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Influence of phosphate ions and competitiveness sodium and calcium cations on the humic acids peptization and coagulation processes

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At the agro-ecosystem level, particularly where such system has some permanence, continued P cycling is dependent on the release of P, by decomposition of leaf litter, roots and other organic materials returned pr added to the soil. Not all organic matter returned or added to soil gets decomposed with the immediate recycling of the contained P. A variable, but usually small proportion of organic matter returned annually, becomes humified, and with P it contains, enters the soil profile to accumulate there continuing to undergo much smaller decomposition than the material from which it was derived. Throughout pedogenesis, organic matter tends to accumulate in the soil profile and much of the mineral P becomes converted into organic matter. Soil organic matter is susceptible to peptization and coagulation processes. These mechanisms depend on many factors. The most important are: temperature, pH environment and soil ionic composition. Humic acids are presented in nature in the form of salts. Cations of humic salts reveal significant features of organic matter. They lead to the peptization and coagulation processes. Actually the concentrations of phosphate anions in the soil continuously increase (wastes, fertilizers). Therefore it can also have significant influence on soil processes, occurring in concern of organic matter. It is connected with possibility of creating of complex phosphate compounds with humic acids through “cation bridges” formed by aluminium and iron cations. These cations are available for soil conversions, as well as for plant and microorganisms.

The aim of the present work was to evaluate the influence of phosphate ions and competitiveness sodium and calcium cations on the humic acids peptization and coagulation processes.

The study was conducted on a few muck samples (Terric Histosols). The samples were collected at 5-20 cm depth from terrains located in a low moor area of the Wieprz-Krzna Canal (Polesie Lubelskie) and Biebrza River in Poland and extracted by Schnitzer Method. For the purpose of investigation of phosphate, sodium and calcium ions influence on HA peptization and coagulation process in the soil. Calcium and sodium forms of the studied extracts were treated respectively by NaH_2PO_4solution and $Ca_3(PO_4)_2$ precipitation in increasing concentration and different pH conditions. The investigation of sodium phosphate influence on the calcium humates at the different pH values has shown that process of organic matter release increases with the increase of pH and amount of sodium monohydrogen (ortho) phosphate added to humates. It is an evidence of strong competitiveness of sodium cations in relation to calcium ones at the high pH conditions. In turn, addition of calcium phosphate with increasing concentration to sodium forms and in the consequence TOC concentration increase is rather caused, only by increase of pH and not by calcium phosphate influence. Achieved results show that in constant pH, amount of organic matter in the solution is the highest for the samples without calcium phosphate and much lower for the samples with the highest calcium phosphate concentration. It is an evidence on coagulation of humic acid at big surplus of calcium cations.