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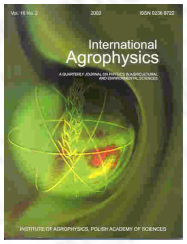

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Structural and Zn-binding features of ortho- and pyrophosphate modified soil metal-humus sorbents (Features of P-modified humus sorbents)

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abstract The results of the experiments showed that the P treatment considerably enhanced the Zn-binding capability of acid soil. The contribution of ortho- and pyro-P to Zn binding was that they changed the structure of humus ligands in the sorbing metal-humus complexes. This was clearly demonstrated with the Fe-HA complex as a simulator of soil sorbent. New double carbon- carbon and phosphorus-oxygen bonds were discovered in the P-modified humic ligand of the Fe-HA complex. Their accumu- lation provided an explanation for the enhancement of Zn binding by P-treated soil. In addition to P=O bonds, the C=C bonds should also be considered as functional groups capable of metal ion bin- ding. Because of the greater number of electron-donor groups in the pyro-P-modified humus ligand, the pyro-P-treated soil bound Zn more firmly than the ortho-P-treated one. The dissimilar struc- ture of the control and ortho-, pyro-P-modified humus ligands had a direct relationship with the capability of microflora to adapt to the rising Zn pollution of soil. As compared with control, toxic action of Zn compounds was even enhanced by ortho-P although its addition to soil promoted the Zn binding. On the contrary, pyro-P addition to soil reduced the toxic action of Zn compounds. Con-sequently, the capability of soil to bind external Zn into inert and nontoxic compounds depends on the structural features of humus ligands in surface metal-humus complexes which are of a great importance as sorption barriers.

keywords humus ligand structure, phosphate fertilizers, zinc binding