

# Bitterroot Soft White Winter Wheat

by Juliet M. Windes, Chad Jackson, Tom Koehler, Jenny Hansen, Katherine O'Brien, Stephen O. Guy, Brad Brown, and Bob S. Zemetra

'Bitterroot' is a soft white winter wheat (*Triticum aestivum* L.) developed by the Idaho Agricultural Experiment Station and released in 2007. Bitterroot was released for its tolerance to *Cephalosporium* stripe, yield potential, straw strength, and superior end-use quality. Bitterroot is adapted to both irrigated and intermediate to high rainfall production systems in Idaho and the Pacific Northwest.

## History

Bitterroot was derived from a cross initially made in 1992, with the pedigree of DH-31/4/Lewjain/3/RDL/SU92//KAL/BB. One row was selected from the F<sub>4</sub> headrows based on agronomic performance, disease resistance, seed appearance, and quality (based on percent protein, and results of a SDS sedimentation test). This headrow was designated ID92-22407A and sent to the Aberdeen wheat breeding program for evaluation under irrigated conditions. It has been evaluated in advanced yield trials since 1999. In 2002, ID92-22407A was entered in the Western Regional White Winter Wheat Nursery and evaluated for three years. ID92-22407A was entered for evaluation in the Tri-State Extension cereal testing nursery in 2005 and evaluated for two years.

Heads were collected in 2004 and were grown during the 2004-2005 growing season at Moscow, Idaho to produce the pre-breeder seed generation. The breeder seed generation was

grown in 2005-2006 at the University of Idaho Research and Extension Center in Kimberly, Idaho and the initial foundation seed generation was grown in 2006-2007. In 2007, ID92-22407A was evaluated by the Pacific Northwest Wheat Quality Council for its end-use quality.

## Description

Bitterroot is a semi-dwarf wheat that is similar in height to Tubbs 06 and taller than Brundage 96, which is considered the current standard for soft white winter wheat in the Pacific Northwest. Bitterroot is blue-green in color with semi-erect flag leaves. Heading date for Bitterroot is similar to Tubbs 06 and 2 days later than Brundage 96. Bitterroot has good straw strength and has shown similar lodging response to Tubbs 06 under rainfed and irrigated conditions (table 1). Glumes of Bitterroot are awned and the seed is intermediate in size, white and soft.

## Adaptation and Agronomic Performance

Bitterroot has excellent yield potential under both rainfed and irrigated conditions (table 1). In 4 years of breeder's trials in Idaho (35 site-years), Bitterroot equaled or exceeded Brundage 96 under both rainfed and irrigated conditions, and equaled Tubbs/Tubbs 06 under irrigated conditions.

In two years of extension testing in northern Idaho (10 site-years), the yield of Bitterroot was similar to both Tubbs 06 and Brundage 96. In southeastern Idaho extension testing, Bitterroot yielded less than Tubbs/Tubbs 06 and Brundage 96, although the three cultivars did not differ for yield in one of the two years of testing. In the southwestern Idaho trials (8 site-years), Bitterroot yielded less than Tubbs 06 in 2006 but was equal to Tubbs 06 for yield in 2007. In Washington extension trials (36 site-years) grown over a range of rainfed and irrigated growing conditions, Bitterroot consistently yielded less than Tubbs 06 and Brundage 96 (table 2).

Bitterroot had a higher test weight under both rainfed and irrigated conditions than either Tubbs/Tubbs 06 or Brundage 96 in Idaho and Washington. In 4 years of breeder's trials in

Idaho (25 site-years rainfed, 10 site-years irrigated), Bitterroot averaged 58.1 lbs/bu rainfed and 59.4 lbs/bu irrigated. In comparison, in the same trials Brundage 96 averaged 56.2 lbs/bu rainfed and 57.6 lbs/bu irrigated; and Tubbs/Tubbs 06 averaged 55.6 lbs/bu rainfed and 58.2 lbs/bu irrigated.

In extension testing in northern Idaho the same relationship was observed among the cultivars, with Bitterroot having a higher test weight (59.5 lbs/bu) than either Brundage 96 (58.9 lbs/bu) or Tubbs 06 (58.0 lbs/bu) over 10 site-years of testing. In southeastern Idaho extension testing, Bitterroot (58.6 lbs/bu) had a similar test weight to Brundage 96 (58.3 lbs/bu), but was again greater than Tubbs 06 (57.7 lbs/bu) over 6 site-years of testing. In the southwestern Idaho extension trials the trend

**Table 1. Yield comparisons of Bitterroot with standard soft white winter wheat varieties grown in Idaho**

Variety	Percent stand	Heading date	Height (inches)	Percent lodging	Test weight (lbs/bu)	Yield (bu/A)
WB 528	96.8	24-May	32.3	7.1	61.6	133.3
Tubbs 06	96.1	31-May	35.7	3.8	58.9	128.1
Brundage	93.5	25-May	30.9	0.0	61.6	128.1
Malcolm	93.3	30-May	33.9	1.7	59.2	127.4
Madsen	93.9	1-Jun	33.8	2.5	59.6	127.0
ORCF-102	92.6	30-May	35.4	2.1	60.2	126.9
Mohler	91.7	31-May	34.6	5.4	59.9	126.8
Simon	93.3	31-May	34.3	0.0	59.9	126.6
Brundage 96	95.6	30-May	30.7	0.0	59.3	125.3
Stephens	94.5	28-May	33.3	9.2	59.7	124.8
Daws	94.6	1-Jun	35.0	6.3	60.4	124.8
Lambert	95.5	29-May	36.1	8.3	60.1	124.2
WB 470	95.0	24-May	32.5	0.4	62.8	123.3
Bitterroot	95.5	1-Jun	36.2	5.4	60.0	123.0
IDO 587	91.8	29-May	32.9	1.7	58.4	118.9
Bruehl	92.2	3-Jun	37.0	17.1	56.8	118.2
ORCF-101	95.1	30-May	33.3	0.0	58.9	116.9
Clearfirst	95.2	1-Jun	33.3	0.0	59.6	114.0
Mean	94.1	30-May	34.3	7.0	59.6	124.0
LSD	3.9	0.7	1.1	8.0	0.8	6.3
CV	7.4	0.8	5.8	199.8	2.2	8.9

Note: Results are from the Extension Variety Testing Programs (2 years, 2006-2007).

observed in the other trials continued with Bitterroot (60.3 lbs/bu) averaging a higher test weight than Tubbs 06 (59.7 lbs/bu), although in 2006 the two cultivars were similar in test weight. In Washington extension testing (36 site-years), Bitterroot (60.0 lbs/bu) exceeded both Brundage 96 (58.6 lbs/bu) and Tubbs 06 (58.3 lbs/bu) for test weight (table 2).

96 for its percentage of flour protein, break flour, flour yield, flour ash, and for its sugar snap cookie diameter. In two years of regional testing, Bitterroot exceeded both Stephens and Madsen for sugar snap cookie diameter and sponge cake flour volume. The Pacific Northwest Quality Council evaluated Bitterroot and found it to have a similar end-use quality as Brundage 96.

## Milling and Baking Quality

Bitterroot has excellent end-use quality, equaling or exceeding Brundage 96. In 3 years of breeder's trials (20 site-years rainfed, 9 irrigated), Bitterroot was equal to or better than Brundage

## Disease Reactions

Bitterroot has moderate resistance to stripe rust (caused by *Puccinia striiformis* Westend.) based on regional testing by Xianming Chen, plant pathologist, ARS Pullman, WA and appears to

**Table 2. Agronomic performance over 2 years of Bitterroot compared to Tubbs 06 and Brundage 96 in extension trials in Idaho and Washington**

Idaho—Northern						
	yield (bu/ac)			test wt (lbs/bu)		
	2006-5 <sup>a</sup>	2007-5	mean	2006-5	2007-5	mean
Tubbs 06	88	69	79	58.8	57.2	58.0
Brundage 96	82	73	78	59.2	58.5	58.9
Bitterroot (92-22407A)	85	68	77	59.4	59.5	59.5

  

Idaho—Southeastern						
	yield (bu/ac)			test wt (lbs/bu)		
	2006-3	2007-3	mean	2006-3	2007-3	mean
Tubbs 06	124	128	126	58.9	56.5	57.7
Brundage 96	124	123	124	60.3	56.2	58.3
Bitterroot (92-22407A)	124	118	121	59.5	57.6	58.6

  

Idaho—Southwestern						
	yield (bu/ac)			test wt (lbs/bu) <sup>b</sup>		
	2006-4	2007-4	mean	2006-2	2007-2	mean
Tubbs 06	134	134	134	60.6	58.8	59.7
Bitterroot (92-22407A)	122	130	126	60.7	59.9	60.3

  

Washington						
	yield (bu/ac)			test wt (lbs/bu)		
	2006-18	2007-18	mean	2006-18	2007-18	mean
Tubbs 06	111	96	104	58.6	58.0	58.3
Brundage 96	106	97	102	58.6	58.5	58.6
Bitterroot (92-22407A)	105	89	97	60.0	59.9	60.0

<sup>a</sup> The number following the year indicates the number of sites tested that year.

<sup>b</sup> The researcher in SW Idaho did not measure test weight at all sites at which yield was measured.

have high-temperature adult-plant resistance. Disease pressure from stripe rust causes significant yield loss in the Pacific Northwest. Bitterroot has moderate to excellent tolerance to Cephalosporium stripe based on results from inoculated nurseries in both Idaho and Oregon. Bitterroot is moderately susceptible to dwarf bunt (caused by *Tilletia controversa* Kühn in Rabenh.) and would require the use of a seed fungicide treatment if grown in a region where dwarf bunt can occur.

## Availability of Bitterroot seed

Seed of Bitterroot will be maintained by the Idaho Foundation Seed Program and may be obtained by contacting the Coordinator, Foundation Seed Program, College of Agricultural and Life Sciences, Kimberly Research and Extension Center, 3793 N. 3600 East, Kimberly, Idaho, 83341. Phone: 208-423-6655. E-mail: [williams@kimberly.uidaho.edu](mailto:williams@kimberly.uidaho.edu). Bitterroot will be submitted for Plant Varietal Protection.

## About the authors

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