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Assessment of Soil Contamination on the Content of Macro and Microelements and the Quality of Grass Pea Seeds (Lathyrus sativus L.)

Authors : Violina R. Angelova

Abstract : Comparative research has been conducted to allow us to determine the content of macro and microelements in the vegetative and reproductive organs of grass pea and the quality of grass pea seeds, as well as to identify the possibility of grass pea growth on soils contaminated by heavy metals. The experiment was conducted on an agricultural field subjected to contamination from the Non-Ferrous-Metal Works (MFMW) near Plovdiv, Bulgaria. The experimental plots were situated at different distances of 0.5 km and 8 km, respectively, from the source of pollution. On reaching commercial ripeness the grass pea plants were gathered. The composition of the macro and microelements in plant materials (roots, stems, leaves, seeds), and the dry matter content, sugars, proteins, fats and ash contained in the grass pea seeds were determined. Translocation factors (TF) and bioaccumulation factor (BCF) were also determined. The quantitative measurements were carried out through inductively-coupled plasma (ICP). The grass pea plant can successfully be grown on soils contaminated by heavy metals. Soil pollution with heavy metals does not affect the quality of the grass pea seeds. The seeds of the grass pea contain significant amounts of nutrients (K, P, Cu, Fe Mn, Zn) and protein (23.18-29.54%). The distribution of heavy metals in the organs of the grass pea has a selective character, which reduces in the following order: leaves > roots > stems > seeds. BCF and TF values were greater than one suggesting efficient accumulation in the above ground parts of grass pea plant. Grass pea is a plant that is tolerant to heavy metals and can be referred to the accumulator plants. The results provide valuable information about the chemical and nutritional composition of the seeds of the grass pea grown on contaminated soils in Bulgaria. The high content of macro and microelements and the low concentrations of toxic elements in the grass pea grown in contaminated soil make it possible to use the seeds of the grass pea as animal feed.

Keywords : Lathyrus sativus L, macroelements, microelements, quality
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