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 ZAK (PI607839)
A SOFT WHITE SPRING WHEAT CULTIVAR

The Washington Agricultural Research Center, Agricultural Research Service, United States Department of Agriculture, Idaho Agricultural Experiment Station and Oregon Agricultural Experiment Station announce the joint release of 'Zak', a soft white spring (SWS) wheat (*Triticum aestivum L.*). K.K. Kidwell, Washington State University's Spring Wheat Breeder and Geneticist, selected Zak as an F_5 head row from a cross generated by Dr. C.F. Konzak, emeritus professor. Zak was released as a replacement for 'Wawawai' in the intermediate to high rainfall (>457 mm of average annual precipitation), non-irrigated wheat production regions of the US Pacific Northwest based on its tolerance to the Hessian fly, high grain yield and superior end-use quality.

Zak, tested under the experimental designations WA007850, W9400154 and K89792, is a $F_{4:5}$ head row selection derived from the cross PAVON "S"/5/PI167822/CI13438 113-6//IDAED/MARFED 68-5/4/LEMHI 66/3/YAKTANA 54A*4//NORIN 10/BREVOR/6/WALLADAY/7/PI506355/8/TREASURE. The following modified

pedigree-bulk breeding method was used to advance early generation progeny. Bulked seed (30 g) from several F_1 plants, was used to establish an F_2 field plot. Approximately 100 heads were selected at random from individual F_2 plants, and a 40 g sub-sample of seed was used to establish a single F_3 plot. Seed from the F_3 plot was bulk harvested, then a 60 g sub-sample was used to establish an F_4 field plot. Single heads from 150 F_4 plants were threshed individually to establish F_5 head row families. Following selection for general adaptation, plant height and grain appearance, seed from 30-50 plants within each selected head row was bulk harvested to obtain F_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 Lind Dryland Experiment Station in Lind, WA.

Zak is an intermediate height, single-gene semidwarf with lax, fusiform heads with white awns and mid-season maturity. It has medium length, white glumed spikes with midlong to long kernels that are white, soft, and ovate. Seed of Zak has a midsize germ with a narrow, mid-deep crease, rounded cheeks and a short, non-collared brush. Among the major pests of spring wheat in the Pacific Northwest, USA, Zak has non-race-specific, high-temperature, adult plant resistance to stripe rust (caused by *Puccinia striiformis* Westend.) to races common in North America, and also has moderate adult-plant resistance to leaf rust (caused by *P. recondita* Rob. ex Desm.). Zak is tolerant to the Hessian fly (*Mayetiola destructor* (Say)) but susceptible to the Russian wheat aphid (*Diuraphis noxia* (Mordvilko)).

Zak was evaluated in replicated field trials under fallow, non-irrigated annual crop and irrigated conditions in Washington, Oregon and Idaho from 1995 to 2000. Grain yields of Zak typically equal or exceed those of other soft white spring wheat entries in non-irrigated as well as irrigated field production. In 53 tests conducted over 4 years in Washington State, the grain yield average of Zak was 4470 kg ha^{-1}, and Zak produced from 67 to 739 kg ha^{-1} more grain than 'Wawawai' (4352 kg ha^{-1}), Alpowa (4389 kg ha^{-1}) and 'Penawawa' (4199 kg ha^{-1}), depending on variety and location. Grain volume weight of Zak averaged 773.5 g l^{-1}, which was 10.3 to 16.7 g l^{-1} lower than those of Wawawai (787.6 g l^{-1}) and Alpowa (785.1 g l^{-1}), and 1.3 to 10.3 g l^{-1} lower than Penawawa (777.3 g l^{-1}). Thousand kernel weight averages of Zak, Wawawai, Alpowa and Penawawa were 42.6 g, 45.0 g, 37.3 and 41.9 g, respectively. The average plant height of Zak was 89 cm, and Zak was 5 cm shorter than Wawawai (94 cm), equal to Alpowa (89 cm) and 5 cm taller than Penawawa (84 cm), depending on location. Lodging percentages of Zak were lower than those of Wawawai and comparable with those of Alpowa and Penawawa. Zak headed 1 to 2 days later than Wawawai (168 julian days), on the same date as Penawawa (170 julian days) and 1 to 2 days earlier than Alpowa (171 julian days).

In tests conducted by the USDA-ARS Western Wheat Quality Laboratory (WWQL) in Pullman, WA using grain produced in breeding and commercial variety testing trials in Washington State from 1994 through 1999, protein content of Zak (10.3 %) was consistently lower than the soft white checks Wawawai (10.7 %), Alpowa (10.4%) and Penawawa (10.5 %). Flour yield of Zak (69.5 %) was higher than Wawawai (68.9 %), Alpowa (68.3 %) and Penawawa (67.1 %), whereas flour ash content for Zak (0.37) was higher than that for Wawawai (0.32) and Alpowa (0.35) but lower than that for

Penawawa (0.40). Zak had a higher average milling score (86.1) than Alpowa (85.4) and Penawawa (80.8) but lower than Wawawai (88.5). Average cookie diameter for Zak (9.6 cm) was larger than Wawawai (9.4 cm), Alpowa (9.3 cm) and Penawawa (9.4 cm), and average sponge cake volume of Zak (1295 cc) was larger than Wawawai (1251 cc) and Penawawa (1283 cc) when the end-use quality of grain samples collected across production region were compared.

Breeder and foundation seed of Zak will be maintained by the Washington State Crop Improvement Association under supervision of the Department of Crop and Soil Sciences and the Washington State Agricultural Research Center. The proposed release date for publicity shall be on the date of final signature of the release notice. Genetic material of this release was deposited in the National Plant Germplasm System where it is available for research purposes, including the development and commercialization of new varieties. PVP status of this variety is pending.

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Oregon State University
Corvallis, Oregon

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

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

February 12, 2001

Dear Greg,

The purpose of this letter is to provide a supplemental description for the soft white spring wheat variety 'Zak'. After reviewing the history of breeder and foundation seed production, it appears that there is a red wheat variant that should be described for the variety. This variant was found at the level of 4 seed per 1000 grams in the breeder seed and from 1 to 3 seed per 1000 grams in various lots of the first foundation seed production. To account for variation in sampling and testing procedures, the variant will be described as follows: Zak soft white spring wheat contains a seed variant, which may be visually or chemically identified as red wheat. Not more than 5 seed per pound of this red wheat variant may be present in classes of certified seed.

The Washington State Crop Improvement Association does an outstanding job of producing high quality, pure foundation seed of WSU wheat varieties, and I sincerely appreciate your efforts to maintain this high standard of excellence. Please contact me at your convenience if you have any further questions concerning this supplemental description of Zak.

Sincerely,

Kimberlee K. Kidwell

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

cc. R. Cavalieri
J. Burns