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Quantitative evaluation of essential and trace elements in nine medicinal plants by IPAA and XRF techniques

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The concentrations of some trace and essential element constituents in nine medicinal plants surveyed in Bucegi Mountains in Romania, namely Achillea millefolium, Chelidonium majus, Cynara scolymus, Hypericum perforatum, Tilia cordata, Matricaria recutita, Mentha, Rosa canina and Urtica, were determined. The above medicinal plant species were used for the experiments as they are an important source of drug with many pharmaceutical effects as well as bioaccumulators of the trace heavy metals and other bioactive chemicals. Samples of about 2 g have been measured by the combined use of photon neutron activation analysis (IPAA) followed by high-resolution gamma;-ray spectrometry and X-ray fluorescence (XRF). The analytical approach allowed the determination of 34 elements in the 9 medicinal plants commonly used in Romania. Usually the trace element concentrations were higher in tree leaves than in herbs, following the order Tilia cordata > Chelidonium majus > Cynara scolymus > Hypericum perforatum > Achillea millefolium > Mentha,> Urtica > Matricaria recutita, especially for Mn, Fe, Cu, and Rb. Most elements vary in a narrow range by a factor of 2 –4 while a few others as Na, Mn, and V, vary in a wide range. All the medicinal herbs contain K, Cl, Mg, P, and Ca as minor constituents along with significant trace amounts of Cr, Cu, Fe, Mn, Se, and V. The detection limits of the analytical method for different elements are discussed in some detail. The interrelationships of the trace metal concentrations of medicinal herbs by factor correlations between pairs of elements have been examined.

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