Selection of Brazilian Cowpea Genotypes for Zinc Contents

Carvalho, J.L.V[1]., Nutti, M.R[1]., Rocha, M.M[2]., Carvalho, L.M.J[3]

[1]Embrapa Food Technology, Av. das Américas 29501, Rio de Janeiro, 23020-470, Brazil (jlvc@ctaa.embrapa.br)
[2]Embrapa Mid-North, Av. Duque de Caxias, 5650, Buenos Aires, Teresina/PI - Brazil, 64006-220
[3]Rio de Janeiro Federal University – Pharmacy Faculty, Av. Carlos Chagas Filho, 373
Bloco L, Room 17, Rio de Janeiro, 21941-902, Brazil

INTRODUCTION

Most efforts to combat micronutrient deficiency in the developing world focus on providing vitamin and mineral supplements to the poor and on fortifying foods with these nutrients through postharvest processing. The introduction of biofortified crops - varieties bred for increased mineral and vitamin content - could complement existing nutrition interventions and provide a sustainable, low-cost way of combating malnutrition. In Brazil, the biofortification activities are coordinated by the Brazilian Agricultural Research Corporation (Embrapa), which includes a number of research centers that are part of the biofortification network. The main food staples under research in Brazil are: cassava and sweet potato with higher levels of carotenoids; maize with higher levels of lysine, tryptophan and pro-vitamin A; rice, common bean, maize, wheat and cowpea with higher levels of iron and zinc; and extruded and bakery products from biofortified flours. In essence, the project aims to fortify foods that are already part of the diet of the population thereby providing access to more nutritious products without requiring any changes in their consumption habits (Nutti, 2009). Legumes play an important role in human nutrition, especially among low income groups in developing countries. Beans are particularly important in Brazil for two reasons: Brazil is the world's largest producer and consumer of grain legumes and the fact that beans are a major source of protein. On the other hand, they have high iron and zinc concentrations. The cowpea (*Vigna unguiculata* (L.) Walp.) is an important food crop and a key production system in dry regions and marginal areas of the tropics and subtropics, including parts of Asia, Oceania, the Midwest and Southeast Europe, Africa, Southeast U.S., Central and South America. It is cultivated throughout the world, mainly for dried beans. However, it can also be cultivated as a vegetable and is consumed as green beans, and also used for mulch and fodder. The world's largest producers are Nigeria, Niger and Brazil. It is estimated that cowpea is grown in about 14.5 million hectares with an annual production of over 4.5 million tons (Sing, 2005). In order to carry out this study, between the years 2007 to 2009, a collection consisting of cowpea genotypes was evaluated considering its zinc contents. The aim of this study was to evaluate zinc content (mg/kg or ppm) in order to make recommendations about the most promising genotypes for commercial cultivation.

METHODS

A collection consisting of 84 genotypes of cowpea types of white, black and green eye was defined considering its importance in the regions North and Northeast Brazil. It was planted and harvested in the years 2007 and 2009 in experimental fields at Embrapa Mid-North and at various locations in those regions.

The samples were collected and sent to the Grain Quality Laboratory at Embrapa Mid-North, where zinc contents were determined in order to select the genotypes with higher levels. The zinc content was analyzed after milling and digesting the samples with nitropercloric acid (2:1) using an atomic absorption spectrometer (Varian), according to AOAC methods (1995) with some modifications.

RESULTS AND DISCUSSION

The genotypes selected were : TE96-290-12G, MNC99-537F-4 (white), MNC05-820B-240(black eye pea), MNC05-843B-88, MNC00-595F-26 and MNC05-847B-125 (green) for presenting the highest zinc levels ranging from 48 to 53 ppm. These genotypes were released as cultivars in 2008 and 2009: genotypes TE97-290-12G as BRS Xiquexique; MNC99-537F-4 as BRS Tumucumaque and MNC05-847B-125 as BRS Aracê, due to the fact they presented the best zinc concentration and the best agronomic performance. They were recommended for cultivation to farmers in the North, Northeast and Midwest of Brazil. It is important to point out that from 2007 to 2009, 84 elite genotypes developed by the Embrapa Mid-North Breeding Program were evaluated, when the genotype zinc variability observed ranged from of 30 to 63 ppm.

CONCLUSIONS

Considering the cowpea samples evaluated so far, it can be concluded that there is variability for zinc contents (30-63 ppm); thus, a breeding program was started for this trait and it is necessary to continue looking for richer sources of this mineral. The decision to recommend the best genotypes (as new cultivars) was based not only on the zinc contents, but also regarding good agronomic performance, as the main goal for the biofortification project is to develop cowpea cultivars which are productive and adapted to the cultivation regions in Brazil and to disseminate them among the farmers

ACNOWLEDGEMENTS

The authors would like to thank HarvestPlus and Embrapa-Monsanto Research Fund for financially supporting the BioFORT project.

REFERENCES

AOAC - ASSOCIATION OF OFFICIAL ANALYTICAL CHEMISTS. (2005). Official methods of analysis of association of official analytical chemists International. 18 ed. HORWITZ, W. (Ed.). 2005.

Nutti, M. R.; Rocha, M. M.; Watanabe, E.; Carvalho, J. L. V. De; Freire Filho, F. R.; Silva, K. J. D. Biofortificação de feijão-caupi no Brasil. In: CONGRESSO NACIONAL DE FEIJÃO-CAUPI, 2., 2009, Belém, PA. Da agricultura de subsistência ao agronegócio: anais. Belém, PA: Embrapa Amazônia Oriental, 2009. p. 26-38. 1 CD-ROM.

Singh, B.B. Cowpea [*Vigna unguiculata* (L.) Walp.]. In Singh, R.J.; Jauhar, P.P. (Ed). Genetic Resources, Chromosome Engineering and Crop Improvement. Boca Raton, FL, USA:BocaCRC Press, 2005. v.1p. 117-162.