

Registration of 'Bauermeister' Wheat

'Bauermeister' (J981107, WA007939) hard red winter wheat (HRW) (*Triticum aestivum* L.) (Reg. No. CV-1002, PI 634717) was released in 2005 by the Agricultural Research Center of Washington State University (WSU) in cooperation with the USDA-ARS. Bauermeister is a semidwarf cultivar adapted to the low- to intermediate-rainfall (< 460 mm average annual precipitation) HRW wheat growing regions of Washington State. It was released for its high grain yield, disease resistance, and excellent quality attributes. Bauermeister is named in honor of Dale and Dan Bauermeister, wheat producers from Connell, WA. The Bauermeisters are strong supporters of WSU wheat research and have cooperated for many years toward the improvement of winter wheat for the low rainfall areas of Washington.

Stephen Jones selected Bauermeister ['TAM200' (PI 578255)/3*Eltan' (PI 536994)] in the BC₂F₆. TAM200 (Worrall et al., 1995) is a HRW cultivar and Eltan (Peterson et al., 1991) is a soft white winter (SWW) cultivar broadly adapted to the Pacific Northwest. The original cross and subsequent backcrosses were made in the WSU Wheat Plant Growth Center. Seed from each BC₂F₁ plant was used to establish a BC₂F₂ field plot (84 total) at Pullman, WA in 1998. Following selection for general adaptation and seed color, 42 BC₂F₃ plots were planted. Based on general adaptation, seed color, maturity, resistance to stripe rust (caused by *Puccinia striiformis* Westend. f. sp. *tritici*), grain yield, test weight, and milling and baking quality, 13 lines were selected and planted as BC₂F₄ replicated plots in two advanced field nurseries in eastern Washington. Using similar selection criteria, 11 BC₂F₅ lines were planted in five replicated nurseries across eastern Washington in 2001, of which two were advanced in 2002 and tested at 16 eastern Washington locations as BC₂F₆ breeding lines. In addition, approximately 100 single spikes from each of the two lines were planted as head rows at Pullman, WA for selection of rows that were homozygous for seed color and hardness. One line (J981107) emerged from the field nurseries as superior in grain yield and test weight. All of its 100 BC₂F₆ head rows were harvested and seed hardness (AACC, 2003, Method 55–31) was determined from a subsample for each head row. BC₂F₇ seed from the 32 head rows of J981107 that were hard (> 70 single kernel hardness) and red were then bulked and planted in replicated commercial field trials as WA007939. In 2003, approximately 2000 BC₂F_{7,8} spikes were selected from a pure seed increase of WA007939 at Pullman, WA and grown as individual head rows, under irrigation, at Othello, WA. Those head rows were evaluated and selected for phenotypic uniformity, maturity, and resistance to disease. Non-conforming rows (< 10%) were removed before harvest and breeder seed of Bauermeister was produced from the bulked BC₂F_{7,9} seed.

Bauermeister is an intermediate height, semi-dwarf HRW cultivar that is phenotypically and agronomically very similar to Eltan for every trait other than its red seed color and hardness. It has an awned, lax spike with long midwide, white glumes. The kernels are elliptical, red, hard, and midlong, with a mid-wide, mid-deep crease and a mid-sized medium length brush. The germ is mid-wide.

Bauermeister exhibits resistance to snow mold (caused by *Typhula idahoensis* Rems and *T. ishikariensis* Imai.) and stripe rust similar to Eltan. Bauermeister was tested for stripe rust in field nurseries with natural infection across Washington State from 2002 to 2004. Stripe rust was well developed in all locations in each of the 3 yr. In most tests, Bauermeister had infection types (ITs) from 0 (no symptom) to 5 (moderately resistant). In a few tests it had IT 8 (moderately susceptible) or

mixed ITs, but severity was never greater than 40%. In 2005, Bauermeister was included in an experiment of randomized split-block design with 24 winter wheat cultivars with four replications to determine yield losses caused by stripe rust and responses to fungicide application. The plots were planted on October 24, 2004 and fungicide treated plots were sprayed with 292 mL ha⁻¹ propiconazole (Tilt) on May 19, 2005 when most of the cultivars were at the jointing stage and the susceptible check genotype, 'PS 279' had 20% stripe rust severity. Stripe rust severities were recorded three times on 21 May (the jointing stage), 7 June (the early heading stage), and 21 June (the early flowering stage). The area under disease progress curve (AUDPC) was calculated for each replication of each cultivar for fungicide treated and untreated plots. Grain of each plot was measured at harvest on August 15 when the grain was naturally dry. Bauermeister had mean AUDPC values of 438 for the untreated and 100 for treated plots, which were not different from the values of a resistant cultivar Eltan (441 for untreated and 118 for treated plots) and much lower than the susceptible HRW cultivar, Hatton, (CItr 17772) (2473 for untreated and 776 for treated plots) ($P < 0.06$). Similarly, Bauermeister produced a mean yield of 5711 kg ha⁻¹ for untreated and 5913 kg ha⁻¹ for treated plots, which were not significantly different from Eltan (5375 kg ha⁻¹ for untreated and 5644 kg ha⁻¹ for treated plots) but significantly different from the mean yields of Hatton (1881 kg ha⁻¹ for untreated and 4435 kg ha⁻¹ for treated) ($P < 0.05$). Thus, Bauermeister has a level of stripe rust resistance equivalent to that of Eltan and much better resistance than those of Hatton and other currently grown cultivars (data not shown) in the field. In greenhouse seedling tests performed under low temperature cycle (diurnal temperature gradually changing from 4°C at 2:00 am to 20°C at 2:00 pm), Bauermeister showed resistance to race PST-21, intermediate resistance to races PST-41 and 95, and susceptibility to races PST-17, 37, 43, 45, 58, 78, 79, 97, 98, 100, and 105 of *Puccinia striiformis* f. sp. *tritici*. In greenhouse adult-plant tests performed under high temperature cycle (diurnal cycle gradually changing from 10°C at 2:00 am to 35°C at 2:00 pm), Bauermeister had resistant to moderately resistant reactions to races PST-37, 43, 58, 97, 98, and 100 of *Puccinia striiformis* f. sp. *tritici*. The contrasting reactions of the adult-plant vs. seedling tests indicate Bauermeister has non-race specific high-temperature adult-plant resistance, which has proven to be durable in many wheat cultivars, including Eltan, grown in the Pacific Northwest (Chen, 2005). Bauermeister showed moderate resistance to dwarf bunt (caused by *Tilletia controversa* Kühn) in tests under high disease pressure with a pathogenic race composite having virulence to the bunt resistance genes *Bt1*, *Bt2*, *Bt3*, *Bt4*, *Bt6*, *Bt7*, *Bt9*, *Bt10*, *Bt14*, and *Bt15* in inoculated field trials in 2003/2004. From 2002–2004, visual disease assessments in three inoculated field trials indicate Bauermeister is moderately susceptible to Cephalosporium stripe (caused by *Cephalosporium gramineum* Nis. & Ika), similar to Eltan, and moderately susceptible to eyespot foot rot (caused by *Tapesia yellundae* Wallwork and Spooner) slightly better than Eltan. In naturally infested fields, 2002–2004 visual disease assessments show Bauermeister slightly susceptible to powdery mildew (caused by *Blumeria graminis* (DC) E. Speer f. sp. *tritici* Em. Marchal) and resistant to leaf rust (caused by *Puccinia triticina* Eriks).

Grain yields of Bauermeister typically exceed ($P < 0.1$) those of HRW cultivars Finley (PI 586757) (Donaldson et al., 2000), Weston (CItr 17727) and Buchanan (PI 532994) (Donaldson, 1993). In 13 rain-fed trials conducted from 2002 to 2004 in the low- to intermediate-precipitation zones (< 460 mm annual precipitation) in Washington, grain yields of Bauermeister, Finley, Buchanan and Weston were 4038 kg ha⁻¹, 3568 kg ha⁻¹,

3514 kg ha⁻¹, and 3595 kg ha⁻¹, respectively. In the same yield trials, grain volume weight of Bauermeister (760 g L⁻¹) was similar to Buchanan (758 g L⁻¹), and slightly less ($P < 0.1$) than Finley (783 g L⁻¹) and Weston (783 g L⁻¹). Bauermeister typically heads about 140 d of year, 2 d later ($P < 0.1$) than Finley. The average thousand-kernel weight of Bauermeister (35.3 g) is less ($P < 0.1$) than Weston (40.4 g), Buchanan (44.5 g) and Finley (47.0 g). The average plant height of Bauermeister is 92 cm, shorter ($P < 0.1$) than Finley (110 cm), Weston (106 cm) and Buchanan (102 cm). Its coleoptile length (73mm) is slightly less ($P < 0.1$) than Finley (81 mm), but field observations note it emerges 1–2 d earlier ($P < 0.1$) than Finley and that final stand counts are similar. Visual observations of straw strength/lodging tolerance indicate it is equal to Eltan in the absence of eyespot foot rot, but stronger than the typical tall HRW variety. In artificial freeze tests conducted in growth chambers at the WSU Wheat Plant Growth Center, the LT₅₀ (temperature at which 50% of fully hardened plants survived) of Bauermeister was -13.6°C, similar to Finley (-13.7°C) and Weston (-13.5°C).

Milling and baking evaluations were conducted by the USDA-ARS Western Wheat Quality Lab in Pullman, WA using grain produced in rain-fed breeding and commercial variety testing trials in Washington State from 2003 and 2004. Results from quality assessments were averaged over all trials in which Bauermeister and the cultivars Finley ($n = 19$), Hatton ($n = 8$) and Weston ($n = 6$) were grown. Bauermeister had a milling yield of 64.6 g kg⁻¹, similar to Weston (65.6 g kg⁻¹) and Hatton (63.9 g kg⁻¹), but less than ($P < 0.05$) Finley (66.7 g kg⁻¹). Bauermeister's dough mix time (3.6 min.) is longer ($P < 0.05$) than Weston (2.4 min), Hatton (2.8 min.) and Finley (2.9 min.). In head to head comparisons, Bauermeister is similar ($P < 0.05$) to Hatton for flour protein concentration (107 g kg⁻¹ vs. 110 g kg⁻¹ respectively), and loaf volume (866 mL, vs. 892 mL, respectively). Bauermeister's flour protein concentration (111 g kg⁻¹) is less than ($P < 0.05$) Finley (116 g kg⁻¹) and Weston (115 g kg⁻¹) as is its loaf volume (878 mL vs. 966 mL and 961 mL, respectively). It is surmised, based on flour yield and flour protein data (although not

confirmed) that Bauermeister contains the 1A/1R translocation found in TAM200.

Contact the corresponding author for all seed requests. No seed will be distributed without written permission from Washington State University for 20 yr from the date of release by Washington State University (2005), at which time seed will also be available from the National Plant Germplasm System (NPGS).

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References

- AACC, American Association of Cereal Chemists. 2003. Method 55–31. *In* Approved Methods of the American Association of Cereal Chemists—10th ed. St. Paul, AACC International.
- Chen, X.M. 2005. Epidemiology and control of stripe rust on wheat. *Can. J. Plant Pathol.* 27:314–337.
- Donaldson, E. 1993. Registration of 'Buchanan' wheat. *Crop Sci.* 33:878.
- Donaldson, E., B. Sauer, S.R. Lyon, C.F. Morris, and R.F. Line. 2000. Registration of 'Finley' wheat. *Crop Sci.* 40:1197.
- Peterson, C.J., Jr., R.E. Allan, G.L. Rubenthaler, and R.F. Line. 1991. Registration of 'Eltan' wheat. *Crop Sci.* 31:1704.
- Worrall, W.D., E.C. Gilmore, Jr., K.B. Porter, and M.E. McDaniel. 1995. Registration of 'TAM-200' wheat. *Crop Sci.* 35:1223.

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