



Biochar contribution to soil pH buffer capacity

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Biochar as ecologically clean and stable form of carbon has complex of physical and chemical properties which make it a potentially powerful soil amendment (Mutezo, 2013). Therefore during the last decade the biochar application as soil amendment has been a matter for a great number of investigations.

For the ecological viewpoint the trend of decreasing of soil organic matter in European agricultural land is a major problem. Society is faced with the task to find possibilities to stabilize or increase soil organic matter content in soil and quality.

The availability of different functional groups (e.g. carboxylic, phenolic, acidic, alcoholic, amine, amide) allows soil organic matter to buffer over a wide range of soil pH values (Krull et al. 2004). Therefore the loss of soil organic matter also reduces cation exchange capacity resulting in lower nutrient retention (Kimetu et al. 2008). Biochar can retain elements in soil directly through the negative charge that develops on its surfaces, and this negative charge can buffer acidity in the soil.

There are lack of investigations about the effect of biochar to soil pH buffering properties,

The aim of our investigation was to investigate the changes in soil pH buffer capacity in a result of addition of carbonized material to temperate region soils. In the experiment different kind of softwood biochars, activated carbon and different soil types with various organic matter and pH were used. The study soils were Albeluvisols, Leptosols, Cambisols, Regosols and Histosols. In the experiment the series of the soil: biochar mixtures with the biochar content 0 to 100% were used. The times of equilibration between solid and liquid phase were from 1 to 168 hours. The suspension of soil: biochar mixtures was titrated with HCl solution. The titration curves were established and pH buffer capacities were calculated for the pH interval from 3.0 to 10.0. The results demonstrate the dependence of pH buffer capacity from soil type, organic matter and type of added carbonized material. Our study showed that the biochar content has significant role in total pH buffer capacity in soil:biochar system.

References.

- Kimetu, J.M., Lehmann, J., Ngoze, S.O., Mugendi, D.N., Kinyangi, J., Riha, S.J., Verchot, L., Recha, J.W., Pell, A.N. 2008. Reversibility of Soil Productivity Decline with Organic Matter of Differing Quality Along a Degradation Gradient. *Ecosystems*, 11, 726-739.
- Krull, E. S., Skjemstad, J.O., Baldock, J.A. 2004 'Functions of Soil Organic Matter and the Effect on Soil Properties'. GRDC report. Project CSO 00029.
- Mutezo, W.T., 2013. Early crop growth and yield responses of maize (*Zea mays*) to biochar applied on soil. International Working Paper Series, 13/03, 50 pp.