The dynamics of compost mineralization in a sandy soil

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The protection, maintenance and preservation of fertility of sandy soils deserve special attention in Hungary as the 20 % of the utilized agricultural area is sandy soil (KÁDÁR et al., 2012). There is a great need for improvement of the water and nutrient management of the humic sandy soils between the both rivers Danube and Tisza (KÖHLER, 1984).

In order to optimize the nutrient management of this kind of soils, it can be used composted agricultural residues and by-products to replace the solids and plant origin nutrients.

Utilization of composts has a significant amount of positive effects on soils: In terms of chemical and biological effects, it enhances the biological activity of the soils; the migration of nutrients is slow, there is little possibility of nutrient leaching; because of its great adsorption ability it grows the nutrient holding capacity of the soils; CO_2 generated by the mineralization of the organic materials assimilates by the plants; because of the ferments that are produced by the acids and microorganisms from the humus decomposition, the plants can take up the poorly soluble mineral nutrients as well; hormonal substances in the compost stimulate the plant growing; the resistance of plants against pathogens and pests rises.

In terms of physical effects, stable soil is formed, which can reduce the danger of deflation and erosion; the management of water and air of the soils improves (HARTMAN et al., 2001).

Last but not least, the compost is an excellent alternative plant nutrient which can (partly) replace the mineral fertilizers – this is a significant contribution to the sustainable plant production.

The main goal of our examinations was, to observe the pH shifting effect with the usage of different compost dosages on humic sandy soils, to define the exploration rate of some nutrients (N-forms, P, K, Mg and Mn), to propose the appropriate dosage of compost, with

these we can clarify and widen our knowledge on nutrient-management. All these are highly important because instead of using different fertilizers, we can apply organic materials to replace nutrients and we can also facilitate the solution of waste disposal problems.

The experiments were performed in the greenhouse and laboratories of the Institute of Agricultural Chemistry and Soil Science at the University of Debrecen, Faculty of Agricultural and Food Sciences and Environmental Management.

For the experiments was a neutral [pH($CaCl_2$) = 7.21] sandy soil from northern part of the area between the Danube and the Tisza, nearby the village Őrbottyán, used. The calcium carbonate content of the soil in the upper layer (0-20 cm) is 7.8-8.0 %, and in the lower one (20-40 cm) is 9.3 %. The soil used for the experiment originated from the cultivated layer (0-30 cm).

The row materials of the compost used in the experiment are sewage sludge, additives (sawdust, wood chips, straw, street-side green waste) and a multi-component complex vaccine as an inoculant.

The date of mixing was 1st of April 2014. The carbonate containing sandy soil and the compost were measured by their volume in five different ratio in four replications. The pots were located randomly. To replace the water loss caused by evaporation, we made it for 60% of total water capacity, daily, with weight supplement method. We took soil samples 6 times for measurements. The experiment ended on 6th of June 2014.

From the original sandy soil, from the compost and from the different ratio mixture of them, in order to determine the element content, from the samples after extraction with 0.01 M dm^{-3} $CaC1_2$ the pH value and the amount of different N-forms as well as P-, K-, Mg- and Mn-contents were measured.

The results of our measurements were statistically evaluated in two different ways. First we used a two-factor analysis of variance with the help of a Microsoft Excel 2007 program written in Macro by László Tolner. The basis of the program was the algorithm written by SVÁB (1981). The other method was the application of the measurement model repeated with the R-program. With this second model we tested the differences in time in the case of the certain treatments, so we can assess that the samples that contains the same amount of compost, in terms of pH and element content changing in time are the same or not.

After running the variance analysis, from the results of the certain samples taken at different sampling times we classified groups. With the Duncan test we could determine

the significant differences between the groups and the levels of the different treatment combinations.

Our experimental results confirmed by the analysis of variance prove that the nutrient management should be done consciously, in moderation, knowing the release time of the certain nutrients and bear in mind this at utilization is subservient to do.

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