

Above winter wheat

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Key words: *Triticum aestivum*, wheat (winter), cultivar description, herbicide tolerance.

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Mots clés: *Triticum aestivum*, blé (d'hiver), description de cultivar, tolérance aux herbicides

Breeding Method and Pedigree

Above was derived from the cross TAM 110*4/FS2 made in 1996 at Amarillo, TX. TAM 110 is a hard red winter wheat cultivar adapted for production in the western areas of the central and southern Great Plains of the United States (Lazar et al. 1997). The wheat germplasm line FS2 was developed by BASF Corporation (formerly American Cyanamid) using sodium azide induced mutagenesis of the French wheat cultivar Fidel to obtain tolerance to the imidazolinone class of herbicides (Newhouse et al. 1992).

During the backcrossing program conducted in the greenhouse at Bushland, TX, selection for seedling imazamox tolerance was practiced by application of imazamox herbicide (44.8 g a.i. ha⁻¹) 2 wk after seedling emergence. In March 1997, BC₃F₂ generation seeds were germinated in petri dishes in the presence of an aqueous solution (50 µL L⁻¹) of imazamox herbicide. Seedlings that survived the imazamox herbicide treatment were transferred to petri dishes containing a filter paper moistened with distilled water. Following vernalization in a cold room for 8 wk at 4°C, seedlings were hand-transplanted in May 1997 to a field nursery in the San Luis Valley, CO. Seed from single plant selections made in early September 1997 were planted in BC₃F_{2.3} progeny rows in late September 1997 at Akron, CO. Application of imazamox herbicide (44.8 g a.i. ha⁻¹) was done in the field

in spring 1998 to allow identification of nonsegregating herbicide tolerant progeny rows. Above was selected as a BC₃F_{2.3} line in 1998 at Akron, CO, and was given the experimental designation CO980894.

Bulk seed increases of Above were grown in 1999 at Fort Collins, CO, concurrent with unreplicated yield trials in eastern Colorado. Following treatment of the seed increases with imazamox herbicide (44.8 g a.i. ha⁻¹) in spring 1999, 500 single heads were selected at random for generation of breeder seed. Breeder seed of Above was produced in 2000 near Yuma, AZ, and Brawley, CA, from a composite of approximately 450 BC₃F_{4.5} head-rows selected for plant height and glume color uniformity and tolerance to imazamox herbicide (44.8 g a.i. ha⁻¹) in the field.

Performance

Above was tested in Colorado Dryland Variety Performance Trials in 2000 and 2001. Averaged over 15 trial locations (seven locations in 2000, eight locations in 2001), Above yielded 7.2% less than Trego, 1.5% less than Jagger, 1.1% less than Alliance, 2.4% greater than Akron, 4.7% greater than TAM 107, and 7.2% greater than TAM 110 (Table 1). Average test weight for Above in these trials was 5.2% less than Trego, 0.8% less than TAM 107, 0.7% less than Akron, 0.3% less than Jagger, similar to Alliance, and 0.8% greater than TAM 110 (Table 1).

Table 1. Two-year summary of agronomic performance of Above and check cultivars in the Colorado Uniform Variety Performance Trial (2000–2001)

Cultivar	Grain yield (kg ha ⁻¹)	Test weight (kg hL ⁻¹)	Height (cm)	Heading date (d) ^z
Trego	3028	75.9	72	142
Jagger	2852	72.2	73	137
Alliance	2843	72.0	73	141
Akron	2746	72.5	75	142
TAM 107	2684	72.6	71	136
TAM 110	2621	71.4	72	137
Above	2811	72.0	72	138
LSD ($\alpha = 0.05$) ^y	389	2.4	6	2
Station-years	15	15	10	3

^zDays after 31 December.^yLeast significant difference (0.05 probability level) based on the cultivar-by-site interaction mean square.

Other Characteristics

Above is an early-maturing, semidwarf hard red winter wheat. Average heading date of Above is about 1.8 d later than TAM 107 and about 3.6 d earlier than Akron (Table 1). Plant height of Above is short, about 1.1 cm taller than TAM 107 and about 3.0 cm shorter than Akron (Table 1). Winterhardiness of Above is similar to both TAM 107 and TAM 110.

SPIKES

Spikes of Above are mid-dense, tapering, inclined at maturity, with mid-long awns; glumes are white, mid-long, and mid-wide; glume shoulders are oblique; glume beaks are acuminate and mid-long.

KERNELS

Kernels of Above are red, hard, and ovate; cheeks are rounded; brush is mid-sized with no collar; germ size is small; crease is narrow.

DISEASE AND INSECT REACTION

In artificially inoculated field screening nurseries, Above has shown resistance to stem rust (caused by *Puccinia graminis* Pers.:Pers. f. sp. *tritici* Eriks & E. Henn.; composite of races RTQQ, QTHJ, TTRS, RTHJ, TPMK) and susceptibility to leaf rust (caused by *Puccinia triticina* Eriks.; syn *Puccinia recondita* Roberge ex Desmaz.; composite of races MLRT, MFBP, TKBP, TDGT, and KBQT). Under natural field infection, Above has shown moderate susceptibility to both wheat streak mosaic virus and barley yellow dwarf virus. In greenhouse seedling screening tests, Above is resistant to greenbug [*Schizaphis graminum* (Rondani)] biotypes C and E and susceptible to the Great Plains biotype of Hessian fly [*Mayetiola destructor* (Say)] and the North American biotype of the Russian wheat aphid [*Diuraphis noxia* (Mordvilko)].

END-USE QUALITY

Milling and bread baking characteristics of Above were determined from composite grain samples from unreplicat-

Table 2. Comparison of milling and bread baking characteristics of Above and the check cultivar TAM 107 in composite milling and baking tests (1999–2000)

Cultivar	Above	TAM 107
Test weight (kg hL ⁻¹)	76.5	75.0
Kernel weight (mg kernel ⁻¹)	31.9	30.8
Flour yield (g kg ⁻¹)	664	655
Flour protein content (g kg ⁻¹)	115	122
Flour ash content (g kg ⁻¹)	4.4	4.3
Water absorption (g kg ⁻¹)	610	616
Mixograph mix time (min)	2.5	2.9
Mixograph tolerance (score) ^z	2.0	2.0
Loaf volume (L)	.79	.88
Crumb grain (score) ^z	1.5	2.0

^zMixograph tolerance and crumb grain score scale: 0, unacceptable to 6, excellent.

ed yield trials in 1999 and the Colorado Dryland Variety Performance Trials in 2000. Relative to the broadly adapted check cultivar TAM 107, Above had higher test weight, kernel weight, and Brabender Quadromat Sr. flour yield (15% temper moisture), with lower flour protein content and higher ash content (Table 2). In optimized, straight-dough bread baking tests [American Association of Cereal Chemists Method 10-10B; (AACC 2000)], Above had lower bake water absorption, shorter mixograph mixing time, lower loaf volume, lower crumb grain and texture score, and the same mixograph tolerance score compared to TAM 107 (Table 2).

Availability of Propagating Material

Breeder seed of Above will be maintained by the Colorado Agricultural Experiment Station. Multiplication and distribution rights of other classes of pedigreed seed have been transferred to the Colorado Wheat Research Foundation, 7700 East Arapahoe Road Suite 220, Englewood, CO 80112 USA. Above has been granted for US Plant Variety Protection under P.L. 91-577 with the certification option.

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