The effect of balanced fertilization on nutrients' concentration and phytic acid to zinc molar ratio in Iranian red been (*Phaseolus calcaratus* L.) cultivars at different stages of seed development

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Abstract

Phytic acid is the main source of organic phosphorus in grains of legumes and cereals. It has great ability of bonding with metals and minerals such as iron, zinc and calcium. As a result, the solubility of these elements and their absorption capability by human will be reduced. This greenhouse research was carried out with the aim of studying the variations of phytic acid to zinc molar ratio and evaluation of nutrients' concentration in different varieties of red bean (*Phaseolus calcaratus* L.) under balanced fertilization conditions (based on soil test) in different timings after flowering stage. Treatments included: 5 varieties of red bean (Akhtar, Naz, Derakhshan, Goli and Sayyad), two levels of fertilizer (control and balanced fertilization) and 3 times of sampling (12, 22 and 32 days after flowering; T_1, T_2 and T_3, respectively) in a factorial arrangement with complete randomized blocks design. Phosphorous, potassium, iron and zinc concentration and phytic acid to zinc molar ratio in grains of different red bean cultivars were determined. The results of analysis of variance showed that the effect of cultivar, fertilizer and sampling time on concentration of zinc, iron, potassium, phosphorous and phytic acid to zinc molar ratio in grain was significant ($P<0.01$). Also, the highest concentration of zinc in grain was measured in Goli cultivar at T_3 timing. The phytic acid to zinc molar ratio in balanced-fertilization treatment was recorded for Goli cultivar at T_1, T_2 and T_3 timings as 11.1, 10.49 and 7.99, respectively. In general, the results of this research showed that balanced fertilization reduced phytic acid to zinc molar ratio. This can be effective in enhancing humans' health by improving the absorption capability of required nutrients. More investigations under field conditions are recommended.

Keywords: Complex formation, Balanced fertilization, Nutrients, Organic phosphorus.

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