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Optimization of the Plant Sample Preparation Procedure for Metal Analysis Using Wavelength Dispersive X-ray Spectroscopy (WDXRF)

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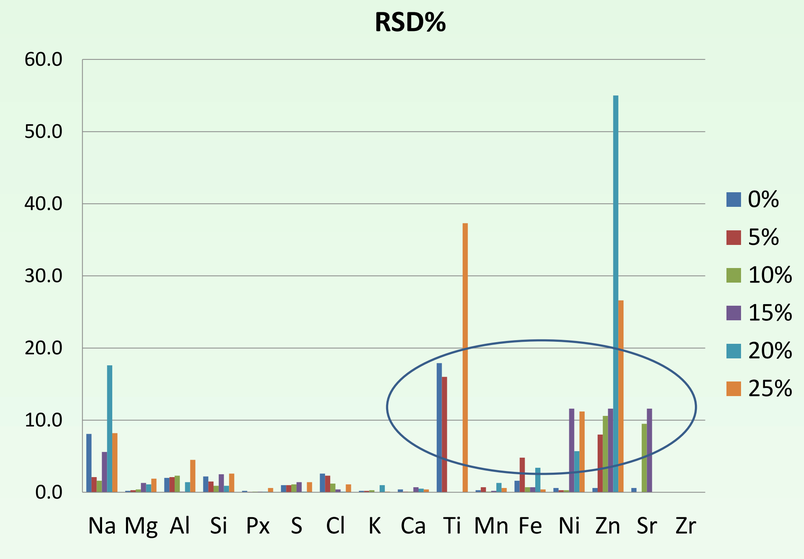
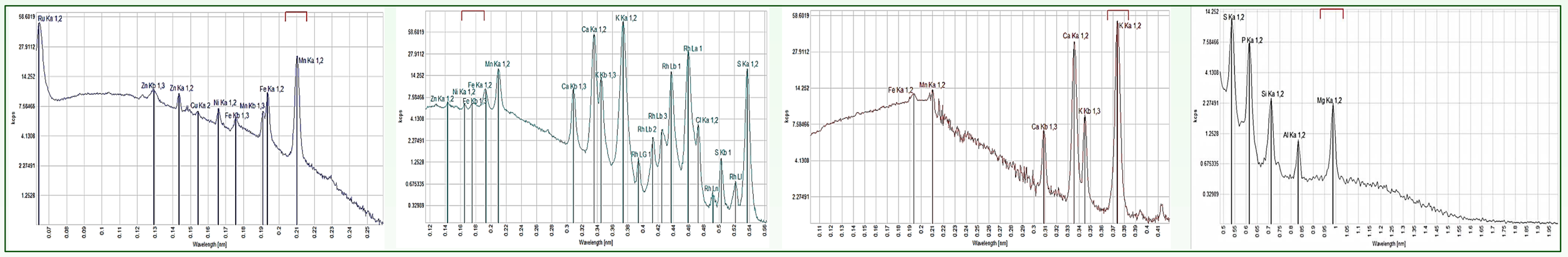
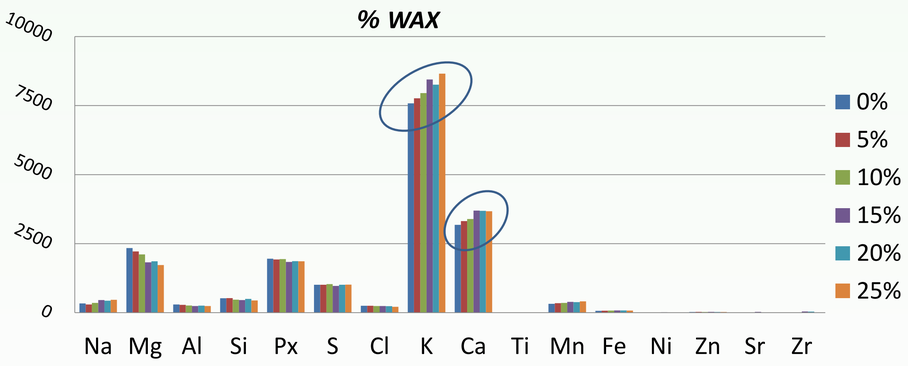
Methods based on direct solid sample analysis are more favourable because they avoid utilization of aggressive and toxic agents, which is in line with green chemistry principles. Besides non-destructiveness, X-ray fluorescence spectroscopy (XRF) is suitable for plant analysis because it offers wide linearity range (from ppm level to 100 %) and possibility of analysis of almost whole PSE (from Be to Am).

Plant sample preparation procedure for WDXRF analysis includes: grinding, drying at 60° C and mixing with a certain amount of binder (Hoechst wax C micropowder) and pressed in a hydraulic press (Retsch PP 25) in order to obtain stable pellet (32 mm diameter). Analysis was performed on ARL™ PERFORM'X Sequential Wavelength Dispersive X-Ray Fluorescence Spectrometer (Thermo Fisher Scientific, Switzerland) combined with ARL software program.

In both types of plant samples the following elements were determined: Na, Mg, Al, Si, P, S, Cl, K, Ca, Ti, Mn, Fe, Ni, Zn, Sr and Zr. Both fir and pine needles show similar trends. As quantity of binder increases, the concentration of Ca and K increases, because wax as binder can contain small quantities of those elements. Repeatability of elements that were found in higher concentrations (Mg, Al, Si, P, S, Cl, K and Ca) is high, while repeatability for low concentration elements (Ti, Fe, Ni, Zn, Sr) decreases as % of binder increases. Addition of 20% of wax provides the most stabile pellets with flattest surface. For adequate pellet stability, recommend mass of pellets should be 4 g, but it has been shown that 3 g is acceptable in the case of a small sample quantity.







UniQuant, as standardless method of analysis, which uses the advanced Fundamental parameters Algorithms for data processing, is well adjusted and able to deal with analysis of different sample masses.

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