for Falcon and 5.4 for Condor. Jaeger is susceptible to covered smut [caused by *Ustilago hordei* (Pers.) Lagerh], to false loose smut [caused by *Ustilago avenae* (Pers.) Rostr], to loose smut [caused by *Ustilago tritici* (Pers.) Rostr.], and to net blotch (caused by *Pyrenophora teres* Drechs.). Jaeger is resistant to septoria leaf blotch (caused by *Septoria passerinii* Sacc.).

Breeder seed of Jaeger is being maintained by the Field Crop Development Ctr., Alberta Agriculture, Food and Rural Development, Lacombe, AB. Distribution rights were granted to Progressive Seeds Ltd., #155 4752 Ross Street, Red Deer, AB. T4N 1X2, Canada. Application has been made in Canada for plant breeder's rights.

James H. Helm, Manuel J. Cortez,* Patricia E. Juskiw, Donald F. Salmon, and William M. Stewart (1)

References and Notes

1. Alberta Agriculture, Field Crop Development Ctr., 5030 50th St., Lacombe, AB T4L 1W8, Canada. Registration by CSSA. Accepted 30 Nov. 1999. *Corresponding author (cortez@agric.gov.ab.ca).

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Registration of 'Accent' Perennial Ryegrass

'Accent' perennial ryegrass (*Lolium perenne* L.) (Reg. no. CV-199, PI 607445), a turf-type diploid ($2n=2x=14$), was developed and released 11 August 1995 by J.R. Simplot Co. dba Jacklin Seed and Medalist America, Post Falls, Idaho. Accent was evaluated under the experimental designations MED-393 and 92-0393. The first Certified seed was produced in 1995.

Accent was developed from the maternal progenies of 18 clones. These consisted of 12 clones selected from 'APM' (10), three clones from 'Advent' (11), two clones from 'Saturn' (9), and one clone from 'Pinnacle' (2). The 18 selected clones were evaluated in spaced-plant nurseries and selected on the basis of dark green color, high tiller density, high seed yield, and relative freedom from foliar disease. The half sib-progenies from these clones were planted in turf trials in 1990 at Rutgers University, Adelphia, NJ and at the Jacklin Research farm in Post Falls.

In August 1992, plugs were removed from the Adelphia turf plots and transferred to greenhouse flats at Post Falls. A subset of 10 plugs from each line was screened for the presence of the fungal endophyte, *Neotyphodium lolii* (Latch, Christensen and Samuels) Glenn, Bacon, Price and Hanlin, which averaged 95% across the 18 lines.

In October 1992, 7200 plugs (400 from each of the 18 half-sib progenies) were transplanted into a spaced-plant nursery near Albany, OR. In the spring of 1993, the block was selected for uniformity, with 50% of the plants being removed before anthesis. Plants with extremely upright or prostrate growth habit, maturity earlier or later than the majority of the field, broad leaves, reduced seed head initiation, and susceptibility to leaf spot {caused by *Drechslera siccans* [(*H. siccans* Drechs.) (teleomorph *Pyrenophora lolii* Dovaston)]}, and stem rust (caused by *Puccinia graminis* Pers.:Pers.) were removed from the field. Breeder seed was first harvested in July 1993 and was used to establish a Foundation field in Oregon in the fall of 1993.

Accent provides an attractive turf with high density and medium-fine leaf texture. In the 1994 National Turfgrass Evaluation Program perennial ryegrass test (5,6,7), Accent exhibited improved turf quality and spring density. In these trials, Accent demonstrated moderate resistance to dollarspot (caused by *Lanzia* and *Moellerodiscus* spp.), large brown patch (caused by *Rhizoctonia solani* Kühn), red thread [caused by *Laetisaria fuciformis* (McAlpine) Burdsall], and gray leaf spot [caused by *Pyricularia grisea* (Cooke) Sacc.]. Accent, in these

trials, maintained a high percentage of ground cover during the spring, summer, and fall seasons.

Accent is recommended for year-round turf and should perform well when used for lawns, parks, roadsides, golf course roughs and fairways, and athletic fields in areas where perennial ryegrass is well adapted. Accent is also adaptable to winter overseeding and was tested in overseeding trials at the Univ. of Florida from 1993 to 1994 (1), Mississippi State Univ. from 1993 to 1994 (4), College of the Desert, CA, from 1993 to 1994 (8), and the Univ. of Arizona from 1994 to 1995 (3).

Breeder seed of Accent is produced and maintained by Simplot Turf and Horticulture. Seed production of Accent is limited to three generations of increase beyond Breeder, one each of Foundation, Registered, and Certified. U.S. plant variety protection will not be applied for.

Susan H. Samudio* and A. Douglas Brede (12)

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Registration of 'Top Gun' Perennial Ryegrass

'Top Gun', a turf-type, perennial ryegrass (*Lolium perenne* L.) (Reg. no. CV-200, PI 607529), was developed and released 4 Sept. 1998 by Simplot Turf and Horticulture dba Jacklin Seed, Post Falls, ID. Top Gun was evaluated under the experimental designations J-1703 and 93-1703. The first Certified seed was produced in 1998.

Top Gun perennial ryegrass was developed from progenies of 'APM' (4). In 1990, 100 elite selections were made from an APM spaced-plant block of 6500 plants near Albany, OR on the basis of improved color, high tiller density, and relative resistance to leaf spot [caused by *Drechslera siccans* (*H. siccans* Drechs.) (teleomorph *Pyrenophora lolii* Dovaston)], and stem rust (caused by *Puccinia graminis* Pers.:Pers.). The selected plants were open pollinated within the APM field and individually harvested. The 100 half-sib progenies were planted in turf trials at Post Falls, ID, or at Adelphia, NJ, at the field station of Rutgers University, or both. After harvest, vegetative plugs from the 100 selections were transferred to pots in a greenhouse for further evaluation and crossing. In June 1992, 84 of the original 100 plants were planted in an isolated field polycross block near Post Falls. During the winter, plant mortality resulted from winter desiccation due to an ice layer over the block. Four additional plants were removed before anthesis. In August 1993, the remaining 72 plants were harvested individually.

Approximately 65 plants per line were established in flats from seed harvested from the 72 plants. A subset of 10 plants from each line was screened for the presence of the fungal endophyte, *Neotyphodium lolii* (Latch, Christensen and Samuels) Glenn, Bacon, Price and Hanlin, which averaged 86% across the 72 lines.

In September 1993, the 65 plants per line were transferred to a spaced-plant block in which the lines were replicated in rows through the field. During the spring of 1994, the field was selected for uniformity, and approximately 45% of the plants with lower tiller density, lighter leaf color or high susceptibility to leaf spot and/or stem rust were removed before anthesis. The first Breeder seed was harvested in July 1994 and used to establish a Foundation field near Albany, OR in late fall of 1994. The Breeder block was selectively harvested in 1995, harvesting seed only from lines with the endophyte.

Top Gun provides an attractive turf with medium-high density, medium-fine leaf texture, and good spring greenup. In the 1994 National Turfgrass Evaluation Program perennial ryegrass test (1, 2, 3), Top Gun exhibited high turf quality. In these trials, Top Gun demonstrated moderate resistance to dollarspot (caused by *Lanzia* and *Moellerodiscus* spp.), large brown patch (caused by *Rhizoctonia solani* Kühn), red thread [caused by *Laetisaria fuciformis* (McAlpine) Burdsall], fusarium patch [caused by *Microdochium nivale* (Fr.) Samuels & I.C. Hallett], and gray leaf spot [caused by *Pyricularia grisea* (Cooke) Sacc.].

Top Gun is recommended for permanent turf and should perform well in areas where perennial ryegrass is well adapted. It can be used for lawns, parks, roadsides, golf course roughs and fairways, and athletic fields. Top Gun is also adaptable to winter overseeding of dormant warm-season turf.

Breeder seed of Top Gun is maintained by Simplot Turf and Horticulture, Post Falls, ID. Seed production of Top Gun is limited to three generations of increase beyond Breeder, one each of Foundation, Registered, and Certified. U.S. plant variety protection will not be applied for.

Susan H. Samudio* and A. Douglas Brede (5)

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Registration of 'LeBaron' Small Red Dry Bean

'LeBaron' small red dry bean (*Phaseolus vulgaris* L.) (Reg. no. CV-166, PI 610495) was developed cooperatively by the Washington Agricultural Research Center, the Idaho Agricul-

tural Experiment Station, and the USDA-ARS and released in 1998. LeBaron is named after Mr. Marshall LeBaron who was Superintendent of the Kimberly Research Station, University of Idaho from 1947 to 1982. Mr. LeBaron contributed greatly to the health and vitality of the Western Bean Industry by selecting and maintaining numerous new bean varieties.

LeBaron is early maturing, making it valuable as a second crop following pea (*Pisum sativum* L.) or other early season crops in the U.S. Pacific Northwest. LeBaron has a growth habit which varies from upright (Type IIa) to floppy (Type IIIa) (4). LeBaron was selected by M.J. Silbernagel, USDA-ARS, from the small-red germplasm line ARS-R93008 developed and released in 1995 by G.L. Hosfield, UDSA-ARS (1). ARS-R93008 was a cooperative release between USDA-ARS and the Michigan Agricultural Experiment Station and is an $F_{2:9}$ line from the three-way cross, X88403/'Revolucion-79'// P86297 (1). X88403, developed by J.D. Kelly of the Michigan Agricultural Experiment Station, is a selection from a complex cross involving six parents with the final cross made to the small-red cultivar, 'Ember' (Novartis Seed Inc., Nampa, Idaho). P86297 is a Michigan Agricultural Experiment Station pinto breeding line and a full-sib of 'Sierra' pinto bean with Type-IIa growth habit (2). Revolucion-79 is a tropical bean cultivar from Nicaragua with small-red seeds (1). The selection that became LeBaron was tested previously as LB-4803, LB-2111 and USRM-11. LeBaron carries the single recessive *bc-1*^{2} gene for resistance to bean common mosaic virus (BCMV). The recessive *bc-1*^{2} resistance gene protects plants against systemic infection caused by BCMV from pathogroups I, II, III, and IV of the virus. The *bc-1*^{2} gene is thought to condition tolerance to the NL-3 strain of bean common mosaic necrosis virus (BCMNV) (3). LeBaron also exhibits resistance to curly top virus (CTV).

Since LeBaron has the upright (Type IIa) short vine growth habit, a narrow row spacing or solid seeding may increase bean yield. LeBaron is an early maturing cultivar, 9 to 10 d earlier than industry standards 'NW-63', 'Rufus' and 'UI-239'. LeBaron averaged 3366 kg ha^{-1} seed yield at the Othello Research unit located in Washington during the last three years, which was 12 and 16% lower than NW-63 and UI-239, respectively. However, seed yield of LeBaron was 2% higher than Rufus at Othello in 3-year trials. LeBaron was also yield tested across 60 location-years in the United States and Canada via the Cooperative Dry Bean Nursery, where it averaged 2485 kg ha^{-1}, 7.7% lower than NW-63. At these locations, Lebaron matured 7 to 10 d earlier than NW-63 (5, 6, 7). Seed of LeBaron is larger and shinier than NW-63 and Rufus. They are 36.4, 32.9 and 31.9 g 100 seeds^{-1} for LeBaron, NW-63 and UI-259, respectively. LeBaron was rated as an acceptable canner in quality trials conducted by USDA-ARS and the Michigan Agricultural Experiment Station in 1995, 1997 and 1998. The canning quality of LeBaron was the same as Rufus and NW-63, the two standard commercial cultivars for small red bean (Hosfield, personal communication).

Variety protection has been applied for under the Plant Variety Protection Act with the option that LeBaron may be sold for seed by name only as a class of certified seed. Breeder and Foundation seed will be maintained by Washington State Crop Improvement Association, Foundation Seed Service-WSU Seedhouse, Pullman, WA 99164-6420. A research fee will be assessed on each unit of Foundation seed sold.

A.N. Hang,* M.J. Silbernagel, P.N. Miklas, and G.L. Hosfield (8)

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Registration of 'California Blackeye 27' Cowpea

'California Blackeye 27' cowpea [*Vigna unguiculata* (L.) Walp.] (Reg. no. CV-167, PI 608035) was developed by the University of California, Riverside (UCR) and released by the California Experiment Station in 1999. California Blackeye 27 (CB27) is an erect, compact blackeye cowpea that has heat tolerance and broad-based resistance to Fusarium wilt and root-knot nematodes. CB27 was evaluated in performance trials conducted in California from 1994–1998 under the designation H8-8-27.

CB27 was developed from a single plant selection made in 1992 from UCR breeding line H8-8. Line H8-8 was developed using a pedigree breeding procedure from a cross between UCR breeding lines 336 and 1393 made in 1986. UCR breeding line 336 resulted from a cross between 'CB5' and 'CB3' made in 1983. UCR heat tolerant breeding line 1393 was developed from a three-way cross involving heat-tolerant accessions 'Prima' and TVu4552 made in 1981, and then University of California, Davis blackeye cowpea breeding line 7977 in 1983. Prima and TVu4552 are accessions that produce abundant flowers and pods under high temperature and long-day conditions that suppress flower bud development and reduce pod set of most cowpea genotypes (1). Segregating progenies that gave rise to 1393 and later to H8-8 were screened for flower production and pod set under very hot summer field conditions at the University of California Desert Research and Extension Center, near El Centro, CA. Selection for agronomic and seed quality traits was conducted at the UCR Experiment Station. H8-8-27 was selected for ability to produce flowers and set pods under very hot summer field conditions at the UCR Coachella Valley Agricultural Research Station, near Indio, CA in 1992 and 1993. Field tests indicated that H8-8-27 has the potential to produce higher yields than CB5 in hot environments in California (2).

Current California cultivars of blackeye beans (CB46, CB88 and CB5) carry the nematode resistance gene *Rk* that confers strong resistance to common strains of *Meloidogyne incognita* (Kofoid and White) root-knot nematode. CB27 carries gene *Rk* and an additional recessive non-allelic gene that act together in an additive fashion to provide protection against

Rk-virulent forms of *M. incognita* and *M. javanica* (Treub) Chitwood root-knot nematodes. Reproduction and root-galling on CB27 caused by *Rk*-virulent *M. incognita* and *M. javanica* are about half those observed on CB46 and CB88 (3). This additional nematode resistance gene probably was derived from TVu4552 and has been designated *rk3* (4).

CB27 has resistance to both Race 3 and Race 4 of Fusarium wilt [*Fusarium oxysporum* Schlechtend.:Fr f.sp. *tracheiphilum* (E.F. Sm.) W.C. Snyder & H.N. Hans.], while CB46 and CB88 only have resistance to Race 3 of this disease. CB5 is susceptible to both Race 3 and Race 4. Race 3 is the predominant race of Fusarium wilt in California, but several fields with Race 4 have been identified in different parts of the San Joaquin Valley. Resistance of CB27 to Races 3 and 4 of Fusarium wilt probably was derived from CB3, but UCD 7977, which has a pedigree of PI 166146/CB5//CB5 where PI 166146 is a Fusarium wilt resistant plant introduction from India, may have provided some resistance to Race 3.

CB27 has out-performed CB46 and CB88 in field trials where Fusarium wilt Race 4 and gene *Rk*-virulent *M. incognita* root-knot nematode were present. CB27 yielded 2350 and 2744 kg ha^{-1}, while CB46 yielded 1848 and 2330 kg ha^{-1}, and CB88 yielded 1288 and 1142 kg ha^{-1} in 1995 and 1996, respectively, in trials conducted in Stanislaus Co., CA.

CB27 has similar botanical and phenological characteristics as CB5, CB46 and CB88. It has similar white flowers, leaf size and shape, foliage color and red pigmentation at the stem and branch nodes. With a May sowing date and typical growing conditions in the San Joaquin Valley, CB27 begins flowering about 52 d after sowing and matures its first flush of pods in about 95 d from sowing. CB27 has an erect 'bush' growth habit and is substantially more compact than CB5 and CB88, and slightly more compact than CB46.

CB27 and the major California cultivar CB46 had similar average grain yields (4350 and 4360 kg ha^{-1}, respectively) over sixteen replicated yield trials that were conducted at several sites in the San Joaquin Valley from 1995–1998. They were in fields free from Race 4 Fusarium wilt and *Rk*-virulent root-knot nematodes. These trials were conducted on raised beds with furrow irrigation using inter- and intra-row spacing and management systems typical of commercial fields in the San Joaquin Valley. Due to its compact growth habit, CB27 performs well on double-row 102 cm and single-row 76 cm raised bed systems, but is less well suited for single-row 102 cm raised bed systems.

CB27 has a bright white seed coat and typical 'blackeye bean' appearance. Seed shape is similar to CB5 and slightly flatter and less round than CB46. Individual average seed weight of CB27 was 224 mg seed^{-1} compared to 217 mg seed^{-1} for CB46 over 11 replicated field trials conducted in the San Joaquin Valley from 1995–1998. The black pigmented portion or 'eye' on the seedcoat does not 'leak' dark pigments during canning. Canning tests by S&W Foods, Modesto, CA and Michigan State University of grain grown in two locations in 1996 and 1997 indicated that this line has excellent canning quality.

Breeder seed will be maintained by the University of California, Riverside. Foundation seed will be produced by the Foundation Seed Service, Davis, CA 95616. Certified seed will be available to growers. Cultivar protection under the U.S. Plant Variety Protection Act and Title V of the Federal Seed Act is pending (Application No. 200000183).

J.D. Ehlers,* A.E. Hall, P.N. Patel, P.A. Roberts, and W.C. Matthews (5)

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Registration of 'AC Redbond' Small Red Dry Bean

'AC Redbond' (Reg. no. CV-168, PI 608356) is a small red dry bean (*Phaseolus vulgaris* L.) developed at the Agriculture and Agri-Food Canada Research Centre, Lethbridge, Alberta, in cooperation with the Agriculture and Agri-Food Canada Research Centre, Morden, Manitoba, and released in 1999. It is a high yielding, early-maturing, small red dry bean particularly well-suited to the narrow-row (drilling) production system used in western Canada. AC Redbond has a Type IIb, indeterminate growth habit, with very short vines, and low pod distribution. Registration number 4914 was issued for AC Redbond on April 30, 1999 by the Variety Section, Plant Products Division, Canadian Food Inspection Agency.

AC Redbond, tested as L94D007, was derived from a cross made in 1988 with the parentage 'Ember'//2×('NW63'//'Redkloud'/'Kentwood'). Ember is a small red dry bean cultivar, from Rogers NK (now Novartis), released in 1986 (M. Wood, personal communication). NW63 is a small red bean cultivar registered in 1982, with resistance to root rot [caused by *Fusarium solani* (Mart.) Sacc. f. sp. *phaseoli* (Burkholder) W.C. Snyder & H.N. Hans.] and with dark green leaves (1). Redkloud is an old (>25 yr) light red kidney bean cultivar from New York (2). Kentwood was released as an early-maturing, high-yielding navy bean cultivar from Agriculture Canada in Harrow, Ontario (3). The F_1 was grown in the greenhouse and advanced to a space-planted F_2 nursery at the Fairfield Farm near Lethbridge in Alberta. The F_3 was field grown in single-plant progeny rows and a single-plant selection was identified for its uniform red seed coat color. The F_4 progeny, which was grown in 1991 in the field at Lethbridge, was selected for marketable seed coat color coupled with earlier maturity than NW63. The F_5 lines were severely hail-damaged in 1992. Plant No. 1 was selected and seed of the weakened plant was greenhouse-grown, as part of a rescue operation in the winter of 1992–1993. The seed from greenhouse-grown F_6 plant No. 1 was used to produce an F_7 row in the field in 1993, which was selected for early maturity, relatively upright growth habit and good seed color. This row was bulk-harvested and entered into yield tests. At this stage, it received the experimental line number L94D007. A series of eight yield tests followed from 1994 to 1996 that included three tests under wide-rows (60 cm row spacing) and five tests under narrow-rows (18 cm row spacing) at Lethbridge and Vauxhall, Alberta. From 1997 to 1998, L94D007 was tested in the Prairie Bean Cooperative Narrow Row Registration Trial, which is part of the official bean registration trials in western Canada, in a total of 15 trials (eight irrigated and seven rainfed). Fifty single-plant selections made in 1996 at Vauxhall were grown in the greenhouse in the winter of 1996–1997. Plant-progenies of these greenhouse-grown plants were grown near Twin Falls, Idaho, USA in 1997 and progeny plots at Kimberly, Idaho to produce Breeder seed in 1998.

AC Redbond proved particularly promising in narrow-row

tests due to its increased yield over the check cultivar, NW63, with a more upright growth habit, averaging 3 d earlier in maturity. In eight irrigated trials, with coefficients of variation for yield below 20%, AC Redbond matured in 100 d with yields of 2816 kg ha^{-1} compared with a corresponding 103 d and 2417 kg ha^{-1} for NW63. In five dryland trials, AC Redbond matured in 98 d with yields of 2014 kg ha^{-1} compared with a corresponding 101 d and 1888 kg ha^{-1} for NW63.

The seed of AC Redbond (at 140 g kg^{-1} moisture) averaged 32.4 g 100 $seed^{-1}$ over 15 sites, and is similar in mass to that of NW63 at 31.2 g 100 $seed^{-1}$. The dry seed color is red, somewhat brighter than that of NW63. Plant height of AC Redbond averaged over eight trials, was 46 cm compared with 48 cm for NW63, and lodging at maturity averaged over two trials was 2.1 and 2.8, respectively (with 1 = upright and 5 = prostrate on the ground).

AC Redbond is less susceptible to white mold [caused by *Sclerotinia sclerotiorum* (Lib.) de Bary], compared to the moderately susceptible check, NW63, based on ratings for both disease incidence and severity in tests in a disease nursery in 1997 and 1998 at Lethbridge. Based on greenhouse inoculation tests, AC Redbond and NW63 are susceptible to common blight [caused by *Xanthomonas axonopodis* pv. *phaseoli* Starr & Garces 1950 emend. Vauterin et al., 1995 (4); syn. *X. campestris* pv. *phaseoli* (Smith) Dye] and halo blight [caused by *Pseudomonas syringae* pv. *phaseolicola* (Burkholder) Young et al.]. Greenhouse tests demonstrated that AC Redbond and NW63 were moderately resistant to infection by fusarium yellows (caused by *Fusarium oxysporum* Schlechtend.:Fr. f. sp. *phaseoli* J.B. Kendrick & W.C. Snyder) and moderately susceptible to rhizoctonia root rot (caused by *Rhizoctonia solani* Kühn).

AC Redbond 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 AC Redbond may be obtained from the corresponding author for at least five years.

H-H. Mündel,* G. Saindon, H.C. Huang, and F.A. Kiehn (5)

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Registration of 'Anacaona' White Bean

'Anacaona' white bean (*Phaseolus vulgaris* L.) (Reg. no. CV-169, PI 603940) was developed and released in 1998 by Centro de Investigación Agrícola del Suroeste (CIAS), Ministry of Agriculture, Dominican Republic (DR) in cooperation with the University of Nebraska and the University of Puerto Rico (PR). Anacaona, tested as L-86020, was derived from multiple crosses of L227-1///B-190/XR235//L183-1. The complex pedigree, with rust [caused by *Uromyces appendiculatus* (Pers.:Pers)Unger] resistance, and bean common mosaic virus resistance of line L227 was described by Freytag et al. (1). The pedigree of L183-1 is not known. The common blight [caused by *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye] (*Xcp*) resistant XR235 line was developed from an interspecific cross *Phaseolus vulgaris*/*P. coccineus* (2). B190 has a gene block (Ur-5) providing resistance to a wide array of rust races (3). The F_1 of the field cross was grown in a screenhouse, and the F_2 and F_3 plants were selected under field conditions for erect plant architecture and acceptable seed type at the University of Puerto Rico, Mayaguez, PR. Seed of L-86020 was harvested in bulk in the F_3. The F_4 was screened for resistance to the web blight pathogen [caused by *Thanatephorus cucumeris* (Frank) Donk (anamorph: *Rhizoctonia solani* Kuhn)] on a farm in the San Juan Valley, DR.

Anacaona has resistance to isolates of AG-1-1B and AG-2-2 of the web blight pathogen in fields at LaVega and Buena Vista, DR, and to prevailing strains of *Xcp* in the DR and Puerto Rico. It was resistant to 10 Dominican pathotypes of rust in a greenhouse inoculation test. Anacaona is susceptible to bean golden mosaic virus. It has an indeterminate growth habit (Type II) with a short vine (75 cm). Physiological maturity is reached at about 70 d after planting. The small white seed are elliptically shaped and range in size from 18–20 g 100^{-1} seeds. It is well adapted to low and intermediate altitudes with mean yields ranging from 2500–2800 kg ha^{-1}. It exceeded the yield of the standard Arroyo Loro at five locations (1989–1993).

Breeder seed of Anacaona will be maintained at CIAS and small quantities are available upon request.

J.C. Nin, E. Arnaud-Santana, F. Saladin, G. Godoy-Lutz, D.P. Coyne,* J.S. Beaver, and J.R. Steadman (4)

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Registration of 'Arroyo Loro Negro' Black Bean

'Arroyo Loro Negro' black bean (*Phaseolus vulgaris* L.) (Reg. no. CV-170, PI 603941) was developed and released in 1998 by Centro de Investigación Agrícolas del Suroeste (CIAS), Ministry of Agriculture, Dominican Republic (DR) in cooperation with the University of Nebraska and the University of Puerto Rico. Arroyo Loro Negro, tested as MUS-

N-4-II, was derived from the cross H-270/XAN223 made at CIAS. H-270 is an erect, Type II high yielding black bean obtained from Michigan State University, East Lansing, MI. XAN-223 is a black bean line with moderate resistance to common bacterial blight (CBB) [caused by *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye] derived from the cross DOR44/XAN112 [Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia].

The F_1 was grown in a screenhouse, and individual F_2 and F_3 plants were selected under field conditions at CIAS for erect plant architecture and acceptable black seed type. The F_4 and subsequent generations were screened for resistance to the web blight pathogen [caused by *Thanatephorus cucumeris* (Frank) Donk (anamorph: *Rhizoctonia solani* Kuhn) at two locations in the DR. Yield and adaptation were evaluated in replicated trials at three locations over four years in the DR. Arroyo Loro Negro is resistant to isolates of AG-1-1B and AG-2-2 of the web blight pathogen present in fields in LaVega and Buena Vista, DR. Resistance to web blight also was observed in fields in Panama, Puerto Rico, and Nicaragua. Resistance to endemic pathotypes of rust [caused by *Uromyces appendiculatus* (Pers.:Pers.) Unger] was observed in fields throughout the Caribbean, and in a greenhouse inoculation test to nine out of 10 DR rust pathotypes. Resistance to CBB was noted in the field in the DR. Arroyo Loro Negro is susceptible to bean golden mosaic virus.

Arroyo Loro Negro is well adapted to a wide range of altitudes (100 to 1500 m) with mean yields ranging from 1046 to 1825 kg ha^{-1} (1993–1997) exceeding the yield of ICTA-JU-90-7 (822-1200 kg ha^{-1}) over three locations in the DR (1993–1996). Arroyo Loro Negro produced a mean yield of 1702 kg ha^{-1} in regional field trials conducted in the DR, Panama, Puerto Rico, and Cuba (1993–1994). Arroyo Loro Negro is more tolerant to drought, high temperature, and low soil fertility than traditional black cultivars such as 'Venezuela 44'.

Arroyo Loro Negro has an indeterminate, short vine Type II growth habit and reaches physiological maturity about 70 d after planting. The seed is opaque black, elliptically shaped, and ranges in size from 19 to 21 g 100^{-1} seeds.

Breeder seed of Arroyo Loro Negro will be maintained at CIAS and small quantities are available upon request.

E. Arnaud-Santana, J.C. Nin, F. Saladin, G. Godoy-Lutz, D.P. Coyne,* J.S. Beaver, and J.R. Steadman (1)

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1. E. Arnaud-Santana, J.C. Nin, F. Saladin (deceased), and G. Godoy-Lutz, Centro de Investigación Agricola del Suroeste (CIAS), Km 5 Carretera San Juan-Las Matas, San Juan de la Maguana, Dominican Republic; D.P. Coyne, Dep. of Horticulture, Univ. of Nebraska, 386 Plant Science Hall, Lincoln, NE 68583; J.S. Beaver, Dep. of Agron. and Soils, Univ. of Puerto Rico, P.O. Box 9030, Mayaguez, PR 00681; and J.R. Steadman, Dep. of Plant Pathology, Univ. of Nebraska, 406 Plant Science Hall, Lincoln, NE 68583. Work supported in part by grants from the Title XII Bean/Cowpea CRSP (USAID Contract No. DNA-1310-G-SS-6008-00). Published as Paper No. 12669 Journal Series, Nebraska Agricultural Division, University of Nebraska, Lincoln, NE. Registration by CSSA. Accepted 31 Oct. 1999. *Corresponding author (dpcoyne@unlnotes.unl.edu).

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Registration of 'CIAS-95' Red Mottled Bean

'CIAS-95' red mottled bean (*Phaseolus vulgaris* L.) (Reg. no. CV-171, PI 603942) was developed and released in 1988 by Centro de Investigación Agrícola del Suroeste (CIAS), Ministry of Agriculture, Dominican Republic (DR) in cooperation with the University of Nebraska and the University of Puerto Rico. CIAS-95, tested as PC-21-SMA, was derived from the cross 'PC-50'/BAT 1274 made at CIAS. PC-50 is a high yielding, Type I red mottled bean cultivar derived from a single plant selection made in the Pompadour Checa landrace by F. Saladin (deceased) in the DR. PC-50 is susceptible to common bacterial blight (CBB) [caused by *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye] and has partial resistance to pathotypes of rust [caused by *Uromyces appendiculatus* (Pers.:Pers.) Unger] in the DR. BAT 1274 is a red mottled Type I bean line with partial resistance to CBB and rust in the field in Colombia. It was derived from a cross ICA L23/Sel 106 [Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia]. The F_1 was grown in a screenhouse, and F_2 and F_3 plants were selected under field conditions for erect plant architecture and acceptable seed type. The F_4 bulk was screened for CBB resistance on a farm in the San Juan Valley, DR. The F_6 bulked seed and subsequent seed increases were tested in replicated trials in different locations in the DR.

CIAS-95 possesses field resistance to strains of *Xanthomonas campestris* pv. *phaseoli* and rust pathotypes present in the DR. However, in greenhouse inoculation tests it was only resistant to five out of nine DR rust pathotypes. It is susceptible to bean golden mosaic virus, resistant to bean common mosaic virus NY-15 strain, but susceptible to bean common mosaic necrotic virus-NL3 strain. CIAS-95 has a Type I determinate bush growth habit and flowers early (30–33 d). Physiological maturity is reached about 75–80 d after planting. Seeds are dark red mottled, elliptically shaped and medium sized (40–45 g 100^{-1} seeds). The number of pods per plant is between 10 and 15 with about 3–4 seeds per pod. The mean yields of CIAS-95 ranged from 1167 to 2000 kg ha^{-1} (1993–1995), and exceeded the yield of the standard PC-50 in four out of six locations.

Breeder seed of CIAS-95 will be maintained at CIAS and small quantities are available upon request.

E. Arnaud-Santana, J.C. Nin, F. Saladin, G. Godoy-Lutz, D.P. Coyne,* J.S. Beaver, and J.R. Steadman (1)

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Registration of 'JB-178' Red Mottled Bean

'JB-178' red mottled bean (*Phaseolus vulgaris* L.) (Reg. no. CV-172, PI 603943) was developed and released in 1998 by Centro de Investigación Agrícolas del Suroeste (CIAS), Ministry of Agriculture, Dominican Republic (DR), in cooperation with the University of Puerto Rico and the University of Nebraska. JB-178, tested in Puerto Rico (PR) as PR9705-178, was derived from the cross 'Jose Beta'/C1308 made in PR in 1984. Jose Beta is an early maturing, determinate (Type I) red mottled bean variety from the DR. C1308 is a red mottled breeding line from Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia, identified in PR for superior agronomic traits and disease resistance. The F_1 was grown in

the field, and F_2 and F_3 plants were selected in PR under field conditions for agronomic traits and acceptable seed type. PR9705-178, a $F_{3:4}$ line, was sent to the DR in 1986 for further evaluation.

JB-178 was evaluated at CIAS and on farms in the San Juan valley of the DR for yield, adaptation and disease resistance. JB-178 has partial resistance (smaller and fewer uredinia) to rust [caused by *Uromyces appendiculatus* (Pers.: Pers.)Unger] in the field in the DR but was susceptible to eight out of nine DR rust pathotypes in a greenhouse test. It is susceptible to bean golden mosaic virus, resistant to bean common mosaic virus NY-15 strain, and susceptible to bean common mosaic necrotic virus-NL3 strain. JB-178 is well adapted to low and intermediate altitudes (100 to 1000 m). Seed yields of JB-178 ranged from 1091 to 2131 kg ha^{-1} and was similar to 'PC-50' in trials in the DR (1993–1995).

JB-178 has a determinate (Type I) growth habit generally reaching a height of at least 50 cm. It reaches physiological maturity from 55 to 60 d after planting. Seeds are light red mottled, ellipticaly shaped and range from 46–47 g 100^{-1} seeds.

Breeder seed of JB-178 will be maintained at CIAS and small quantities are available upon request.

E. Arnaud-Santana, J.C. Nin, F. Saladin, G. Godoy-Lutz, J.S. Beaver, D.P. Coyne,* and J.R. Steadman (1)

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Registration of 'PC-50' Red Mottled Bean

'PC-50' a red mottled bean (*Phaseolus vulgaris* L.) (Reg. no. CV-173, PI 603944) was released in 1987 by Centro de Investigación Agrícola del Suroeste (CIAS), Ministry of Agriculture (MA), Dominican Republic (DR) in cooperation with the University of Nebraska and the University of Puerto Rico. PC-50 was derived from a single plant selection made by Freddy Saladin (MA, DR) (deceased) in the Pompadour Checa landrace for earliness, bright red mottled seed coat color and rust [caused *Uromyces appendiculatus* (Pers.:Pers) Unger] resistance. The seed of this selection was increased and grown in replicated trials in different parts of the DR in the period 1985–1990.

PC-50 has a Type I determinate growth habit and reaches physiological maturity 55–60 d after planting. The seed is medium sized (40–42 g 100^{-1} seeds), elliptically shaped and red mottled. Cooking quality was regarded as excellent by local people following use of their traditional pot cooking methods. PC-50 is well adapted to low to intermediate altitudes (100–1500 m) in the DR. In replicated yield trials at seven locations in the DR, yields ranged from 720 to 1775 kg ha^{-1} (1985–1990) and exceeded Pompadour Checa (524 to 1564 kg ha^{-1}) in six out of the seven locations.

PC-50 possesses the *Ur-4* and *Ur-9* genes for resistance to rust (1, 2). It shows partial resistance to the rust pathotypes in DR fields in recent years, but was susceptible to six out of 10 DR rust pathotypes in greenhouse tests. PC-50 is susceptible to Type II bean golden mosaic virus, common bacterial blight [caused by *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye], to isolates of AG-1-1B and AG-2-2 of the web blight pathogen [caused by *Thanatephorus cucumeris* (Frank) Donk (anamorph: *Rhizoctonia solani* Kuhn)] in LaVega and Buena Vista, DR, and to bean common mosaic virus.

Breeder seed of PC-50 will be maintained at CIAS and small quantities will be made available upon request.

F. Saladin, E. Arnaud-Santana, J.C. Nin, G. Godoy-Lutz, J.S. Beaver, D.P. Coyne,* and J.R. Steadman (3)

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Registration of 'Saladin-97' Red Mottled Bean

'Saladin-97' red mottled bean (*Phaseolus vulgaris* L.) (Reg. no. CV-174, PI 603945) was developed and released in 1998 by Centro de Investigación Agrícola del Suroeste (CIAS), Ministry of Agriculture, Dominican Republic (DR) in cooperation with the University of Nebraska and the University of Puerto Rico. Saladin-97, tested as PC-21 SME, was derived from the cross 'PC-50'/BAT 1274 made at CIAS. PC-50 is a high yielding, erect Type I red mottled bean cultivar derived from a single plant selection made in the Pompadour Checa landrace by F. Saladin (deceased) in the DR. PC-50 is susceptible to common bacterial blight (CBB) [caused by *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye] and exhibits partial resistance (fewer and smaller uredinia) to local pathotypes of rust [caused by *Uromyces appendiculatus* (Pers.:Pers.) Unger] in the DR. BAT 1274 [Centro Internacional de Agricultura Tropical (CIAT) Cali, Colombia] is a red mottled Type I bean line with moderate field resistance to CBB and rust in Colombia. The F_1 was grown in a screenhouse, and F_2 and F_3 plants were selected under field conditions for erect plant architecture, and acceptable seed type at CIAS. The bulk F_4 was screened for CBB resistance on a farm in the San Juan Valley, DR. The F_6 and subsequent seed increases were evaluated for rust, yield and agronomic performance at six locations in the DR (1993–1995).

Saladin-97 has field resistance to strains of the CBB patho-

gen in the DR. It is susceptible to Type II of the bean golden mosaic virus, resistant to bean common mosaic virus NY-15 strain, and susceptible to bean common mosaic necrotic virus-NL3 strain. Saladin-97 exhibited partial resistance to rust in the field in the DR, but was resistant to only three out of 10 DR rust pathotypes in a greenhouse inoculation test. Yields ranged from 1309 to 2073 kg ha^{-1}, and exceeded the standard cultivar PC-50 in five out of six locations in the DR (1993–1995). Saladin-97 has a determinate Type I growth habit and matures in about 60 d after planting. The seeds are light red mottled, elliptically shaped, and medium sized (42–44 g 100^{-1} seeds). The number of pods per plant is between 13 and 15 with 3–4 seeds per pod.

Breeder seed of Saladin-97 will be maintained at CIAS and small quantities are available upon request.

J.C. Nin, E. Arnaud-Santana, F. Saladin, G. Godoy-Lutz, D.P. Coyne,* J.S. Beaver, and J.R. Steadman (1)

References and Notes

1. J.C. Nin, E. Arnaud-Santana, F. Saladin (deceased), and G. Godoy-Lutz, Centro de Investigación Agricola del Suroeste (CIAS), Km 5 Carretera San Juan-Las Matas, San Juan de la Maguana, Dominican Republic; D.P. Coyne, Dep. of Horticulture, Univ. of Nebraska, 386 Plant Science Hall, Lincoln, NE 68583; J.S. Beaver, Dep. of Agron. and Soils, Univ. of Puerto Rico, P.O. Box 9030, Mayaguez, PR 00681; and J.R. Steadman, Dep. of Plant Pathology, Univ. of Nebraska, 406 Plant Science Hall, Lincoln, NE 68583. Work supported in part by grants from the Title XII Bean/Cowpea CRSP (USAID Contract No. DNA-1310-G-SS-6008-00). Published as Paper No. 12665 Journal Series, Nebraska Agricultural Division, University of Nebraska, Lincoln, NE. Registration by CSSA. Accepted 31 Oct. 1999. *Corresponding author (dcoyne@unlnotes.unl.edu).

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Registration of 'Tamrun 98' Peanut

'Tamrun 98' (Reg. no. CV-64, PI 608737) is a runner market-type peanut (*Arachis hypogaea* L. subsp. *hypogaea* var. *hypogaea*) with partial resistance to sclerotinia blight (caused by *Sclerotinia minor* Jagger), high grade, and good yield potential. It was tested as Tx901417 and released by the Texas Agricultural Experiment Station in 1998.

Tamrun 98 has a prostrate plant growth habit with leaflet size and shape, stem thickness, and leaf color similar to 'Florunner' (l). The main stems of Tamrun 98 tend to be slightly shorter, but the secondary branches are more compressed, making the main stem more prominent than Florunner.

Tamrun 98 was derived from the backcross of TxAG-5 (4) to Texas breeding line TP 107-11. TP 107-11 was selected from progeny of a cross of Florunner × PI 109839 and is a sister line of 'Langley' (2). TP 107-11 has good fruiting and plant growth traits, and maturity slightly earlier than Florunner (5 to 7 d). F_2 plants from TP 107-11//TxAG-5/TP 107-11 were harvested separately and subsequent generations were managed as F_2-derived lines. $F_{2:3}$ progeny were simultaneously screened for reaction to sclerotinia at Stephenville, Texas Agricultural Experiment Station, and evaluated agronomically in soil without sclerotinia infestation near Bryan, TX. Yield testing of the $F_{2:5}$ line was begun in 1992. Disease reaction, yield, and grade evaluations were expanded in subsequent years into Oklahoma through cooperation with the USDA. In 1997, the line was entered in the Uniform Peanut Performance Test, in collaboration with breeders in the seven major peanut producing states. Seed from 45 typical appearing individually harvested plants were planted in Puerto Rico in the late fall of 1995. Seed from the harvest of each individual plant were planted as progeny rows on the Texas Agricultural Research Station at Yoakum in summer 1996. One of the progeny rows was discarded because of atypical plant type and another was harvested for additional, individual testing. Following presampling and grading each of the progeny rows, the 43 plant progenies were shelled and composited for breeder seed.

Tamrun 98 exceeded Florunner and 'Tamrun 88' (3) in yield by more than 50% in Texas and Oklahoma tests with moderate to heavy sclerotinia disease pressure during the years 1992 to 1996. Disease ratings averaged 2.5 (0 = no disease, 10 = all plants dead) for Tamrun 98 in Texas tests compared with 6.5 for Florunner. A 4-test average rating of 2.5 for Tamrun 98 compared with an average of 5.0 for Tamrun 96. The average pre-digging disease incidence for Tamrun 98 in the Oklahoma trials was 33% compared with 71% for 'Okrun'. In the absence of sclerotinia blight, yields of Florunner and Tamrun 98 in North Texas have been similar, and both have been inferior to Tamrun 96. However, the total sound mature kernel percentages of both Tamrun 98 and Florunner have exceeded those of Tamrun 96 by approximately 2%. Shelling and quality factors have shown Tamrun 98 to be acceptable for commercial markets although the O/L ratio was slightly lower than Florunner. Mature seed of Tamrun 98 have ranged from 53 to 68 g 100^{-1}, depending upon environment, similar in size to that of Florunner.

Tamrun 98 is susceptible to tomato spotted wilt virus and both early and late leaf spot. Data for reaction to other diseases is inadequate for conclusions.

Foundation seed of Tamrun 98 may be obtained from the Foundation Seed Services, Texas A&M University Agricultural Research and Extension Center, Vernon, TX. Tamrun 98 is to be grown as a class of certified seed only. Plant Variety Protection on Tamrun 98 is pending (PVP Certificate no. 9900189).

C.E. Simpson,* O.D. Smith, and H.A. Melouk (5)

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Registration of 'Oxford 414NF' Tobacco

'Oxford 414NF' flue-cured tobacco (*Nicotiana tabacum* L.) (Reg. no. CV-117, PI 608021) was developed by the North Carolina Agricultural Research Service and released by North Carolina State University in 1998. Oxford 414NF is "non-flowering" (short-day photoperiod sensitive) (5) with improved resistance to black shank [caused by *Phytophthora parasitica* Dastur var. *nicotianae* (Breda de Haan) Tucker; syn *P. nicotianae* Breda de Haan var. *nicotianae* G.M. Waterhouse]

and bacterial wilt, [caused by *Pseudomonas solanacearum* (Smith) Smith].

Oxford 414NF is a maternally derived, doubled-haploid selection from a cross between 'NC 37NF' (PI 552712) and 'K346' (PI 549110). A population of haploid plants was produced by the *N. africana* procedure (2). The chromosome compliment of the haploid plants was doubled using leaf midvein culture (4). Seed collected from individual doubled haploids were used in field testing. Doubled-haploid lines were screened concurrently for the non-flowering genotype and disease resistance. Individual lines were grown in separate black shank and bacterial wilt disease nurseries. Lines possessing the non-flowering trait were identified in the field on the basis of days to flower (≥100). Non-flowering selections possessing a combination of moderate to high resistance to black shank and bacterial wilt were evaluated further in replicated yield and quality field trials at multiple locations in North Carolina.

Oxford 414NF possesses moderate resistance to bacterial wilt and is resistant to Races 1 and 3 of the root knot nematode, *Meloidogyne incognita* (Kofoid & White) Chitwood. Oxford 414NF has a high level of resistance to black shank. Black shank resistance is of the 'Florida 301' type and is effective against Races 0 and 1 of the fungus. Levels of resistance to black shank and bacterial wilt are substantially improved from those of NC 37NF. Oxford 414NF is susceptible to all of the major viral diseases of flue-cured tobacco.

Oxford 414NF has produced high yields and excellent quality cured leaves in all public tests in which it has been evaluated. Oxford 414NF was tested as OX4114NF in the North Carolina Official Variety Test in 1995 (1), in the five-state Flue-Cured Tobacco Regional Small Plot Test in 1996 (3), in the Regional Farm Test in 1997 (3), and as Oxford 414NF in the 1998 North Carolina Official Variety Test (1). The 4-yr average yield of Oxford 414NF in these tests was 3153 kg ha^{-1} compared with 3257 and 3035 kg ha^{-1} for the cultivars K326 and K346, respectively. The average dollar value per quintal ($177.58) and grade index (73) of the cured leaves of Oxford 414NF are comparable to K326 ($176.72 and 73) and K346 ($175.21 and 72). Cured leaves of Oxford 414NF met the chemical and physical standards established by the Regional Minimum Standards Program and were declared acceptable in smoke flavor (3). Average percent total alkaloids of Oxford 414NF was 2.67%, compared with 2.49% for K326 and 2.67% for K346 (1, 3). These data indicate that Oxford 414NF is adapted throughout the flue-cured producing region in the USA.

Non-flowering cultivars have the potential to produce higher leaf numbers than conventional cultivars (40 vs. 20 leaves per plant). Topping height and time of topping have a pronounced effect on yield and cured-leaf quality. Recommended management practices for non-flowering cultivars suggest limiting leaf production to 20 to 24 leaves per plant and topping as soon as possible after the desired leaf number is reached. Oxford 414NF had an average plant height of 100.6 cm and 20.7 leaves after topping (1, 3). In these same tests K326 averaged 21.1 leaves and a 100.6 cm tall stalk and K346 averaged 19.9 harvestable leaves and a stalk height of 102.4 cm.

Exclusive release of Oxford 414NF has been granted to Profigen, Inc., Nashville, TN 37203, and its subsidiary, RG Seeds, Oxford, NC 27565. Ownership of Oxford 414NF is retained by the North Carolina Agricultural Research Service, N.C. State University, Box 7643, Raleigh, NC 27695; and Breeder seed of Oxford 414NF will be maintained by the developer.

V.A. Sisson* (6)

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Registration of 'MD 402' Tobacco

'MD 402' Maryland tobacco (*Nicotiana tabacum* L.) (Reg. no. CV-118, PI 608042) was developed by the Maryland Agricultural Experiment Station and released in 1999 because of its multiple disease resistance and good quality characteristics. MD 402 has resistance to tobacco mosaic virus (TMV), wildfire [caused by *Pseudomonas syringae* pv. *tabaci* (Wolf & Foster) Young et al.], and Race 0 black shank [caused by *Phytophthora parasitica* Dastur var. *nicotianae* (Breda de Haan) Tucker; syn. *P. nicotianae* Breda de Haan var. *nicotianae* G.M. Waterhouse].

MD 402 was developed using the pedigree method of breeding after a cross of A911/'MD 609' (5) and one backcross with MD 609. A911 is a Maryland tobacco breeding line developed from the cross 'MD 872' (3)/'MD 201' (6) and has resistance to TMV and wildfire. MD 609 has the 'Florida 301' type of black shank resistance. In each selfed generation, single plant selections were made in a summer breeding nursery that had resistance to TMV and wildfire. Breeding nurseries were hand inoculated with each disease. Seeds of these selected plants were planted in the greenhouse during the winter and screened for black shank resistance (4). The base for this cultivar is a composite of F_{13} seed collected from three plants in a single F_{12} progeny row grown in 1998.

MD 402 was tested as line A4021 for six years (1991 to 1996) in replicated plots at the Upper Marlboro Facility, Central Maryland Research and Education Center, and two farms in southern Maryland (1). Four standard cultivars: MD 609, MD 201, 'MD 341' (7), and 'MD 40' (PI 583833) (2), were included in the tests. The yield per hectare of MD 402 (1863 kg) was similar to MD 609 (1859 kg) and MD 40 (1826 kg), but significantly less than MD 201 (1951 kg) and MD 341 (1966 kg). MD 402 was significantly better than the four standard cultivars in the test for quality index and percentage of desirable L (tan), F (cherry red), and R (red) cured leaf colors. To date, MD 609 produces the highest quality leaf of the previously released cultivars. Over the six years of testing, MD 402 had an average quality index of 60.8 and produced 59.2% of L, F, and R cured leaf colors compared to 56.4 and 49.1%, respectively, for MD 609. MD 402 was significantly shorter (73.4 cm) than MD 341 and MD 40 and had fewer leaves per plant (18.9) than MD 201 and MD 341. MD 402 flowered 63.4 d after transplanting, which was similar to MD 609, MD 201, and MD 40, but 3 d later than MD 341. Total alkaloid level for MD 402 was 2.81%, which was significantly lower than the other Maryland cultivars.

Tests for black shank resistance were conducted on young

seedlings in the greenhouse, and tops and roots were scored on a scale of 0 to 4 with 0 indicating no disease symptom and 4 indicating tops were dead and roots were all brown. Top scores for MD 402 and MD 609 in the 1998 test were 0 and 0.5, respectively. Root scores for MD 402 and MD 609 were the same, 1.0. These scores indicate that MD 402 has a high level of resistance to Race 0 black shank.

MD 402 is suitable for production throughout the Type 32 Maryland tobacco growing area, and is particularly useful in fields where both black shank and TMV are persistent problems. Breeder seed of MD 402 will be maintained and distributed by the Maryland Agricultural Experiment Station, University of Maryland, College Park, MD 20742-4452. U.S. plant variety protection for MD 402 will not be applied for.

M.K. Aycock, Jr.* (8)

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Registration of 'MD 601' Tobacco

'MD 601' Maryland tobacco (*Nicotiana tabacum* L.) (Reg. no. CV-119, PI 608041) was developed by the Maryland Agricultural Experiment Station and released in 1999 because of its multiple disease resistance and good quality characteristics. MD 601 has resistance to tobacco mosaic virus (TMV), wildfire [caused by *Pseudomonas syringae* pv. *tabaci* (Wolf & Foster) Young et al.], and Race 0 black shank [caused by *Phytophthora parasitica* Dastur var.*nicotianae* (Breda de Haan) Tucker; syn. *P. nicotianae* Breda de Haan var. *nicotianae* G.M. Waterhouse].

MD 601 was developed using backcross breeding. After the initial cross of 'MD 341' (5)/'MD 609' (4), seven backcrosses were made with MD 609 as the recurrent parent followed by 11 generations of self pollination. MD 341 has resistance to TMV and wildfire, and MD 609 has the 'Florida 301' type of black shank resistance. In each backcross and selfed generation, single plant selections were made in a summer breeding nursery that had resistance to TMV and wildfire. Breeding nurseries were hand inoculated with each disease. Seeds of selected plants were planted in the greenhouse during the winter and screened for black shank resistance (3). The base for this cultivar is a composite of F_{11} seed collected from four plants in a single F_{10} progeny row grown in 1998.

MD 601 was tested as line A601 for six years (1991 to 1996) and compared with MD 609 in replicated plots at the Upper Marlboro Facility, Central Maryland Research and Education Center, and two farms in southern Maryland (2). The six-year average yield per hectare of MD 601 and MD 609 was similar, producing 1812 and 1859 kg, respectively. MD 601 and MD 609 were similar for price ($\$ kg^{-1}$), plant height, number of leaves per plant, days to flower after transplanting, and percentage of total nitrogen. However, MD 601 had a significantly higher quality index than MD 609, 60.0 and 56.4, respectively. The cured leaves of MD 601 exhibited a significantly higher percentage of desirable L (tan), F (cherry-red), and R (red) leaf colors than MD 609, 59.9 and 49.1, respectively. The level of total alkaloids for MD 601 was slightly higher than MD 609, 3.16 and 3.06%, respectively.

Tests for black shank resistance were conducted on young seedlings in the greenhouse, and tops and roots were scored on a scale of 0 to 4 with 0 indicating no disease symptom and 4 indicating tops were dead and roots were all brown. Scores for MD 601 and MD 609 in the 1998 test were the same; 0.5 for tops and 1.0 for roots. These scores indicate that MD 601 has a high level of resistance to Race 0 black shank.

MD 601 and 'MD 402' (1) were released at the same time by the Maryland Agricultural Experiment Station. In addition to different pedigrees, MD 601 is taller, has longer internodes, and a higher percentage of total alkaloids than MD 402.

MD 601 is suitable for production throughout the Type 32 Maryland tobacco growing area, and is particularly useful in fields where both black shank and TMV are persistent problems. Breeder seed of MD 601 will be maintained and distributed by the Maryland Agricultural Experiment Station, University of Maryland, College Park, MD 20742-4452. U.S. plant variety protection will not be applied for.

M.K. Aycock, Jr.* (6)

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Registration of 'Scholar' Wheat

'Scholar' (Reg. no. CV-879, PI 607557) is a hard red spring wheat (*Triticum aestivum* L.) developed by the Montana Agricultural Experiment Station. A moderate level of sawfly resistance, good yield and protein potential, and acceptable end-use quality provided the justification for the release of Scholar. Scholar is named in honor of the scores of undergraduate students that assist with the varietal development program at Montana State University. Scholar derives from an F_4 plant selection from the cross MT 8808/'Marberg' (3). MT 8808 was derived from the cross MT 7746/'Lew' (2). MT 7746 was a selection from 'Kronstad S-Gallo', which originated from a Center for International Maize and Wheat Improvement (CIMMYT) nursery. Scholar was evaluated as MT 9433 in a Preliminary Yield Nursery at four sites in Montana in 1994, and has been evaluated in an Advanced Yield Nursery at nine Montana locations since 1995. MT 9433 was entered

into the Uniform Regional Hard Red Spring Wheat Nursery in 1997.

Scholar has white straw and chaff and the spike is awned. The glumes are white with tan-colored tips and edges. The kernels are ovate with a medium length, and have a short fine brush. Kernels have a medium V-shaped crease with angular cheeks.

Scholar possess an intermediate level of stem solidness similar to 'Amidon', and thus has moderate resistance to the wheat stem sawfly (*Cephus cinctus* Nort.). Based on screening with races collected from Eastern Montana, Scholar is resistant to stem rust (caused by *Puccinia graminis* Pers:Pers.). Scholar is moderately susceptible to leaf rust (caused by *Puccinia triticina* Eriks), based on leaf rust infestations in Montana. Scholar is susceptible to the Russian wheat aphid [*Diuraphis noxia* (Mordvilko)].

Scholar matures in mid-season with an average heading date of 27 June for six dryland sites and 1 July for three high rainfall/irrigated sites each tested in Montana from 1995 to 1998. This is similar to 'McNeal' (1). Scholar contains no known semi-dwarf genes, and is classified as a normal height cultivar. Height of Scholar has been approximately 93 and 87 cm on irrigated and dryland sites in Montana, respectively. Scholar is about 4 cm taller than McNeal and 6 cm shorter than Lew. Yield of Scholar has averaged 3420 kg ha^{-1} on six dryland sites in Montana from 1995 to 1998. This is approximately 6% more than sawfly resistant cultivars Lew and Ernest, and 5% less than McNeal. Scholar averaged 5504 kg ha^{-1} on three high rainfall or irrigated sites in Montana from 1995 to 1998, 9% greater than Lew, 2% less than Ernest, and 3% less than McNeal. Grain volume weight of Scholar is similar to other spring wheat varieties grown in Montana (80.9 kg L^{-1} on dryland and 80.6 kg L^{-1} on irrigated and high rainfall acreage) . Grain protein percentage on dryland has been about 0.3% higher than McNeal (14.6 vs. 14.3%), and 0.2% less than Ernest. Grain protein percentage under irrigation has been about 0.1% higher than McNeal (14.0 vs. 13.9) and 0.2% lower than Ernest.

Milling and baking quality of Scholar is good based on tests by the Montana State University Cereal Quality Laboratory of grain from 10 locations from 1995 to 1998. Flour yield, optimal water absorption of flour for baking, bake mixing time, and loaf volume were 69%, 75%, 3.6 min, and 1036 cm^3, respectively. Among commonly grown wheats in Montana, Scholar is most similar to Amidon in terms of milling and baking quality. Breeder and Foundation Seed of Scholar will be maintained by the Foundation Seed Stocks Program, Plant Sciences Department, Montana Agricultural Experiment Station, Montana State University, Bozeman MT 59717. U.S. plant variety protection will not be applied for.

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Registration of 'Culver' Wheat

'Culver' (Reg. no. CV-880 , PI 606726) is a hard red winter wheat (*Triticum aestivum* L.) developed cooperatively by the Nebraska Agricultural Experiment Station and USDA-ARS and released to seed producers in 1999 by the developing institutions. Culver was selected from the cross NE82419/'Arapahoe', which was made in 1987. The pedigree of NE82419 is 'Trapper'//'Comanche'/'Ottawa'/3/unknown CIMMYT line/'Scout'/4/'Buckskin' sib/'Homestead'. Culver is an F_3-derived line that was selected in the F_4 generation. Culver was released primarily for its superior adaptation to dryland wheat production systems in southern and central Nebraska and similar growing areas in adjacent states.

Culver is an awned, white-glumed cultivar. Its field appearance is most similar to 'Alliance', although not as yellow-green in color. After heading, the canopy is moderately open and upright. The flag leaf is erect and twisted at the boot stage. The foliage is green with a waxy bloom at anthesis. The leaves are glabrous. The spike is tapering in shape, moderately long to long, and middense. The glume is midlong and midwide to wide, and the glume shoulder is sloping to square. The beak is short in length with an acuminate tip. The spike is usually nodding at maturity. Kernels are red colored, hard textured, and ovate to elliptical in shape. The kernel has no collar, a large brush of medium length, rounded cheeks, midsize to large germ, and a narrow and shallow crease.

Culver was evaluated as NE93554 in Nebraska yield nurseries starting in 1994, in the Northern Regional Performance Nursery in 1996 and 1997, and in Nebraska cultivar performance trials in 1997 and 1998. In two years of testing in Nebraska cultivar performance trials, Culver was the highest yielding line (4690 kg ha^{-1}) in the south central district trials (four test environments). For comparison, 'Jagger' yielded 4610 kg ha^{-1}, Alliance yielded 4510 kg ha^{-1}, and Arapahoe yielded 4300 kg ha^{-1} in those trials. In the west central trials (12 environments in two years), Culver's yield (4310 kg ha^{-1}) was surpassed only by the yield of Quantum hybrid '7406' (4730 kg ha^{-1}) and 'Jules' (4390 kg ha^{-1}). For comparison, the yields of Jagger, 'Windstar', Alliance, 'Niobrara', and Arapahoe were 4260, 4240, 4160, 4160, and 4120 kg ha^{-1}, respectively. In the southeast district trials (four environments), Culver yielded similarly to Niobrara (3510 kg ha^{-1}), 340 kg ha^{-1} less than '2137', and 130 kg ha^{-1} less than 'Nekota'. In the western trials (12 environments), Culver was equal in yield to Arapahoe and 70 to 270 kg ha^{-1} less than Alliance, 'Akron', 2137, Niobrara and Windstar. In the Northern Regional Performance Nursery in 1996 and 1997 (29 environments), Culver ranked seventh of 16 lines tested at 10 locations in those years, was above the average yield, and 360 kg ha^{-1} higher yielding than 'Abilene'. In one or both years, it showed superior adaptation for use in the intra-regional production zones of the north-central plains, northern plains and the northern high plains. The main advantage of Culver when compared to most other available wheat cultivars within its area of adaptation, is its high grain yield and superior leaf rust (caused by *Puccinia triticinia* Eriks.; syn *P. recondita* Ro-

berge ex Desmaz. f. sp. *tritici* Eriks and E. Henn.) resistance in dryland production systems.

Culver is medium in maturity, about 0.5 d later flowering than Arapahoe and 2 d later than Alliance. It has a medium length coleoptile, similar to 'TAM 107' and Arapahoe, but shorter than 'Pronghorn'. The mature plant height of Culver (83 cm) is similar to Arapahoe, but 2 cm taller than Alliance. Culver has moderately strong straw strength, similar to Windstar and slightly better than Alliance, Arapahoe, and Pronghorn. The winterhardiness of Culver is good to very good, similar to Abilene and comparable to other winter wheat cultivars adapted and commonly grown in Nebraska.

Culver is moderately resistant to stem rust (caused by *P. graminis* Pers:Pers.; containing *Sr6* and *Sr24*, and other unnamed resistance genes) and leaf rust (similar to Arapahoe and most likely containing *Lr16*), and susceptible to wheat soilborne mosaic virus, Hessian fly (*Mayetiola destructor* Say), barley yellow dwarf virus, and wheat streak mosaic virus. Culver has a moderately low grain volume weight (75.6 kg hl^{-1}), higher than Alliance (75.3 kg hl^{-1}), but lower than Arapahoe (76.1 kg hl^{-1}), and Pronghorn (77.4 kg hl^{-1}). The milling and baking properties of Culver were determined for five years by the Nebraska Wheat Quality Laboratory. In these tests, Arapahoe and 'Scout 66' were used as check cultivars. The average wheat protein content of Culver (123 g kg^{-1}) was similar to Arapahoe (125 g kg^{-1}) and Scout 66 (125 g kg^{-1}). The average flour extraction (716 g kg^{-1}) on the Buhler Laboratory Mill for the Culver was similar to Arapahoe (714 g kg^{-1}), but less than Scout 66 (734 g kg^{-1}). The flour ash content (44 g kg^{-1}) was similar to the check varieties. The average flour protein content (103 g kg^{-1}) was less than the check varieties (113 g kg^{-1}). Dough mixing properties of Culver were similar to Arapahoe and stronger than Scout 66. Average baking absorption was similar to the check varieties. The average loaf volume of Culver (873 cm^3) was less than the check cultivars (898 cm^3). The scores for the internal crumb grain and texture were good or very good, which were superior to Arapahoe and Scout 66. In comparison to Alliance, Culver had a higher average wheat protein content, baking absorption, and crumb grain and texture score. The overall end-use quality characteristics for Culver should be acceptable to the milling and baking industries.

The name Culver was chosen in recognition of Moses M. Culver whose farm was purchased on June 25, 1874 by the University of Nebraska as a site for agricultural research and teaching. This site eventually became the University of Nebraska-Lincoln's East Campus. The year 1999 will be the 125th anniversary of this event, marked by the availability of high quality Nebraska certified seed of this new variety to wheat producers, resulting from a long-standing commitment to meet the needs of agriculture and the world. East Campus is the home for the Institute of Agriculture and Natural Resources with its associated divisions of research, teaching, extension, and service, which is celebrating its 25th anniversary.

The Nebraska Foundation Seed Division, Department of Agronomy, University of Nebraska-Lincoln, Lincoln, NE 68583 provided Foundation seed to qualified certified seed enterprises in 1998. The USDA will not have seed for distribution. The seed classes will be Breeder, Foundation, Registered, and Certified. The Registered seed class will be a nonsalable seed class. Culver will be submitted for plant variety protection under P.L. 10577 with the certification option. Small quantities of seed for research purposes may be obtained from the corresponding author and the Department of Agronomy, University of Nebraska for at least five years from the date of this publication.

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References and Notes

1. P.S. Baenziger, B. Moreno-Sevilla, D.R. Shelton, R.E. Elmore, R.N. Klein, D.D. Baltensperger, and L.A. Nelson, Dep. of Agronomy; C.J. Peterson, USDA-ARS and Dep. of Agronomy; J.E. Watkins, Dep. of Plant Pathology, Univ. of Nebraska, Lincoln, NE 68583; D.V. McVey, USDA-ARS and Dep. of Plant Pathology, Univ. of Minnesota, St. Paul, MN 55108; J.H. Hatchett, USDA-ARS and Dep. of Entomology, Kansas State Univ., Manhattan, KS 66506. Culver was developed with partial financial support from the Nebraska Wheat Development, Utilization, and Marketing Board. Cooperative investigations of the Nebraska Agr. Res. Div., Univ. of Nebraska, and USDA-ARS. Contribution no. 12612 from the Nebraska Agr. Res. Div. Registration by CSSA. Accepted 30 Nov. 1999. *Corresponding author (Pbaenziger1@unl.edu).

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REGISTRATIONS OF GERMPLASM

Registration of UMN 3176 Alfalfa Germplasm

UMN 3176 alfalfa (*Medicago sativa* L.) germplasm (Reg. no. GP-336, PI 610664) was developed by the USDA-ARS and the Minnesota Agricultural Experiment Station at St. Paul, MN and was released 10 Nov. 1998. This germplasm was developed to permit introduction of new traits into alfalfa by Agrobacterium-mediated transformation and regeneration of transgenic plants in tissue culture in a genetic background that is incapable of utilizing nitrogen from the atmosphere through symbiotic N_2-fixation.

One hundred and fifty Ineffective Agate (Reg. no. GP-228, PI 536529) plants and 150 Ineffective Saranac (Reg. no. GP-229, PI 536530) plants were crossed onto 68 clones of a highly regenerating genotype Regen-SY (Reg. no. GP-242, PI 537440) to produce UMN 3070 and UMN 3072, respectively. Ineffective Agate and Ineffective Saranac were developed by the USDA-ARS and the University of Minnesota Experiment Station (Barnes et al., 1990). Nodulation with *Rhizobium meliloti* occurs in both of these germplasms producing small white nodules that are incapable of fixing N. Both sources of ineffective nodulation are controlled by the same recessive gene (in_1) with tetrasomic inheritance. (Peterson and Barnes, 1981). Regen-SY, which has improved regeneration capability from callus tissue was released by the Wisconsin Agricultural Experiment Station (Bingham, 1991). The ability to regenerate plants in culture in alfalfa appears to be controlled by the interaction of two dominant loci (Reisch and Bingham, 1980; Kielly and Bowley, 1992). All Syn.1 progeny of both crosses were effectively nodulated.

Approximately 105 plants each from UMN 3070 and UMN 3072 were randomly intercrossed to produce Syn.2 seed desig-