Washington Agricultural Research Center
Washington State University
Pullman, Washington

and

Idaho Agricultural Experiment Station
University of Idaho
Moscow, Idaho

and

Oregon Agricultural Experiment Station
Oregon State University
Corvallis, Oregon

and

United States Department of Agriculture
Agricultural Research Service
Washington, D.C.

RELEASE OF HOLLIS (PI632857) A HARD RED SPRING WHEAT CULTIVAR

The Washington Agricultural Research Center, Idaho Agricultural Experiment Station, Oregon Agricultural Experiment Station, and the Agricultural Research Service, United States Department of Agriculture announce the joint release of 'Hollis', a hard red spring wheat (*Triticum aestivum L.*). K.K. Kidwell, Washington State University (WSU) Spring Wheat Breeder and Geneticist, selected Hollis as an F_5 head row from a cross generated by Dr. C.F. Konzak, WSU emeritus professor, in 1989. Hollis was named after Hollis Shelton, who was a farmer/rancher in Garfield County in Washington for more than 70 years, and grandfather of Gary Shelton, Research Technician Supervisor, WSU Spring Wheat Program. Hollis was released as a replacement for 'Scarlet' in non-irrigated, direct seeded wheat production systems in the semi-arid to intermediate rainfall (<400 mm of average annual precipitation) regions in Washington State based on its resistance to the Hessian fly, high grain protein content, high grain weight volume and superior bread baking quality.

Hollis was tested under the experimental designations H9500173, K90445, and WA007859, which were assigned through progressive generations of advancement. Hollis is a $F_{4:5}$ head row selection derived from the cross 'Butte 86'/'Copper'/4/'Sawtell'/'Tabasi'//'Makay'/3/'Minnpro', which was made in 1989. A modified pedigree-bulk breeding method was used to advance early

generation progeny. Bulked seed from F_1 plants was used to establish an F_2 field plot. Seeds from approximately 100 randomly selected heads from individual F_2 plants were bulked together to establish a single F_3 plot that was bulk harvested to establish an F_4 field plot. Single heads from 150 F_4 plants were threshed individually to establish $F_{4:5}$ head row families. Following selection for general adaptation, plant height and grain appearance, seed from all plants (30 to 50) within each selected head row were bulk harvested to obtain $F_{4:6}$ seed for grain yield assessment. F_1, F_2, F_4, and F_5 progeny were advanced in field nurseries in Pullman, WA, whereas F_3 progeny were advanced at the WSU Dryland Experiment Station in Lind, WA. Breeder seed of Hollis was produced in 2002 as a reselection based on phenotypic uniformity of 1800 $F_{4:12}$ headrows grown with irrigation at the WSU Royal Slope Research Station in Royal City, WA. Selected headrows were bulked at harvest resulting in the production of 1590 lb of Breeder seed.

Hollis is a tall, possible single gene semi-dwarf plant with lax, fusiform heads with white awns and medium length, white glumed spikes. Hollis has large, blocky kernels that are red, hard and rough textured. Seed of Hollis has a round, oval and centered germ with a wide, sometimes dimpled crease, with semi-sharp to sharp cheeks and a medium length, lightly collared brush.

Hollis displayed varying levels of resistance to local stripe rust races (caused by *Puccinia striiformis* Westend.). In greenhouse seedling tests conducted in Pullman, WA in 2002, Hollis was highly resistant to races PST-29, 37, 43, 45, and 78, but moderately resistant or moderately susceptible to 02-305 (a new race similar to PST-78). These races were either previously predominant in the Pacific Northwest or are currently predominant throughout the U.S. Based on results from non-inoculated and inoculated field disease screening trials conducted in Mt. Vernon, WA and Pullman, WA in 2001 and 2002, Hollis was highly resistant to stripe rust at all testing sites. Based on controlled environment insect screening trials conducted at the University of Idaho, as well as naturally infested field trials in Walla Walla, WA and Pullman, WA, Hollis is resistant to Hessian fly biotypes E, F and GP. Based on pedigree and natural field infestation ratings from Pullman, WA, Hollis is susceptible to the Russian wheat aphid (*Diuraphis noxia* (Mordvilko)).

Hollis was evaluated in replicated field trials under fallow, non-irrigated and irrigated conditions in Commercial Variety, Tri-State and USDA-ARS Western Regional nurseries in Washington, Idaho and Oregon from 1999 to 2002. In 57 tests conducted over 4 years in non-irrigated and irrigated yield performance trials in Washington State, grain yield averages of Hollis, Scarlet, Tara 2002 (Kidwell et al. 2002) and Westbred 926 were 3729 kg ha^{-1}, 3971 kg ha^{-1}, 3837 kg ha^{-1}, and 3669 kg ha^{-1}, respectively. Hollis produced 175 to 195 kg ha^{-1} less grain than Scarlet across non-irrigated production sites, and 1323 kg ha^{-1} less than Scarlet with irrigation. Based on 23 site years of data in the semi-arid region, Hollis (2358 kg ha^{-1}) produced slightly less grain than Scarlet (2553 kg ha^{-1}), similar grain quantities as Tara 2002 (2278 kg ha^{-1}), significantly more grain than Westbred 926 (2157 kg ha^{-1}). Grain volume weight of Hollis averaged 769.6 g l^{-1}, which was significantly higher than Scarlet (761.9 g l^{-1}) and Westbred 926 (765.8 g l^{-1}), and similar to Tara 2002 (770.9 g l^{-1}). Grain volume weight averages of Hollis were 6.4 to 7.8 g l^{-1} higher than Scarlet in target production areas. Thousand kernel weight averages of Hollis, Scarlet, Tara 2002 and Westbred 926, were 42.2 g, 48.8 g, 46.6 g, and 45.6 g, respectively. The

average plant height of Hollis was 94 cm, which was 13 cm taller than Scarlet (81 cm) and Tara 2002 (81 cm), and 19 cm taller than Westbred 926 (75 cm). Lodging percentages of Hollis (≤1%) were comparable with those of Westbred 926 and Tara 2002, and lower than those of Scarlet (10%). Hollis (165 Day of Year) headed on the same day as Scarlet, and 2 and 3 days later than Westbred 926 (163 Day of Year) and Tara 2002 (162 Day of Year), respectively.

Based on 57 tests conducted in Washington State from 1999 to 2002, average grain protein concentration of Hollis (144 g kg^{-1}) was similar to Westbred 926 (145 g kg^{-1}), and significantly higher than Scarlet (139 g kg^{-1}) and Tara 2002 (145 g kg^{-1}). In tests conducted by the USDA-ARS Western Wheat Quality Laboratory in Pullman, WA using grain produced in breeding and commercial variety testing trials in Washington State from 1999 through 2002, flour yield of Hollis (66.3 %) was similar to Scarlet (66.5%), and higher than Tara 2002 (65.5%) and Westbred 926 (64.6 %). Flour ash content for Hollis (0.37 %) was significantly greater than that for Scarlet (0.35 %), similar to that for Tara 2002 (0.38 %) and significantly lower than that for Westbred 926 (0.41 %). The mixing time for Hollis (4.7 min) was similar to that for Scarlet (4.5 min), shorter than that for Tara 2002 (6.1 min), and longer than that for Westbred 926 (4.1 min). Average pup loaf volume for Hollis (1048 cm^3) was similar to those for Tara 2002 (1056 cm^3) and Westbred 926 (1027 cm^3), and significantly larger than that for Scarlet (991 cm^3).

Foundation seed of Hollis will be maintained by the Washington State Crop Improvement Association under supervision of the Department of Crop and Soil Sciences, Washington State University, Pullman, WA and the Washington State Agricultural Research Center, and small quantities may be obtained for research purposes by contacting the corresponding author or through the National Plant Germplasm System. U.S. Plant Variety Protection status will not be requested for this cultivar.

Ralph P Cavalieri

Director, Washington Agricultural Research Center
Washington State University

7-16-03

Date

Yes, the USDA-ARS wishes to join in the release of 'Hollis' and has signed below.

Administrator, USDA Agricultural Research Service
Washington, D.C.

6-13-03
Date

Yes, the Idaho Agricultural Experiment Station wishes to join in the release of 'Hollis' and has signed below.

Director, Idaho Agricultural Experiment Station
University of Idaho
Moscow, ID 83844

6/27/2003
Date

Yes, the Oregon Agricultural Experiment Station wishes to join in the release of 'Hollis' and has signed below.

Director, Oregon Agricultural Experiment Station
Oregon State University
Corvallis, OR 97331

08/11/2003
Date

___No, Oregon Agricultural Experiment Station does not wish to join.

WASHINGTON STATE UNIVERSITY
Department of Crop and Soil Sciences

Mr. Greg Vollmer
WA State Crop Improvement Asso.
WSU – Seed House
Pullman, WA 99164-6420

April 27, 2004

Dear Greg,

The purpose of this letter is to provide you with a supplemental description for the hard red spring wheat variety 'Hollis'. The variety description for Hollis should include a tolerance for white seed. Hollis contains a naturally occurring white wheat variant that was observed in 2002 breeder seed at 3 white seed per pound, and in the 2003 foundation seed at 5 white seed per pound as determined by the Washington State Department of Agriculture Seed Laboratory by visual observation and NaOH confirmation. Further evaluation by WSCIA showed 8 white seed in 600 g, or approximately 6 per pound, of the 2003 foundation seed lot using NaOH screening. Please amend the Hollis variety description to include a "white wheat variant not to exceed 10 per pound in all classes of certified seed".

Sincerely,

Kimberlee K. Kidwell

Dr. Kimberlee K. Kidwell
Asso. Professor,
Spring Wheat Breeder and Geneticist

cc. R. Cavalieri
J. Burns

PO Box 646420, Pullman, WA 99164-6420
509-335-3475 • Fax: 509-335-8674 • http://css.wsu.edu