



CULTIVAR RELEASE

BRS 374 – Wheat cultivar

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Abstract – BRS 374 is a wheat cultivar developed by Embrapa. It resulted from a cross between the F₁ generation of PF 88618/Coker80.33 and Frontana/Karl. BRS 374 belongs to the soft wheat class, has a low plant height, a high potential grain yield, and white flour.

Key words: *Triticum aestivum*, crop breeding, soft class.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is an autogamous species, widely adapted at the global level and significant for Brazilian agriculture. Currently, around 11 million tons of wheat are consumed per year in Brazil, far exceeding the national cereal production of a little over 5 million tons in 2011 (CONAB 2012).

The national agricultural research has contributed significantly to increase growth and enhance the quality of Brazilian wheat. This effort began in 1919 with the establishment of experimental stations in Alfredo Chaves (nowadays Veranópolis) and Ponta Grossa, Paraná, Brazil, by the Ministry of Agriculture. The first steps of breeding consisted of the selection of plant progenies derived from seed collections of genotypes used by settlers in Brazil, and the first artificial crosses were performed in 1925. The 70's were fruitful for the development of wheat breeding in Brazil, when private and public research centers were founded, directly influencing the expansion of wheat production in the country (Sousa 2004). Since then, more than 100 new cultivars were developed, contributing to increase the mean grain yield on fields and consequently the sustainability of rural properties.

The wheat breeding program of Embrapa aims to provide the production chain of this cereal with agronomically competitive cultivars suited for different segments of the milling industry in terms of quality and scope of use. Some of the main challenges are: a higher grain yield potential

associated with a plant architecture that supports such an increase; tolerance/resistance to biotic (leaf rust, powdery mildew, leaf spots and scab) and abiotic stress (pre-harvest sprouting, soil acidity and grain shattering). BRS 374 is a new cultivar, released in partnership with the Fundação Pró-Sementes de Apoio a Pesquisa, which participated in the trial process, marketing and distribution of the cultivar.

PEDIGREE AND BREEDING METHOD

The wheat cultivar BRS 374 was obtained from a double cross in 1998, of the F₁ generation of PF 88618/Coker80.33 and Frontana/Karl, in a greenhouse of Embrapa Wheat, Passo Fundo, Rio Grande do Sul. The agronomic characteristics of line PF 88618 are good, mainly in view of the short plant height and high tillering capacity. Frontana is an old cultivar, but one of the best genetic sources for pre-harvest sprouting, durable resistance to leaf rust tolerance and grain shattering. The wheat genotypes Coker and Karl were introduced, providing, respectively, high yield and quality traits. The F₁ seeds were advanced to F₅ by mass selection in plots of six 6-m rows, spaced 0.2 m apart, at a density of approximately 15 seeds per meter. Later, they were selected by the pedigree method from F₆ to F₈. Both mass selection and selection by the pedigree method were based on the following traits: low plant height, resistance to leaf and ear diseases, high tillering capacity, lodging resistance and tolerance to pre-harvest sprouting. When the line was homogeneous, it was bulk-harvested, resulting in line PF 040 310, with the following pedigree: F47867-0F-100F-

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0F-0F-4F-9F-12F-0F (letter “F” stands for Passo Fundo as the location of the cross and selections). The numbers preceding “F” indicates the selection method (0F = mass selection and 4F, 9F or 12F = number of plants selected by the pedigree method. Line PF 040310 was evaluated in an observation plot in 2004, in an experimental area of Embrapa, where it was compared with controls and an outstanding performance for grain yield was noted. This first assessment was conducted in plots of three 3-m rows with commercial cultivation density (approximately 300 plants m⁻²). In 2005 and 2006, the line was tested again in preliminary tests of Embrapa.

PERFORMANCE

For the Value for Cultivation and Use (VCU test), the yield performance of BRS 374 was determined in 2007, 2008 and 2010, in 25 tests in different agro-climatic regions defined for wheat cultivation, distributed across the Evaluation Network of the States: in Rio Grande do Sul, the tests were conducted in Vacaria (lat 28° 30' 44" S, long 50° 55' 59" W - Oxisol), Passo Fundo (lat 28° 15' 46" S, long 52° 24' 00" W - Oxisol), São Borja (lat 28° 39' 38" S, long 56° 14' 24" W - Oxisol), Três de Maio (lat 27° 46' 24" S, long 54° 14' 24" W - Oxisol) and in Victor Graeff (lat 28° 15' 46" S, long 52° 44' 54" W - Oxisol); in Santa Catarina in the locations Abelardo Luz (lat 26° 33' 53" S, long 52° 21' 00" W - Oxisol), Campos Novos (lat 27° 24' 06" S, long 51° 13' 30" W - Oxisol), Canoinhas (lat 26° 10' 38" S, long 50° 24' 0" W - Oxisol), and Chapecó (lat 27° 05' 47" S, long 52° 58' 59" W - Oxisol); in Paraná in Guarapuava (lat 25° 25' 36" S, long 51° 27' 00" W - Oxisol). To evaluate the treatments, the relative percentage of BRS 374 in relation to the mobile average of the two best controls per trial site, for a rigorous comparison. All assays were conducted in a randomized block design with three treated replications (shoot treated with fungicide and insecticide) and one without treatment. The treated replications were considered for grain yield calculation and the untreated replication to assess the genotype response to diseases at each location. Each experimental unit consisted of one genotype, which

was sown in five 5-m rows spaced 0.2 m apart, of which a total area of 5m² was evaluated. All cultural practices to install and conduct the experiment were applied according to the technical information of the Comissão Brasileira de Pesquisa Wheat and Triticale. Prior to sowing, the seeds of the trials were treated with imidacloprid + triadimenol.

The relative yield performance of BRS 374 was superior to the average of the two best controls in 2007, 2008 and 2010 (with 113%, 104% and 103%, respectively) (Table 1). In 25 experiments conducted in the three years of assessment, the average grain yield of BRS 374 was 4,733 kg ha⁻¹ (106% of the average of the two best controls in each assessed environment). The average cultivar yield peaked in 2008, with 5,392 kg ha⁻¹.

BRS 374 was registered for cultivation in the regions 1 and 2 of the states of Rio Grande do Sul and Santa Catarina, aside from the wheat cultivation region 1 of the state of Paraná.

BRS 374 belongs to the bioclimatic group of spring wheat and has an early cycle (on average 80 days of silking and 130 days of maturation, in the region of Passo Fundo). It is moderately resistant to lodging and pre-harvest grain loss and moderately susceptible to soil Al toxicity and pre-harvest sprouting. In studies on the optimal nitrogen rate to exploit the maximum yield potential of the cultivar, a rate of 80 kg ha⁻¹ N was determined, considering the economic return and agronomic characteristics of BRS 374.

The cultivar response to major diseases that attack wheat varies. BRS 374 is moderately resistant to powdery mildew (*Blumeria graminis*) and spot blotch (*Bipolaris sorokiniana*), moderately susceptible to soil-borne wheat mosaic virus (SBWMV), the virus of Barley yellow dwarf virus (BYDV) and Helminthosporium leaf blight (*Helminthosporium* sp.). It is susceptible to scab (*Fusarium graminearum*). To leaf rust (*Puccinia triticina*), the following reactions were observed in the field in the test periods (S = susceptible, MS = moderately susceptible): 2007 (60S), 2008 (10S/MS) and 2010 (100S). In the greenhouse, the seedlings were susceptible (races B₃₄, B₄₀, B₄₃, B₄₄, B₄₈, B₄₉, B₅₀, B₅₁, B₅₂, B₅₅, B₅₆, B₅₇, B₅₈, and B₅₉).

Table 1. Mean grain yield (kg ha⁻¹) of BRS 374 and average of the two best controls from 2007 to 2010

Genotype	2007		2008		2010		Mean	
	(kg ha ⁻¹)	(%) ¹						
BRS 374	3.677	113	5.392	104	5.129	103	4.733	106
1 ^a T ²	2.709	84	5.270	101	4.738	96	4.239	95
2 ^a T ³	3.775	116	5.127	99	5.177	104	4.693	105
T _M ⁴	3.242	100	5.199	100	4.957	100	4.466	100

¹ % = Percentage in relation to the mean of the two best controls.

² First control: BRS Louro (2007 and 2008), Fundacep Raizes (2010).

³ Second control: Pampeano (2007 and 2008), Quartzo (2010).

⁴ TM - Mean of the two control cultivars.

BRS 374 has a low plant height (on average 75 cm in the years of experimentation). The auricles are heterogeneous, slightly colored to colorless. The ear is fusiform, awned and light-colored at maturation. The grain shape is predominantly oval and the color light red.

BRS 374 was preliminarily classified as basic wheat, in the wheat regions 1 and 2, mean gluten strength (W) of 123×10^{-4} J in 19 samples from the experimental sites (Table 2). It has white flour ($L = 94.3$, $a = -0.2$, $b = 9.7$) and a balanced tenacity/extensibility ratio (P/L). In view of its qualitative traits, the cultivar is suggested for the manufacturing of

cookies, cakes, pastries, pizzas, fresh pastas and homemade food, feed, and flour blends.

SEED PRODUCTION AND DISTRIBUTION

BRS 374 is registered by the Ministry of Agriculture, Livestock and Supply (MAPA) under number 28232. Embrapa Wheat is responsible for the genetic seed, the Serviço de Produtos e Mercados (SPM) for the basic seed and Instituidores da Fundação Pró-Sementes de Apoio a Pesquisa, in partnership with Embrapa, is in charge of certified seed.

Table 2. Qualitative profile of BRS 374 for regions 1 and 2 and percentage of samples in the classes Other Uses (O), Basic (B) and Domestic (D)

Data	Region 1				Region 2				Overall mean
	O	B	D	mean	O	B	D	mean	
Sample	4	3	3	10	3	5	1	9	19
% Class	40	30	30	100	33.3	55.5	11.1	100	100
FN	325	327	300	318	251	294	416	293	306
W	68	131	201	127	90	127	170	120	123
Color L*	94.2	94.4	95.1	94.6	93.6	94.3	94.3	94.1	94.3
Color b*	10.0	10.0	9.3	9.8	9.6	9.4	9.9	9.5	9.7
P	41	61	69	55	48	56	64	54	55
L	63	86	98	80	73	89	100	85	83
P/L	0.7	0.7	0.7	0.7	0.8	0.6	0.6	0.7	0.7
EI	29.1	36.4	49.6	37.5	31.2	39.6	44.1	37.3	37.4
Hardness	53.1	46.1	30.4	45.7	46.0	47.9	80.0	51.2	48.3
Protein	-	-	11.8	11.8	-	-	-	-	11.8
Flour extraction	58.0	55.5	58.0	57.2	48.9	56.8	62.6	54.8	56.1

O = other uses; B = basic wheat; D = domestic wheat;

Samples = Number of samples per class and region; % Class = percentage of samples assigned to a class; FN= Falling number (s); W = gluten strength ($\times 10^{-4}$ Joules); L* = Luminosity (Minolta) – “0” = black and “100” = white; b* positive= tending to yellow; b* negative= tending to blue. Color b*, Minolta.; P = Tenacity or maximum force at rupture; L = Extensibility (mm); P/L = tenacity/extensibility ratio; EI = elasticity index (%).

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