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BRS Minotauro - Triticale Cultivar

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ABSTRACT - *The triticale cultivar BRS Minotauro was developed by the Brazilian Agricultural Research Corporation Embrapa. It is a result of a cross of Brazilian wheat and rye with hexaploid triticale. BRS Minotauro is hexaploid, has a medium cycle, medium to tall plant stature, adapts extremely well to cultivation conditions in the south of Brazil, with an average grain yield of 3,790 kg ha^{-1}, i.e., 9% higher than the mean yield of the controls, and has a high yield stability in different environments.*

Key words: X *Triticosecale*, crop breeding, production, adaptation.

INTRODUCTION

The cultivation of triticale has increased to a stable level of about 100 thousand hectares per year in the last seven harvests. Increases were most significant in the south of the state of São Paulo and north of Paraná, due to the adaptability of triticale to water stress and to the lower cost of labor, compared to other winter crops. Owing to the favorable climate during the reproductive stage of the plants, the quality of the triticale grain harvested in this region is higher and prices are comparable to those of wheat. This is also due to the mills nearby in the region and to the multiple possible uses of triticale in blends with wheat flour for the production of cookies and/or crackers, dough and bread.

In the traditional triticale region however, at latitudes above the central-southern Paraná, including the states of Santa Catarina and Rio Grande do Sul, there was a drop and then a stabilization in the cultivation area in the beginning of this decade. High rainfall favored the fusarium head blight disease or scab, which caused great damage in wheat and barley as well. In the harvest of winter 2007, this region was once again severely affected by excess rain, resulting in considerable losses in grain yield and quality.

No effective source of resistance to head blight in triticale is known, and most of the triticale cultivars indicated for cultivation in Brazil are susceptible. In the triticale breeding program of Embrapa Trigo (National Wheat Research Center), in association with the CIMMYT (International Maize and Wheat Improvement Center), genotypes with improved tolerance or lower susceptibility to this disease are therefore being selected, based on adequate inoculation and evaluation methodologies along with favorable conditions for the disease development, to explore the genetic variability in the germplasm for this trait.

Wheat and rye, cultivated in Brazil since over a century, have genetic traits that can be transferred to triticale to improve the adaptability. Cultivar BRS Minotauro is a result of different crosses and selections performed in the last years by Embrapa Trigo, originating the first triticale cultivar developed in the

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country from Brazilian wheat and rye, adapted to the soil-climate cultivation conditions of southern Brazil.

HISTORY OF SELECTION AND BREEDING METHODS

For the development of the triticale cultivar BRS Minotauro, the wheat line PF 89358 (BR 35*3//BR 14*2/ LARGO) was crossed with Rye BR1 in Passo Fundo, in 1991. In 1992, 25 seeds of five haploid ears (n=4x), were sown in pots in a greenhouse and treated with colchicine for chromosome duplication, resulting in three plants. Of these only two produced fertile grains. In 1993, the new octoploids (2n=8x) designated OCTO 92-3, were sown by hand in a greenhouse, ear-to-row. In 1994, five selected plants were sown in the field and labeled with plot numbers 408102 to 408106. In plot no. 408102, 11 ears were selected and sown in 1995 for evaluation, selection and crosses. To favor natural crosses, alternating rows were sown (ear-to-row, each 1.5 meter long) with rows of the hexaploid triticale (2n=6x) 'Triticale BR4', due to the high pollen sterility of the octoploid. The ears of OCTO 92-3 were harvested in bulk, threshed and all seeds sown in the field. In 1996, 200 ears of distinct plants were selected in the plot. These ears were sown in 1997, according to the pedigree method (ear-to-row), numbered from 1 to 200. Twelve ears of the row of number 14 were selected and sown likewise, in 1998. In this year, modified mass selection was performed and undesirable plants eliminated. The resulting plant material was evaluated in 1999, and multiplied in ear-to-row, under rigorous selection for the production of genetic seed. In 2000, the progeny was once more purified, designated PFT 008, and evaluations began in preliminary grain yield trials and in the internal collection by Embrapa Trigo (sowing date and reaction to head blight, to soil aluminum toxicity and to soil-born viruses). From 2001 on, this line was evaluated in VCU (value for cultivation and use) trials, in the southern region of Brazil (RS, SC, PR and SP) in partnership with the Fundação Pró-Sementes de Apoio à Pesquisa, and was characterized in the DUS-test (distinctness, uniformity and stability) in 2002 and 2003, in Passo Fundo, RS, and considered appropriate for registration, as BRS Minotauro, in 2004.

PERFORMANCE TRAITS

Cultivar BRS Minotauro has a medium cycle (an average 86 days from emergence to heading and 143 days to maturation), medium – tall plant stature (mean of 113 cm in Passo Fundo). The anthocyanin coloration of the auricles is absent or very weak and the glaucosity of the flag leaf sheath medium to strong. The ears are completely awned, light-colored at maturation, fusiform, with weak pigmentation of the awns and medium to weak coloration of the anthers.

BRS Minotauro is tolerant to aluminum toxicity, and regarding the main diseases, resistant to stem rust and leaf rust, moderately resistant to leaf spot, soil-born viruses and barley yellow dwarf virus (BYDV), and moderately susceptible to head blight and to sprouting.

In VCU trials conducted in the Rio Grande do Sul, Santa Catarina, Paraná and São Paulo, from 2001 to 2003, the grain yield of BRS Minotauro amounted to 3,790 kg ha^{-1}, exceeding the mean yield of the controls by 9% (Table 1).

BRS Minotauro performed better than the controls and other plant material in cultivation in several aspects: for hectoliter weight; with a Hagberg Falling Number of over 120 seconds (where the maximum is 250 seconds) and a less severe reaction to head blight than the recommended cultivars, under artificial inoculation as well as in natural environment, even in conditions of high rainfall.

Due to the performance of the material and to the similarity of the climatic and cultivation conditions in Santa Catarina, Rio Grande do Sul and southern Paraná (Southern Region) and in northern Paraná, Mato Grosso do Sul and São Paulo (Central South Region) and to the cultivation technologies presently available to farmers, the triticale cultivar BRS Minotauro was registered for trade aiming at grain production in all wheat-producing regions in the South and Central South Region of Brazil (RS, SC, PR, MS and SP), in the cold season. In view of the low susceptibility to head blight BRS Minotauro represents one of the best options for cultivation in the southern Region.

SEED DISTRIBUTION AND MAINTENANCE

BRS Minotauro is a protected cultivar; the multiplication of foundation seed is incumbent on the Embrapa, specifically the Serviço de Negócios para Transferência de Tecnologia da Embrapa (SNT). The EMBRAPA in partnership with the Fundação Pró-Sementes de Apoio à Pesquisa is in charge of the certified seed propagation.

Table 1. Grain yield of triticale genotypes (kg ha^{-1}), in the period from 2001 to 2003, in Value for Cultivation and Use experiments in Rio Grande do Sul, Santa Catarina, Paraná, and São Paulo states.

Year and location	CV (%)	Genotypes				Control mean[1]	% rel control mean[2]
		BRS Minotauro	Iapar 23 - Arapoti	BRS 203	Embrapa 53		
2001							
Vacaria/RS	12.8	4,640	3,510	4,773	-	4,142	112
São Luiz Gonzaga/RS	15.5	2,599	2,213	1,809	-	2,011	129
Tapera/RS	15.5	4,273	3,026	2,967	-	2,996	143
Ponta Grossa/PR	10.6	4,300	2,680	3,113	-	2,896	148
Mean (2001)	-	3,953	2,857	3,166	-	3,011	133
2002							
Vacaria/RS	12.4	4,498	4,581	4,308	-	4,444	101
São Luiz Gonzaga/RS	16.3	2,718	2,494	2,449	-	2,472	110
Passo Fundo/RS	15.2	2,250	2,709	2,943	-	2,826	80
Abelardo Luz/SC	8.9	2,946	2,092	2,398	-	2,245	131
Ponta Grossa/PR	12.8	2,253	2,391	2,166	-	2,278	99
Mean (2002)	-	2,933	2,853	2,853	-	2,853	104
2003							
Vacaria/RS	14.6	3,838	2,896	-	3,803	3,350	115
São Luiz Gonzaga/RS	14.2	3,925	4,000	-	4,277	4,138	95
Passo Fundo/RS	10.9	4,486	3,663	-	4,087	3,875	116
Abelardo Luz/SC	6.3	5,548	5,616	-	5,808	5,712	97
Ibiporã/PR	12.2	3,290	4,057	-	3,629	3,843	86
Ponta Grossa/PR	10.4	6,654	7,381	-	6,994	7,188	93
Avaré/SP	15.1	3,391	3,554	-	3,292	3,423	99
Capão Bonito/SP	12.6	2,820	2,867	-	3,100	2,984	95
Mean (2003)	-	4,244	4,254	-	4,374	4,314	99
Overall mean (2001/03)	**-**	**3,790**	**3,514**	**2,992**	**4,374**	**3,578**	**109**

[1] Control mean (Iapar 23 -Arapoti, BRS 203 and/or Embrapa 53)
[2] Relative percentage of mean yield of cultivar BRS Minotauro, compared to the control mean