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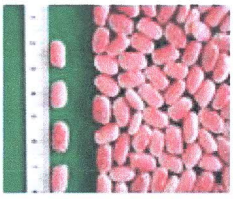

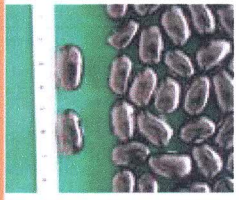

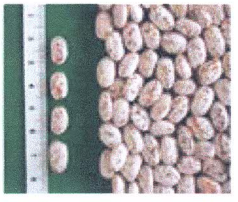

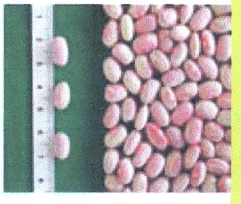

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PROSPECT FOR BIOFORTIFIED COMMON BEAN GENOTYPES (*PHASEOLUS VULGARIS, L.*) AS IRON AND ZINC SOURCES IN BRAZILIAN POOR POPULATION DIET

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Introduction:
The common beans (*Phaseolus vulgaris, L.*) assume an important role as a source of nutrients (proteins, carbohydrates, vitamins and minerals) and dietary fiber for Brazilians (1), and it is a product daily present at both rural and urban people's diet (2). Regarding the minerals, common beans are rich especially in potassium, phosphorus, copper, iron, zinc and magnesium, but sodium. The bioavailability of minerals is relevant and normally it is lower in vegetables. Some factors can affect the bioavailability such as food digestibility, chemical state of the mineral, other minerals content in the diet, the chelating agents presence and others (1). Iron and Zinc are essential minerals for the organism metabolism. Diets which are poor in these minerals can cause anemia, less work ability, immunological problems, slow development and, for more serious cases, the death. The anemia caused by iron lack is probably one of the main nutritional problems of many developing countries (3). The zinc has antioxidant properties and is part of many enzymes, influencing the brain control on the muscles and assuming structural, enzymatic and regulating functions on human body (4). So the aim of this work was to evaluate common bean genotypes originated from the high mineral nursery of CIAT (HMN) in order to identify sources with high iron (100 ppm) and zinc (50 ppm) contents which can be considered biofortified seeds for consumption by malnourished Brazilian people especially from Northeast region.

Material and Methods:
81 common bean genotypes were originated from the high mineral nursery of CIAT and multiplied in Santo Antonio de Goiás, Goiás State, Brazil, at Embrapa Rice and Beans, under irrigated conditions (Figure I). The grains were harvested in September/2007 and evaluated for iron and zinc contents after a very strict preparation of samples, avoiding mineral contamination, mainly by iron, since harvest. The determination of mineral levels followed the method described by AOAC (5) with some adjustments, using the nitro-perchloric digestion (2:1) of the sample flour (200 mg) at 170ºC for 7 hours through the spectrophotometer of atomic absorption.

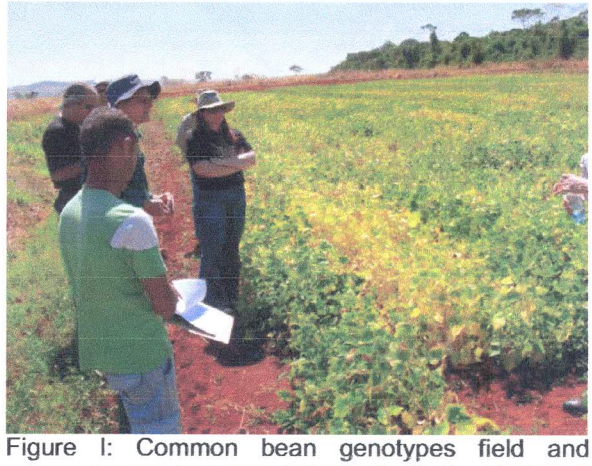

Figure I: Common bean genotypes field and research team in Santo Antonio de Goiás, Embrapa Rice and Beans, Brazil.

Results and Discussion:
The results for iron and zinc distribution among the samples can be observed in Figure II.

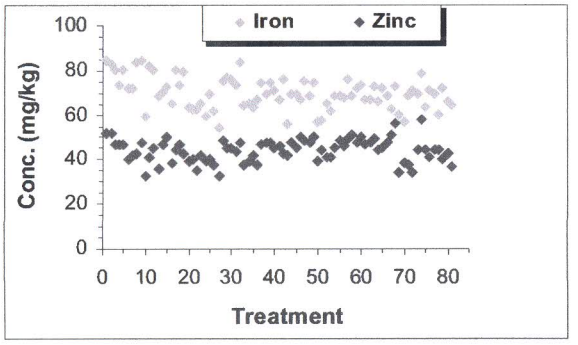

Figure II – Distribution of iron and zinc contents in common beans genotypes (dry matter).

According to Figure II, it can be verified that there are many irrigated common bean genotypes with high iron and zinc levels. The zinc contents found for the samples showed to be superior to those related in literature for beans. The iron levels ranged from 54,34 to 85,09 mg/kg while the zinc levels were between 32,44 and 57,82 mg/kg, with mean values of 70,19 and 44,28 mg/kg respectively. Some samples presented high levels of both minerals at the same time (e.g. HMN-67 and HMN-72) and so they can be interesting for human consumption. In tables I and II we pointed out five genotypes with the higher concentrations of iron or zinc. In this experiment it was possible to find biofortified samples for zinc, but we still need to search for other higher iron-content common beans to reach the goal of the project.

Table I – Identified common beans genotypes with higher iron content (dry matter).

Treat.	Sample	Fe (mg/kg) Mean (3 repetitions)
1	HMN-67	85,09
9	HMN-57	84,92
32	HMN-11	84,11
8	HMN-52	83,66
2	HMN-72	82,99

Table II - Identified common beans genotypes with higher zinc content (dry matter).

Treat.	Sample	Zn (mg/kg) Mean (3 repetitions)
74	BRASIL 0001	57.82
68	HMN-8	56.20
1	HMN-67	51.99
2	HMN-72	51.69
67	HMN-56	51.50

Conclusion:

Several studied common bean genotypes presented high levels of iron and zinc under irrigated system and for some samples a positive correlation was observed for both minerals.

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