

PARAMAGNETIC PROPERTIES OF CHERNOZEM TYPICAL HUMIC ACIDS AND THEIR CHANGE UNDER DIFFERENT SOIL TILLAGE

M. A. Popirny

National Scientific Center "Institute for Soil Science and Agrochemistry Research named after O.N. Sokolovsky», Kharkiv, Ukraine
E-mail: max_papirny@mail.ru

As a result of physical-chemical analysis there were revealed the structural features of the transformation of humic acids of chernozem typical under the influence of minimized, no till and traditional methods of soil tillage. It was investigated the mechanism of structural transformation of humic acids under different soil tillage, by electron paramagnetic resonance (EPR). It was found that for the ordinary tillage of chernozem typical there was an increase in spin signal allocated preparations of humic acids, due process chelates and macrocyclic effect.

Keywords: Chernozem typical, humic acid, soil tillage, electron paramagnetic resonance (EPR), chelates, macrocyclic effect.

References

1. Orlov, D.S., 1990. Humic acids of soils and the general theory of humification. Moscow State University. (Rus.).
2. Stevenson, F.J., 1994. Humus chemistry: Genesis, composition, reactions. 2nd ed. John Wiley & Sons, Ltd.
3. Orlov, D.S., 1993. Features and functions of humic substances. In: Humic substances in the biosphere. Moscow. Pp. 16-27. (Rus.).
4. Schnitzer, M., Schulten, H., 1997. State of the Art Structural Concept for Humic Substances. Naturwissenschaften. №80. Pp. 29-30.
5. Piccolo, A., 2001. The supramolecular structure of humic substances. Soil Sci. № 166. Pp. 810-832.
6. Nebbioso, A., Piccolo, A., 2012. Advances in Humeomic: enhanced structural identification of humic molecules after size fractionation of a soil humic acid. Analytica Chimica. № 720. Pp. 77- 90.
7. Piccolo, A., Conte, P., 2000. Supramolecular associations versus macromolecular polymers. Adv. Environ. Res. № 3. Pp. 508-521.
8. Kravchenko, Y., Rogovska, N., Petrenko, L., 2012. Quality and dynamics of soil organic matter in a typical Chernozem of Ukraine under different long-term tillage systems. Canadian Journal of Soil Science. № 92, Pp. 429-438.
9. Medvedev, V.V., 2010. Zerro tillage of soil in European countries. Kharkiv. (Rus.).
10. Degtyarev, V.V., 2011. Humus of chernozems of Forest-Steppe and Steppe of Ukraine. Kharkiv. (Ukr.).
11. Ovchinnikov, M.F., 2012. Features and mechanisms of humic substances agrogenic transformations sod-podzolic soil. Agrohimiya, №1, Pp. 3-13. (Rus.).
12. Parfitt, R.L., Theng, B.K., Whitton, J.S., Shepherd, T.G., 2000. Effect of no-till cropping systems on soil organic matter in a sandy clay loam Acrisol from Southern Brazil monitored by electron spinresonance and nuclear magnetic resonance. Soil & Tillage Research, № 53. Pp. 95-104.
13. Soil quality. Sampling DTR 4287: 2004. - [Valid from 2005-07-01]. - K.: Derzhspozhivstandart of Ukraine, Kyiv. 2005. (National Standard of Ukraine). (Ukr.).
14. Soil quality. Methods for determination of organic matter : DTR 4289:2004 [Valid from 2005-07-01]. K.: Derzhspozhivstandart of Ukraine, Kyiv. 2005. (National Standard of Ukraine). (Ukr.).
15. Soil quality. Methods for determining available (labile) of organic matter. : DTR 4732:2007 – [Valid from 2008-01-01.] Derzhspozhivstandart of Ukraine, Kyiv. 2008. (National Standard of Ukraine). (Ukr.).
16. Determination of group and fractional humus composition by I.Tyurin methods in modification V.V.Ponomareva and T.A.Plotnikova; burning on B.A. Nikitin (version NSC ISSAR) In: Methods for determination of soils composition and properties. T.1. Pp. 129-155. Drukarnya 13, Kharkiv. (Ukr.).
17. Ingram, D., 1972. Electron Paramagnetic Resonance in Biology. Mir, Moscow 1972. - p. 295.
18. Gubin, S.P., 1982. Chemistry of clusters. Nauka, Moscow. (Rus.).
19. Altshuler, S.A., Kozyrev, B.M., 1972. Electron paramagnetic resonance of compounds of the elements of the intermediate groups. Nauka, Moscow. (Rus.).
20. Melson, G.A., 1979. Coordination Chemistry of Macrocyclic Compounds. Plenum Press, New York.
21. Sauvage, J. P., 1990. Interlacing molecular threads on transition metals: catenands, catenates, and knots. Pure Appl. Chem, №62. Pp. 319-327.
22. Len, J.M, 1998. Supramolecular chemistry. Concepts and Perspectives. Nauka, Novosibirsk. (Rus.).
23. Pedersen, C.J., 1967. Cyclic polyethers and their complexes with metal salts. Journal of the American Chemical Society, №89. Pp. 7017-7036.
24. Hiraoka, M., 1986. Crown compound. Trans. from English. Mir, Moscow. (Rus.).
25. Ionenko, V.I., 1988. Crown clathrate concept humus structure. In: Reclamation and use of chemicals in agriculture Moldova: mes. rep. Rep. Conf. Part 1. Chisinau. Pp. 5-8. (Rus.).
26. Tsapko, Yu.L., 2014. The structural construction of humic acids in aspect of influence on acid soil functions. News of HNAU named after V.V. Dokuchaev. №1. Pp. 12-18. (Ukr.).
27. Clapp, C.E., Chen, Y., Hayes, M.H.B., Cheng, H.H., 2001. Plant growth promoting activity of humic substances. In: Swift, R.S., Sparks, K.M. (Eds.), 2001. Understanding and Managing Organic Matter in Soils, Sediments, and Waters, International Humic Science Society, Madison. Pp. 243-255.

ПАРАМАГНИТНЫЕ СВОЙСТВА ГУМИНОВЫХ КИСЛОТ ЧЕРНОЗЕМА ТИПИЧНОГО И ИХ ИЗМЕНЕНИЕ ПРИ РАЗНЫХ СПОСОБАХ ОБРАБОТКИ ПОЧВЫ

М.А. Попирный

Национальный научный центр «Институт почвоведения и агрохимии имени А.Н. Соколовского»

E-mail: max_papirny@mail.ru

По результатам определения электронного парамагнитного резонанса (ЭПР) выделенных препаратов гуминовых кислот чернозема типичного, определили природу сигнала и структурные особенности трансформации кислот, под влиянием минимизированной, нулевой и традиционной (вспашка) обработки почвы. Методом ЭПР исследовали механизм структурной трансформации гуминовых кислот при разных способах обработки почвы. Выявили, что под влиянием длительной традиционной обработки чернозема типичного происходит усиление парамагнитного сигнала в выделенных препаратах гуминовых кислот благодаря процессу хелатообразования.

Ключевые слова: *чернозем типичный, гуминовые кислоты, способы обработки почвы, электронный парамагнитный резонанс (ЭПР), хелаты.*