ASSESSMENT OF ESSENTIAL ELEMENTS AND POTENTIALLY TOXIC ELEMENTS (PTES) IN ORGANIC AND CONVENTIONAL FLAXSEEDS: IMPLICATIONS FOR DIETARY EXPOSURE AND FOOD SAFETY

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Abstract

INTRODUCTION: Flax (*Linum usitatissimum* L.) is a commercially important crop valued for both its fibers and nutrient-rich seeds. While flaxseeds are a known source of essential elements, they can also accumulate potentially toxic elements (PTEs), raising concerns about consumer health risks. Despite their growing popularity, data on the elemental composition of flaxseeds remain limited. **OBJECTIVES**: This study aimed to quantify the concentrations of 11 essential elements (Ca, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Zn) and 9 PTEs (Al, B, Ba, Cd, Li, Ni, Pb, Sr, V) in commercially available flaxseed. **MATERIAL AND METHODS**: Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) was used to estimate the concentration of all elements. Dietary exposure was assessed for two consumption scenarios (15 g/day and 30 g/day), and potential health risks were evaluated through the Target Hazard Quotient (THQ) and Hazard Index (HI). **RESULTS**: The results revealed notable differences between organic and conventional flaxseeds. Concentrations of Cu, K, Mg, Na, B, Ba, Pb, Sr, and V were higher in the organic group, whereas Al and Ni were more prevalent in the conventional group. Cadmium (Cd) levels in both sample types remained below the maximum limit set by Regulation (EU) 2023/915 (0.50 mg/kg), with values of 0.116 mg/kg (organic) and 0.127 mg/kg (conventional). The highest Estimated Daily Intakes (EDIs) were recorded for K, Mg, and Ca, reaffirming the nutritional relevance of flaxseeds. However, the HI values indicated that aluminum (Al) and lead (Pb) may pose potential health risks. **CONCLUSION**: These findings underscore the dual role of flaxseeds as a nutritional supplement and a possible source of toxic element exposure. Given the absence of specific regulatory limits for most elements in flaxseeds and the scarcity of analytical data, further monitoring and risk assessment are warranted to ensure consumer safety.

Keywords: Flaxseeds, Trace Elements, Potentially Toxic Elements, Dietary Exposure, Risk Assessment