



## CULTIVAR RELEASE

# BRS Estilo - Common bean cultivar with Carioca grain, upright growth and high yield potential

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**ABSTRACT** - *BRS Estilo* is a new common bean cultivar with Carioca grain, suitable for cultivation in 12 states in the five macro-regions of Brazil. With a mean yield of 2,134 kg ha<sup>-1</sup> it exceeds the control by 6.3 %, has a high yield potential (4011 kg ha<sup>-1</sup>), upright growth and is resistant to lodging and anthracnose.

**Key words:** *Phaseolus vulgaris* L., grain yield, common bean improvement.

## INTRODUCTION

Brazil is the world's largest producer of common bean, which is the basic protein food source in the nutrition of the Brazilian population. Consumers are regionally picky about grain color and type as well as the cooking quality. Currently, about 70 % of the grain consumed is carioca grain, 20 % is black grain and 10 % are other grain types produced mainly in the states in the South, Southeast and Midwest (Del Peloso and Melo 2005). To meet this demand, common bean is grown all year long, in the most varied cropping systems. In 2008, 2.8 million tons of beans were produced in an area of 2.5 million hectares, representing a national average yield of 1,135 kg ha<sup>-1</sup> (Feijão 2010).

The breeding program of common bean Embrapa Rice and Beans is focused on the search for high-yielding cultivars that are more disease-resistant and upright, enabling mechanized harvesting, so farmers can offer a better product quality to final consumers and earn higher incomes with the crop. This was the objective of the release of the common bean cultivar BRS Estilo, with Carioca grain,

appropriate for Rio Grande do Sul, Santa Catarina, Paraná, São Paulo, Goiás, Distrito Federal, Mato Grosso, Mato Grosso do Sul, Tocantins, Rondônia, Pernambuco, and Sergipe. The cultivar has upright plant architecture, high yield potential, and resistance to eight pathotypes of the causal fungus of both anthracnose and common mosaic virus. This cultivar has advantages over others indicated earlier, exceeding BRS Pontal (Del Peloso et al. 2004) in plant architecture and better than BRS Requite (Faria et al. 2004) in grain yield and commercial standard.

## Breeding methods

BRS Estilo originated from EMP 250 /4/ A 769 /// A 429 / XAN 252 // V 8025 / PINTO UI 114, crossed in 1991 at the International Center for Tropical Agriculture (CIAT), domiciled in Cali, Colombia. Embrapa Rice and Beans received this population in the F<sub>4</sub> generation from CIAT in 1994. In the F<sub>5</sub> generation, individual plants were selected based on resistance to angular leaf spot. In F<sub>5,6</sub>, families were selected for rust resistance, anthracnose and angular leaf spot and in the F<sub>5,7</sub> generation families were selected

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again for rust resistance and upright growth. In the F<sub>5:8</sub> generation plants were individually selected for yield, adaptation, upright growth, resistance to common bacterial blight, and commercial standard of carioca grain. In the F<sub>8:9</sub> generation, line LM 98202709 was selected for yield and upright growth. In 1999, this line was assessed along with 159 others from the breeding program of Embrapa Rice and Beans and with four Carioca controls. Preliminary tests were performed at four sites (Pelotas- RS, Passo Fundo-RS, Santo Antônio de Goiás-GO and Ponta Grossa-PR). In 2001, the line was assessed along with 43 others and two controls, in the Intermediate Trial conducted in seven environments: Santo Antônio de Goiás-GO, Ponta Grossa-PR, Lavras-MG, Sete Lagoas-MG, Planaltina-DF, Simão Dias-SE, and Seropédica-RJ. The combined data analysis for grain yield and other agronomic traits indicated line LM 98202709, with the pre-commercial name CNFC 9461, for the Test of Value for Cultivation and Use (VCU). In the VCU test it was evaluated once more with 11 lines and four controls, in a randomized block design with four replications and plots of four 4-m rows, using the recommended technologies for the different cropping systems in a total of 44 environments, in the states Santa Catarina, Goiás, Distrito Federal, São Paulo, and Tocantins. Thereafter, further VCU tests were conducted in 82 environments in the states of Goiás, Distrito Federal, Mato Grosso, Mato Grosso do Sul, Paraná, Santa Catarina, Rio Grande do Sul, Sergipe, Pernambuco and Rondônia.

### Grain yield and potential

The grain yield of BRS Estilo (CNFC 9461) was 6.3 % higher than of the control mean (Pérola, Iapar 81, BRS Horizonte, BRS Requite and IPR Juriti) (Table 1) in the 134 VCU tests conducted from 2003 to 2009, sown in the winter season in Tocantins, in the rainy season in São Paulo, Sergipe and Pernambuco and Rio Grande do Sul, in the dry season in Mato Grosso do Sul and in Rondônia, in the rainy and dry seasons in Santa Catarina and Paraná, in the winter and dry seasons in Mato Grosso, and rainy, dry and winter seasons in Goiás and Federal District of Brazil. The overall average yield was 2,134 kg ha<sup>-1</sup>, versus 2,010 kg ha<sup>-1</sup> of the controls. Two controls were always used for comparison, and cultivar Pérola was used in all tests. The second control was preferentially Iapar 81. When this control was not present, one of the other cultivars mentioned above was used instead, according to the test settings.

**Table 1.** Grain yield of cultivar BRS Estilo compared to the mean of the two controls in the tests of value for cultivation and use, per state and growing season, from 2003 to 2009

State	Season	BRS Estilo (kg ha <sup>-1</sup> )	Control mean (kg ha <sup>-1</sup> )	Relative yield (%)	Number of environments
GO/DF	rainy	2131	2119	100.6	12
	winter	2931	2654	110.5	12
	dry	1276	1085	117.6	7
RO	dry	927	848	117.9	8
TO	winter	2099	2092	100.3	7
SE	rainy	2657	2626	101.2	9
RS	rainy	2076	1926	107.8	8
PE	rainy	1826	1708	106.9	11
SP	rainy	3308	3143	105.3	6
MT	dry	1517	1445	105.0	8
	winter	2210	2273	97.2	6
MS	dry	1697	1751	96.9	7
PR	rainy	2941	2268	129.7	7
	dry	2317	1994	116.2	8
SC	rainy	2707	2508	107.9	7
	dry	1671	1782	93.8	11
General mean		2134	2010	106.3	134

Considering the data of each growing season and state, the BRS Estilo performed 24% better than the controls, in the rainy season in the State of Paraná. Paraná accounts for approximately 27% of the nationwide bean production and is therewith the state that produces most of this grain in Brazil. BRS Estilo had a mean yield of 2,317 kg ha<sup>-1</sup> and 2,941 kg ha<sup>-1</sup> in the dry and rainy seasons, respectively, exceeding the controls by 19 and 31%, respectively. In the states of São Paulo and Goiás/Distrito Federal, which are the third and fourth largest producers, respectively, the performance of BRS Estilo also exceeded the controls by more than 5%.

The yield potential of BRS Estilo, calculated from the average of the five tests with the highest yields of this cultivar, was 4,011 kg ha<sup>-1</sup>. This estimate shows the high genetic potential of the cultivar, and in a favorable environment and under good growing conditions, high yields are possible.

### Other features

In terms of industrial and technological grain quality characteristics, grain color and size of BRS Estilo are uniform and the average 100-grain weight is 26.0 grams, similar to the controls Pérola and Iapar 81 (Table 2). The mean cooking time of BRS Estilo is 26 minutes, shorter than that the average of about 29 minutes of the controls. The average protein content of BRS Estilo was around 23%, similar to that of the two controls.

**Table 2.** Grain traits of the common bean cultivar BRS Estilo compared with the controls Pérola and Iapar 81

Cultivar	Cooking time (minutes)	Protein content (%)	100 grain weight (g)
BRS Estilo	26	23	26
IAPAR 81	29	23	25
Pérola	29	22	26

Under artificial inoculation BRS Estilo, is resistant to common mosaic virus and to the pathotypes 23, 55, 71, 89, 89AS, 95, 127, and 453 of *Colletotrichum lindemuthianum*, causal agent of anthracnose. In field trials it proved to be susceptible to angular leaf spot, bean yellow mosaic virus and fusarium wilt. To rust and common bacterial blight, it is moderately susceptible (Table 3) and moderately resistant to anthracnose.

**Table 3.** Agronomic traits and disease reaction of cultivar BRS Estilo, compared to the control Pérola

Cultivar	Grain type	Cycle	M100	PGr	AN	CBB	RU	LSp	BCMV	BYMV	FW
Pérola	Carioca	N	26	Semi-erect	S	S	MS	MS	R	S	MR
BRS Estilo	Carioca	N	26	Erect	MR	MS	MS	S	R	S	S

M100 = 100 grain weight (grams); PGr = plant growth; AN = anthracnose; CBB = common bacterial blight; RU = rust; LSp = leaf spot; BCMV = bean common mosaic virus; BYMV = bean yellow mosaic virus; FW = Fusarium wilt; N = normal cycle; R = resistant; MR = moderately resistant; MS = moderately susceptible; and S = susceptible.

The cycle of BRS Estilo is normal (85-90 days from emergence to physiological maturity), similar to the controls. The plants are shrubby, have an indeterminate growth habit Type II and the flowers are white. At physiological maturity, the pods are bicolored (yellow with light red stripes). At harvest maturity, the pod color is completely sand-yellow. The grains are Carioca (beige with brown stripes), elliptically shaped, not shiny, similar to cultivar Pérola. In terms of plant architecture, BRS Estilo is upright, considerably lodging-resistant and is appropriate for mechanical and even direct harvesting.

### Seed production

BRS Estilo was registered by the Ministry of Agriculture, Livestock and Supply, on May 15, 2009 (no. 25 746), and protected as of September 15, 2009 (certificate NO. 20100058). The basic seed production is responsibility of Embrapa Technology Transfer.

### CONCLUSIONS

The plants of the common bean cultivar BRS Estilo grow upright, have high yield potential and yield stability, light-colored grains with similar size as Pérola and lodging resistance.

The BRS Estilo is recommended for sowing in the seasons: rainy season in Goiás, Distrito Federal, São Paulo, Paraná, Santa Catarina, Pernambuco, Sergipe and Rio Grande do Sul; winter season in Goiás, Distrito Federal, Mato Grosso and Tocantins, and for dry season in Goiás, Distrito Federal, Paraná, Santa Catarina, Rondonia, Mato Grosso and Mato Grosso do Sul.

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