Registration of 'Hatcher' Wheat

'Hatcher' (Reg. no. CV-971, PI 638512) hard red winter wheat (*Triticum aestivum* L.) was developed by the Colorado Agricultural Experiment Station and released to seed producers in August 2004. Hatcher was released based on its resistance to the original North American biotype, designated as Biotype 1 (D.R. Porter, personal communication, 2004) of the Russian wheat aphid [*Diuraphis noxia* (Mordvilko)], and its adaptation to nonirrigated production in eastern Colorado and the west-central Great Plains. 'Hatcher' was named in honor of the late E.L. "Shug" Hatcher, a former Colorado Wheat Industry leader who farmed near Lamar, CO.

Hatcher was selected from a population derived from a series of crosses and backcrosses completed in 1993: 'Yuma'/PI 372129//'TAM-200'/3/4*Yuma/4/KS91H184/'Vista'. PI 372129 is a Russian wheat aphid–resistant landrace from Turkmenistan that carries the *Dn4* Russian wheat aphid resistance gene (Quick et al., 1991); Yuma (PI 559720) is a hard red winter wheat cultivar released by Colorado State University in 1991; TAM-200 (PI 578255) is a hard red winter wheat cultivar released by Texas A&M University in 1986 (Worrall et al., 1995); Vista (PI 562653) is a hard red winter wheat cultivar

released by the University of Nebraska in 1992 (Baenziger et al., 1993); and KS91H184 is an experimental line from Kansas State University (T.J. Martin, personal communication, 2004) derived from a random mating population involving CI 17884 (Wells et al., 1982). Following each backcross with Yuma as recurrent parent, progeny were screened for Russian wheat aphid Biotype 1 resistance in standard greenhouse screening tests (Nkongolo et al., 1989), and resistant plants were used as parents for the next cross. The final cross was made between a Russian wheat aphid-resistant BC_3F_1 plant and an F_1 plant from the cross KS91H184/Vista. Based on visual uniformity and agronomic appearance, Hatcher was selected in 1998 as an $F_{4:5}$ line following advance from the F_2 through the F_4 using the bulk breeding procedure. Hatcher was assigned experimental number CO980607 and evaluated in nonreplicated preliminary yield trials in 1999, replicated advanced yield trials in 2000, replicated statewide variety trials from 2001 to 2004, and the Southern Regional Performance Nursery (SRPN) in 2003 and 2004. Seed purification of Hatcher was done by visual identification and removal of off-type rows among 135 $F_{9:11}$ headrows grown at Yuma, AZ, in 2002 and bulking the seed from rows with uniform appearance. Breeder seed ($F_{9:12}$) was produced in 2003 under irrigation in Colorado.

Hatcher is an awned, white-chaffed, medium maturity, semidwarf hard red winter wheat. Hatcher has medium maturity, 144 d to heading from 1 January, and is 4 d later than 'Prairie Red' (PI 605390) and 1 d later than 'Yumar' (PI 605388) and 'Ankor' (PI 632275). Plant height of Hatcher is short (65.5 cm), and is 1.5 cm shorter than Prairie Red and 4.1 cm shorter than Yumar and Ankor. Coleoptile length of Hatcher (73.6 mm, n = 8 observations) is shorter than that of Prairie Red (85.0 mm) and Ankor (77.4 mm) but longer than that of Yumar (62.9 mm). Shattering tolerance of Hatcher is good (3.6 score, 1 = no shatter to 9 = severe shatter, n = 3 observations), slightly less than Ankor (2.7 score) but better than Prairie Red (4.1 score) and Yumar (4.2 score). On the basis of evaluations through the USDA Regional Testing Program, Hatcher is moderately susceptible to stem rust (caused by *Puccinia graminis* Pers.:Pers f. sp. *tritici* Eriks. & E. Henn; composite of races QFCS, QTHJ, RCRS, TPMK, and TTTT) and leaf rust (caused by *Puccinia triticina* Eriks.; composite of races MLRT, MFBP, TKBP, TDGT, and KBQT). The rating scale of infection responses in these evaluations consisted of four classes: R (resistant), MR (moderately resistant), MS (moderately susceptible), and S (susceptible) determined primarily on the basis of the size of uredinia. Based on natural field infection in Colorado, Hatcher is moderately resistant to stripe rust (caused by *Puccinia striiformis* Westend.; 4.3 score, 1 = resistant and 9 = susceptible, n = 4 evaluations). Based on cooperative evaluations through the USDA Regional Testing Program, Hatcher is susceptible to both *Wheat streak mosaic virus* and *Barley yellow dwarf virus*, heterogeneous for resistance to the Great Plains biotype of Hessian fly [*Mayetiola destructor* (Say)], and susceptible to greenbug [*Schizaphis graminum* (Rondani)]. Resistance to Russian wheat aphid Biotype 1 in Hatcher is conditioned by the *Dn4* resistance gene. Russian wheat aphid resistance scores for Hatcher (1.9 score, 1 = very resistant to 5 = very susceptible, n = 12 observations) in standard greenhouse seedling screening tests using Biotype 1 are similar to other cultivars that carry *Dn4* including Yumar (2.2 score), Prairie Red (2.2 score), and Ankor (1.9 score).

Hatcher was tested at 22 trial locations of the Colorado Dryland Uniform Variety Performance Trial (UVPT) during 2001 (eight locations), 2002 (three locations), 2003 (six locations), and 2004 (five locations). Mean grain yields of Hatcher (3118 kg ha^{-1}) were slightly lower than that of 'Trego' (3178 kg ha^{-1}; PI 612576) but higher than those of all other entries tested including Ankor (3011 kg ha^{-1}), Prairie Red (2964 kg ha^{-1}), and Yumar (2943 kg ha^{-1}). Average grain volume weight of Hatcher (748 g L^{-1}) was lower than that of Trego (768 g L^{-1}) but similar to that of Yumar (746 g L^{-1}) and higher than that of Ankor (740 g L^{-1}) and Prairie Red (739 g L^{-1}). Hatcher was tested at eight locations of the Colorado Irrigated Variety Performance Trial (IVPT) during 2002, 2003, and 2004. In these trials, Hatcher (6598 kg ha^{-1}) had a lower mean yield than Prairie Red (7015 kg ha^{-1}) but a higher mean yield than Ankor (6510 kg ha^{-1}). Average grain volume weight of Hatcher (745 g L^{-1}) was higher than that of both Prairie Red and Ankor (723 g L^{-1}). The straw strength of Hatcher in these irrigated trials was moderate (4.6 score, 1 = erect to 9 = flat scale, n = 9 observations), and weaker than those of Ankor (3.9 score) and Prairie Red (2.3 score). Hatcher was tested in the 2003 and 2004 Southern Regional Performance Nursery (SRPN). Across locations in the High Plains region, Hatcher was the second highest entry in the trial in both 2003 (seven location mean yield 4697 kg ha^{-1}; 46 total entries) and 2004 (nine location mean yield 3533 kg ha^{-1}; 50 total entries).

Milling and bread baking characteristics of Hatcher were determined from multilocation composite grain samples in 2000, 2001, and 2002 and three single-location evaluations in 2001 (n = 6 observations). Ankor and 'Prowers 99' (PI 612420) were used as checks in these evaluations. Values for milling-related variables were generally superior to both Ankor and Prowers 99. Hatcher had higher grain volume weight (761.9 kg m^{-3}) than Ankor (732.3 kg m^{-3}) and Prowers 99 (749.0 kg m^{-3}). On the basis of Single Kernel Characterization System (SKCS) analysis, Hatcher had higher kernel weight (28.5 mg kernel^{-1}) than Ankor (25.2 mg kernel^{-1}) and Prowers 99 (26.3 mg kernel^{-1}); higher SKCS kernel diameter (2.17 mm) than Ankor (2.03 mm) and Prowers 99 (2.11 mm); and lower SKCS kernel hardness index (71.8 score) than Ankor (73.3 score) and Prowers 99 (80.0 score). Hatcher had higher Quadromat Senior flour extraction (685 g kg^{-1}) than Ankor (658 g kg^{-1}) and Prowers 99 (679 g kg^{-1}) and lower flour ash (4.1 g kg^{-1}) than Ankor (4.4 g kg^{-1}) and Prowers 99 (4.8 g kg^{-1}). Values for baking-related variables of Hatcher were generally intermediate between Ankor and Prowers 99. Hatcher (120 g kg^{-1}) had similar grain protein content as Ankor (120 g kg^{-1}) and lower than Prowers 99 (138 g kg^{-1}). In mixograph tests optimized for water absorption, Hatcher had higher water absorption (618 g kg^{-1}) than Ankor (615 g kg^{-1}) and lower than Prowers 99 (649 g kg^{-1}); higher tolerance score (3.2 score; 0 = unacceptable to 6 = excellent scale) than Ankor (2.2 score) and lower than Prowers 99 (4.0 score); and longer mixing time (3.2 min) than Ankor (2.9 min) and shorter than Prowers 99 (4.0 min). In straight-grade pup loaf baking tests, Hatcher had lower bake water absorption (600 g kg^{-1}) than Ankor (604 g kg^{-1}) and Prowers 99 (633 g kg^{-1}); longer bake mixing time (4.2 min) than Ankor (3.6 min) and shorter than Prowers 99 (5.1 min); smaller pup loaf volume (0.872 L) than Ankor (0.888 L) and Prowers 99 (0.945 L); and lower loaf crumb grain score (3.8 score; 0 = unacceptable to 6 = excellent scale) than Ankor (4.0 score) and Prowers 99 (4.5 score).

The Colorado Agricultural Experiment Station will maintain Breeder seed of Hatcher. Multiplication and distribution rights of other classes of Certified seed have been transferred from the Colorado Agricultural Experiment Station to the Colorado Wheat Research Foundation, 7100 S. Clinton St. Suite 120, Centennial, CO 80112. Hatcher has been submitted for U.S. Plant Variety Protection under Public Law 91-577 with the certification only option. Small quantities of seed for

research purposes may be obtained from the corresponding author for at least 5 yr from the date of this publication.

S.D. Haley,* J.S. Quick, J.J. Johnson, F.B. Peairs, J.A. Stromberger, S.R. Clayshulte, B.L. Clifford, J.B. Rudolph, B.W. Seabourn, O.K. Chung, Y. Jin, and J. Kolmer

Acknowledgments

Hatcher was developed with financial support from Colorado Agricultural Experiment Station Projects 795 and 646, the Colorado Wheat Administrative Committee, and the Colorado Wheat Research Foundation.

References

Baenziger, P.S., J.W. Schmidt, C.J. Peterson, D.R. Shelton, D.D. Baltensperger, L.A. Nelson, D.V. McVey, and J.H. Hatchett. 1993. Registration of Vista wheat. Crop Sci. 33:1412.

Nkongolo, K.K., J.S. Quick, W.L. Meyer, and F.B. Peairs. 1989. Russian wheat aphid resistance of wheat, rye, and triticale in greenhouse tests. Cereal Res. Commun. 17:227–232.

Quick, J.S., K.K. Nkongolo, W. Meyer, F.B. Peairs, and B. Weaver. 1991. Russian wheat aphid reaction and agronomic and quality traits of a resistant wheat. Crop Sci. 31:50–53.

Wells, D.G., R.S. Kota, H.S. Sandhu, W.S. Gardner, and K.F. Finney. 1982. Registration of one disomic substitution line and five translocation lines of winter wheat germplasm resistant to wheat streak mosaic virus. Crop Sci. 22:1277.

Worrall, W.D., E.C. Gilmore, Jr., K.B. Porter, and M.E. McDaniel. 1995. Registration of TAM-200 wheat. Crop Sci. 35:1223.

S.D. Haley, J.S. Quick, J.J. Johnson, J.A. Stromberger, S.R. Clayshulte, and B.L. Clifford, Soil and Crop Sciences Dep., Colorado State Univ., Fort Collins, CO 80523; F.B. Peairs and J.B. Rudolph, Bioagricultural Sciences and Pest Management Dep., Colorado State Univ., Fort Collins, CO 80523; B.W. Seabourn and O.K. Chung, USDA/ARS/Grain Marketing and Production Research Center/Hard Winter Wheat Quality Laboratory, 1515 College Avenue, Manhattan, KS 66502; Y. Jin and J. Kolmer, USDA/ARS/Cereal Disease Laboratory, 1551 Lindig St., Univ. Minnesota, St. Paul, MN 55108. Registration by CSSA. Accepted 30 April 2005. *Corresponding author (scott.haley@colostate.edu).

doi:10.2135/cropsci2005.0030
Published in Crop Sci. 45:2654–2656 (2005).

Registration of 'Carrizalito' Small Red Bean

Small red dry bean (*Phaseolus vulgaris* L.) 'Carrizalito' (Reg. no. CV-247, PI 639174) was developed at the Escuela Agricola Panamericana (EAP), Zamorano, Honduras, and released for Honduras in 2003 and Costa Rica in 2004, in collaboration with the National Bean Programs of Honduras and Costa Rica, and the University of Puerto Rico. Carrizalito is a high yielding, disease resistant cultivar, adapted to the midaltitude (800–1200 m asl) bean production regions of Central America.

Carrizalito was an $F_{2:6}$ derived line from the cross 'Tio Canela 75'/DICTA 105. Tio Canela 75 has small red seed and resistance to *Bean golden yellow mosaic virus* (BGYMV) (Rosas et al., 1997). DICTA 105 is a bean pod weevil (*Trichapion godmani* Wagner) resistant small red breeding line from the Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia, and the Direccion de Ciencia y Tecnología Agropecuaria (DICTA), Tegucigalpa, Honduras. Carrizalito is a sister line of the small red bean cultivar 'Amadeus 77' released for Central America in 2003 (Rosas et al., 2004).

The F_1 was grown in a screen house. Individual F_2 plants were selected in the field at Zamorano for upright architecture and early maturity ($\leq$70 d). The F_3 to F_6 families were evaluated during 1996 to 1998 for agronomic traits as well as for resistance to natural incidence of *Bean common mosaic virus* (BCMV), anthracnose [caused by *Colletotrichum lindemuthianum* (Sacc. & Magnus) Lams.-Scrib.], angular leaf spot [caused by *Phaeoisariopsis griseola* (Sacc.) Ferraris], and web blight [caused by *Thanatephorus cucumeris* (Frank) Donk.]. Artificial inoculations with local isolates of the common bacterial blight (CBB) pathogen *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye and with rust [caused by *Uromyces appendiculatus* (Pers.:Pers.) Unger] spores collected from infected bean fields were also performed to evaluate resistance. F_4 families were screened under drought stress (~180 mm water was applied during the growing season), using sprinkler irrigation in 1997; and selected F_6 families were evaluated under natural incidence of BGYMV at Comayagua from October to December 1997. Plants within BGMYV resistant families were harvested in bulk. Selection for commercial small red seed type was practiced in every generation.

In 2004, Carrizalito was mechanically inoculated at the University of Puerto Rico (UPR) with the NL3 strain of *Bean common mosaic necrotic virus* (BCMNV) and found to have top necrosis caused by the presence of the dominant *I* gene for resistance to BCMV. Ashy stem blight is favored by warm dry conditions associated with drought stress (Mayek-Pérez et al., 2002). Seedlings of Carrizalito were inoculated in the greenhouse at the UPR with the ashy stem blight pathogen *Macrophomina phaseolina* (Tassi) Goid. and found to be resistant (M. Alameda-Lozada, personal communication, 2004).

In 1999, the average yield of Carrizalito across 17 locations in the Central American and Caribbean Regional Yield and Adaptation Trial (ECAR) was 2259 kg ha^{-1} compared to 1803 kg ha^{-1} for the local check and 1741 kg ha^{-1} for the elite check 'Dorado'. In 2000, the average yield of Carrizalito across 13 locations in the ECAR trial was 2039 kg ha^{-1} compared to 1347 kg ha^{-1} for the local and 1730 kg ha^{-1} for elite checks. In 2001, the average seed yield across six locations in the ECAR trial was 1981 kg ha^{-1} for Carrizalito, 1417 kg ha^{-1} for the local, and 2025 kg ha^{-1} for the elite checks (Rosas and Escoto, 2003).

In diverse regions of Honduras in 2001 and 2002, Carrizalito produced an average yield of 2576 kg ha^{-1}, whereas the elite cultivar Dorado averaged 1980 kg ha^{-1} and the local check produced 2339 kg ha^{-1}. In on-farm trials in 2002 across 43 locations in 11 municipalities in Honduras, the average yield of Carrizalito was 1660 kg ha^{-1} compared to 960 kg ha^{-1} for the local check. Also, Carrizalito was superior to the bean landraces for resistance to anthracnose, angular leaf spot, BGMYV, CBB and rust.

In 40 yield trials in Costa Rica, conducted from 1999 to 2002 in diverse bean production areas, from 9 m asl at Cañas to 960 m asl at Puriscal, Carrizalito produced an average yield of 1098 kg ha^{-1} compared to 885 kg ha^{-1} for 'Bribri' (Rosas et al., 2003) and 1007 kg ha^{-1} for the local check. Carrizalito was superior to Bribri and the local check in 85 and 70% of these trials, respectively. The experimental mean seed yield of Carrizalito was 1090 kg ha^{-1} with a maximum yield of 2722 kg ha^{-1}. Under conventional production practices in on-farm trials, Carrizalito produced an average yield of 1062 kg ha^{-1} with a maximum yield of 1840 kg ha^{-1} (Hernandez and Araya, 2004).

Carrizalito has an indeterminate upright, Type III growth habit with a short vine. Carrizalito flowers in 35 to 37 d and matures in 68 to 70 d. Stem color is green with red pigmentation. Green pods turn yellow with red pigmentation at physio-