

ACCUMULATION OF MICRONUTRIENTS BY DIFFERENT COMMON BEAN CULTIVARS GROWN IN DIFFERENT PLANT DENSITIES IN CONVENTIONAL CROP SYSTEM

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INTRODUCTION: The aim of the current study was to follow the accumulation of micronutrients throughout the crop cycle in different cultivars of common bean with carioca seed type, grown under different plant densities in field experiments using a conventional cropping system.

MATERIALS AND METHODS: The experimental design was randomized blocks with three replications and a 4x5 factorial scheme, involving four bean cultivars (Table 1) and five plant densities (75, 145, 215, 285 and 355 thousand plants.ha⁻¹). The soil preparation was carried out by one operation with plow and two operations with harrow. The experiment had not been irrigated. Each plot had four rows with 5.0 m length and spacing of 0.5 m between rows. At sowing (November, 2006), all the plots had received identical fertilization, determined by the soil analysis interpretation. The N fertilization at covering (at 21 days after emergency-DAE) was 30 kg.ha⁻¹ of N, urea source. Every 10 days, samples of 10 plants were collected and dried under air circulation to 65-70°C, until constant mass, soon after they had been triturated and sent to the Laboratory of Leaf Analysis of the Soil Science Department (UFLA) for determination of the micronutrients content. The Cu, Fe, Mn e Zn contents were evaluated by digestion by nitric and perchloric acid and quantified in the extract (espectrophotometry of atomic absorption) and B by incineration and colorimetric determination by the curcumin method.

Table 1. Principal characteristics of the studied cultivars.

Characteristics	BRS Radiante*	Bolinha**	Ouro Vermelho*	Jalo EEP 558*
Commercial group	Others	Others	Others	Jalo
Seed color	cream / beige	yellow	red	yellow
Growth habit	I	II	II/III	III
100 grain's weight	44-45 g	32-33g	25 g	30-40 g
Stem	erect	erect	semi-erect	semiclimber
Cultural cycle	early	middle	normal	middle

* Ramalho & Abreu (2006), ** Alves (2008)

RESULTS AND DISCUSSION: At flowering, large proportion of the each micronutrient is reached by the bean cultivars. B and Cu showed low initial accumulation, what is even developed from 40-50 DAE up to maturing. The others micronutrients are accumulated in the significant form from the beginning of the cycle; in the cases cv. Bolinha-B and cv. Ouro Vermelho-Fe there was significant interaction between DAE and plant population (Table 2). The bean cultivars do not differ in relation to the B and Zn accumulations, but the cvs. Jalo EEP 558 and BRS Radiante accumulates more Fe and the cv. Ouro Vermelho accumulates more Mn and Cu (Table 3). The general decreasing order of accumulation is Fe>B>Mn>Zn>Cu.

Table 2. Accumulation of micronutrients (g ha⁻¹) by four bean cultivars, in function of DAE.

Cultivar	Nutrient	Regression	R ² (%)
Bolinha	B at 215*	Y= 7,654401 - 0,970793 x + 0,035184 x ²	91,14
	B at 285	Y= -4,134850 + 0,484578 x + 0,014964 x ²	94,27
	B at 355	Y= 25,855394 - 1,435278 x + 0,054272 x ²	91,54
	Cu	Y= 3,780875 - 0,291062 x + 0,009606 x ²	96,20
	Fe	Y=338,195160 + 30,677495 x - 0,159501 x ²	78,46
	Mn	Y= -33,616847 + 3,469581x - 0,028700 x ²	81,76
	Zn	Y= -18,188573 + 1,796735 x - 0,009419 x ²	93,43
Jalo EEP 558	B	Y= 70,842289 - 6,221562 x + 0,121331 x ²	95,33
	Cu	Y= 3,430436 - 0,153673 x + 0,006931 x ²	96,68
	Fe	Y=574,245040 + 14,765826 x + 0,208370 x ²	79,76
	Mn	Y= -16,214513 + 2,227783 x - 0,013614 x ²	96,53
	Zn	Y= -1,848392 + 0,515472 x + 0,008154 x ²	99,59
BRS Radiante	B	Y= 101,004786 - 8,835937 x + 0,166445 x ²	94,50
	Cu	Y= -0,794424 + 0,260449 x + 0,000655 x ²	83,25
	Fe	Y=43,641668 + 64,753179 - 0,634523 x ²	83,13
	Mn	Y= -24,017412 + 2,859347 x - 0,027997 x ²	84,06
	Zn	Y= -10,457097 + 1,320357 x - 0,004796 x ²	94,84
Ouro Vermelho	B	Y= 21,234398 - 1,861711 x + 0,054747 x ²	95,39
	Cu	Y= -5,275257 + 0,455941 x + 0,001429 x ²	95,29
	Fe at 75*	Y= 26,432282 - 1,276536 x + 0,179910 x ²	76,07
	Fe at 145	Y= -94,064832 + 5,103501 x + 0,130694 x ²	79,15
	Fe at 215	Y= -18,615219 + 2,872428 x + 0,196607 x ²	89,64
	Fe at 285	Y= -189,034036 + 15,583867 x + 0,011961x ²	81,04
	Fe at 355	Y= -122,765127 + 13,021096 x + 0,076238 x ²	91,53
	Mn	Y= -36,998363 + 3,769834 x - 0,022769 x ²	95,48
	Zn	Y= -26,654019 + 2,624665 x - 0,013706 x ²	94,97

*At considered significant plant populations.

Table 3. Micronutrients accumulation (g ha⁻¹) in the aerial part of the plant of four bean cultivars.

	Cu	Mn	Zn	B	Fe
Bolinha	49 a	61 b	65 a	126 a	1221 b
Jalo EEP 558	25 b	68 b	73 a	145 a	1626 a
BRS Radiante	20 b	38 c	53 a	153 a	1479 a
Ouro Vermelho	39 a	105 a	79 a	159 a	1039 b
Means	33	68	68	146	1341

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