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INTRODUCTION

Seed phosphorus (P) is a fundamental energy source that acts on germination and seedling development. In addition to the inorganic P (Pi), the seed also accumulates as phytate salts and other forms of phosphate compounds denominated organic P (Po). Although necessary for the seed development, an excess of Po may interfere with the accumulation of calcium, iron and zinc nutrients, which are easily complexed with P and become unavailable for human diet and animal feed (RABOY, 2009). The availability of P in the soil or nutrient solution may influence the storage forms of this mineral in the seed. Therefore, the study aimed to evaluate the partition of the absorbed P in common bean genotypes grown in different levels of P in hydroponic solution.

MATERIAL AND METHODS

The experiment was carried out in the greenhouse at Agronomic Institute of Paraná (IAPAR), Londrina, Paraná, Brazil, in September to December 2015. The experimental design was a randomized block with six replicates and treatments arranged in a factorial design with two genotypes (BRS Estilo and IPR Tangará) and five P levels (2, 4, 6, 8 e 10 mg L^{-1}). The seedlings with uniform shoot and roots were transplanted into polyethylene pots with capacity 3.35 L containing nutrient solution Hoagland and Arnon (1950), modified by Pavan and Bingham (1982). The redox potential (pH) and electrical conductivity (EC) of the nutritive solution were monitored daily. The solution was aerated continuously and when the electric conductivity reached 0.14 dS cm^{-2} the nutrient solution was exchanged. To determine total P content the seeds were ground in Perten 3100 mill and submitted to nitroperchloric digestion according to the methodology of Miyazawa et al. (1999). Pi content was extracted according to the method proposed by Raboy and Dickson (1984) and it was quantified by the method described by Chen et al. (1956). Po content was obtained by subtracting the Pi from the total P. The phytate content was determined according to the methodology of Oomah et al. (2008). The data have been subjected to analysis of variance and test Tukey ($p \leq 0.05$) for mean comparison. The statistical analyzes were performed using the Sisvar version 5.3 software (FERREIRA, 2010).

RESULTS AND DISCUSSION

Among the genotypes, no significant differences were observed in the total P, Pi, Po and phytate contents at the different P levels. In the seeds of BRS Estilo and IPR Tangará, the contents of total P, Pi, Po increased as there was an increase in the P concentrations of the nutrient solution (Table 1). Po values present in genotypes accounted for about 95% of total P seeds and these values ranged from 4.29 to 7.27 g Kg^{-1} in BRS Estilo and 4.56 to 7.04 g Kg^{-1} in IPR Tangará (Table 1). The BRS Estilo and IPR Tangará genotypes showed low Pi content in relation to the Po content. The mean values of Pi for BRS Estilo ranged from 0.28 to 0.38 g Kg^{-1} and from 0.25 to 0.35 g Kg^{-1} for IPR Tangará (Table 1). In the present study, the phytate content in the genotypes showed significant differences in the different P levels. Phytate contents in BRS Estilo and IPR Tangará ranged from 11.85 to 15.11 mg g^{-1} and from 12.53 to 15.27 mg g^{-1}. These

values were higher than observed by Vasić et al. (2012) in different common bean genotypes whose values ranged from 5.34 to 10.47 mg g^{-1}. The increase of P concentration in the nutrient solution caused a significant linear increase in the content of Po in the seed of BRS Estilo (R^2 = 0.76) and IPR Tangará (R^2 = 0.67). However, variations in phytate content did not increased linearly with P levels (R^2 = 0.23 and R^2 = 0.35 for BRS Estilo and IPR Tangará cultivars). The increase in the level of P in the nutrient solution increased the total P and Po content in the seed without, however, changing the phytate values in the seed, maintaining the availability of other nutrients for the human diet and animal feed.

Table 1. Total P, Pi, Po and phytate content in common bean grown in hydroponic condition with different phosphorus concentrations. Londrina - PR, Brazil, 2015.

P* (mg L^{-1})	Total P (g Kg^{-1})		Pi (g Kg^{-1})		Po (g Kg^{-1})		Phytate (mg g^{-1})	
	BRS Estilo	IPR Tangará	BRS Estilo	IPR Tangará	BRS Estilo	IPR Tangará	BRS Estilo	IPR Tangará
2	4.57aA	4.81aA	0.28aA	0.25aA	4.29aA	4.56aA	11.85aA	12.53aA
4	5.68aA	6.52bA	0.35abA	0.28abA	5.33aA	6.24bA	14.72bA	14.67abA
6	7.62bA	7.30bA	0.35abA	0.31abA	7.27bA	6.98bA	15.11bA	15.27bA
8	7.45bA	6.85bA	0.38bA	0.33abA	7.07bA	6.52bA	13.39abA	14.54abA
10	7.42bA	7.39bA	0.38bA	0.35bA	7.04bA	7.04bA	14.53bA	14.54abA
CV(%)	13.00		18.02		13.77		9.19	

* Phosphorus level (mg L^{-1}) in the nutrient solution.
Means followed by the same letter, lower case letter in the column and capital letter in the line, are not significantly different by Tukey at 5% probability.

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