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MICRO-NUTRIENT CONTENT IN CRUDE SEEDS OF BEAN LANDRACES BEANS GROWN IN TWO REGIONS

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INTRODUCTION

The common bean plant is very demanding in nutrients due to the small and shallow root system and its short cycle. In addition, nutrients need to be readily available to the crop in times of demand so as not to limit productivity. The seeds, similar to the other organs of plants, have a very variable chemical composition because it is an organ formed at the end of the plant cycle. The concentration of mineral micronutrients in the seeds can also affect the biological fixation of atmospheric nitrogen, especially in the case of legumes (JACOB NETO E FRANCO, 1989).
Micronutrients, such as iron, manganese and zinc, are determinants or components of several processes, such as protein synthesis, membrane permeability, ion absorption, respiration, and starch synthesis and hormone control. Pereira et al. (2009) and Piegas et al. (2011) evaluating the content of nutrients in landraces beans in the State of Santa Catarina and Rio Grande do Sul, respectively, observed genotypes that stood out for the micronutrient contents. The goal of this study was to evaluate the iron, manganese and zinc content in native cultivars from Rio Grande do Sul and their interaction with two planting environments.

MATERIAL AND METHODS

The seeds were obtained from the evaluation of cultivars of Embrapa Clima Temperado cultivars implanted in two cultivation sites: Sobradinho and São Luiz Gonzaga, in Rio Grande do Sul. 12 genotypes were evaluated, mostly black beans, except Amarelinho of yellow grain, TB 0226 (red) e Vinho 141 (purple). The controls used were BRS Intrépido (Black check) and Carioca (color check). The iron, manganese and zinc contents were evaluated in whole seeds according to Silva (1999). Variance analysis was performed for cultivation site, genotypes, and a comparison test of means to evaluate the genotypes at each culture site.

RESULTS AND DISCUSSION

The analysis of variance indicated that there was a significant interaction between genotypes and culture environment for the nutrient content analyzed. Fe and Zn contents were lower in São Luiz Gonzaga, unlike Mn. It is known that both water stress and high temperature during the period of grain filling may be possible explanations for the variations in nutrient concentration fact observed mainly in São Luiz Gonzaga.

Fe levels in Sobradinho and São Luiz Gonzaga (Table 1) ranged from 0.08 to 0.12 $g.kg^{-1}$ and 0.06 to 0.10 $g.kg^{-1}$ respectively. These values are similar to those found by Pereira et al., (2011) evaluating genotypes in two environments. However, higher than those found in Colombia (BEEBE et al., 2000). The AM-10 genotype showed the highest levels at both sites, although not differing from other genotypes. In Sobradinho, the TB 02-20 genotype presented a similar value to AM-10. In São Luiz Gonzaga, all genotypes were statistically similar and inferior to AM-10.
The genotypes ZL-1 and Preto Ibérico showed the highest levels for zinc (Zn) and manganese (Mn) in seeds from Sobradinho, as well as the AM-10 genotype was the highest in São Luiz Gonzaga.

According to Lemos et al. (2004), the nutritional characteristics are influenced by both genotype and environmental conditions in plant and seed development. Pereira et al. (2009) observed a significant reduction in the accumulation of some nutrients in the environment that presented high precipitation, in the pod formation phase, similar to what happened in São Luiz Gonzaga, where the grains presented lower levels for most nutrients.

Table 1 - Levels of zinc (Zn), manganese (Mn) and iron (Fe) in seeds of bean landraces cultivated at two sites, Sobradinho (SOB) and São Luiz Gonzaga (SLB), RS, Brazil.

	Fe (g\kg)		Zn (mg\kg)		Mn (mg\kg)	
Genotypes	SOB	SLB	SOB	SLB	SOB	SLB
AM-10	0.11 A ab	0.10 A a	28.27 B defg	32.58 A a	16.88 B bc	20.90 A a
Amarelinho	0.09 A cdef	0.06 B b	30.57 A bcde	24.30 B fg	16.70 A bcd	16.32 A de
AS-7	0.10 A bcde	0.08 B b	26.27 B fg	29,53 A b	15.68 B cde	17.91 A c
BRS Intrépido(C)	0.09 A cde	0.07 B b	29.20 A cdef	26.00 B def	14.68 B e	19.34 A b
Carioca (C)	0.09 A def	0.08 A b	30.76 A bcde	26.55 B bcdef	16.37 B bcd	19.43 A b
CK-4	0.08 A ef	0.06 B b	31.10 A bcd	24.74 B efg	14.65 A e	15.22 A ef
Guabiju	0.08 A f	0.08 A b	27.14 A fg	27.45 A bcde	13.31 B f	19.73 A b
Preto Ibérico	0.10 A abc	0.07 B b	33.30 A b	29.33 B BC	17.03 A b	16.88 A cd
TB 02-20	0.12 A a	0.07 B b	31.67 A bc	26.44 B cdef	16.90 A bc	13.98 B fg
TB 02-21	0.10 A bcde	0.08 B b	27.97 A efg	22.57 B g	15.56 A de	13.93 B g
TB 02-25	0.10 A bcd	0.07 B b	26.00 A g	28.47 A bcd	14.71 A e	15.06 A fg
TB 02-26	0.09 A def	0.06 B b	28.75 A cdefg	28.58 A bcd	14.97 A e	14.43 A fg
Vinho 141	0.10 A bcd	0.07 B b	32.25 A b	27.23 B bcdef	16.66 A bcd	17.63 A c
ZL-1	0.10 A bcd	0.07 B b	37.22 A a	28.65 B bcd	18.61 A a	19.55 A b
Average	0.10	0.07	30.03	27.32	15.90	17.17
CV%	10.3		5.6		4.2	

Averages followed by the same capital letter in the row and lower case letters in the column do not differ by Duncan's test at the level of 5%.

CONCLUSIONS

There is interaction between genotype and environment for nutrient content in whole grains. In Sobradinho, the ZL-1 genotypes are distinguished for high levels of Zn and Mn and TB 02-20 for Fe content. In São Luiz Gonzaga, the AM-10 genotype stands out for Fe, Zn and Mn.

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