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The influence of soil pH and humus content on received by Mehlich 3 method nutrients analysis results

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Soils provide vital ecosystem functions, playing an important role in our economy and in healthy living environment. However, soils are increasingly degrading in Europe and at the global level. Knowledge about the content of major plant available nutrients, i.e. calcium, magnesium, potassium and phosphorus, plays an important role in the sustainable soil management. Mobility of nutrients depends directly on the environmental conditions, two of the most important factors are the pH and organic matter content. Therefore it is essential to have correct information about the content and behaviour of the above named elements in soil, both from the environmental and agronomical viewpoint.

During the last decades several extracting solutions which are suitable for the evaluation of nutrient status of soils have been developed for this purpose. One of them is called Mehlich 3 which is widely used in USA, Canada and some European countries (e.g. Estonia, Czech Republic) because of its suitability to extract several major plant nutrients from the soil simultaneously.

There are several different instrumental methods used for the analysis of nutrient elements in the soil extract. Potassium, magnesium and calcium are widely analysed by the AAS (atomic absorption spectroscopic) method or by the ICP (inductively coupled plasma) spectroscopic methods. Molecular spectroscopy and ICP spectroscopy were used for the phosphorus determination. In 2011 a new multielemental instrumental method MP-AES (microwave plasma atomic emission spectroscopy) was added to them. Due to its lower detection limits and multielemental character, compared with AAS, and lower exploitation costs, compared with ICP, the MP-AES has a good potential to achieve a leading position in soil nutrient analysis in the future.

The objective of this study was to investigate: (i) the impact of soil pH and humus content and (ii) applicability of MP-AES instrumental method for the determination of soil nutrients extracted according to Mehlich 3. For the experiment 100 soil samples with different content of organic matter and pH were used. The determination of Ca, Mg, K and P was analysed by MP and ICP methods and additionally P was analysed molecular spectroscopically. Within the framework of the study the regressions between MP and ICP methods were created for all the analysed elements, i.e. Ca, Mg, K and P. According to MP and ICP, the relationships between the analysed soil major nutrient contents at different soil humus levels and at different pH ranges were determined for the evaluation of their impact. The optimal instrumental settings for calcium, magnesium and potassium analysis, according to Mehlich 3 using MP-AES method, are reported.