



CULTIVAR RELEASE

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BRS Harmonia - triticale cultivar

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Abstract – *The triticale cultivar BRS Harmonia has moderate resistance to leaf rust, is outstanding in grain yield and quality, and its flour is suitable for cookie baking. It is an excellent alternative as winter crop for the different grain production systems in south-central Brazil.*

Key words: *Triticosecale, crop breeding, protein.*

INTRODUCTION

The state of Paraná became the main producer of triticale in Brazil in the period between 2000 and 2012. On the other hand, in the traditional producing States of Rio Grande do Sul and Santa Catarina, the harvested area declined sharply in the same period, from 20,000 in 2000 to less than 6,000 hectares in 2013. In São Paulo, unlike in other States, the sowing area was clearly maintained at an average of 22,000 hectares since 2000. In 2013, the State became the major producer of this cereal, with a grain yield of 50,200 tons from 20,000 actually harvested hectares, and Paraná the second largest producer, producing 36,600 tons of grain on 16,500 hectares (IBGE 2014).

The increased disease incidence in triticale, mainly of leaf diseases, such as tan spot (*Drechslera tritici-repentis*), leaf spot (*Bipolaris sorokiniana*) and head blight (*Gibberella zeae*) in the cold and wet traditional producing regions, including the southern state of Paraná, possibly caused the migration of the crop to warmer and drier regions, such as northern Paraná and southern São Paulo, where the climate thwarts these diseases and triticale is better adapted by better tolerance to acid soils and drought, resulting in higher grain yields than those of other winter cereal cultivars. In addition, the use of triticale grain of this region for flour production and the application of this flour for cookie baking in blends with wheat flour ensure a better market price of the grain, helping to maintain the area of cultivation,

by the producer's preference, for this alternative to wheat cultivation (Nascimento Junior et al. 2008).

Some cultivars, e.g., BRS Minotauro (Nascimento Junior et al. 2008) and BRS Saturno (Nascimento Junior et al. 2011), have a better response to scab. However, with regard to the re-incidence of leaf rust detected in Rio Grande do Sul in 2010, and now in the North of Paraná in 2013, few recorded genotypes have vertical resistance or tolerance to this disease. The most commonly planted genotype in Brazil, cultivar IPR 111, is highly susceptible to leaf rust; BRS Saturno is moderately susceptible; and BRS Minotauro has better resistance, but low seed availability.

Demands for better plant resistance to biotic and abiotic factors and for quality of grain, flour and plants, accelerate research on the development of more productive and resistant cultivars that add value and income for rural producers. Embrapa has partnered with the Fundação Meridional de Apoio à Pesquisa Agropecuária and the International Maize and Wheat Improvement Center (CIMMYT), in collaboration with the Agronomic Institute of Paraná - IAPAR in triticale to develop technologies for integrating agricultural production systems in south-central Brazil.

PEDIGREE AND BREEDING METHOD

The development process of BRS Harmonia began in 2006, when some international triticale collections introduced from CIMMYT were sown; among them, the col-

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lection named “38th International Triticale Yield Nursery” (38ITYN). This collection was tested in the municipality of Coxilha/RS, and the population number 822 stood out for its earliness and agronomic type, presenting, however, genetic variability.

Entry 822 was a result of the cross “DAHBI_6/3/ARDI_1/TOPO1419//ERIZO_9/4/SONNI_3”, performed in El Batan, Mexico, in 1999. The segregating populations F₂ to F₇ were planted in the Yaqui Valley (Y), in Toluca (M), and in El Batan (B). After two selection cycles in Brazil, the resulting pedigree was “CTSS99Y00115S-1Y-0M-0Y-8B-1Y-0B-1F-0F”. In 2008, the plant material was propagated in Passo Fundo – RS, at Embrapa Wheat, and part of the seeds was used for internal collection tests, to describe disease reactions and agronomic traits.

In 2009, the line was named PFT 0905 and evaluated in the Preliminary Yield Trial (EPRTCL) in Passo Fundo and São Borja, both in the State of Rio Grande do Sul, and in internal collections tests in Passo Fundo. For being outstanding in agronomic traits such as yield, test weight, early maturity, and plant stature, the line was promoted to

tests of Value for Cultivation and Use (VCU) in the States of Santa Catarina, Paraná, São Paulo, and Mato Grosso do Sul, by the Agronomic Institute of Paraná (IAPAR), Embrapa Soybean and Fundação Meridional de Apoio à Pesquisa Agropecuária.

PERFORMANCE

In the three-year average of VCU testing (2010 - 2012), the yield of the triticale line PFT 0905 exceeded that of the two best controls by 2.8% (Table 1). The triticale cultivars BRS 203, BRS Minotauro, BRS Saturno, BRS Ulisses, Embrapa 53 and IPR 111 were used as control, at all locations and in all years of assessment.

In the internal collection tests, PFT 0905 was earlier in heading and maturity, had a shorter plant stature and intermediate test weight, in comparison with the other cultivars (Table 2).

OTHER TRAITS

BRS Harmonia is resistant to powdery mildew (*Blumeria graminis*); moderately resistant to leaf rust (*Puccinia triticina*)

Table 1. Grain yield (kg ha⁻¹) and relative percentage (%) of BRS Harmonia compared to the two best controls in 2010, 2011 and 2012

Wheat region/UF ³	2010			2011			2012			Mean		
	BRS Harmonia	Test ¹ .	Test ² (%)	BRS Harmonia	Test ¹ .	Test ² (%)	BRS Harmonia	Test ¹ .	Test ² (%)	BRS Harmonia	Test ¹ .	Test ² (%)
1/SC	5,082	5,457	93.1	3,763	4,298	87.6	-	-	-	4,423	4,878	90.7
2/SC	5,397	5,368	100.5	5,767	5,856	98.5	3,037	2,961	102.6	4,734	4,728	100.1
1/PR	5,730	5,917	96.8	6,896	7,011	98.4	4,676	4,642	100.7	5,767	5,857	98.5
2/PR	6,665	6,545	101.8	6,413	5,840	109.8	6,376	5,790	110.1	6,485	6,058	107.0
3/PR	5,036	4,628	108.8	4,539	4,584	99.0	4,987	4,844	103.0	4,854	4,685	103.6
2/SP	9,487	9,406	100.9	5,555	4,992	111.3	5,160	4,830	106.8	6,734	6,409	105.1
3/MS	3,257	3,264	99.8	3,888	3,453	112.6	4,074	3,433	118.7	3,740	3,383	110.5
Mean	5,808	5,798	100.2	5,260	5,148	102.2	4,718	4,417	106.8	5,262	5,121	102.8

¹ Mean (kg ha⁻¹), per wheat region/UF, of the two best controls, defined at each location, of the cultivars BRS 203, BRS Minotauro, BRS Saturno, BRS Ulisses, Embrapa 53 or IPR 111. In 2010, the best two controls were BRS 203 and BRS Ulisses, in 2011 BRS Saturno and IPR 111, and in 2012 BRS Ulisses and IPR 111;

² Percentage of mean grain yield of BRS Harmonia, in relation to the overall mean of the two best controls;

³ Homogeneous adaptation regions of wheat and triticale cultivars (1, 2 and 3) for the Federal Units (UF) or States of Santa Catarina (SC), Paraná (PR), São Paulo (SP) and Mato Grosso do Sul (MS). Test locations: 1/SC: Campos Novos; 2/SC: Abelardo Luz; 1/PR: Guarapuava, Irati and Ponta Grossa; 2/PR: Cascavel, Mauá da Serra and Pato Branco; 3/PR: Cambará, Cruzmaltina, Londrina and Warta; 2/SP: Itaberá and 3/MS: Antonio João and Maracajú.

Table 2. Means of heading (HEAD), maturation (MAT), plant stature (PS) and hectoliter weight (HW), of BRS Harmonia compared to other triticale cultivars in Passo Fundo - RS, between 2010 and 2013, without fungicide treatment

Cultivar	HEAD (days)	MAT (days)	PS (cm)	HW (kg hL ⁻¹)
BRS Harmonia	68.3 e ¹	129.1 f	92.1 f	65.9 e
BRS 203	71.6 d	131.3 d	109.8 a	70.7 b
BRS 148	72.2 c	131.7 b	109.5 b	67.6 d
IPR 111	72.2 c	131.5 c	99.1 e	65.3 f
Embrapa 53	72.7 b	132.3 a	102.8 d	68.8 c
BRS Saturno	73.0 a	130.7 e	108.3 c	71.5 a
CV%	2.2	1.6	1.6	2.2

¹ Means followed by the same letter in the column do not differ statistically by Duncan test at the 5% level of significance.

Table 3. Means¹ of hectoliter weight (HW), 1,000-grain weight (ThGW), grain hardness index (GDI), grain protein content (GPC), Hagberg Falling Number (FN), water activity of the flour (a_wF) and flour whiteness (W^*) of BRS Harmonia compared to other triticale genotypes in trials of Value for Cultivation and Use (VCU) in 2012

Cultivar	HW (kg hL ⁻¹)	ThGW (g)	GDI	GPC (%)	FN (s)	a_wF	W^*
BRS Harmonia	72.5 ² d	44.9 a	49.1 d	10.6 d	78 c	0.58 b	94.1 b
TPOLO 0608	na ³	na	44.7 e	11.4 c	63 d	na	na
PFT 0609	76.0 a	38.9 c	57.2 b	11.8 b	101 b	0.56 c	93.4 d
IPR 111	70.8 e	44.7 a	52.5 c	11.9 b	76 cd	0.52 e	93.5 c
BRS Ulisses	72.8 c	39.0 c	60.1 a	12.7 a	121 a	0.54 d	93.3 e
TPOLO 3-8	73.2 b	42.8 b	52.1 c	12.9 a	122 a	0.67 a	94.2 a
CV%	0.4	1.6	3.5	2.1	18.4	1.8	0.1

¹ Means of analysis of the grain harvested in Value for Cultivation and Use (VCU) tests in the municipalities of Irati, Pato Branco, Londrina and Itaberá, respectively, homogeneous adaptation regions of wheat and triticale cultivars 1/PR, 2/PR, 3/PR and 2/SP.

² Means followed by the same letter in the column do not differ statistically by the Duncan test at 5% significance.

³ information not available (na).

and the yellow dwarf virus (BYDV); moderately susceptible to leaf diseases (*Bipolaris sorokiniana*, *Drechslera* spp. and *Stagonospora nodorum*) and to “crestamento” (soil acidity); it is susceptible to pre-harvest sprouting, to scab or head blight (*Fusarium graminearum*), and to blast (*Pyricularia oryzae*).

Some characteristics related to grain and flour of BRS Harmonia and of some triticale genotypes are listed in Table 3. According to Labuschagne et al. (1997), cookie flours of good quality are obtained from soft grains with low crude protein content, with grain hardness as the main trait. However, Leon et al. (1996) mentioned the low protein content as one of the main traits for the selection of genotypes for cookie baking. Compared to the commercial cultivars IPR 111 and BRS Ulisses and other elite genotypes, the grains of BRS Harmonia had a lower protein content, and were semi-hard. BRS Harmonia also has a higher 1,000-grain weight than most genotypes, low water activity (0.58), light flour with high whiteness (> 94), and test weight and Hagberg falling number intermediate to the other cultivars (Table 3). These characteristics, particularly of grain texture and protein content, suggest the use of BRS Harmonia flour for cookie baking, in blends with wheat flour.

In view of the performance of the genotype and similarity of climate and cultivation in the States of Santa Catarina,

REFERENCES

- IBGE (2014) **Levantamento sistemático da produção agrícola**. Available at <<http://www.ibge.gov.br/home/estatistica/indicadores/agropecuaria/lspa/default.shtm>>. Accessed on May 15, 2014.
- Labuschagne MT, Claassen A and Deventer CS (1997) Biscuit-making quality of backcross derivatives of wheat differing in kernel hardness. **Euphytica** **96**: 263-266.
- Leon AE, Rubiolo A and Anon MC (1996) Use of triticale flours in cookies: quality factors. **Cereal Chemistry** **73**: 779-784.
- Nascimento Junior A, Scheeren PL, Silva MSS, Caierão E, Eichelberger L, Lima MIPM, Brammer SP and Albuquerque ACS (2008) BRS Minotauro - Triticale Cultivar. **Crop Breeding and Applied Biotechnology** **8**: 174- 76.
- Nascimento Junior A, Silva MSS, Caierão E and Scheeren PL (2011) BRS Saturno - Triticale Cultivar. **Crop Breeding and Applied Biotechnology** **11**: 286- 288.

Paraná, Mato Grosso do Sul and São Paulo and of the currently available farming technologies, BRS Harmonia was registered for grain production and marketing in the wheat regions 1 and 2 of Santa Catarina, 1, 2 and 3 of Paraná, 3 of Mato Grosso do Sul, and 2 of São Paulo, for rainfed cultivation in the cold season.

The triticale cultivar BRS Harmonia has an early cycle for heading, medium cycle for maturity, medium/low stature and an excellent agronomic plant type. The moderate resistance to leaf rust and greater grain productivity and quality than of the recommended varieties make BRS Harmonia an excellent option for the cultivation different systems of winter grain production in south-central Brazil.

SEED MAINTENANCE AND DISTRIBUTION

BRS Harmonia was registered by the Ministry of Agriculture, Livestock and Supply (MAPA) of Brazil, under number 31152, on 16/09/2013. Embrapa Wheat is in charge of the genetic seed production, Embrapa Products and Markets (SPM) produces foundation seed, and the production of certified seed is reserved exclusively for the supporter institutions of the Fundação Meridional de Apoio à Pesquisa Agropecuária.