

GENETIC VARIABILITY OF BEAN GRAINS CREOLE FOR WATER ABSORPTION

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The bean cooking time is important in the definition of farming to be made available for research institutions due to the cooking time that can prevent consumer acceptance. Thus, breeding programs should prioritize the identification of genotypes that have reduced cooking time, with coats without damage during cooking and high volumetric expansion after cooking. Furthermore, it is also important to the productivity and disease resistance as well as technological product quality (Costa et al., 2001). The faster the higher water absorption is also the capacity of the cooking grains (Perez-Ibarra et al., 1996). During cooking, the grain structure is modified, the gelled starch and denatured proteins. In this work, we aimed to perform the analysis of the water absorption of Creole beans accessions cultivated in the mesoregion of North of Minas Gerais State, Brazil.

Ten Creole bean accessions commonly grown by small family farmers in the middle region north of the Minas Gerais state were analyzed: 'Curiango', 'Penquinha', 'Meia Corda', 'Roxo', 'Olho de Pombo', 'Cores', 'Branco', 'Mulatinho', 'Fava Branca' and 'Fava Cores'. In August 2015, samples were collected in the county of Montes Claros, Minas Gerais State (Geographical coordinates of 15°96'69" South Latitude, 08°50'59" West Longitude and 596 meters). Samples were taken at random from different points of crops. The water absorption tests were performed at the Biotechnology Laboratory of the ICA/ UFMG, using a completely randomized design with three replications. The means (μ), variances (σ^2) and analysis of variance (ANOVA) were calculated using the GENES program (Cruz, 2001). Moisture content was estimated by drying the samples at 105°C according to AOAC (1995). The humidity was obtained by the expression $H = [(iw - fm) / iw] \times 100$; where H = humidity (%), iw = initial weight of sample (g) and fm = the final mass of sample (g). To measure the capacity of water absorption, the grains were placed in cups becker with 200 ml of distilled water remaining in soaking for a period of 12 hours. Samples of the grain were removed and partially dried with paper towels, proceeding to count the normal grain, hard (hardshell) and total (normal + hard). The number of normal grains relative to the total grains evaluated in samples of 50g of grains, or those which have absorbed water after immersion in distilled water were used to calculate the percentage of water absorption. The number of hard grains (without moisture) in relation to the total number of grains was used to calculate the percentage hardshell grains.

There was a significant effect on moisture and the ability of water absorption by the grains of the studied accessions (Table 1). The average value of the capacity of water absorption by the grains was 57.4605%. However, it was observed that the accessions differ for the evaluated parameters and great amplitude values (21.0692% to 96.6251%) (Table 2). This information is important since accessions that showed high rate of water absorption by the beans are associated with a shorter cooking time (Plhak et al., 1989). Thus, in the germplasm it is possible to identify that access may have lower cooking time, which can be identified by some accessions that had near total absorption of water by the grains. The existence of genetic variability for water absorption by the beans has been reported by other authors (Costa et al., 2001; Ramos Junior &, 2002). This indicates that selection for this character may be useful for early identification of strains with greater facilities for cooking. However, it is important that standardized methodology for fast and efficient identification

of the percentage of water absorption by the grains because this method is questioned (Carbonell et al., 2002). Moreover, Plhak et al. (1989) found that cooking capacity seems to be indeed associated with rapid absorption of water by the beans. In this work, we found strong evidence about the genetic variability of absorption of water by the grains in Creole bean accessions, suggesting that it is possible genetic selection for this genetic character.

Table 1. Summary of variance analyzes of moisture and the ability of water absorption in Creole bean accessions cultivated in mesoregion of North of Minas Gerais State, Brazil.

	ANOVA	FD	SS	MS	F	P value	F critical
Moisture	Accessions	9	20.5644	2.2849	13.8546	8.7122E-07	2.3928
	Residue	20	3.2984	0.1649			
	Total	29	23.8628				
Absorption of water	Accessions	9	26.481.0439	2.942.3382	189.7549	2.2769E-17	2.3928
	Residue	20	310.1197	15.5059			
	Total	29	26.791.1637				

ANOVA: Analysis of Variance; FD: Freedom Degree; SS: Sum of Squares; MS: Mean Square.

Table 2. Means (μ) and variances (σ^2) of the units and water absorption capabilities in Creole bean accessions cultivated in mesoregion of North of Minas Gerais State, Brazil.

Creole bean accessions	Contents (%)			
	Moisture		Water Absorption	
	μ	σ^2	μ	σ^2
Curiango	8.9200	0.1236	95.4338	4.6733
Penquinha	8.9304	0.0468	96.6251	1.4721
Meia Corda	9.2517	0.0236	94.6860	64.5622
Roxo	8.6609	0.1467	21.0692	0.9740
Olho de Pombo	9.5658	0.0029	31.2023	0.8023
Cores	8.3513	0.3775	80.9878	8.2009
Branco	9.3050	0.0297	46.9986	26.6431
Mulatinho	10.2214	0.0104	23.8680	2.6848
Fava Branca	10.5994	0.1783	32.5433	26.4680
Fava Cores	11.0297	0.7093	51.1909	18.5788

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