

FORECASTING OF MICROELEMENT STATUS OF SOIL SYSTEM FOR EFFICIENT REMEDIATION AND USING

V.L. Samokhvalova¹, V.I. Lopushnjak², A.I. Fateev¹, V.M. Gorjakina¹, V.V. Shymel¹

¹National Scientific Center "Institute for Soil Science and Agrochemistry Research named after O.N. Sokolovsky", Kharkiv, Ukraine

²Lviv National Agrarian University, Dublyany Lviv region, Ukraine
(v.samokhvalova@mail.ru)

Grounded the method for forecasting of the heavy metals (HM) and trace elements (TE) mobile forms content in the soil system on the example of surveyed soils of different genesis on their trace element status in different climatic zones of Ukraine, contaminated soils around Zmiyiv TPP PJSC "Tsentrnergo" NJSC "Energy Company of Ukraine" Kharkiv Region, JSC "Ukrtsynk" and JSC "Avdeyevka Coke-Chemical Plant" Donetsk region climatic zones of Forest-steppe and Steppe zones of Ukraine and soils of the Lviv region of Western Forest-steppe zone of Ukraine on the effectiveness influence of organic-mineral, organic and mineral fertilizing systems. Elaboration of the method include conducting a patent search; field stage - soil-geochemical research on the local and regional levels, including the conditions of the technological load on the soil and the conditions for sustainable impact of pollution emission sources of inorganic nature; fixed a series of field experiments; analytical stage of determining performance of soils properties; in-office stage - the assessment of trace element status of soils for expert evaluation of regulatory reference documentation, statistical data processing. The essence of the utility model: by defining an additional indicator of hydrolytic acidity of soils with application of organic-mineral and /or mineral and / or organic fertilizing systems and technogenic pollution by the HM and received by the established mathematical models dependences of hydrolytic acidity, group composition of humus, and ME and /or HM mobile forms content in the soil provided an effective prediction of their content with the subsequent extension of the method algorithm on other types of soils which ensures the universality of the method, the express receipt and improving accuracy of the predicted values of the TE and HM content in soils. Technical result: providing the possibility to increase the accuracy and forecasting the express content of chemical elements in soils of different genesis with simultaneous increase remediation capacity of the soil of a particular type by expanding the range of informative indicators for predicting the content of HM and TE mobile forms in the soil system. Distinctive features and benefits of the proposed technical solution in comparison with known methods and approaches are the express receipt and improve the accuracy of predicted values of the TE and HM content in soils; universality of the method for all types of soils of different climatic zones of Ukraine. A method of trace element status prediction system for soil remediation and the effective use should be used in agroecology on issues of diagnosis, assessment, forecasting and TE status danger of excessive accumulation of HM in soils; including technogenic contaminated, for elaboration ways of contaminated areas remediation, as components of complex methods of environmental remediation of soils and, consequently, to reduce man-made and technological loads on soils of different genesis, intensity of their degradation and recovery properties. A new methodological approach protected with patent (patent for utility model 95649 UA 2014).

Key words: soil, trace elements, heavy metals, the group composition of humus, hydrolytic acidity, technogenic pollution, technological load, the method of forecasting.

References

1. Vlasjuk P.A. Guide agronomist on fertilization. (Za red. P.A. Vlasjuka, P.O. Dmytrenka). K: Derzhsil'gospvydav, 1962. 680 p.
2. Fertilizers and their use: Dovidnyk. K.: Aristej, 2010. 254 p.
3. Diagnosis of the chemical elements state of the soil-plant system: Metodyka. (Za red. A.I. Fatjejeva, V.L. Samokhvalovoi'. - Harkiv: KP «Mis'ka Drukarnja», 2012. 146 s.
4. Pat. na poleznuju model' 2050544 RU, MPK: G01N33/24 A method of determining available for mineralization biophilic elements of the soil and the degree of its availability / Yslamov S.S.; zajavnytel' y patentnoobladatel' Agrofyzicheskyj nauchno-ysledovatel'skyj ynstytut (RU). - № 5030236/15; zajavl. 12.02.1992; opubl. 20.12.1995. 6 p.
5. Pat. na korysnu model' 58720 UA, MPK: (2011.01) A01B 79/00 Method of predicting changes in the content of mobile forms of zinc and copper in irrigated dark chestnut soil at regular fertilization / Melashych A.V. (UA); Filip'jev I.D. (UA); Vozhegova R.A. (UA); Lavrynenko Ju.O. (UA); Kokovihin S.V. (UA); zajavnyk ta patentoutrymuvach Instytut zemlerobstva pivdenного regionu (UA). - u201010994; zajavl. 13.09.2010; opubl. 26.04.2011, Bjul. № 8. 3 p.
6. Detoxication of heavy metals in the soil system. Metodychni rekomendacii / A.I. Fatjejev, V.L. Samokhvalova. Kharkiv: KP «Mis'ka Drukarnja», 2012. 70 p.
7. Pat. na korysnu model' 89939 UA, MPK (2014.01) A01B 79/00 Method of forecasting soil trace elements availability / Fatjejev A.I. (UA); Semenov D.O. (UA); Smirnova K.B. (UA); Miroshnychenko M.M. (UA); Lykova O.A. (UA); Shemet A.M. (UA); Jankovs'ka T.Je. (UA); zajavnyk ta patentoutrymuvach NNC "Instytut gruntoznavstva ta agrohimii" im. O.N.Sokolovs'kogo" NAAN (UA). - № u201311847; zajavl. 08.10.2013; opubl. 12.05.2014, Bjul. № 9 5 p.

8. Orlov D.S. Humic acids soils and the general theory of humification. M: Izd-vo MGU, 1990. 325 p.

9. Pat. na korysnu model' 95649 UA, MPK: (2014.01) A01B 79/00, A01N 63/00, B09C 1/00, C09K 17/00; G01N 33/24 (2006.01) The method of forecasting the content of heavy metals and trace elements mobile forms in soil system for remediation efficiency and using / Samohvalova V.L. (UA); Lopushnjak V.I. (UA); Fatjejev A.I. (UA); Gorjakina V.M. (UA); zjavnyk ta patentoutrymuvach NNC "Instytut g'runtoznavstva ta agrohimii" imeni O.N. Sokolovs'kogo" (UA). u201408753; zjavl. 04.08.2014; 25.12.2014, Bjul. № 24. 8 p.

ПРОГНОЗИРОВАНИЕ МИКРОЭЛЕМЕНТНОГО СТАТУСА ПОЧВЕННОЙ СИСТЕМЫ ДЛЯ ЭФФЕКТИВНОЙ РЕМЕДИАЦИИ И ИСПОЛЬЗОВАНИЯ

В.Л. Самохвалова¹, В.И. Лопушняк², А.И. Фатеев¹, В.Н. Горякина¹, В.В. Шимель¹

¹**Национальный научный центр «Институт почвоведения и агрохимии имени А.Н. Соколовского», Харьков, Украина (v.samokhvalova@mail.ru)**

²**Львовский национальный аграрный университет, Дубляны, Львовская обл., Украина**

На примере результатов обследования микроэлементного статуса почв разного генезиса различных природно-климатических зон Украины, загрязненных почв вокруг Змиевской ТЭС ПАО "Центрэнерго" НАК "Энергетическая компания Украины" Харьковской области, ОАО «Укрцинк» и ОАО «Авдеевский коксохимический завод» Донецкой области природно-климатических зон Лесостепи и Степи Украины, а также почв Львовской области Западной Лесостепи Украины по изучению эффективности влияния органоминеральной, органической и минеральной систем удобрения обоснован способ прогнозирования содержания подвижных форм тяжелых металлов (ТМ) и микроэлементов (МЭ) в почвенной системе. В разработанном методическом подходе за счет определения дополнительного показателя гидролитической кислотности почвы в естественных условиях и при техногенном загрязнении ТМ, технологической нагрузке, а также использования полученных математических моделей установленных зависимостей показателей гидролитической кислотности (Нг), группового состава гумуса ($C_{ГК} / C_{ФК}$) и содержания подвижных форм МЭ и / или ТМ в почвах различных типов обеспечивается экспрессность получения и повышения точности прогнозирования микроэлементного статуса почв.

Ключевые слова: почва, микроэлементы, тяжелые металлы, групповой состав гумуса, гидролитическая кислотность, техногенное загрязнение, технологическая нагрузка, способ, прогнозирование.