

WASHINGTON AGRICULTURAL RESEARCH CENTER  
WASHINGTON STATE UNIVERSITY  
PULLMAN, WASHINGTON 99164

and

IDAHO AGRICULTURAL EXPERIMENT STATION  
UNIVERSITY OF IDAHO  
MOSCOW, IDAHO 83844

and

OREGON AGRICULTURAL EXPERIMENT STATION  
OREGON STATE UNIVERSITY  
CORVALLIS, OR 97331

and

UNITED STATES DEPARTMENT OF AGRICULTURE  
AGRICULTURAL RESEARCH SERVICE  
WASHINGTON, D.C. 20250

**NOTICE OF RELEASE OF 'OTIS'  
Hard White Spring Wheat**

'Otis' hard white spring wheat (*Triticum aestivum* L.) (Reg. no. CV-XXX, PI 634866) was developed by the Agricultural Research Center of Washington State University in cooperation with the Agricultural Experiment Stations (AESs) of the University of Idaho and Oregon State University, and the United States Department of Agriculture-Agricultural Research Service (USDA-ARS). Otis was jointly released by the AESs of Washington, Idaho and Oregon and the USDA-ARS in 2005. Otis was named in honor of Kody 'Otis' Kidwell, beloved nephew of, and inspiration to, Dr. Kidwell. Otis is targeted for production in the semi-arid and intermediate rainfall (<400 mm of average annual precipitation), nonirrigated wheat production regions of Washington State based on its high grain yield potential, high-temperature adult-plant resistance to local races of stripe rust (*Puccinia striiformis* Westend. f. sp. *tritici*), partial resistance to the Hessian fly [*Mayetiola destructor* (Say)], and superior dual purpose end-use quality for making noodle and bread products.

Otis, tested under the experimental designations WA007931, HWN990071, and H95089, which were assigned through progressive generations of advancement, is a F4:5 head row selection derived from the cross Idaho 377s (PI 591045)/3/'Tanager 'S'' (PI 519878)/'Torim 73' (PI 433769)///'Spillman' (PI 506350), which was made in 1994. The following modified pedigree-bulk breeding method was used to advance early generation progeny. Bulk seed (10 g) from F1 plants was used to establish an F2 population in the Wheat Research Facility in Pullman, WA, which was segregating for red and white seed color. White seed selected from approximately 100 heads from

individual F2 plants was bulked together to establish a single F3 plot that was planted in the field at the Washington State University Dryland Experiment Station in Lind, WA. A 60-g subsample of the bulk-harvested seed was used to establish an F4 field plot at Spillman Farm in Pullman, WA. Single heads from approximately 150 F4 plants were threshed individually to establish F4:5 head row families at that same site the following year. Following selection for general adaptation, plant height and grain appearance, seed from 30 to 50 plants within each selected head row were bulk harvested to obtain F4:6 seed for grain yield assessment. Breeder seed of Otis was produced as a reselection based on phenotypic uniformity of 1200 F4:10 head rows grown with irrigation in Othello, WA in 2003. Selected head rows were bulked at harvest, resulting in the production of 668 kg of Breeder seed.

Otis is a tall, semidwarf plant, with lax, tapering, inclined curved heads with white awns and white glumes that are long in length, wide in width with narrow, acuminate shoulders, and narrow beaks. Kernels are ovate, white, and hard in texture. Seed of Otis has a mid-size germ with a narrow, shallow crease, rounded cheeks, and a short, non-collared brush.

In greenhouse seedling tests conducted in 2003 and 2004 under a low diurnal temperature cycle gradually changing from 4°C at 2:00 am to 20°C at 2:00 pm (Chen and Line 1992) with wheat stripe rust (caused by *P. striiformis* f. sp. *tritici*) races PST-37, PST-43, PST-45, PST-78, and PST-98, Otis was resistant to PST-43, PST-45, and PST-98 but susceptible to PST-37 and PST-78 indicating that it has race-specific, all-stage (seedling) resistance to some races. When tested with races PST-78 and PST-100 in adult-plant stages under a high diurnal temperature cycle gradually changing from 10°C at 2:00 am to 35°C at 2:00 pm (Chen and Line 1995), Otis was highly resistant indicating that it has high-temperature adult-plant (HTAP) resistance. In field tests conducted in various locations in Washington State from 2001 to 2004, Otis displayed a high level of non-race-specific, HTAP resistance to the primary virulent races in current stripe rust populations in the Pacific Northwest region of the United States, including PST-78, PST-98 and PST-100. On the basis of insect screening trials conducted at the University of Idaho, Otis is partially resistant (47%) to Hessian fly [*M. destructor* (Say)] biotypes E, F and GP. On the basis of pedigree and natural field infestation ratings from Pullman, WA, Otis is susceptible to the Russian wheat aphid [*Diuraphis noxia* (Mordvilko)].

Otis was evaluated in replicated field trials under fallow, nonirrigated and irrigated conditions. Grain yields of Otis typically equaled or exceeded those of hard white spring entries in nonirrigated and irrigated field evaluations conducted in Washington, Oregon, and Idaho from 2002 to 2004. In 51 tests conducted across 3 yr in Washington State, the average grain yield of Otis was 3642 kg ha<sup>-1</sup>, which was comparable to the yield average of Lolo (3715 kg ha<sup>-1</sup>) (Souza et al., 2003) and significantly higher than 'Macon' (3373 kg ha<sup>-1</sup>) (Kidwell et al., 2003), Idaho 377s (3473 kg ha<sup>-1</sup>) (Souza et al., 1997). On the basis of 40 site-years of data from the semi-arid and intermediate rainfall zones (<400 mm of average annual precipitation), Otis (3195 kg ha<sup>-1</sup>) produced less grain than Lolo (3303 kg ha<sup>-1</sup>), but significantly more grain than Idaho 377s (3063 kg ha<sup>-1</sup>) and Macon (3006 kg ha<sup>-1</sup>).

On the basis of 51 tests, grain volume weight of Otis averaged 763 g l-1, which was comparable to Lolo (767 g l-1), and significantly higher than Macon (740 g l-1) and Idaho 377s (752 g l-1). Thousand-kernel weight averages of Otis, Macon, Idaho 377s, and Lolo were 40.5, 46.1, 36.6, and 47.6 g, respectively. The average plant height of Otis was 84 cm, which was 9 cm taller than Macon and Idaho 377s (75 cm), and 7 cm taller than Lolo (77 cm). Lodging percentages of Otis (2 to 5 %) when grown with irrigation were identical to those of Macon, Idaho 377s, and Lolo. Otis headed 3 d later than Macon ([Day of Year (DOY) 164]) and 1 d later than Idaho 377s and Lolo (DOY 166).

In tests conducted at the USDA-ARS Western Wheat Quality Laboratory in Pullman, WA using grain produced in breeding and commercial variety testing trials in Washington State from 2002 through 2004, average grain protein content of Otis (131 g kg-1) was significantly higher than Macon (128 g kg-1) and significantly lower than Idaho 377s (136 g kg-1). Flour yield of Otis (663 g kg-1) was comparable to Macon (652 g kg-1), and significantly higher than Idaho 377s (619 g kg-1). Flour ash content for Otis (4.1 g kg-1) was similar to Idaho 377s (4.0 g kg-1) and higher than Macon (3.9 g kg-1). The flour protein content of Otis (121 g kg-1) was similar to Macon (122 g kg-1), and Idaho 377s (125 g kg-1). Rapid Visco Analyzer (RVA) values of Otis (2236 cP), which reflect starch quality, were lower than those of Idaho 377s (2438 cP), which like Otis, is a partial waxy type, and were significantly higher than Macon (1999 cP), a normal starch type. Mixograph water absorption for Otis (62.1%) was similar to Idaho 377s (62.3%), and Macon (61.8 %). The dough mixing time for Otis (3.1 min) was significantly shorter than Macon (4.8 min) and Idaho 377s (4.4 min). Average loaf volume for Otis (963 cm<sup>3</sup>) was smaller than Macon (1031 cm<sup>3</sup>) and larger than Idaho 377s (930 cm<sup>3</sup>). Alkaline noodle color stability, expressed as the brightness (L\*) value of a noodle sheet stored at room temperature for 24 hours, were comparable for Otis (24 hr L\*=80.7), Macon (24 hr L\*=81.1), and Idaho 377s (24 hr L\*=81.9).

Seed of Otis 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. Small quantities may be obtained for research purposes by contacting the National Plant Germplasm System. U.S. Plant Variety Protection status for this cultivar is pending.

### References

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- Kidwell, K.K., V.L. DeMacon, G.B. Shelton, J.W. Burns, B.P. Carter, C.F. Morris, X.M. Chen, and N.A. Bosque-Pérez. 2003. Registration of 'Macon' Wheat. *Crop Sci.* 43:1561-1563.

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

Ralph P. Cavalieri  
Director, Washington Agricultural Research Center  
Washington State University  
Pullman, WA 99164

8/30/05  
Date

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

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

7/25/05  
Date

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

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

5/2/05  
Date

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

Judith B. St. John  
Administrator, USDA Agricultural Research Service  
Washington, D.C.

8/19/04  
Date

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Department of Crop and Soil Sciences

Mr. Jerry Robinson  
WA State Crop Improvement Asso.  
WSU Seed House  
Pullman, WA 99164-6420

February 4, 2005

Dear Jerry,

This letter is to provide WSCIA with a supplemental description for the hard white spring wheat variety "Otis". The variety description for Otis should include a tolerance for red seed. Otis contains a naturally occurring red wheat variant that was observed in 2003 breeder seed at 4 red seed per pound, and in the 2004 foundation seed at 5 red seed per pound. Variant estimates were determined by personnel from the Washington State Seed Laboratory through visual observation during grading. In two NaOH screenings conducted by WSCIA, 5 and 3 red seed per pound, respectively, were detected. Please amend the Otis variety description to include a "red wheat variant not to exceed 10 per pound in all classes of certified seed".

Sincerely,



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

cc. R. Cavalieri  
J. Burns