

An ICP-OES approach for macro-element profiling of legume species conventionally grown in Serbia

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In this study, macro-element profiles were determined in the following major legume species: common beans (*Phaseolus* spp; n=17), faba beans (*Vicia* spp; n=8), field peas (*Pisum* spp; n=7) and grass peas (*Lathyrus* spp; n=6). Samples were cultivated conventionally at the Institute of Field and Vegetable Crops in Serbia, in 2019. They were milled into flour and digested in a microwave oven, following a slightly modified and shortened method compared to the standard method for cereal grains, as provided by the manufacturer. About 0.5 g ($\pm 2\%$) of each flour sample was put in a teflon vessel, where 5 ml of 65% nitric acid and 2 ml of 30% hydrogen peroxide were added. The microwave power used was 800 W, with a total digestion time of 40 minutes, with additional 20 minutes for cooling down the sample vessels to room temperature. The clear liquid, obtained after sample digestion, was diluted with 2% nitric acid and put in a glassy vial till analysis on an ICP-OES device, for macro-elements: phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg). All samples were analyzed in triplicate. Summary statistics, MANOVA and PCA were performed using the SPSS 26.0 software. The mean contents of P, K, Ca and Mg, respectively, were as follows: 4003.7, 14177.4, 1400.0 and 1280.0 in mg/kg of common bean; 3389.7, 13679.4, 1004.1 and 1164.4 in mg/kg of faba bean; 2309.3, 8980.7, 938.4 and 961.8 in mg/kg of field peas; and 4324.2, 11743.3, 1004.7 and 1139.5 in mg/kg of grass peas flour. MANOVA revealed significant differences between common beans and field peas in P, K, Ca and Mg contents; between field and grass peas in P and K contents; and between faba beans and field peas in K content. The P content was the highest in grass peas, and the K, Ca and Mg in common beans. According to the literature, legume grains are high in calcium and magnesium, compared to the cereals, indicating these crops could provide a nutritional balance. In addition, while potassium needs could easily be met in daily nutrition, legumes are considered an important source of phosphorus.