

Assessment of the weather-sensitive soil-plant system to correct soil fertility models

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Keywords: humidity, temperature, electric and magnetic fields, dynamics of soil properties and chemical composition of plants.

Abstract

The conducted studies show the expediency of considering the influence of weather conditions on the soil-plant system at different hierarchical levels: taking into account long-term cosmic cycles, with changes over a number of years, during the year, vegetation of plants, individual days and hours.

The paper presents the results of experimental studies of the influence of electric fields on the germination of seeds and the development of plants. Thus, in the case of a magnetic storm, the development of cress-salad seedlings and the number of sprouted seeds have improved considerably in comparison with the calm magnetic situation. Changes in the properties of soils in perennial cycles and in seasonal dynamics from humidity and temperature have been studied. As follows from the data of studies conducted from 1967 to 2001, the minimum content of mobile phosphates is noted in well-cultivated and poorly cultivated soil in different years. Nitrogen and phosphorus are absorbed by plants worse at temperatures below 100, and the absorption by plants of calcium and potassium is significantly dependent on the wavelength of solar radiation. It has also been established that, depending on the temperature, the degree of moistening and the atmospheric pressure in the soils, the intensity of evaporation of mineral compounds varies. As research has shown, the risk of a fall in yield and a decrease in energy input to the soil under extreme weather conditions is higher when growing winter wheat and lower when growing perennial grasses. According to the results of the research, it is established that the chemical composition of plants is affected by weather conditions. The change in climatic conditions affects the accumulation of phosphorus and calcium in the phytomass of crops. However, the effect of temperature and humidity on the chemical composition of the phytomass of individual crops is different.

Along with the influence on the soil-plant system of humidity and temperature, according to our studies, it is necessary to take into account the gradient of these independent variables and their rate of change, the sequence of changes, as well as climatic conditions such as wind speed, pressure, magnetic and electric fields and Space and the geophysical fields of the Earth that depend on them. In this case, the local nature of such changes in time and space is important.

References

- [1] S.L. Belopukhov, V.I. Savich, V.V. Gukalov. The influence of organo-mineral composts on the properties, processes and regimes of the soil-plant system. *Bulletin of the Kazan Technological University*. **2016**. Vol.19. No.11. P.176-179. (russian)
- [2] V.N. Gukalov. Assessment of the state of heavy metals in the chernozems of the South-European group of the steppe soil-climatic region in the agrolandscape system, Author's abstract. Doct. Diss, M., *RGAU-MAHA*. **2015**. 47p. (russian)
- [3] V.I. Savich, S.L. Belopukhov, W.A. Gray, D.N. Nikitakis. Agroecological evaluation of complex compounds in soils. *Izvestiya TSKHA*. **2013**. No.6. P.5-11. (russian)
- [4] A.G. Zamaraev, V.I. Savich, V.G. Sychev. Energy exchange in the link of the field crop rotation, Part 2, Moscow, *RGAU-MAHA, VNIIA*. **2005**. 336p. (russian)
- [5] B.F. Karpunin, I.V. Ushakovskaya. Adaptive responses of flax-dolguntsa to changes in climatic conditions during vegetation. *Agriculture*. **2015**. No.6. P.36-39. (russian)

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- [6] T.V. Snee, E.S. Old, T.A. Fedorova, M.D. Maslov, S.L. Belopukhov, A.A. Shevchenko. Changes in physico-chemical properties of soil colloids depending on the ionic composition of the soil absorption complex. *Fertility*. **2014**. No.3. P.33-35. (russian)
- [7] V.I. Savich, D.N. Nikitochkin, D.S. Scriabin. Gradient of physical fields and soil properties, as a fertility factor. *Agrochemical Herald*. **2013**. No.5. P.16-18. (russian)
- [8] V.I. Savich, M.A. Mazirov, V.A. Sedykh. Agroecological assessment of geophysical fields. *Moscow: RGAU-MAHA, VNIIA*. **2016**. 492p. (russian)
- [9] V.I. Savich, V.D. Naumov, M.E. Kotenko. Local course of soil-forming processes as a factor in correcting fertility models of soils. *International Agricultural Journal*. **2017**. No.1. P.49-53. (russian)
- [10] V.I. Savich, V.G. Sychev, P.N. Balabko. The balance of biophilic elements in the soil-plant system. *Bulletin of the BSAU*. **2016**. No.1. P.14-19. (russian)