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Goetze

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Soft White Winter Wheat

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Variety description

Goetze is a common soft white winter wheat variety developed at Oregon State University in cooperation with the USDA Agricultural Research Service (USDA-ARS). It is an awned, short-statured, semidwarf variety with moderately early maturity and high yield potential. Goetze is resistant to stripe rust and moderately resistant to Septoria leaf blotch. The name Goetze commemorates the leadership and contributions of Norm Goetze, retired OSU Extension cereals specialist, to the Oregon wheat industry.

Area of adaptation

Goetze is best adapted to western Oregon and areas where the variety Gene is grown (blue-shaded regions in Figure 2). Goetze is also adapted to a larger production region in Oregon that includes areas shown in red in Figure 2. However, in these additional areas, Goetze is at risk for damage from cold winter temperatures.

Year of release

Goetze was released in 2007 and is protected under U.S. Plant Variety Protection without the Title 5 option.



Figure 1. Vince Dobbin harvesting a Goetze wheat test plot at Dobbin Farms near Hillsboro, Oregon. The combine in the photograph was previously owned by Norm Goetze, retired OSU Extension specialist, for whom Goetze wheat is named.

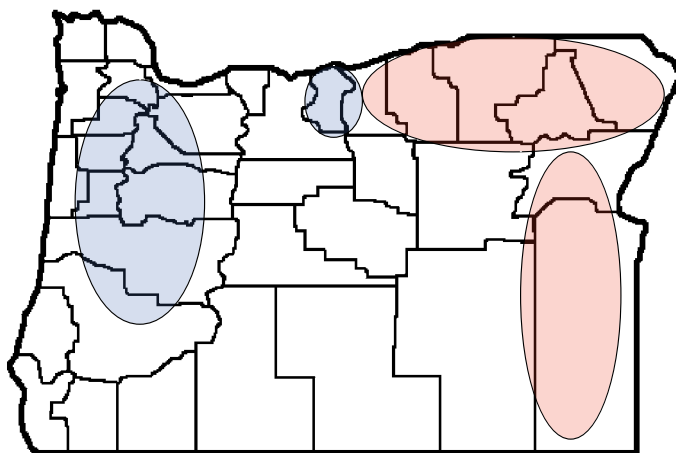


Figure 2. Regions of Oregon where the Goetze wheat variety can be grown (red) and regions where Goetze is best adapted (blue).

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Agronomic characteristics

Height and lodging resistance

In trials over 24 site-years, Goetze was found to be approximately 2 inches shorter than Stephens, 5 inches shorter than Tubbs or Tubbs-06, and about 1 inch taller than Gene (Table 1). The height differentials are somewhat greater in the high-rainfall environment of western Oregon, where Goetze may be as much as 6–7 inches shorter than Tubbs or Tubbs-06 and 3–4 inches shorter than Stephens and Madsen. Goetze's straw strength is excellent, and lodging has not been observed in any production environment.



Figure 3. Goetze wheat in the field.

Maturity

Goetze is a moderately early-maturing variety, similar to Gene. It heads 2 days earlier than Stephens and approximately 6 days earlier than Madsen (Table 1).

Vernalization and cold tolerance

Goetze is a facultative winter wheat, meaning that it requires little to no vernalization (winter chill) to initiate flowering. Crown freezing tests conducted by the USDA-ARS suggest that Goetze is similar to Gene in

Table 1. Grain yield and agronomic data for six soft white winter wheat varieties grown across a range of environments in Oregon, 2005–2007.

Variety	Grain yield						Agronomic data			
	Corvallis		Sherman County		OWEYT*		Test weight	Grain protein	Plant height	Heading date
	2-year mean (bu/ac)	3-year mean (bu/ac)	2-year mean (bu/ac)	3-year mean (bu/ac)	24 site-years (bu/ac)	33 site-years (bu/ac)	24 site-years (lb/bu)	21 site-years (%)	22 site-years (in)	8 site-years (DOY)**
Goetze	122.1	118.4	82.2	84.4	87.7	91.4	58.9	9.7	31.8	141.9
Stephens	110.5	97.0	78.1	80.5	86.6	87.4	59.0	10.2	33.7	143.9
Madsen	105.5	95.1	77.4	78.1	84.9	86.0	59.2	10.3	34.1	147.5
Gene	109.1	97.9	75.4	81.2	78.0	83.3	57.9	10.5	30.4	141.6
Tubbs	116.3	102.0	73.3	74.6	89.8	90.4	58.7	9.6	36.7	146.1
Tubbs-06	123.4	—	77.8	—	91.8	—	58.8	9.6	37.0	145.7
Mean	114.5	102.1	77.4	79.8	86.4	87.7	58.8	10.0	34.0	144.4
LSD _(0.05) ***	12.5	8.1	5.9	5.3	3.1	2.6	0.5	0.3	0.6	0.8

*Oregon Winter Elite Yield Trial

**Day of year

***Least significant difference



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cold tolerance (less cold tolerant than Stephens). These factors increase the risk of winter damage when growing Goetze in northeast Oregon. The vulnerability of Goetze to cold temperatures was confirmed in 2005 variety trials at Washington State University.

Disease resistance

Goetze is resistant to stripe rust and moderately resistant to Septoria leaf blotch (Table 2). Both are important diseases of wheat in western Oregon. Goetze also is moderately resistant to leaf rust and strawbreaker footrot. Goetze is moderately susceptible to Cephalosporium stripe and Fusarium crown rot. Goetze is susceptible to take-all root rot and dwarf bunt. A seed treatment is recommended to control bunt and other seedling diseases.

Yield

Goetze has shown excellent yield potential across a range of environments in Oregon. Over 33 site-years of OSU variety testing (2005–2007), Goetze has averaged 91.4 bushels per acre. This yield is similar to that for Tubbs and 4–5 bushels per acre higher than Stephens and Madsen (Table 1). Goetze excels in the high-yield environment of western Oregon, where it averages 16–23 bushels per acre more than Madsen. In areas where Gene is commonly grown, Goetze has shown a yield advantage of 3–6 bushels per acre when compared to Gene.

Test weight and quality

The test weight of Goetze averaged 58.9 pounds per bushel and was similar to test weights for Stephens, Tubbs, and Tubbs-06 (Table 1). However, Goetze has slightly lower kernel weights than Stephens (similar to those for Madsen and Tubbs).

Table 2. Agronomic and disease ratings for six soft white winter wheat varieties grown in Oregon.

Variety	Maturity	Winter hardiness*	Rust**		Septoria**	Crown rot**	Cephalosporium stripe**	Strawbreaker foot rot** <i>Pseudocercospora</i>
			Stripe	Leaf				
Goetze	Early–mid	2	R	MR	MR	MR/MS	MS	MR
Stephens	Early–mid	3	R	S	S	S	S	S
Madsen	Midseason	5	R	MR	MS	MR/MS	MR	R
Gene	Early	2	MR/MS	S	S	MR	MS	MS/MR
Tubbs	Midseason	5	MS	MS	MS	S	S	R
Tubbs-06	Midseason	5	MR/MS	MS	MS	S	S	R

*Scale: 1–10 (10 = excellent; 1 = poor)

**R = resistant; MR = moderately resistant; MS = moderately susceptible; S = susceptible

Data were compiled from the following sources: *Winter Grain Varieties for 2003*, Special Report 775, Oregon State University Extension Service; 2004 through 2007 *Oregon Winter Elite Yield Trial Disease Ratings and Variety Characteristics*, Washington State Crop Improvement Association.

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Grain protein of Goetze averaged less than that for Stephens, Madsen, and Gene. Across Oregon environments, Goetze averaged 9.7 percent grain protein—about 0.5 percent lower than that for Stephens and equal to grain proteins for Tubbs and Tubbs-06 (Table 1).

Milling and baking evaluations from the Western Wheat Quality Laboratory in Pullman, Washington, and the Wheat Quality Council found that Goetze is similar to Stephens and is acceptable as a soft white winter wheat. Grain hardness values for Goetze averaged 6 points higher than Stephens and 3 points less than Tubbs when measured with the Pertin Single Kernel Characterization System (SKCS). Average break flour yields for Goetze were similar to those for Stephens and Tubbs. Cookie baking performance was found to be similar to that for Stephens, and Goetze had an average 0.2 centimeter wider cookie spread than Tubbs. Goetze had lower water absorption than either Stephens or Tubbs. Flour swelling volume tests found normal starch properties for Goetze (Table 3).

Development

Goetze is a semidwarf soft white winter wheat from the 1995 cross OR8303765/E81FR. OR8303765 has the pedigree 6720-11//Ministerio de Agri 38/WRM (Weique/Red Mace). Selection 6720-11 is a sister of CI17576, with the pedigree Cappelle Desprez/Pullman sel. 101//Druchamp. The origin and pedigree of E81FR are unknown. Goetze is an F₅-derived line that was identified as a headrow in 2000 by HybriTech Seed International, Inc., a division of the Monsanto Company. Goetze was among the HybriTech germplasm donated by Monsanto to Oregon State University in 2000. In 2001, it was selected as a single F₆ plot grown in Pendleton, Oregon, and given the experimental number ORH010920.

Breeder and Foundation seed will be maintained by the Washington State Crop Improvement Association (WSCIA). Goetze is an open release protected under U.S. Plant Variety Protection without the Title 5 option. Certification classes recognized for Goetze include Foundation, Registered, and Certified.

Table 3. End-use quality analyses of Goetze soft white winter wheat in paired comparisons with Stephens and Tubbs.

Variety	Kernel hardness (SKCS)*	Break flour yield (%)	Flour yield (%)	Flour ash (%)	Milling score	Flour protein (%)	Mix absorption (%)	Cookie diameter (mm)
Goetze	41.7**	48.3	68.8	0.42	80	9	54.8	9.3
Stephens	35.1	48.3	70.3**	0.45**	84.3**	9.3	55.7**	9.3
Goetze	40.6	47.9	67.8	0.44	79.2	8.4	55.1	9.4**
Tubbs	43.6**	48.4	68.5**	0.44	80.2	8.2	56.4**	9.2

*Single Kernel Characterization System

**Indicates a statistically significant increase ($p < 0.05$), based on a paired t-test.

Data provided by USDA-ARS Western Wheat Quality Lab, Pullman, Washington.



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Management guidelines

Planting date

Goetze has shown excellent yield potential in its adaptation zones for “on-time” plantings (Tables 1, 4). Plantings in early to mid-October are considered on-time for much of Oregon.

Yields of Goetze in early plantings may be reduced by as much as 20 bushels per acre compared to common varieties such as Tubbs (Table 4). These yield reductions are likely due to the facultative nature and poor cold tolerance of Goetze. Early plantings also increase the risk of insect-vectored diseases, such as Barley yellow dwarf virus, dryland root rots, and Cephalosporium stripe. For these reasons, planting of Goetze prior to October is not recommended.

Table 4. Grain yield of seven soft white winter wheat varieties in a planting date study at Pendleton, Oregon, 2006 and 2007.

Planting date	Stephens (bu/ac)	Madsen (bu/ac)	Tubbs (bu/ac)	Tubbs-06 (bu/ac)	ORCF-101 (bu/ac)	ORCF-102 (bu/ac)	Goetze (bu/ac)	LSD _(0.05) * (bu/ac)
2006								
September 12	94.2	86.6	103.9	—	88.9	93.3	83.9	10.0
October 3	91.7	101.2	102.4	—	98.7	105.9	105.6	8.8
November 20	83.6	74.8	89.1	—	78.6	88.7	88.7	6.8
2007								
September 12	81.7	—	—	83.3	82.1	84.1	80.7	11.5
October 3	80.9	—	—	76.7	79.9	75.5	84.5	12.2
November 20	48.0	—	—	62.2	49.0	57.8	62.1	7.1

*Least significant difference

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In late plantings, yields of all varieties are reduced compared to on-time plantings. However, Goetze seems to be an excellent choice for late plantings. Studies have shown that Goetze is among the highest yielding varieties when planted late, producing yields similar to those for Tubbs, Tubbs-06, and ORCF-102. Goetze averages 5–14 bushels more per acre than Stephens, Madsen, and ORCF-101 in late plantings (Table 4). The facultative nature of Goetze also makes it an option for January and February plantings, as compared to varieties that may fail if the vernalization requirement is not met.

Seeding rate

The recommended seeding rate for soft white winter wheat in Oregon is 22 seeds per square foot. For late-planted wheat, increase the seeding rate to 33 seeds per square foot. Seeding rate trials have confirmed that these general recommendations are valid for Goetze. Increased seeding rates in late plantings have resulted in a yield increase of up to 17 bushels per acre for Goetze (Table 5).

Seeding rates for most equipment are adjusted in pounds per acre. To avoid heavy or light plantings, it is important to determine the proper seeding rate using the number of seeds per pound. Conversions for a range of seeds per pound are found in Table 6.

Table 5. Grain yield of Goetze for planting date studies at Pendleton and Moro, Oregon, 2007.

Planting date	Seeding rate (seeds/ft ²)			
	11 (bu/ac)	22 (bu/ac)	33 (bu/ac)	LSD _(0.10) * (bu/ac)
Moro				
October 3	89.1	92.6	102.6	18.9
November 20	54.9	69.6	68.0	12.6
Pendleton				
October 3	85.1	89.3	79.0	18.4
November 20	58.8	55.4	72.1	12.1

*Least significant difference

Table 6. Seeding rate conversion from seeds per square foot to pounds per acre.

Seeds per pound	Weight of 50-seed sample (g)	Seeding rate	
		Pounds per acre needed for 22 seeds/ft ²	Pounds per acre needed for 33 seeds/ft ²
8,000	2.84	120	180
9,000	2.52	106	160
10,000	2.27	96	144
11,000	2.06	87	131
12,000	1.89	80	120
13,000	1.75	74	110
14,000	1.62	68	103
15,000	1.51	64	96

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The number of seeds per pound depends on seed size and varies based on variety, production environment, and year. Research has shown that Goetze has a higher number of seeds per pound than Stephens and Tubbs because Goetze has lower kernel weight. Seeds per pound may be obtained from your seed dealer or determined by weighing a 50-seed sample and using Table 6.

Fertilization

Goetze has been grown across a wide range of environments, and no special fertility requirements have been observed. Growers should follow the recommended fertility guidelines for soft white winter wheat in their area.

Herbicide applications

Sensitivity to herbicides varies among wheat varieties. To date, no adverse effects of herbicide application have been observed with Goetze. Many, but not all, of the current herbicides labeled for wheat in Oregon have been applied to Goetze without visible herbicide damage. When applying herbicides, follow label directions and all applicable state and federal regulations.

Fungicide applications

In western Oregon, growers routinely apply fungicides to control Septoria leaf blotch. In 2004 and 2005, growers also applied fungicides to control stripe rust on the variety Foote after the occurrence of a stripe rust race change.

Goetze is resistant to current races of stripe rust and moderately resistant to Septoria leaf blotch (Table 2). Growers should scout fields of Goetze to confirm that Septoria leaf blotch is present and above the economic threshold before applying fungicides. If a fungicide application is needed, it should be made at flag leaf emergence (Feekes 8). Follow label directions and all applicable state and federal regulations.

Yield component analysis

Wheat yield can be broken down into three components: head number, kernels per head, and kernel weight. Both head number and kernels per head are determined early in wheat development (Feekes 2–5). Kernel weight is determined later in the growing season, at Feekes 10.1–10.5.

While environment plays an important role in yield determination, genetic factors heavily influence how the three components combine to determine final wheat yield. Total grain yield of Goetze is determined more by early factors influencing head number and size than by kernel

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Table 7. Yield component comparison of Goetze, Stephens, and Tubbs/Tubbs-06.

Yield component	Variety comparison
Head number	Tubbs/Tubbs-06 < Stephens = Goetze
Head size	Stephens < Tubbs/Tubbs-06 < Goetze
Head fertility	Tubbs/Tubbs-06 < Stephens = Goetze
Kernel weight	Goetze < Tubbs/Tubbs-06 < Stephens

weight. Compared with widely grown varieties such as Tubbs and Stephens, Goetze is characterized by high head numbers, a large head size, average to high head fertility, and lower average kernel weights (Table 7).

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