

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

**Proposal for release of ORLD112334  
Soft White Winter Wheat**

ORLD112334 is a common soft white winter wheat (*Triticum aestivum* L.) co-developed by Oregon State University (OSU) and Limagrain Cereal Seeds LLC (LCS) that is being proposed for release based on its yield potential, disease resistance and adaptation to growing conditions in the wheat production areas of Oregon, Washington and Idaho. It is targeted as a replacement cultivar in regions where Goetze and LCS ArtDeco were/are grown. The name for ORLD112334 will be decided at a later date by OSU and LCS. The name will be cleared through the USDA prior to a decision.

ORLD112334 is an awned semi-dwarf soft white winter wheat from the cross Goetze/Skiles. 'Goetze' is a soft white winter wheat cultivar developed at Oregon State University with the pedigree MDA38/WRN//E81FR. Skiles pedigree is Dusty/ZGP-4072//Unknown. The initial cross of Goetze to Skiles was made in 2008 by OSU and forty F<sub>2</sub> seed were provided to LCS in fall, 2009 to produce dihaploid lines. Dihaploid lines were returned to OSU in January, 2011 and were planted at the OSU Hyslop research farm in February, 2011 as single rows. The dihaploid nursery was provided supplemental irrigation and was evaluated for stripe rust resistance in June, 2011. Lines showing stripe rust resistance were harvested and planted as single plots in a yield nursery at the Ruggs field nursery east of Pendleton, Oregon in fall, 2011. The dihaploid nursery was evaluated for disease resistance, straw strength, yield and test weight. Lines selected by both OSU and LCS breeders were advanced by entering them into multiple location advanced and elite nursery testing in Oregon, Washington, and Idaho by OSU and/or LCS in fall 2012. Lines in the advance and elite nurseries were evaluated for disease resistance, yield, agronomic performance, and end-use quality by both OSU and LCS. In August, 2013, OSU and LCS breeders met to select lines or potential release candidates to be advanced to the apex nursery for further evaluation. The apex nursery was planted in multiple locations in Oregon, and Washington, and Idaho by OSU and LCS. The lines in the apex nursery were evaluated for disease resistance, yield, agronomic performance, and end-use quality by both OSU and LCS. In August 2014, OSU and LCS breeders met to select lines for potential release. ORLD112334 was advanced to breeder seed production. In addition, ORLD112334 was entered into extension testing in Oregon, Washington and Idaho in fall, 2014. Based on the yield, agronomic performance, and disease resistance of ORLD112334 in these trials it was decided to release ORLD112334.

ORLD112334 is best adapted to the intermediate to high rainfall/irrigated production regions in Oregon, Washington and Idaho. ORLD112334 is a winter wheat that requires vernalization to initiate flowering. Based on response in the field and molecular markers, ORLD112334 is photoperiod sensitive. Agronomically, ORLD112334 is similar to Goetze in both height and heading date (Tables 1 and 2). ORLD112334 has good straw strength that is equal or better than Goetze based on lodging scores (Table 1 and 2).

In Oregon, ORLD112334 was evaluated in the Apex Nursery (Table 1) in 2014 and in the Oregon Elite Extension Trial in 2015 (Table 2). In the Apex Nursery ORLD112334 was higher yielding than Goetze (98.6 bu/ac and 88.1 bu/ac respectively) and was similar to Skiles for yield (98.6 bu/ac and 100.2 bu/ac respectively). In terms of mean test weight, ORLD112334 had a mean test weight (lbs/bu) of 58.9 that was greater than any of cultivars except for Skiles. ORLD112334 also had the lowest mean grain protein (8.6) of any of the lines in the Apex Nursery. In the Oregon Elite Extension Trial, ORLD112334 had an equal or higher yield than all of the controls except for LCS ArtDeco. In comparison to Skiles and Goetze, ORLD112334 was 11 to 12 bu/ac higher yielding (98.3) than either Skiles or Goetze (87.7 and 86.6 respectively). ORLD112334 had a mean test weight (58.9 lbs/bu) that was equal to or greater than all the check cultivars in the trial. ORLD112334 was also evaluated in 2014 and 2015 by LCS in their Washington nurseries (Table 3 and 4). In 2014, LCS grew the equivalent of the Apex Nursery as part of the collaborative breeding effort between OSU and LCS (Table 3) in Idaho, Oregon and Washington. ORLD112334 had a similar mean yield to SY Ovation and Bobtail in the 2014 nurseries with a test weight averaging 59.6 lbs/bu across locations. ORLD112334 was again evaluated by LCS in trials in the Pacific Northwest in 2015 (Table 4). ORLD112334 had the fourth highest mean yield behind SY Ovation, LCS ArtDeco and ORLD113092 (Norwest Duet) and a mean test weight similar to LCS ArtDeco and greater than Bobtail or Stephens. In 2015, ORLD112334 was grown by Northwest Grain Growers in two locations in Washington, one in a high rainfall site near Walla Walla, WA and the other a low rainfall / dryland site near Eureka, WA (Table 6). ORLD112334 was one of the three top yielding lines at both locations and had the highest mean test weight when averaged over the two sites. In Idaho, ORLD112334 was evaluated in the 2015 Winter Wheat Extension trials in both northern (Table 7) and southeastern (Table 8) Idaho. In the northern Idaho trials, ORLD112334 performed well under the rainfed conditions in all four locations (Tammany, Genesee, Moscow and Tensed, Idaho) having the third highest mean yield coming in behind only the cultivars LCS ArtDeco and Norwest Duet (Table 7). For test weight, ORLD112334 had a higher average test weight than all the check cultivars. ORLD112334 appears to be well adapted to the growing conditions in this region of Idaho. In the southeastern Idaho trials ORLD112334 performed well but average yield was lower than all the check cultivars except for Stephens. While its mean test weight (55.4 lbs/bu) was low, it was greater than any of the test weights of the check cultivars (Table 8).

End-use quality of ORLD112334 was tested by the USDA-ARS Western Wheat Quality Laboratory in collaboration with the OSU wheat breeding program in 2015 on seed harvested

from the Apex nurseries in 2014 (Table 8 and 9). Comparing ORLD112334 to Goetze and three cultivars of varying levels of quality (Tubbs 06 moderate/low, Kaseberg – high and Bobtail – high), ORLD112334 was intermediate in performance, better than Tubbs 06 and Goetze for most quality parameters while falling below Kaseberg and Bobtail for kernel hardness (higher score less favorable), percent break flour, and cookie diameter. ORLD112334 had an intermediate percent flour ash and percent flour yield. In terms of baking quality, ORLD112334 was acceptable to good for sugar snap cookie diameter, better than both Tubbs 06 and Goetze but below Kaseberg and Bobtail. For sponge cake volume ORLD112334 was below Kaseberg but better than Tubbs 06 and Bobtail. In terms of solvent retention capacity (SRC) scores (Table 9), ORLD112334 was most similar to Tubbs 06 but with a better score for SRC-lactic acid (higher) and SRC-sucrose (lower) than Tubbs 06. ORLD112334 was similar to Goetze for all four SRC parameters which was expected since Goetze was one of the parents of ORLD112334. The SRC-sucrose score for ORLD112334 is similar to both Bobtail and Kaseberg. The SRC-water score for ORLD112334 is high compared to Kaseberg and Bobtail but is similar to the SRC-water scores for Tubbs 06 and Goetze. In 2015, ORLD112334, ORLD113092 (Northwest Duet) and Skiles were submitted to four wheat quality laboratories for evaluation similar to quality evaluation done for the Pacific Northwest Wheat Quality Council testing. The laboratories were; the OSU Wheat Quality Laboratory, the University of Idaho Wheat Quality Laboratory, LCS Wheat Quality Laboratory and the USDA-ARS Western Wheat Quality Laboratory. In terms of milling, ORLD112334 performed well, having the highest percent break flour yield (31.1%) of the three lines evaluated (Table 10). In terms of baking quality ORLD112334 scored below both Skiles and Northwest Duet for both sugar snap cookie diameter and sponge cake volume except for the cookie bake done at the OSU wheat quality laboratory (Tables 10 and 11). In terms of SRC scores, ORLD112334 performed as it did in 2014, having a higher water, sodium carbonate and sucrose scores than the check cultivar. Overall, ORLD112334 has an intermediate/good level of end-use quality that is better than Tubbs 06 and Goetze, with Goetze being one of the cultivars that ORLD112334 is targeted to replace. ORLD112334 will be evaluated by the PNW Wheat Quality Council in early 2017.

Initial selection of ORLD112334 for stripe rust resistance was done in 2011 when the dihaploid lines were grown as single rows at the Hyslop research farm near Corvallis, Oregon. Only resistant lines were advanced and similar screening was done in 2012, 2013 and 2014 with ORLD112334 showing good resistance each year. In evaluation for stripe rust (*Puccinia striiformis* Westend) resistance in Oregon in 2015 by Chris Mundt, OSU cereal pathologist, ORLD112334 showed resistance to the current stripe rust races present in the Pacific Northwest (Table 13). ORLD112334 showed greater resistance to stripe rust than Goetze and LCS ArtDeco (0%, 48% and 39% respectively) and showed a similar level of resistance as Skiles and Bobtail. In the USDA-ARS stripe rust screening trial in 2015 (Table 14), ORLD112334 showed good stripe rust resistance, similar to Bobtail and Skiles and greater than Goetze. Based on molecular marker data, ORLD112334 carries the *Yr15* resistance gene that was most likely contributed by

Skiles. ORLD112334 appears moderately susceptible to Fusarium crown rot (*Fusarium pseudograminearum*) (Table 15), is susceptible to Septoria leaf blotch (*Septoria tritici* Roberge in Dezmaz), moderately susceptible to Cephalosporium stripe (*Cephalosporium gramineum* Nis. & Ika.), moderately susceptible to barley yellow dwarf virus (BYDV), and moderately susceptible to sharp eyespot (*Rhizoctonia cerealis*) (Table 16). Based on molecular marker data, ORLD112334 does not carry either of the *Pch1* or *Pch2* genes that confer resistance to strawbreaker foot rot (*Oculimacula aciformis* and *O. yallundae*) and is susceptible to strawbreaker foot rot. ORLD112334 is susceptible to soilborne wheat mosaic virus (sbWMV).

In the fall of 2014 a breeder seed increase was produced by Washington State Crop Improvement at Othello, Washington. The field was evaluated for uniformity in spring, 2015 and the field was then bulk harvested. Breeder seed was then planted in February, 2016 in Walla Walla, Washington to produce Foundation and Registered seed. Breeder seed will be maintained by LCS and Washington State Crop Improvement Association (WSCIA). A Plant Variety Protection (PVP) application will be submitted for ORLD112334 without the title 5 option allowing the sale of Registered, Certified or common classes of seed, with royalties on the authorization of OSU and LCS through their respective seed supplier networks. Royalties for ORLD112334 will be split between OSU and LCS based on the terms of the licensing agreement for ORLD112334. Recommended royalty split for ORLD112334 is 50 / 50 with seed being available to both the OSU seed suppliers and LCS seed associates. The cultivar will be co-marketed by OSU and LCS. Certification classes recognized for ORLD112334 will include Foundation, Registered and Certified. A maximum of 1/1000 (0.1%) tall plants (heads two or more head lengths above the crop canopy) will be allowed in all classes of ORLD112334. A maximum of 1/1000 (0.1%) awnless/awnletted plants will be allowed in all classes of ORLD112334. A maximum of 1/1000 (0.1%) bronze or brown chaffed plants will be allowed in all classes of ORLD112334. A maximum of 60 red seed / pound (approximately 60/10,000) in all classes of ORLD112334 will be allowed. Seed of ORLD112334 will be deposited in the USDA National Small Grains Collection in Aberdeen, Idaho. It is requested that the source of this material be acknowledged in future use by wheat breeding and genetics programs.

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