

UENF 2014: a new common bean cultivar

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Abstract: UENF 2014 is a new common bean cultivar from the black commercial group, developed by UENF. The cultivar is adapted to the Northern and North-western regions of the Rio de Janeiro state and presents a good performance, mainly for high grain yield, high stability and wide adaptation to these regions.

Key words: *Phaseolus vulgaris* L., plant breeding, stability, adaptation.

INTRODUCTION

Brazil stands out worldwide as one of the leading producers and consumers of common bean (*Phaseolus vulgaris* L.). According to estimates of the National Food Supply Agency (CONAB 2016), Brazil produced 3.12 million tons of bean in 2014/2015, in a total cultivated area of 3.04 million hectares, reaching grain yield of 1025 kg ha⁻¹.

Common bean is grown in almost all Brazilian states, under different production systems, where the productive performance is influenced by environmental conditions (Pereira et al. 2009). Thus, genotype-environment interaction may be a problem for breeding programs, hindering the selection and the development process of cultivars for a variety of environments. Genotype-environment interaction can be defined as the change in the relative performance of the genotypes, depending on differences in the environments (Borém and Miranda 2009), and it can be simple or complex. In the first case, the difference between genotypes does not change the classification of genotypes between environments. In the second case, the genotypes do not correlate with in the different environments (Cruz and Carneiro 2003). This lack of correlation indicates that the performance of a superior genotype in a given environment is not the same as in another environment (Falconer 1987).

The most appropriate procedure to circumvent the influence of genotype-environment interaction has been the use of cultivars with high performance and stability in different environments (Oliveira et al. 2006, Pereira et al. 2009).

The study of genotype-environment interaction is of primary importance for plant breeding. However, the knowledge of this interaction, solely, does not provide detailed information on the behavior of genotypes as a response to environmental variations (Cruz and Carneiro 2003). Thus, estimates of phenotypic adaptability and stability are useful in genotypes characterization in responses related to differences between the environments.

The purpose of this paper was to describe the main traits of UENF 2014, the new common bean cultivar of the black commercial group, developed by

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UENF, which is adapted to the Northern and Northwestern regions of the Rio de Janeiro state.

PEDIGREE AND BREEDING METHODOLOGY

The common bean cultivar UENF 2014 was developed by the common bean breeding program of Universidade Estadual do Norte Fluminense Darcy Ribeiro - UENF. This breeding program started with two groups (Group 1 and Group 2) of segregating populations formed by different bi-parental crossings. The generation was advanced in two cycles per year, in the fall and winter seasons, in Campos dos Goytacazes (lat 21° 45' S, long 41° 20' W, alt 11 m asl), northern state of Rio de Janeiro. The procedure was carried out by the single seed descent method – SSD, up to the F₆ generation, when plants were selected. Each F₆ plant obtained from an F₂ plant was considered as a Recombinant Inbred Line (RIL). RIL number 14 was selected and registered in the Ministry of Agriculture, Livestock, and Supply - MAPA under the name UENF 2014. The cultivar UENF 2014 was originated from crossings between BR1-Xodó × Rico Pardo 896 (Group 2), performed in 1999 (Figure 1).

The selected RILs and four cultivars were evaluated in yield trials competition from 2002 to 2006, in Campos dos Goytacazes, in the northern state of Rio de Janeiro, and in Itaocara (lat 21° 40' S, long 42° 04' W, alt 76 m asl), in the northwestern state of Rio de Janeiro. In 2006, the experiment was carried out in Bom Jesus do Itabapoana (lat 21° 08' S, long 41° 40' W, alt 88 m asl), in the northwest state of Rio de Janeiro. The 30 best lines were selected based mainly on grain yield.

In 2008, four yield trials were performed with the 30 selected lines in Campos dos Goytacazes and Itaocara, in two seasons, from April to August and from September to December. In 2010 and 2011, adaptability and stability test was performed with 29 common bean lines. The cultivars Xamego, BR1-Xodó, and BR3-Ipanema were used as controls. Six yield trials were carried out in three locations, two in Campos dos Goytacazes, and one in Itaocara, in one season, from April to August, in 2010 and 2011 (Table 1). These yield trials were performed according to the rules of the 'VCU' (Value of Cultivation and Use) of the Brazilian Government.

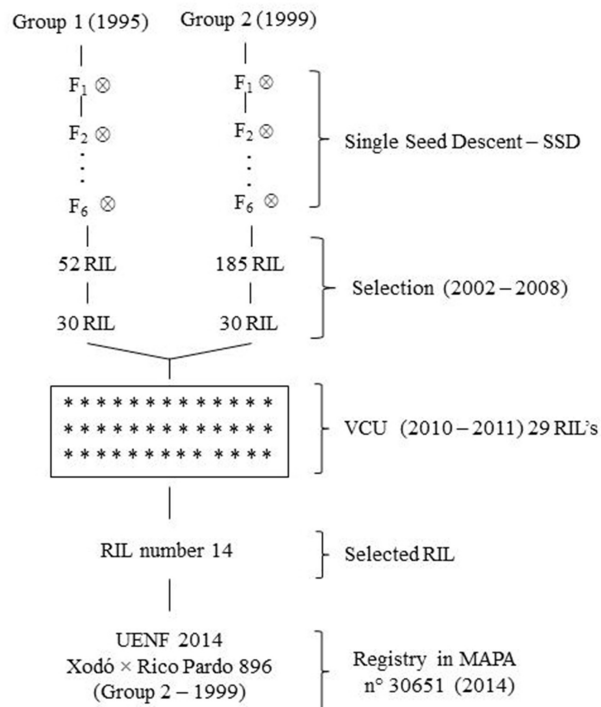


Figure 1. Pedigree of the common bean cultivar UENF 2014.

Table 1. Relative grain yield in kg ha⁻¹ of the common bean cultivar UENF 2014 and of the control cultivars, in three environments and two years

Environment	Year	Grain yield (kg ha ⁻¹)			
		UENF 2014	Xamego	BR1-Xodó	BR3-Ipanema
E1	2010	2425	2262	2488	1974
E2	2010	2339	1948	2386	2334
E3	2010	2243	1922	1390	2167
E1	2011	2750	2254	2451	2578
E2	2011	2316	2252	1900	2389
E3	2011	2633	1880	1822	2325
Overall mean		2451	2086	2073	2295
Relative yield (%) ¹		-	17.50	18.23	6.8

¹ Relative yield (%) of the common bean cultivar UENF 2014 in relation to the control cultivars Xamego, BR1-Xodó and BR3-Ipanema; E1: Pesagro-Rio Experimental Station, Campos dos Goytacazes-RJ; E2: Technical School Antônio Sarlo Experimental Station, Campos dos Goytacazes-RJ; E3: Pesagro-Rio Experimental Station, Itaocara-RJ.

Table 2. Technological/nutritional qualities of the common bean cultivar UENF 2014 and the respective control cultivars

Cultivar	Traits		
	Cooking time (min)	Protein content (%)	Absorption (%)
UENF 2014	25.2	26.5	101.25
Xamego	22.2	26.0	96.27
BR1-Xodó	22.5	24.3	97.53
BR3-Ipanema	25.1	22.5	97.12

PERFORMANCE

The common bean cultivar UENF 2014 was superior to all commercial cultivars used as controls (Xamego, BR1-Xodó and BR3-Ipanema), considering the overall mean. These commercial cultivars are recommended for cultivation in the state of Rio de Janeiro. Cultivar BR1-Xodó is the most cultivated in the region, and also the most productive among the cultivars of the black commercial group. It was also used as parent in the crossing that originated the common bean cultivar UENF 2014. The relative grain yield of 'UENF 2014' was 17.5%, 18.23%, and 6.80% higher than that of Xamego, BR1-Xodó, and BR3-Ipanema (controls), respectively (Table 1). The cultivar contains 26.5% crude protein, similar to that of Xamego (26.0%) and higher than that of BR1-Xodó (24.3%) and BR3-Ipanema (22.5%) (Table 2). Results reveal that cultivar UENF 2014 was promising for this trait. Values greater than 23% characterize high crude protein content in common beans (Dalla Corte et al. 2003).

In addition to the high crude protein content, the cultivar presents typical resistance to cooking level (Proctor and Watts 1987). According to Costa et al. (2001), the development of common bean cultivars with a cooking time shorter than 30 minutes is desirable for it provides benefits to consumers.

The percentage of seed water absorption of cultivar UENF 2014 was higher than that of the control cultivars, with a mean value of 101.25% of water absorbed, in relation to its initial mass (Table 2). Corrêa et al. (2010) observed a change in the percentage of seed water absorption from 100.3 to 120.3% in the evaluation of seven common bean cultivars.

OTHER CHARACTERISTICS

The common bean cultivar UENF 2014 presents mass of 1000 seeds equal to 205.11 g. It flowers at 35.6 days, on average, and reaches harvest maturity at 79.67 days after emergence. The main stem has 72.67 cm, with indeterminate growth habit, no guides on the lateral branches and short guides on the main stem. It is an upright plant, and the angle formed by the branches does not exceed 90°. The flowers are violet; the pods are green with purple stripes when ripe, and yellow with spots or stripes when dried. The seeds of cultivar UENF 2014 have black tegument, opaque brightness, and oblong format. Under field conditions, the common bean cultivar UENF 2014 was resistant to bean rust and common bacterial blight, and moderately resistant to anthracnose and angular leaf spot of the common bean.

SEED PRODUCTION

The cultivar UENF 2014 was registered in the Ministry of Agriculture, Livestock, and Supply - MAPA in 2014 (MAPA 2014), under the number 30651. The seeds of cultivar UENF 2014 are produced in the seed production area of UENF, in Itaocara-RJ.

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