GENETIC VARIABILITY FOR PROTEIN AND MINERALS CONTENT IN COMMON BEAN LINES (*PHASEOLUS VULGARIS* L.)

Camila Andrade Silva[1], Ângela de Fátima Barbosa Abreu[2], Magno Antonio Patto Ramalho[1], Angelita Duarte Correa[1] and Lucas Gontijo Silva Maia[1]

[1]Universidade Federal de Lavras, Lavras, MG, Brazil, P.O. Box 3037,
e-mail: camilaagro01@yahoo.com.br; magnoapr@ufla.br; angelita@ufla.br;
lucasgsm@hotmail.com; and [2]Embrapa Arroz e Feijão/Universidade
Federal de Lavras, Lavras, MG, Brazil, P.O. Box 3037;
e-mail: afbabreu@ufla.br

INTRODUCTION

The common bean (*Phaseolus vulgaris* L.) has high nutritional value, with significant concentrations of protein and minerals. It represents the main source of protein for low income populations, especially in developing countries. The identification of lines with high levels of protein and minerals, adds value to the cultivars, without increasing the cost to consumers. Thus, breeding programs should be to associate great agronomic performance and nutritional quality in lines. Therefore, this study has as objective to evaluate the genetic variability for protein and minerals content of 100 common beans lines belonging to germplasm bank at Universidade Federal de Lavras (UFLA).

MATERIALS AND METHODS

The levels of protein and minerals (iron, phosphorus, potassium, calcium, magnesium, copper, manganese and zinc) of 100 common bean lines, differing in color, shape and size of the grains, belonging to germplasm bank of UFLA were quantified. Lines seeds, which have been stored in a cold chamber, were sown in February 2009 in experimental field of Biology Department at UFLA.

After the harvest, three samples of 50 grams of grains of each line were taken to determine the levels of protein and minerals. These analyses were carried out in Leaf Analysis Laboratory in Department of Chemistry at UFLA. Samples were grounded to obtain particles of size less than 1 mm in micro-mill. Nitro-perchloric digestion was carried out to determine levels of minerals content. Nitrogen content was determined using Kjeldahl method (Malavolta et al., 1997). Crude protein was obtained by formula: nitrogen content in seed x 6.25. Later this value was corrected to dry basis.

Variance analysis of data was carried out using a completely randomized experimental design with three replications. Heritability (h^2) was estimated using methodology presented by Ramalho et al. (2003).

RESULTS AND DISCUSSION

Significant differences were observed among lines by test F ($P \leq 0.01$) for protein and minerals contents. Average content of protein was 25%, ranging from 19.6 to 30.4%. However it is possible to increase protein content by common bean breeding. Interestingly, the occurrence of wide genetic variability was detected for iron, which is very important in human nutrition (Table 1). Iron content ranged from 54.2 to 161.5 mg kg^{-1}. However it is possible to raise iron content in common bean cultivars.

Wide variation was observed for the other minerals contents (Table 1), especially for zinc, which has important structural, enzymatic and regulatory functions in living cells (Cozzolino, 2007). The great genetic variability detected permit to infer that it is possible to increase by over 50% the zinc content in common bean grains. This is corroborated by the high h^2 estimate obtained for zinc content, as for other minerals and protein (Table 1). Therefore there is possibility of success in the selection of cultivars that present good adaptation and commercial higher nutritional quality grains.

Table 1. Mean protein and minerals contents and heritability (h^2) estimates obtained in evaluation of 100 common bean lines of germplasm bank at UFLA.

Nutrient	Mean and variation	h^2 (%)
Protein (%)	25.00 (19.60 – 30.40)	94.78
Iron (mg kg^{-1})	88.14 (54.20-161.50)	97.40
Phosphorus (g $100g^{-1}$)	0.52 (0.40 - 0.61)	98.29
Potassium (g $100g^{-1}$)	1.80 (1.45 – 2.06)	97.01
Calcium (g $100g^{-1}$)	1.43 (1.21 – 1.80)	96.82
Magnesium (g $100g^{-1}$)	0.25 (0.19 – 0.29)	94.41
Copper (mg kg^{-1})	11.30 (5.76 – 15.60)	98.40
Manganese (mg kg^{-1})	22.71 (9.19 – 36.78)	98.71
Zinc (mg kg^{-1})	49.24 (29.33 – 65.50)	97.86

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