



CULTIVAR RELEASE

BRS 327 - a new bread wheat cultivar

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ABSTRACT - Wheat cultivar BRS 327 resulted from a cross between CEP 24 and BRS 194. 'BRS 327' has high yield, white flour and belongs to the bread class. The mean grain yield in the four years of evaluation was 3,998 kg ha⁻¹.

Key words: *Triticum aestivum*, crop breeding.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is an autogamous species cultivated worldwide which is essential for the Brazilian agriculture. Around 11 million tons of wheat per year are currently consumed in Brazil, clearly exceeding the national grain production with just over 6 million tons in 2008 (Conab 2009).

The national agricultural research has contributed significantly to increase yields and improve wheat quality in Brazil. These efforts began in 1919 with the establishment of experimental stations in Alfredo Chaves (today Veranópolis) and Ponta Grossa, PR, by the Ministry of Agriculture. The first improvement studies focused on the selection of progeny plants derived from seed collections of genotypes used by the settlers, while first artificial crosses were performed only in 1925. The 70s were significant for the development of wheat breeding in Brazil, when private and state research centers were founded, with a direct impact on the expansion of wheat production across the country (Sousa 2004). Since then, over 100 new cultivars have been developed by the research programs,

contributing to the rise of the mean yield level on the field and sustainability and rural properties.

The wheat breeding program of Embrapa aims at providing the productive chain with cultivars that are competitive at the agronomic level and suitable in quality and type for different segments of milling industry. Some of the main challenges consist of an increase in the potential grain yield associated with a plant architecture that supports this increment; tolerance/resistance to biotic (leaf rust and scab) and abiotic stresses (pre-harvest sprouting, soil acidity and shattering). 'BRS 327' was released by Embrapa in partnership with the Fundação Pró-Sementes de Apoio a Pesquisa, which participates in the process of cultivar testing, marketing and dissemination. It is characterized by excellent resistance to leaf diseases and grain yield stability.

Pedigree and breeding method

'BRS 327' was derived from the female parent CEP 24 and male parent BRS 194, crossed in the greenhouse of Embrapa Trigo, in 1996. The F₁ generation was planted in

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the summer of 1997, in a greenhouse (plot no. 761 258), as part of the set of crosses made for durable resistance to leaf rust. The selection method of segregating populations was predominantly bulk. Only in the F₆ generation the bulk of selected ears was opened by the pedigree method.

In 2002, the population of the plant-derived F₆ generation was sown in the experimental field of Embrapa Trigo, where uniform growth was observed. The plot was harvested (labeled line PF 030027) with the following history of selection: F57637-0F-0F-0F-11F. In 2003, the line was evaluated for grain yield in the preliminary trial of wheat lines, in Passo Fundo, and in the following years in the other tests of the experimental network of Embrapa.

Performance

The evaluation of yield performance of 'BRS 327' to determine the Value for Cultivation and Use (VCU test) was conducted from 2005 to 2008 at 41 locations in the different agro-climatic regions defined for the crop in each state. In Rio Grande do Sul tests were conducted in Cachoeira do Sul, Passo Fundo, Santa Rosa, Santo Augusto, São Borja, Três de Maio and Vacaria; in Santa Catarina in the counties Abelardo Luz, Campos Novos, Canoinhas, and Chapecó; in Paraná in Cafelândia, Campo Mourão, Cascavel, Guarapuava and Ponta Grossa; in São Paulo, in the counties Itaberá, Manduri, Paraguaçu Paulista; and in Mato Grosso do Sul in Maracajú and Ponta Porã. The mobile mean of the two best controls per experimental site was used for comparison, resulting in accurate results. All tests were conducted in a randomized block design with three replications treated and one untreated replication. The treated replications were used to calculate grain yield and the untreated replication to evaluate the genotype performance in terms of diseases at site. Each experimental unit consisted of one genotype sown in five 5m rows, covering a total evaluated area of 5m². All cultural practices to initiate and conduct the experiment were according to the research-based recommendations defined by the Comissão Sul-brasileira de Pesquisa de Trigo (2008).

The percentage relative to the yield performance of cultivar 'BRS 327' exceeded the controls in the states of Rio Grande do Sul (103 %), Paraná (104 %) and Mato Grosso do Sul (102 %) in the assessment period from 2005 to 2008 (Table 1) in the states of Santa Catarina and São Paulo, respectively, the percentage obtained was 98% and 95%. In 41 experiments conducted in four years of evaluation, the mean yield of BRS 327 was 3,998 kg ha⁻¹ (102 % of the two

best controls in each evaluation environment). The cultivar yields were highest in 2007 in the state of Paraná, reaching 5,239 kg ha⁻¹ and up to 6,781 kg ha⁻¹ under irrigation, although the cultivar is not particularly recommended for these conditions.

The cultivar 'BRS 327' was registered for cultivation in the states of Rio Grande do Sul (regions 1, 2 and 3), Santa Catarina (regions 4 and 5), Paraná (regions 7 and 8), Mato Grosso do Sul (regions 9 and 10) and Paul (regions 11 and 12).

Other traits

'BRS 327', with early maturity (75 days to heading and maturity of an average of 130 days in the region of Passo Fundo) belongs to the bioclimatic group of spring wheat. It is characterized as moderately resistant to soil aluminum toxicity, to shattering, pre-harvest germination and frost in the growth phase and moderately susceptible to lodging. In studies on the optimum nitrogen dose to exploit the maximum potential yield of the cultivar, it was determined that 60 kg ha⁻¹ of this macronutrient should be recommended, in view of the traits of 'BRS 327' (Wiethölter et al. 2008).

The cultivar reaction to the major wheat diseases is characterized by moderate resistance septoria glume blotch (*Stagonospora nodorum* f. sp. *Tritici*), powdery mildew (*Blumeria graminis*), spot blotch (*Bipolaris sorokiniana*), to scab (*Fusarium graminearum*), barley yellow dwarf virus (BYDV) and Soil Borne Wheat Mosaic Virus (SBWMT). 'BRS 327' is susceptible to leaf blight (*Helminthosporium* sp.). With regard to leaf rust (*Puccinia triticina*), the following reactions were observed in the field: 2005 (20S/10S), 2006 (40S), 2007 (10MR/MS) and 2008 (5S), where S: susceptible, MS: moderately susceptible, and MR: moderately resistant. In the greenhouse, susceptibility to race B₃₄ was observed in seedlings (Table 2).

BRS 327 has medium/high plant height (mean of 94 cm in the years of experimentation).

The auricles are predominantly colorless. The ear is characteristically fusiform, awned and light-colored at maturity. The grain is predominantly oval-shaped and light red.

'BRS 327' was classified preliminarily as bread wheat, with a mean gluten strength (W) of 248 x 10⁻⁴ J in 35 samples from the sites of experimentation in the states of Rio Grande do Sul (18 samples), Santa Catherine (4 samples), Paraná (8 samples), Mato Grosso do Sul (3 samples), and Sao

Table 1. Grain yield (kg ha⁻¹) of cultivar ‘BRS 327’, of the mobile mean of the two best controls and the relative percentage of the cultivar and the controls in the environments of experimentation in the different states of Brazil

Year	Cultivar	State					
		RS	SC	PR	MS	SP	Brazil
2005	BRS 327	3,914	3,050	4,391	1,518	2,778	3,455
	Mobile mean of best control ¹	3,745	3,416	4,337	1,399	2,928	3,437
	Mobile mean of 2 nd best control ²	3,612	3,345	4,180	1,357	2,811	3,320
	General mean of the controls	3,679	3,381	4,259	1,378	2,869	3,379
	% Relative	108	89	103	109	98	103
2006	BRS 327	4,689	4,556	4,450	1,166	6,781*	4,214
	Mobile mean of best control ¹	4,911	5,118	3,997	1,164	7,750	4,405
	Mobile mean of 2 nd best control ²	4,779	4,929	3,948	1,151	7,578	4,294
	General mean of the controls	4,845	5,024	3,972	1,158	7,664	4,350
	% Relative	99	91	112	96	88	99
2007	BRS 327	3,685	3,215	5,239	-	-	3,956
	Mobile mean of best control ¹	3,401	3,005	5,375	-	-	3,795
	Mobile mean of 2 nd best control ²	3,325	2,910	5,304	-	-	3,716
	General mean of the controls	3,363	2,957	5,340	-	-	3,756
	% Relative	112	111	98	-	-	108
2008	BRS 327	5,004	4,936	-	-	-	4,981
	Mobile mean of best control ¹	5,377	5,055	-	-	-	5,269
	Mobile mean of 2 nd best control ²	5,264	4,839	-	-	-	5,122
	General mean of the controls	5,320	4,947	-	-	-	5,196
	% Relative	94	99	-	-	-	96
Mean	BRS 327	4,320	3,939	4,618	1,342	4,112	3,998
	Mobile mean of best control ¹	4,355	4,148	4,511	1,281	4,535	4,058
	Mobile mean of 2 nd best control ²	4,239	4,005	4,403	1,254	4,400	3,946
	General mean of the controls	4,297	4,077	4,457	1,268	4,467	4,002
	% Relative	103	98	104	102	95	102

* Under irrigation.

¹ Mean of the best control at each evaluation site; ² Mean of the 2nd best control at each evaluation site.

Yield order of controls used in 2005: Cachoeira do Sul (BRS 194 and BRS 208), Passo Fundo (Safira and BRS 208), Santa Rosa (CD 104 and Ônix), São Borja (CD 104 and BRS 208), Vacaria (BRS 220 and BRS 208), Abelardo Luz (Ônix and BRS 194), Campos Novos (Ônix and BRS Camboatá), Campo Mourão (BRS 194 and CD 105), Cascavel (Ônix and BRS 194), Guarapuava (Safira and BRS 208), Ponta Grossa (BRS 220 and BRS Camboatá), Manduri (CD 104 and BR 18), Paraguassú Paulista (CD 104 and BR 18), Maracajú (Ônix and BRS 208) and Ponta Porã (BR 18 and CD 105).

Yield order of controls used in 2006: Cachoeira do Sul (BRS Guabijú and BRS 208), Passo Fundo (BRS 220 and BRS 208), Santo Augusto (Ônix and Fundacep 50), São Borja (CD 104 and Ônix), Vacaria (BRS 220 and BRS Camboatá), Canoinhas (BRS 208 and BRS 220), Xanxerê (Ônix and BRS 208), Cascavel (BRS 208 and BRS Guamirim), Guarapuava (BRS Camboatá and BRS 208), Itaberá (CD 104 and BRS 208), Maracajú (BR 18 and BRS 208) and Ponta Porã (BRS Guamirim and BRS 208).

Yield order of controls used in 2007: Passo Fundo (Safira and BRS 208), São Borja (Abalone and BRS 208), Três de Maio (Safira and BRS 208), Vacaria (Safira and BRS 208), Campos Novos (BRS 220 and BRS 208), Chapecó (BRS 220 and BRS 208), Guarapuava (BRS 208 and BRS Guamirim) and Ponta Grossa (BRS 220 and BRS 208)

Yield order of controls used in 2008: Passo Fundo (BRS Guamirim and Fundacep Cristalino), São Borja (BRS Guamirim and Fundacep Cristalino), Três de Maio (BRS 208 and Quartzo), Vacaria (Safira and Fundacep Cristalino), Campos Novos (Fundacep Cristalino and BRS Guamirim) and Chapecó (Quartzo and BRS Guamirim).

Table 2. Reaction of cultivar ‘BRS 327’ to different races of wheat leaf rust in the seedling stage, in a greenhouse

	Leaf rust races							
	B34	B44	B53	B54	B55	B56	B57	B58
Reaction	3	:	2+/0	2/1	2/1;1+;0	1/2-	0	;

; = traces; Scale 0 a 5 = level of susceptibility (5 = most susceptible).

Source: Embrapa Trigo.

Paulo (2 samples) (Table 3). The cultivar had a mean fall number of more than 220 seconds in all states, indicating good sprouting tolerance. In an experimental mill, mean extraction was 50 % and the ratio of P (tenacity) by L (extensibility) 1.0, appropriate for baking. 'BRS 327' has bright flour ($L = 94$, $a = -0.2$, $b = 7.5$) (Table 3).

Seed maintenance and distribution

'BRS 327' is being registered and patented by the Ministério da Agricultura, Pecuária e Abastecimento (MAPA). Embrapa Trigo is in charge of the genetic seed of the cultivar, the Serviço de Negócios para Transferência

Table 3. Qualitative profile of 'BRS 327' wheat cultivar – samples analyzed at the quality laboratory of Embrapa Trigo

Trait	Unit	RS	SC	PR	MS	SP	Brazil
No. of samples	No.	18	4	8	3	2	35
Gluten strength	10 ⁴ J	219	251	299	249	296	248
Fall number	Seconds	327	352	298	293	404	325
Extraction	%	50	52	46	50	53	50
Elasticity index	%	52	56	59	52	57	55
Tenacity (P)	mm	77.6	90.5	89.8	89.0	100.5	84.1
Extensibility (L)	mm	86.1	79.5	96.8	85.7	86.0	87.7
Ratio P/L	-	1.0	1.3	1.0	1.1	1.2	1.0
Cor Minolta L	Minolta	94.5	93.9	94.3	93.7	94.8	94.3
Cor Minolta a	Minolta	-0.3	-0.3	0.0	0.1	-0.2	-0.2
Cor Minolta b	Minolta	7.8	7.6	7.0	7.3	6.6	7.5

Source: Embrapa Trigo.

de Tecnologia da Embrapa (SNT) for foundation seed and Instituidores da Fundação Pró-Sementes de Apoio a Pesquisa, a partner institution of Embrapa, is responsible for the basic seed.

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