COOKING TIME OF BLACK BEANS GENOTYPES EVALUATED IN DIFFERENT ENVIRONMENTS

P.P. Torga[2], H.S. Pereira[1], L.C. Melo[1], P.Z. Bassinelo[1], W.G. Teixeira[2], G.C. Melo[3], B.A.R. Paiva[2], J.L.C. Díaz[1], M.C.S. Magaldi[1], M.J. Del Peloso[1], P.G.S. Melo[2], L.C. Faria[1] and A. Wendland[1]

[1]Embrapa Arroz e Feijão; [2]Universidade Federal de Goiás; and [3]Uni-anhanguera, Brasil
Corresponding author: helton@cnpaf.embrapa.br

Among the many common bean types grown in Brazil. 430.000 t (FEIJÃO. 2010) of black beans are harvested annually, corresponding to 20% of the total beans output (Del Peloso & Melo. 2005). This type is mostly consumed in the states of Rio Grande do Sul. Santa Catarina, Paraná and Rio de Janeiro, although other states also produce it in smaller amounts. Lines developed by breeding programs are expected to have improved agronomical characteristics, good culinary quality such as environment affected cooking time.

Since the final quality tests of black bean lines from the Rice and Beans Research Center breeding program are carried out in a great number of environments. it is possible to determine the cooking time of lines tested in those environments and to verify the presence of genotype x ambient interaction.

In 2009 trials were carried out in five environments: Inhumas/Goiás/dry season (ENV1); Ponta Grossa/Paraná/dry season (ENV2); Santo Antônio de Goiás/Goiás/winter season (ENV3); Porangatu/Goiás/winter season (ENV4); and Senador Canedo/Goiás/winter season (ENV5).

A completely randomized block design arranged is plots with four meter rows and two replicates were used. Each trial comprised fourteen genotypes of common black beans (Table 1). Samples were collected from the two central rows and stored at room temperature for a maximum of 90 days. Cooking tests were performed according to the method described by Proctor and Watts (1978). Two replicated of whole seeds were placed in 100 ml of distilled water for 16 hours at room temperature. After that, 25 seeds were placed in a beaker at the Mattson cooking apparatus containing 1000 ml of boiling distilled water and cooking time recorded until the 13^{th} rod fell. Data were subjected to the analysis of variance and the Scott Knott test at 10% was used for mean comparison.

The joint analysis showed adequate precision (CV=11.7%) and significant differences ($P<0.01$) among genotypes. environment and genotype x environment interaction were detected. The average cooking time was 32.0 minute, varying from 22.5 to 47.1, depending on the environment the beans were tested (Table1). That range is related to the variations in the environmental conditions, harvesting method and storage time, since the tests were conducted after different storage periods. Samples with the longest cooking time were those from the dry season with drought spells and high temperature, and storage period longer than the samples from other environments.

Among the controls tested BRS 7762, Supremo showed the shortest cooking time (28.6 min), BRS Campeiro, IPR Uirapuru and BRS Esplendor were assigned to a third group along with five lines with cooking time similar to those cultivars already being formed. Those lines had an "acceptable" cooking time, although had not shown any advantage for that characteristic. Other four lines had cooking times superior to all controls tested. Line CNFP 11976 had the shortest cooking time among the genotypes tested (22.6 min); 6 min shorter than the best control (BRS 7762 Supremo-28.6 min) corresponding to 20% less time. Even in then environments with higher average cooking time that line did not show cooking time longer than 30 min. considered "standard".

Table 1. Average cooking time (CT) (minutes) of 14 genotypes of common beans commercial type black. Brazil. 2009.

GENOTYPES	CT	ENV1	ENV2	ENV3	ENV4	ENV5
CNFP 11976	22.6 a	29.5	29.5	17.0	18.0	19.0
BRS 7762 SUPREMO	28.6 b	30.5	44.0	20.5	24.0	24.0
BRS CAMPEIRO	30.7 c	31.0	44.0	25.0	25.0	28.5
CNFP 11973	30.8 c	37.5	48.0	22.0	23.5	23.0
IPR UIRAPURU	31.3 c	40.5	39.0	23.0	29.5	24.5
BRS ESPLENDOR	31.5 c	40.0	43.0	22.5	26.5	25.5
CNFP 11995	31.7 c	38.0	49.0	24.5	22.5	24.5
CNFP 11984	32.6 c	39.5	53.5	22.0	24.5	23.5
CNFP 11985	32.7 c	42.0	48.5	23.5	24.5	25.0
CNFP 11979	33.3 c	46.0	43.0	24.0	27.5	26.0
CNFP 11994	34.7 d	45.5	59.0	19.5	24.5	25.0
CNFP 11991	35.2 d	41.5	57.0	23.5	24.0	30.0
CNFP 11978	36.1 d	47.5	51.0	24.0	31.0	27.0
CNFP 11983	36.3 d	55.5	51.5	24.0	24.0	26.5
AVERAGE	32.0	40.3 c	47.1 d	22.5 a	24.9 b	25.1 b

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

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