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Preliminary Analysis on the Distribution of Elements in Cannabis

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Abstract : Cannabis plant contains 113 cannabinoids and it is commonly known for its psychoactive substance tetrahydrocannabinol or as a source of narcotic substances. The recent years' cannabis cultivation also increases due to its wide use both for medical and industrial purposes as well as for uses as para-pharmaceuticals, cosmetics and food commodities. Depending on the final product, different parts of the plant are utilized, with the leaves and bud (seeds) being the most frequently used. Cannabis can accumulate various contaminants, including heavy metals, both from the soil and the water in which the plant grows. More specifically, metals may occur naturally in the soil and water, or they can enter into the environment through fertilizers, pesticides and fungicides that are commonly applied to crops. The high probability of metals accumulation in cannabis, combined with the latter growing use, raise concerns about the potential health effects in humans and consequently lead to the need for the implementation of safety measures for cannabis products, such as guidelines for regulating contaminants, including metals, and especially the ones characterized by high toxicity in cannabis. Acknowledging the above, the aim of the current study was first to investigate metals contamination in cannabis samples collected from Greece, and secondly to examine potential differences in metals accumulation among the different parts of the plant. To our best knowledge, this is the first study presenting information on elements in cannabis cultivated in Greece, and also on the distribution pattern of the former in the plant body. To this end, the leaves and the seeds of all the samples were initially separated and dried and then digested with Nitric acid (HNO_3) and Hydrochloric acid (HCl). For the analysis of these samples, an Inductive Coupled Plasma-Mass Spectrometry (ICP-MS) method was developed, able to quantify 28 elements. Internal standards were added at a constant rate and concentration to all calibration standards and unknown samples, while two certified reference materials were analyzed in every batch to ensure the accuracy of the measurements. The repeatability of the method and the background contamination were controlled by the analysis of quality control (QC) standards and blank samples in every sequence, respectively. According to the results, essential metals, such as Ca, Zn and Mg, were detected at high levels. On the contrary, the concentration of high toxicity metals, like As (average: 0.10ppm), Pb (average: 0.36ppm), Cd (average: 0.04ppm), and Hg (average: 0.012ppm) were very low in all the samples, indicating that no harmful effects on human health can be caused by the analyzed samples. Moreover, it appears that the pattern of contamination of metals is very similar in all the analyzed samples, which could be attributed to the same origin of the analyzed cannabis, i.e., the common soil composition, use of fertilizers, pesticides, etc. Finally, as far as the distribution pattern between the different parts of the plant is concerned, it was revealed that leaves present a higher concentration in comparison to seeds for all metals examined.

Keywords : cannabis, heavy metals, ICP-MS, leaves and seeds, elements
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