PROTEIN CONTENT IN GENOTYPES OF COMMON BLACK BEANS

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Common beans commercial type black are the second most consumed in Brazil, with 20% market share (Del Peloso & Melo, 2005). Brazilian breeding programs have been supplying farmers with improved cultivars to increase yield. Besides agronomic characteristics, other traits related to nutritional quality are becoming important. Among them, bean protein content assumes prominent importance considering that common beans are the main vegetable protein source in the Brazilian diet. Therefore it is highly desirable to determine bean protein content, comparing it to adopted standards, during genotype evaluation to aggregate value to new cultivars. Taking into account that the final evaluation of common beans commercial type black, developed by the breeding program of the Embrapa Arroz e Feijão is conducted in a large number of locations and environments, there is a possibility of measuring the protein content and to verify the existence of interaction genotypes x environments for that characteristic. Based on the above, the objective of this work was to evaluate the protein content of common black beans genotypes and to verify the presence of genotypes x environments for that characteristic.

In 2009, trials were conducted in four environments: Inhumas-GO, dry season; Ponta Grossa-PR, dry season; Santo Antônio de Goiás-GO, winter; and Porangatu-GO, winter. The experimental design was a completely randomized block arranged in four meter long four row plots, with two replicates. Each trial was composed of 14 genotypes of black common beans (Table 1). The protein content was measured in bean samples collected from the two central rows. Raw protein content (PC %) was calculated multiplying nitrogen content by factor 6.25. Total N content was determined by the sulfuric digestion method, according to Sarruge and Haag (1974). Data were submitted to the analysis of variance, and the Scott Knott test at 10% probability was applied for mean comparison.

Joint analysis showed adequate experimental precision (CV=5.9%) and significant differences ($P<0.01$) among environments. There were not significant differences observed for treatments as well as for genotypes x environments interaction, suggesting that genotypes evaluated in those environments had the similar protein contents. The average protein content was 22.3%, varying from 17.9% to 24.4%, depending upon environment (Table 1). The significant differences observed among environment means may be related to environmental conditions (soil; temperature; moisture; and rain fall) during trial conduction. Those differences indicate that bean protein content is highly affected by weather conditions. The environment producing beans with the highest protein content were Santo Antônio de Goiás/winter (24.4%) and Ponta Grossa, dry season (23.9%), while the lowest values were observed in Porangatu/winter (17.9%).

Protein content of the genotypes varied from 21.3 to 22.9%, absolute values; representing a relative difference of approximately 8% between the highest and the lowest values, showing small genetic variability for that trait among the genotypes evaluated. It is important to mention that all genotypes evaluated came from 12 distinct crosses, suggesting that the difference observed in the protein content is due to the small variability found for that characteristic. Farinelli & Lemos (2010) also found low variability for protein content in common beans when working with a number of various commercial genotypes (black and carioca). Results obtained in this work indicate that the highest protein content found in black beans was obtained especially due to the environmental conditions where the genotypes were cultivated. However, further evaluations should be carried out to confirm these results.

Table 1. Protein contents (PC) of 14 genotypes of common black beans evaluated in four environments in Brazil, in 2009.

Genotypes	PC %	Inhumas/Dry	Ponta Grossa/Dry	Santo A. de Goiás/Winter	Porangatu/ Winter
CNFP 11978	22.0	21.5	24.0	24.5	18.0
CNFP 11991	22.0	23.0	22.0	25.5	17.5
BRS Esplendor	22.1	22.0	24.0	25.0	17.5
IPR Uirapuru	21.3	22.5	23.5	23.0	16.0
CNFP 11995	22.3	22.5	24.5	24.5	17.5
CNFP 11983	22.4	23.0	24.0	23.5	19.0
BRS 7762 Supremo	22.5	22.0	23.5	26.0	18.5
CNFP 11985	22.6	24.5	23.0	25.0	18.0
CNFP 11973	21.8	22.0	24.0	23.0	18.0
CNFP 11976	21.8	22.0	23.5	23.5	18.0
BRS Campeiro	22.8	24.0	25.0	24.0	18.0
CNFP 11979	22.8	22.5	24.5	25.0	19.0
CNFP 11984	22.9	24.5	24.0	25.0	18.0
CNFP 11994	22.9	24.0	25.0	24.5	18.0
Mean	22.3	22.9 b	23.9 a	24.4 a	17.9 c

[1]Means followed by the same letter do not differ among them by the Scott Knott test at 10% probability.

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