











doi: <https://doi.org/10.36812/pag.2023291103-108>

## SHORT COMMUNICATION

### “RS Centenário”: New cultivar of brindle bean with high added value

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**Abstract** - To increase productivity, new types of beans that present different characteristics, such as higher grain yield, are necessary. The cultivar RS Centenário is the result of a selection carried out in 2007 using the “Iraí” cultivar, in a plot of genetic seed production. In the 2008 crop season, the seeds of the selected plants originated a segregant population. In 2009, the mass selection was carried out again. After two advancing generations, the phenotypic uniformity of the population was reached and the seeds were harvested in bulk. After several tests, the “SM 0112” lineage was denominated cultivar “RS Centenário” and the results of the assessed at a value for cultivation and use (VCU) trials were used to register the new cultivar. “RS Centenário” was registered as a new cultivar to be commercially grown in the Rio Grande do Sul state (RS), in southern Brazil. “RS Centenário” is a common bean (*Phaseolus vulgaris* L.) cultivar with a brindle seed coat, average weight of 1,000 seeds of 343 g, erect plants, indeterminate growth habit II/III, cycle of 88 days, high added value and average yield of 1,685 kg ha<sup>-1</sup>.

**Keywords:** Plant breeding. Added value. *Phaseolus vulgaris* L.

### “RS Centenário”: Nova cultivar de feijão rajado com alto valor agregado

**Resumo** - Para aumentar a produtividade, são necessários novos tipos de feijão que apresentem características diferenciadas aos agricultores. A cultivar “RS Centenário” é resultado de seleção realizada sobre a cultivar “Iraí”, em 2007, em parcela de produção de sementes genéticas. Na safra de 2008, as sementes da planta selecionada originaram uma população segregante. Em 2009, a seleção em massa foi realizada novamente. Após duas gerações avançadas, quando a uniformidade fenotípica da população foi alcançada, todas as sementes foram colhidas em *bulk*. Após diversos testes, a linhagem “SM 0112” foi denominada cultivar “RS Centenário” e os resultados dos ensaios VCU foram utilizados para registrar a nova cultivar. “RS Centenário” foi registrado como uma nova cultivar para ser cultivada comercialmente no estado do RS. A “RS Centenário” é uma cultivar de feijoeiro (*Phaseolus vulgaris* L.) com tegumento rajado, peso médio de 1.000 sementes de 343 g, plantas eretas, hábito de crescimento indeterminado II/III, ciclo de 88 dias, alto valor agregado e rendimento médio de 1.685 kg ha<sup>-1</sup>.

**Palavras-chave:** Melhoramento de plantas. Valor adicionado. *Phaseolus vulgaris* L.

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*Phaseolus vulgaris* L. is a widely cultivated species (PITURA and ARNTFIELD, 2019) and one of the most important legumes in the world (BROUGHTON *et al.* 2003; MYERS and KMIECIK, 2017). It is the third legume most used as a food globally, only surpassed by soybeans (*Glycine max*) and peanuts (*Arachis hypogea*) (GONZÁLEZ *et al.*, 2006). Latin America, Africa, and Asia are the largest producers of the *Phaseolus* genus, with Myanmar, India, Brazil, the United States, Mexico, and Tanzania, collectively contributing to 57 % of global production, amounting to approximately 15.3 million tons (FAOSTAT, 2020).

Despite the global importance of the crop, small-scale producers still experience low financial returns. Moreover, the crop yield is still quite below the ideal. Among the world's major common bean producers, the highest average production is observed in the United States, yielding around 2,000 kg ha<sup>-1</sup> yield, while India reports the yield of approximately 400 kg ha<sup>-1</sup>. Brazil, being the largest producer, records an average yield of approximately 1,000 kg ha<sup>-1</sup> (FAOSTAT, 2020). According to Bertoldo *et al.* (2015), this value does not reflect the yield potential of the currently recommended cultivars (> 2,000 kg ha<sup>-1</sup>).

In this context, to increase productivity, enhancing productivity necessitates the development of novel bean types that exhibit distinct attributes. These attributes encompass augmented yields, enhanced resistance to pests and diseases, as well as resilience in the face of adverse climatic conditions, all contributing to an amplified economic yield. Consequently, the “RS Centenário” bean cultivar, was developed to be able to contribute to augmented farmer income. Belonging to the brindle group, “RS Centenário” has higher added value in addition, to its higher yield when compared to other cultivars of the same group, such as Iraí. Also, its more upright growth can enhance its use, as it is erect, rendering it amenable to mechanically harvested.

The cultivar “RS Centenário” (Registration number 51405) is the result of a selection carried out on the “Iraí” cultivar, in 2007, in a plot of genetic seed production, in the research unit then belonging to the Fundação Estadual de Pesquisa Agropecuária (FEPAGRO). Currently, this unit is known as the Departamento de Diagnóstico and Pesquisa Agropecuária, under Secretaria de Agricultura, Pecuária, Produção Sustentável e Irrigação (DDPA/SEAPI), situated in Maquiné/RS, in southern Brazil. An atypical plant with different characteristics from the “Iraí” cultivar was selected in field, giving rise to the cultivar “RS Centenário”.

In the following crop season (2008), seeds from the selected plant gave rise to a segregant population. In this population, plants with distinct height and growth habits, but with a seed type similar to “Iraí” cultivar were mass-selected. In 2009, the mass selection was carried out again. After two advancing generations, when the phenotypic uniformity of the population was reached and the seeds were harvested in bulk. The entire selection process was carried out at the Maquiné Research Center, always during the growing season, with the initial stage in September and the subsequent one in February. In the ensuing year, within the spring-summer cultivation of 2011/12 crop season, the experimental lineage, designated as “SM 0112”, was submitted to a preliminary yield test, carried out at the Maquiné Research Center. In the same agricultural year and location, in 2012, the “SM 0112” strain was subjected to another preliminary yield test.

During the growing seasons 2014/15, 2015/16, and 2017/18, in the harvest (first harvest) and off-season (second harvest) periods, the SM 0112 line “SM 0112” was assessed at a value for cultivation and use (VCU)





trial data on yield and quality carried out in the State of Rio Grande do Sul (RS), according to the methodologies established by the National Service for the Protection of Cultivars (SNPC), of the Ministry of Agriculture (MAPA). After the VCU, “SM 0112” was denominated cultivar “RS Centenário” and the results of the trials were used to register and protect the new cultivar. “RS Centenário” is registered as a new cultivar to be commercially grown in RS state.

The VCU tests were established in several cities throughout the RS state: Maquiné, Júlio de Castilhos, Vacaria, Veranópolis, and São Borja. An experimental design was used in randomized blocks, with at least three replications and plots with four lines of 4.0 m in length, spaced at 0.5 m, the two central lines being harvested to obtain the production data, submitted to analysis of variance. “FEPAGRO Triunfo” and “FEPAGRO Garapiá” were chosen as control cultivars. Grain yield averages were compared by Tukey's test at the 5 % probability level. Only tests in which the experimental coefficient of variation was below 25 % or the calculated F value exceeded the tabulated F value at least at a 5 % probability level were used, and their results were considered. At the end of three years of evaluation in the VCU trials, considering only the experiments in which the norms prescribed by MAPA were met, the cultivar “RS Centenário” (line “SM 0112”), belonging to the brindle group (others), showed an average grain yield of 1,685 kg ha<sup>-1</sup>, while the average of the control cultivars, from the “black” and “carioca” groups, reached 2,125 kg ha<sup>-1</sup> (Table 1).

There is a reduced number of registered cultivars with brindle seeds available to the farmers. In addition, the cultivars with brindle seeds have a lower yield potential than the cultivars of the black and carioca groups. The production of special bean grains in Brazil is only in its initial stage, given the lack of adapted cultivars with high yields (BRAZ *et al.* 2022). Within the brindle group, the average yield presented by “RS Centenário” can be considered high. Thus, the registration of the new cultivar with an experimental average yield lower than the control cultivars, from the “black” and “carioca” groups, is justified. Including “RS Centenário” in the group of registered cultivars represents a genetic advance and a new option for producers (Figure 1). The cultivar has added value due to the fact that it is brindle, in addition to having erect plants. Its growth habit is indeterminate, type II/III, initial flowering in 32 days, cycle of 88 days (emergence to the point of harvest), average cooking time is 25 minutes and protein content is 18.5 %. Even being from a brindle group, from which a lower yield is expected, it showed productivity close to the controls of the black and carioca group, indicating that in addition to its added value, its yield can be considered good. As previously mentioned, the brindle grain of the cultivar “RS Centenário” is a market differential. There are other types of beans, consumed on a smaller scale, grown as an alternative source to offer a differentiated product with greater added value to the domestic market, in addition to the possibility of export (RIBEIRO *et al.* 2014). There is a need to diversify the consumption of beans and this cultivar, as it presents a good yield and a more upright growth, can be an excellent option for farmers.

Its cultivation is indicated for the many cultivation systems recommended by the official bean agricultural zoning for crops in the State of Rio Grande do Sul, such as: in the harvest and off-season periods, in rainfed or irrigated crops, in no-tillage or conventional, single or intercropped. However, it should not be cultivated in conditions that are in disagreement with those recommended by the official research for the





cultivation of beans in Rio Grande do Sul and/or contrary to the recommendations contained in the Agricultural Zoning of the Ministry of Agriculture (MAPA).

**Table 1.** Grain yield of the “RS Centenário” cultivar compared to the two control cultivars, in assessment of variety value for cultivation and use (VCU) trials conducted in 17 environments in two crop seasons.

Municipality	Crop season (Harvest)	Year	SM 0112 (kg ha <sup>-1</sup> )	Control cultivars (kg ha <sup>-1</sup> )		Mean yield of Control Cultivars (kg ha <sup>-1</sup> )
				FEPAGRO TRIUNFO	FEPAGRO GARAPIA	
Maquiné	1 <sup>a</sup>	2014	677 a	1,323 a	1,003 a	1,163
Maquiné	2 <sup>a</sup>	2015	1,698 a	2,134 a	2,031 a	2,082
Júlio de Castilhos	1 <sup>a</sup>	2014	345 a	1,041 a	971 a	1,006
Veranópolis	1 <sup>a</sup>	2014	2,522 a	2,152 a	2,333 a	2,243
Vacaria	1 <sup>a</sup>	2014	1,632 ab	1,920 ab	1,961 ab	1,941
Maquiné	1 <sup>a</sup>	2015	1,693 a	1,862 a	2,030 a	1,946
Maquiné	2 <sup>a</sup>	2016	898 a	884 a	853 a	869
Júlio de Castilhos	2 <sup>a</sup>	2016	1,568 b	2,699 a	2,116 ab	2,408
Veranópolis	1 <sup>a</sup>	2015	938 a	1,563 a	985 a	1,274
Veranópolis	2 <sup>a</sup>	2016	1,782 ab	2,430 a	1,615 b	2,023
Vacaria	1 <sup>a</sup>	2015	1,331 a	1,834 a	1,724 a	1,779
São Borja	2 <sup>a</sup>	2016	1,778 a	2,378 a	2,700 a	2,539
Maquiné	1 <sup>a</sup>	2017	2,179 ab	2,704 ab	1,388 ab	2,046
Júlio de Castilhos	1 <sup>a</sup>	2017	1,383 b	2,768 ab	2,929 ab	2,848
Júlio de Castilhos	2 <sup>a</sup>	2018	2,287 a	2,893 a	3,155 a	3,024
Veranópolis	1 <sup>a</sup>	2017	2,958 a	3,167 a	3,333 a	3,250
Vacaria	1 <sup>a</sup>	2017	2,213 ab	1,985 b	3,290 ab	2,638
Mean wet (1 <sup>a</sup> harvest)			1,632 a	2,029 a	1,995 a	2,012
Mean dry (2 <sup>a</sup> harvest)			1,738 a	2,404 a	2,073 a	2,245
Overall means			1,685	2,216	2,034	2,125

Means followed by letter, and columns, do not differ significantly from each other, at the 5 % probability level, by Tukey's test.

### Conflict of Interests

The authors declare that the research was conducted in the absence of any potential conflicts of interest.

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