Registration of 'Otto' Wheat

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ABSTRACT

Resistance to strawbreaker foot rot (caused by *Oculimacula yallundae* Crous & W. Gams and *O. acuformis* Crous & W. Gams) and to stripe rust (caused by *Puccinia striiformis* Westend. f. sp. *tritici* Eriks.) are important traits for winter wheat cultivars produced in the Pacific Northwest region of the United States. The objective of this research was to develop an adapted winter wheat cultivar with highly effective resistance to both diseases. 'Otto' (Reg. No. CV-1087, PI 667557) soft white winter wheat (*Triticum aestivum* L.) was developed and released in September 2011 by the Agricultural Research Center of Washington State University. Otto was tested under the experimental designations J980218, J980218-6, and WA008092, which were assigned through progressive generations of advancement. Otto is a semidwarf cultivar adapted to the low rainfall (<300 mm of average annual precipitation), unirrigated wheat production regions of Washington. Otto is resistant to strawbreaker foot rot, has high-temperature, adult-plant resistance to the stripe rust pathogen, is tolerant to both speckled (caused by *Typhula ishikariensis* S. Imai) and pink [caused by *Microdochium nivale* (Fr.:Fr.) Samuels & I. C. Hallett] snow molds, is intermediate in height, has midseason maturity, and has a high test weight and grain yield potential. Otto has end-use quality properties similar or superior to those of 'Stephens', 'Brundage 96', and 'Xerpha'.

Strawbreaker foot rot (caused by *Oculimacula yallundae* Crous & W. Gams and *O. acuformis* Crous & W. Gams) and stripe rust (caused by *Puccinia striiformis* Westend. f. sp. *tritici* Eriks.) are major disease threats of winter wheat (*Triticum aestivum* L.) grown in the Pacific Northwest region of the United States. There are relatively few soft white winter (SWW) wheat cultivars currently in commercial production that are adapted for the low rainfall regions (<300 mm average annual precipitation) with adequate levels of resistance to both stripe rust and foot rot resistance, especially under heavy disease pressure. The objective of this research was to develop an SWW wheat cultivar that combined improved levels of resistance to stripe rust and foot rot compared with current cultivars grown in the low-rainfall regions of Washington State.

'Otto' (Reg. No. CV-1087, PI 667557), an SWW wheat, was developed and released in September 2011 by the Agricultural Research Center of Washington State University (WSU). Otto was named in honor of Otto and Doris Amen for their tireless support of wheat research and development at WSU. Otto was released as an alternative for 'Eltan' (PI 536994; Peterson et al., 1991) and 'Xerpha' (PI 645605; Jones et al., 2010) in unirrigated wheat production systems in the low-rainfall (<300 mm of average annual precipitation) regions of Washington State. The release of Otto is based on its (i) resistance to strawbreaker foot rot, (ii) high-temperature, adult-plant resistance to local races of stripe rust, (iii) tolerance to both speckled (caused by *T. ishikariensis* S. Imai) and pink [caused by *Microdochium nivale* (Fr.:Fr.) Samuels & I. C. Hallett] snow molds, (iv) improved end-use quality, and (v) high grain-yield potential in the target production regions.

Materials and Methods

Otto, tested under the experimental designations J980218, J980218-6, and WA008092 (assigned through progressive generations of advancement), is an $F_{3:4}$ headrow selection derived from the cross Eltan//'Madsen'/Eltan/3/Eltan. The final cross for Otto was completed in the greenhouse in Pullman, WA in 1997. Eltan is an SWW cultivar released in 1990 by WSU with the pedigree 'Luke' (CItr 14586; Peterson et al., 1974)//BR-70443-4 /Sel.101 (CItr 13438). Madsen (PI 511673; Allan et al., 1989) is an SWW wheat cultivar released by WSU in 1988 with the pedigree 'VPM 1'(PI 519303)/'Moisson 951'//2*'Hill 81'(CItr 17954; Kronstad et al., 1982).

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Abbreviations: IT, infection type; SWW, soft white winter; WSU, Washington State University.

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The following modified pedigree bulk-breeding method was employed to advance early-generation progeny. Bulked seed (3 g) from F_1 plants, identified as J980218, was used to establish a 1-m F_2 row in 1999. Seeds from approximately 50 heads within the row were bulk harvested and a 7-g subsample was used to establish a 1-m F_3 row in 2000. Single heads of approximately 50 F_3 plants were threshed individually to establish $F_{3:4}$ headrow families in 2001. F_1 progeny were advanced at the WSU Plant Growth Facilities on the WSU in Pullman. F_2 through F_4 progeny were advanced in field nurseries at Pullman.

Following selection among F_4 rows for general adaptation, resistance to stripe rust, plant height, and grain appearance, seed from 30 to 50 plants within each selected headrow was bulk harvested to obtain $F_{3:5}$ seed for early-generation quality assessment. Screening methods included high-molecular-weight glutenin profiles, seed-coat color, and tyrosinase assays. Selections with preferred high-molecular-weight glutenin profiles, proper seed coat color, and polyphenol oxidase reactions were retained and advanced to grain yield assessment trials. Seven $F_{3:5}$ headrow selections were individually advanced to a nonreplicated field trial in Pullman and grown in yield plots in 2002. The resulting grain was evaluated for yield, grain volume weight, grain protein concentration, and disease resistance and evaluated again with early-generation quality assessment tools. One line, identified as J980218-6, was selected and advanced to an F_6 field trial at Lind, WA and grown in nonreplicated plots in 2003. Lines were evaluated for emergence from deep planting, plant height, grain yield, grain volume weight, and disease resistance. Additionally, early-generation quality assessment tools were employed to evaluate end-use quality.

Using seed generated in a nonreplicated field trial, Otto was evaluated in replicated field trials for 54 location-years in preliminary (2 locations), advanced (12 locations), and western regional (1 location) trials from 2004 through 2011 in low (<300 mm average annual precipitation), intermediate (300–500 mm average annual precipitation), and high precipitation zones (>500 mm average annual precipitation) in Washington State. All years of field testing utilized the same data collection strategy with either a randomized complete block design (4 replications) (2004–2008) or a general α lattice design (3 replications) (2009–2011) (Mason et al., 2003). J980218-6, one of the original seven F_4 headrow selections, was advanced to preliminary replicated yield trials in Pullman (high precipitation zone) and Lind (low precipitation zone) and evaluated in 2004 and 2005. This line was entered into advanced replicated trials at multiple locations from 2006 through 2007. Based on these data, J980218-6 was selected for testing on a regional basis and assigned the new identification number of WA008092 in 2008. WA008092 was entered in the WSU Extension Uniform Cereal Variety Testing Program and tested at 20 locations in both 2009 and 2010 and at 21 locations in 2011 throughout eastern Washington. WA008092 also was evaluated in the 2011 Western Regional Nursery Trials. Additionally, WA008092 was retained in the advanced replicated yield trials and tested at multiple locations from 2008 to 2011. Since 2002, WA008092 was evaluated for end-use quality by the USDA-ARS Wheat Genetics, Quality, Physiology, and Disease Research Unit, Pullman, according to approved methods of the American Association of Cereal Chemists (AACC, 2000). WA008092 was evaluated by the Pacific Northwest Wheat Quality Council in 2011.

WA008092 was evaluated for strawbreaker foot rot in both natural and inoculated field trials conducted by personnel at WSU at Spillman Farm near Pullman and at the USDA-ARS Plant Pathology Farm near Pullman in both breeding and disease nurseries in 2009 to 2011. The disease index, which is on a scale from 0 to 100, was calculated by multiplying the percentage of infected stems (disease incidence) by the disease severity of infected stems and divided by four. Values ranged from 0 to 100% and represent the mean of four replicate plots.

WA008092 was tested for stripe rust resistance in naturally infected field trials conducted by the USDA-ARS, Wheat Genetics, Quality, Physiology, and Disease Research Unit, Pullman on the Whitlow and Spillman Farms near Pullman, at the Lind Dryland Research Station near Lind, at Walla Walla and Mt. Vernon, WA in breeding nurseries in 2009 to 2011, and in various breeding nurseries throughout eastern Washington from 2002 to 2011. Greenhouse seedling tests for stripe rust resistance were conducted from 2009 through 2011 under low-temperature cycles (diurnal temperature cycle gradually changing from 4 to 20°C; Chen and Line, 1992), and adult-plant tests were conducted at high temperatures (diurnal temperature cycle gradually changing from 10 to 35°C; Chen and Line, 1995).

WA008092 was tested for Cephalosporium stripe [caused by *Cephalosporium gramineum* (Nisikado and Ikata)] in inoculated field trials conducted by personnel at WSU at the USDA-ARS Palouse Conservation Field Station near Pullman from 2009 to 2011. The disease index, which ranges from 0 to 100, was calculated by multiplying the percentage of infected stems (disease incidence) by the disease severity of infected stems and dividing by four. The plot rating taken in 2011 is a visual rating for the percentage of plot area with stunted plants and/or white heads per plot and was descriptive of the severity of Cephalosporium stripe. Values ranged from 0 to 100% and represented the mean of four replicate plots. Additional data was collected by Washington State personnel in breeding trials near Waterville and Mansfield, WA in 2006 and 2011 for the level of snow mold resistance that WA008092 exhibits in naturally infested environments. The snow mold rating is a visual estimate of growth approximately 1 mo after snowmelt that is based on both the percentage of recovery and vigor. The scale ranges from 0 to 8, with 0 = no recovery and 8 = complete recovery.

Breeder seed of WA008092 (Otto) was produced as a reselection, on the basis of phenotypic uniformity, of 2000 $F_{3:13}$ headrows grown under irrigation in Othello, WA in 2011. Selected headrows (2% were discarded) were bulked at harvest, resulting in the production of 2056 kg of breeder seed. A 9.7-ha foundation-seed increase was planted under irrigation in Othello in the fall of 2011.

Data generated from 2008 to 2011 were analyzed with the general lattice (ALS) procedure in Agrobase Generation

2, version 33.10.1 (Agronomix Software). Since four major wheat-producing regions with distinct agroclimatic conditions are present in Washington State, data were analyzed across locations within regions instead of over all locations. Location means and ranks from 2009 to 2011 were generated via the arithmetic mean of the ALS adjusted mean. The arithmetic means and ALS adjusted means were subjected to analysis of variance, and breeding lines were advanced based on excellent performance within each location, across locations within a region, and across regions within a year. Once Otto was selected for release, the final data analysis used only entries common to the trials across all years. End-use quality data were analyzed by the Student's paired *t*-test procedure (Cochran and Cox, 1957).

Characteristics

Otto is an intermediate height, semidwarf SWW wheat cultivar. It has a lax, clavate, inclined inflorescence with white awns and white glumes that are medium in length and in width, with wanting shoulders and medium acuminate beaks. Otto has ovate kernels that are white and soft. The seed of Otto has a midsize germ with a crease width and depth that are 80% and 35%, respectively, of that of the kernel; rounded cheeks; and a medium, collared brush. Otto lacks anthocyanin pigmentation in the coleoptile, displays a semierect juvenile plant growth habit, and is yellow-green with an erect, untwisted, nonwaxy flag leaf at Feekes growth stage 10.0 (Large, 1954). The stem of Otto lacks anthocyanin pigmentation, a waxy bloom is absent, the last internode of the rachis is solid, the auricle lacks pigmentation, pubescence is present, and the peduncle is recurved and has an average length of 26 cm. In the target production region (<300 mm average annual precipitation), the heading date of Otto was similar to Eltan's and statistically ($P < 0.05$) 2 d later than Madsen's and Xerpha's (Table 1). Otto was similar in height to Eltan and Xerpha and statistically ($P < 0.05$) taller than Madsen by 4 cm (Table 1).

From 2009 to 2011, Otto was evaluated for resistance to strawbreaker foot rot in inoculated field trials at the Plant Pathology Farm. Included in these trials were the susceptible checks Eltan and Xerpha and the resistant check Madsen. The resistance that Madsen carries is inherited from the cultivar VPM1, which derives resistance from *Triticum ventricosum* (Tausch). Marker analysis with *Xorw1* and *Xorw5* (Leonard et al., 2008) indicates that Otto carries the same resistance as Madsen (data not shown). In the 2009 trial, Otto (38.1%) was similar to Madsen (42.0%) indicating a resistant reaction, whereas Eltan (69.2%) and Xerpha (70.3%) demonstrated a susceptible reaction. The 2011 data confirmed the resistance levels observed in 2009, when Otto (28.0%) and Madsen (39.9%) expressed a resistant reaction and Xerpha (73.5%) was rated as susceptible. These data indicate that Otto has strawbreaker foot rot resistance similar to its parent Madsen.

Otto, together with its parental cultivars Eltan and Madsen in addition to other entries, was evaluated for stripe rust resistance in various field locations in Washington State under natural infection and under controlled greenhouse conditions with selected races of *P. striiformis* from 2009 to 2011. In 2009, stripe rust developed to adequate levels in the field for evaluation where the check 'PS 279' was susceptible (infection type [IT] 8; severity 90–100%) in the flowering and soft dough stage. Otto (IT 0–2; severity 0–5%), Eltan (IT 2–3; severity 1–10%), and Madsen (IT 0–2; severity 0–5%) were all rated as resistant. Again in 2010 and 2011, stripe rust developed to adequate levels for field evaluation where PS 279 (IT 8; 80–100%) displayed susceptible reactions, whereas Otto (IT 2–3; 2–10%), Eltan (IT 2–5; severity 5–40%), and Madsen (IT 2; 1–20%) all displayed resistant reactions. In greenhouse seedling tests conducted in 2009, Otto was resistant (IT 1–2) to races PST-45 and PST-116, and moderately resistant (IT 3–5) to PST-100 and PST-127. These seedling reactions indicate that Otto has race-specific, all-stage resistance that is not effective against all of the predominant races currently in the region. However, when tested at the adult-plant stage at high temperatures with races PST-100, PTS-116 and PST-127 in the greenhouse, Otto was highly resistant (IT 1), similar to Madsen and more resistant than Eltan (IT 2–3). Similar results were obtained in 2010, in which PST-116 was replaced with PST-114 because the latter was the most predominant race in the Pacific Northwest in 2009. The 2011 greenhouse data were consistent with those of 2009 and 2010. Field results were confirmed through results from greenhouse evaluations, which indicated that Otto has

Table 1. Mean heading date, plant height, grain volume weight, and grain yield of soft white winter wheat cultivars from 32 location-years of data from Washington State University Extension Uniform Cereal Variety Performance Trials grown from 2009 through 2011 in eastern Washington.

	Heading date		Plant height		Grain volume weight		Grain yield	
Cultivar	<300 mm†	300–400 mm‡	<300 mm†	300–400 mm‡	<300 mm†	300–400 mm‡	<300 mm†	300–400 mm‡
	d after 1 January		cm		kg m^{-3}		kg ha^{-1}	
Otto	148	143	80	101	774	752	3588	7169
Eltan	147	142	79	101	777	757	3568	7243
Madsen	146	141	76	96	775	768	3151	7082
Xerpha	146	141	79	101	777	763	3716	8103
LSD ($P < 0.05$)	0.4	0.3	1	2	3	4	128	262

†Means averaged over trials from 2009 through 2011 in locations receiving <300 mm of average annual precipitation including Connell, Harrington, Horse Heaven, Lind, Ritzville, and St. Andrews (17 location-years).

‡Means averaged over trials from 2009 through 2011 in locations receiving 300–400 mm of average annual precipitation including Almira, Anatone, Creston, Dusty, and Lamont (15 location-years).

non-race-specific, high-temperature adult-plant resistance to stripe rust similar to Madsen.

From 2009 to 2011, Otto was evaluated for resistance to Cephalosporium stripe in inoculated field trials at the Palouse Conservation Field Station. Included in these trials were the susceptible check 'Stephens' (CI 17596; Kronstad et al., 1978), the parental lines of Otto (Madsen and Eltan), and Xerpha. The disease pressure from Cephalosporium stripe was severe in both years (2009 and 2011), based on the reaction of Stephens (93.2% and 88.3% respectively). In both trials, the resistance of Otto (82.2% and 58.9%) was similar to Madsen (77.3% and 63.7%), which was considered moderately susceptible. Conversely, the ratings for Xerpha (61.2% and 51.8%) and Eltan (65.1% and 44.1%) indicate a higher tolerance to Cephalosporium stripe than Otto. These results indicate that Otto is moderately susceptible to Cephalosporium stripe.

Snow mold evaluation trials are conducted near Waterville and Mansfield, WA every year and require a minimum of 100 d of snow cover on unfrozen or lightly frozen soils for the disease to develop to adequate levels of infection for data collection. In 2006 and 2011, disease severity was sufficient to evaluate cultivars for combined resistance to speckled and pink molds. Otto, together with its parental cultivars Eltan and Madsen in addition to other entries, was evaluated for snow mold resistance in both 2006 and 2011. Eltan has adequate levels of resistance, whereas Madsen is highly susceptible, and both were used as checks in these trials. In 2006, Otto (5.33) was similar to Eltan (5.33), indicating resistance, and both cultivars were superior to Madsen (0.67). Data collected in 2011 support the 2006 data. Eltan (6.0) and Otto (5.0) were rated moderately resistant and Madsen (3.0) was rated moderately susceptible. These results indicate that Otto has adequate resistance, similar to the cultivar Eltan.

Otto was evaluated for dwarf bunt (caused by *Tilletia controversa* J. G. Kühn) in a USDA-ARS inoculated screening nursery near Logan, UT in 2010. The susceptible cultivar Cheyenne (PI 192268) was used as a check. A scale of 0 to 100 was used for evaluation, where 0 indicates a high level of resistance and 100 indicates complete susceptibility. The average rating (67) of the check Cheyenne indicates moderate to severe susceptibility, whereas the average rating (0) of Otto is indicative of cultivars displaying high levels of resistance.

Table 2. Grain yield and grain volume weight of soft white winter wheat cultivars from 31 location-years of breeding trials in eastern Washington.†

Cultivar	Grain yield	Grain volume weight
	kg ha^{-1}	kg m^{-3}
Otto	5241	764
Eltan	4770	766
Madsen	4703	759
Xerpha	4569	763
LSD ($P < 0.05$)	195	12

†Agronomic performance evaluated at Pullman, Kahlotus, Mansfield, Ritzville, Steptoe, 2008 to 2011; Lind, 2008, 2010 to 2011; Harrington, 2010 to 2011; Waterville, 2008 and 2011; Colton and St. Andrews, 2008.

Agronomic Performance

When data were averaged over 31 location-years of evaluation in breeding nurseries, the grain yield of Otto was significantly ($P < 0.05$) greater than that of Eltan, Madsen, and Xerpha (Table 3). The average grain volume weight of Otto was statistically similar ($P < 0.05$) to that of Eltan, Madsen, and Xerpha in these breeding trials (Table 2).

In 58 rain-fed location-years of the WSU Extension Uniform Cereal Variety Testing Winter Wheat Performance Trials conducted from 2009 through 2011, the grain yields of Otto were greater than those of Madsen and similar to those of Eltan and Xerpha in the <300-mm precipitation zone (17 location-years; $P < 0.05$; Table 1). In the 300–400-mm precipitation zone (15 location-years), Otto produced significantly ($P < 0.05$) less grain than Xerpha and had similar grain yields as Eltan and Madsen (Table 1). The grain yields of Otto were similar to those of Xerpha in the 400–500-mm precipitation zone (15 location-years), and both varieties produced significantly ($P < 0.05$) more grain than Eltan and significantly ($P < 0.05$) less grain than Madsen (Table 3). In the >500-mm precipitation zone (11 location-years), Otto grain yields were statistically similar ($P < 0.05$) to those of Eltan, Madsen, and Xerpha (Table 2). Average grain volume weight of Otto was statistically ($P < 0.05$) similar to that of Eltan, Madsen, and Xerpha in the <300-mm precipitation zone and significantly ($P < 0.05$)

Table 3. Mean heading date, plant height, grain volume weight, and grain yield of soft white winter wheat cultivars from 26 location-years of data from Washington State University Extension Uniform Cereal Variety Performance Trials grown from 2009 through 2011 in eastern Washington.

	Heading date		Plant height		Grain volume weight		Grain yield	
Cultivar	400–500 mm†	>500 mm‡	400–500 mm†	>500 mm‡	400–500 mm†	>500 mm‡	400–500 mm†	>500 mm‡
	d after 1 January		cm		kg m^{-3}		kg ha^{-1}	
Otto	165	156	104	105	765	774	8365	8533
Eltan	164	155	102	106	763	776	7700	8587
Madsen	162	154	102	102	781	776	8809	8392
Xerpha	162	153	104	102	767	770	8285	8506
LSD ($P < 0.05$)	0.4	0.4	2	2	3	3	235	242

†Means averaged over trials from 2009 through 2011 in locations receiving 400–500 mm of average annual precipitation including Dayton, Mayview, Reardan, St. John, and Walla Walla (15 location-years).

‡Means averaged over trials from 2009 through 2011 in locations receiving > 500mm of average annual precipitation including Colton, Fairfield, Farmington, and Pullman (11 location-years).

Table 4. Mean grain protein content, flour yield, break flour yield, flour ash, milling score, flour protein, flour swelling volume, cookie diameter, and mixograph water absorption of soft white wheat cultivars from winter wheat trials in eastern Washington.

Cultivar	Grain protein content	Flour yield	Break flour yield	Flour ash	Milling score	Flour protein	Flour swelling volume	Cookie diameter	Mixograph water absorption
	g kg^{-1}	%		g kg^{-1}		g kg^{-1}	mL g^{-1}	cm	g kg^{-1}
Stephens†	103	67.3	47.0	35.0	84.8	86	19.7	9.3	554
Otto	98	66.0	48.7	34.0	83.8	83	18.5	9.4	554
LSD ($P < 0.01$)	7	1.2	1.3	5.0	3.4	7	1.0	0.1	12
Brundage 96‡	102	68.7	51.2	40.0	83.2	86	18.6	9.5	555
Otto	99	67.5	49.5	36.0	84.4	85	18.5	9.4	554
LSD ($P < 0.01$)	4	0.8	0.6	3.0	2.3	3	0.9	0.1	8
Xerpha§	101	68.8	45.8	38.0	84.2	86	17.1	9.2	550
Otto	104	69.0	48.3	37.0	85.3	89	17.4	9.3	550
LSD ($P < 0.01$)	4	0.7	0.6	1.0	1.0	3	0.9	0.1	8

†Data analysis performed on 12 location-years.

‡Data analysis performed on 18 location-years.

§Data analysis performed on 22 location-years.

lower than Eltan, Madsen, and Xerpha in the 300–400-mm precipitation zone (Table 1). In the 400–500-mm precipitation zone, the grain volume weight of Otto was similar to that of Eltan and Xerpha and significantly ($P < 0.05$) lower than that of Madsen (Table 2). The average grain volume weight of Otto, Eltan, Madsen, and Xerpha were statistically ($P < 0.05$) similar in the >500-mm precipitation zone (Table 2).

End-Use Quality

End-use quality of Otto was assessed at the USDA-ARS Western Wheat Quality Laboratory in Pullman using grain produced in 41 breeding and commercial variety testing trials in Washington from 2002 through 2010. Stephens, Brundage 96 (PI 631486; Zemetra et al., 2003), and Xerpha were used as checks in these evaluations. The grain protein and flour protein content of Otto were similar to those of Stephens, Brundage 96, and Xerpha ($P < 0.01$) (Table 4). The flour yield of Otto was significantly greater than for Xerpha, significantly lower than for Brundage 96 ($P < 0.01$), and similar to that of Stephens (Table 4). The break flour yield of Otto was significantly lower than for Brundage 96 ($P < 0.01$), and significantly ($P < 0.01$) greater than Stephens and Xerpha (Table 4). The flour ash content of Otto was significantly ($P < 0.01$) lower than for Brundage 96 and similar to that of Stephens and Xerpha (Table 4). The milling score, cookie diameter, and mixograph water absorption of Otto were similar to those of Stephens, Brundage 96, and Xerpha (Table 4). Flour swelling volume indicates that Otto has normal starch type, similar to the three checks (Table 4). Limited data ($n = 4$) indicate that Otto (1324 cm^3) did not differ significantly ($P < 0.01$) from Brundage 96 (1313 cm^3) in sponge cake volume. Conversely, when compared with a limited data set ($n = 13$) to Xerpha (1267 cm^3), the sponge cake volume of Otto (1313 cm^3) was significantly greater ($P < 0.01$) (data not shown).

In 2011, Otto was evaluated by the Pacific Northwest Wheat Quality Council, where commercial millers and bakers concluded that Otto has acceptable milling, dough handling, and baking properties and is equal to other SWW wheat cultivars that are currently in production in the Pacific Northwest (data not shown).

Availability

Foundation seed of Otto 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. Seed of Otto has been deposited in the National Plant Germplasm System, from which small quantities of seed may be obtained for research purposes. U.S. Plant Variety Protection status for this cultivar is pending.

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