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RELEASE OF FINCH
A SOFT WHITE WINTER WHEAT

The Agricultural Research Service, United States Department of Agriculture, Washington Agricultural Research Center, Oregon State University Agricultural Experiment Station, and University of Idaho Agricultural Experiment Station announce the joint release of 'Finch' a soft-white winter (SWW) wheat variety. It is being proposed for release because of its combination of yield potential and disease resistance with the excellent end-use quality characteristics desired for soft white wheat in the PNW. It is being targeted to medium rainfall production zones primarily in Washington state, northeast Oregon, and north Idaho. It possesses the *Pch1* gene, derived from Madsen, which confers resistance to strawbreaker foot rot (causal agent *Tapesia yallundae* Wallwork & Spooner = *Pseudocercosporella herpotrichoides* (Fron) Deighton).

Pedigree:
Finch is a composite of single head selections made in the F_{14} and F_{16} generations from a plot of WA7853 at Pullman, WA. The pedigree of WA7853 is 'Dusty'//WA7164/'Dusty' (Peterson et al., 1987). The pedigree of WA7164 is 'VPM1'/'Moisson 951'//'Yamhill'/'Hyslop'. The cross was made under the direction of R.E. Allan in 1985. The population was advanced without selection to the F_2 generation as 85X619.

Generation Advance:
WA7853 was a reselection in the $F_{2:7}$ generation from a plot of 91PS81 which later bore the experimental name of WA7794. WA7794 was derived from a single F_2 head selection and was segregating for chaff color. In 1992, thirty nine heads were selected for uniformity of head type, maturity, and height from 91PS81. Progeny from a single head row were selected in 1993, advanced, and designated A96118. From 1995-2001, A96118 was evaluated in the USDA replicated yield nurseries in eastern Washington and northern Oregon. It was also evaluated in the ARS strawbreaker foot rot yield loss trial at Pullman in 1995-2000 and in the ARS Cephalosporium stripe yield loss nursery at Pullman in 1996-1998.

In 1997-2001, A96118 was named WA7853; and it has been evaluated in the Washington State University soft white winter wheat variety trials from 1998-2000 for a total of 52 location-years. Finch has been entered into the Oregon and north Idaho winter cereals variety trials in 2001.

Agronomic Yields:
Finch has performed well in small plot ARS yield trials throughout eastern Washington and northeastern Oregon. Over 44 location-years in eastern WA and northeast OR from 1997-2000, the average yield of Finch (5582 kg/ha, 83 bu/ac) was 5% better than Madsen, Eltan (both 5313 kg/ha, 79 bu/ac) and 9% better than Stephens (5111 kg/ha, 76 bu/ac). The yield advantage of Finch over Madsen is more evident in the low (below 28cm annual rainfall) and intermediate rainfall locations (28-43 cm annual rainfall). The yield of Finch was 5581 kg/ha (83 bu/ac) and 3968 kg/ha (59bu/ac) or 7 and 8% better than yields of Madsen in intermediate and low rainfall locations, respectively. The yields of Madsen were 5178 kg/ha (77 bu/ac) and 3698 kg/ha (55 bu/ac) in those same locations. In the ARS trials, Finch has consistently performed better than the check cultivars at low and at intermediate yielding locations. The test weight of Finch has been high, averaging 798.93 kg/m^3 (62 lb/bu), 12.89 kg/m^3 (1 lb/bu) better than that of Madsen and 25.78 kg/m^3 (2 lb/bu) better than Eltan.

Over 52 location-years of evaluation in the Washington State University soft white winter wheat variety trials from 1998-2000, yields of Finch were 6538 kg/ha (97.2 bu/ac) or 4% better than Eltan, 8% better than Stephens, and equal to Madsen and Rod. The test weight of Finch was 785.65 kg/m3 (60.1 lb/bu) or 2% heavier than that of Madsen, 3% heavier than Eltan and Stephens, and 4% better than Rod.

Current Seed Increase Status:
In 1998, seed from individual $F_{7:13}$ spikes of WA7853 was threshed and planted in head rows at Othello, WA under irrigation to begin the breeder's seed increase of Finch. Those head rows were evaluated and selected for uniform maturity, height, head type, color, and resistance to disease. Grain harvested from individual selected head rows was bulked to form the $F_{14:15}$ breeders seed. In 2000, approximately 2000 $F_{7:15}$ spikes were selected from a pure seed increase of WA7853 at Pullman, WA. Seed from individual $F_{7:16}$ spikes was threshed and planted in individual head rows at Othello, WA under irrigation to begin the breeder's seed increase. Those head rows were evaluated and selected for uniform maturity, height, head type, color, and resistance to disease. Grain harvested from individual selected head rows was bulked to form the

$F_{16:17}$ breeders seed of Finch. In 2002, seed from the $F_{14:15}$ breeders seed and the $F_{15:16}$ breeders seed bulks will be combined to produce seed for the Foundation generation of Finch.

Description of Variety:
Finch is a soft white winter wheat with an appearance most similar to Madsen. Coleoptiles and auricles lack anthocyanin. Juvenile plant growth is semi-erect. Plant color at boot stage is green. Internodes are hollow. Finch is late maturing with an average heading date of 157 days from the beginning of the year, 1 day later than 'Eltan' and 6 days later than Madsen. It is a semidwarf with a height equal to Madsen and Eltan (87cm or 34 in averaged over all locations from 1997-2000). Lodging resistance of Finch has been good, similar to Madsen (less than 1% over all locations).

Spikes are lax, awned, and fusiform, inclined at maturity Glumes are glabrous, white, long and midwide with oblique shoulders and narrow, acuminate beaks, 2-3mm in length. Anther color is yellow. Kernels are soft and white; 6-8mm in length 3-4mm wide. Kernel shape is oval with sides tapering at both ends, texture is smooth, germ is medium to large, rounded to oblong, brush is light, germ angle is low, cheeks are rounded to sharp, crease is straight and flared at tips. Kernel weight has ranged between 32 and 35g per thousand seed depending on the harvest season, similar to that of Madsen and Eltan but less than Stephens.

Disease Resistance:
Finch is resistant to strawbreaker foot rot (caused by *Tapesia yallundae* Wallwork & Spooner) and carries the *Pch1* gene for resistance derived from *Aegilops ventricosa* Tausch. (Doussinault et al., 1983) and present in the breeding lines and cultivars VPM, Roazon, Madsen, and others. The *Pch1* gene is located on chromosome 7DL and can be identified through its linkage with the *Ep-D1b* band of endopeptidase (McMillin et al., 1986). Yield losses due to foot rot were 10% for Finch and Madsen as compared with 25% for the susceptible cultivar Eltan, averaged over four years in the inoculated ARS strawbreaker foot rot yield loss nursery at Pullman. Lodging due to foot rot was less than 1% for WA7853 in the inoculated nursery.

Finch is moderately resistant to stripe rust (caused by *Puccinia striiformis* Westend. f. sp. *tritici*). Only traces of stripe rust were detected in a nursery at Pullman that had been inoculated with stripe rust races CDL17, 37, and 43, 45 (virulent on 'Twin', 'Stephens', 'Tres', and 'Hyak', respectively). Very slight disease (infection type 2) was observed under natural infection at Walla Walla. Finch probably possesses high temperature adult plant resistance to stripe rust at a level similar to that of 'Rod'. At Mt. Vernon, WA under natural infection and greater disease pressure than is experienced in the wheat growing areas east of the Cascades, Finch exhibited infection types from 5-8 with less than 10% of leaf area infected.

Finch has a low level of resistance to leaf rust (caused by *Puccinia tritici* Eriks). It was rated moderately susceptible to moderately resistant under natural infection at Pullman in 1997 but rated resistant at Walla Walla in 1998. Finch does not possess the *Lr37*, *Sr38*, *Yr17* gene complex on 2AS derived from VPM (Bariana & McIntosh, 1993) that is present in Madsen.

Finch was grown in a nursery that suffered from a severe natural infection of Cephalosporium stripe (caused by *Cephalosporium gramineum* Nisikado & Ikata in Nisikado *et al.*). In this nursery, the yields of Finch were 4505 kg/ha (67 bu/ac), slightly higher than Madsen and Eltan 3698 kg/ha (55 bu/ac)and 33% better than the susceptible cultivar 'Stephens' 2958 kg/ha (44 bu/ac). Visual rating for symptoms of Cephalosporium stripe was conducted at 4 locations (rated 1.7 on a 1-5 scale with the susceptible cultivar Stephens rating 3.1) and were similar to Madsen and Eltan.

Finch was rated as moderately resistant to Powdery Mildew (caused by *Erysiphe graminis* DC. f. sp. *tritici* Em.Marchal) at one location (2% leaf area infected where the susceptible Temple rated 33%). Its has exhibited moderate symptoms of physiological leaf spot, similar to Madsen. Its dwarf bunt (caused by *Tilletia controversa* Kühn in Rabenh Ergot) reaction is unknown. It is susceptible to Hessian Fly (*Mayetiola destructor* (Say) (*Phytophaga destructor*) (Say)) and snow mold (caused by *Typhula idahoensis* Remsberg *T. incarnata* F) based on its pedigree. Severe symptoms of Barley Yellow Dwarf virus were noted under natural infection at Hermiston in 2000.

Emergence:
Coleoptile and first leaf length of Finch are slightly longer than Madsen but not significantly. In 1998 and 1999, after 21 days, emergence of Finch under deep (>15cm, >6 in) sowing has averaged 16% of 100 seeds sown, compared to 25% for Edwin, 10% for Eltan, and 4.5% for Coda.

Cold Hardiness
The LT_{50} ratings of Finch (–11°C) have been similar to Stephens. Even so, the spring stand and vigor ratings at Pullman and Lind in 1999 were 76% and 6.5 (1-10 scale with 10 being the best) after the severe winter of 1999. These ratings were similar to Madsen and better than Stephens which had a spring stand of 67% and a vigor rating of 5.3. Eltan, the most winter hardy soft white wheat in Washington, had a spring stand rating of 83% and a vigor rating of 7.8 that year.

Quality:
Finch was milled at the USDA-ARS Western Wheat Quality Laboratory in Pullman, WA in experimental trials for a total of 57 nurseries over four years. The end use quality of Finch is excellent. The end use quality of Finch was compared with soft white winter wheat varieties Eltan, Madsen, and Stephens through t-test analyses. The grain test weight of Finch is greater than Eltan, Madsen, and Stephens (812, 802, 802, and 791 kg/m^3 for Finch, Eltan, Madsen, and Stephens, respectively). Grain protein is less than Madsen and Stephens and equal to other checks (90, 90,97, and 97 g/kg for Finch, Eltan, Madsen, and Stephens, respectively). The milling performance of Finch is similar to Eltan, Madsen, and Stephens (milling score of 85.6, 85.6, 85.2, and 85.0 for Finch, Eltan, Madsen, and Stephens respectively). Finch has statistically superior test weight, flour yield, and break flour yield but the flour ash of Finch is higher than that of Eltan, Madsen, and Stephens. Starch is a non-waxy, low amylopectin type. The mixograph water absorption is lower than Eltan and Madsen, equal to Stephens (53, 54, 54, and 53 % for Finch, Eltan, Madsen, and Stephens respectively). The cookie spread is wider than Madsen and Stephens and similar to Eltan (9.4, 9.4, 9.1, and 9.2 cm for Finch, Eltan, Madsen,

and Stephens respectively). The flour swelling volume of Finch is lower than that of Eltan, and Stephens and equal to Madsen. The flour RVA is significantly lower than that of Eltan, Madsen, and Stephens. The improved baking quality over Madsen justifies its release on quality considerations alone.

Weaknesses:

The LT_{50} value for Finch is lower than other major PNW cultivars. This value is difficult to interpret in light of positive yield data. We suspect that the superior disease resistance and perhaps the late maturity of Finch is protecting it against severe winter injury. In years with mild winters such as 2000, Finch has a significant yield advantage over existing common soft wheat cultivars. In years with more severe winters, its performance is equal to that of Madsen. The severe winter of 1999 favored the very hardy cultivar Eltan. The late maturity of Finch may limit its use in northeast Oregon when terminal drought shortens the grain fill period. The threshability of Finch using commercial combines is currently unknown. The rate of straw breakdown of Finch is also unknown at this time. Growers who use conservation tillage have complained that Madsen has tough straw.

Targeted Production Zone:

Finch is best suited to the low to intermediate rainfall zones of Washington state and north Idaho south of WA State Route 2. Finch is a compliment to Madsen with a 5% yield advantage, slightly better emergence, more consistent yields in low and intermediate rainfall zones, better test weight, and significantly better end use quality.

Seed Availability:

Finch will be released as a nonexclusive public variety to certified seed producers through the Washington State Crop Improvement Association. Finch will be sold as a class of Certified seed. The generation sequence of seed production is Breeders, Foundation, Registered, and Certified. Plant Variety Protection under the Plant Variety Act, Public Law 91-577 with the Title V exclusion has been applied for. Finch has been deposited in the National Small Grains Germplasm Collection. Small samples of seed are available from the breeder for research purposes.

USDA-ARS endorses the release of 'Finch' and has signed below.

Administrator, Agricultural Research Service
U.S. Department of Agriculture