

OPTIMIZATION OF AGROPHYSICAL PROPERTIES OF LIGHT SOD-PODZOLIC SOIL BY APPLICATION OF NEW ORGANO-MINERAL FERTILIZER

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The reproduction of sod-podzolic soils fertility is a main problem of the high-value agriculture in the Nonchernozem zone. The crisis of the industry has led to the development of latent degradation processes in actively used agricultural sod-podzolic soils. The aim of the study, started in 2012, was to find effective options for the application of a new organo-mineral fertilizer, providing the maximum agronomic effect and rapid restoration of fertility of degraded sod-podzolic soil. The investigations were conducted in a microfield experiment in polyethylene vessels without bottom, 1×1×0.4 m in size with artificially formed topsoil of the degraded sandy-loam agricultural sod-podzolic soil. The topsoil was characterized by the following average values: pH_{KCl} – 4.75, Ng – 3.46 mmol (EQ) 100g⁻¹, OBM – 3.20 mmol (EQ) 100g⁻¹, humus content – 1.83%, mobile forms of phosphorus and potassium – 217 and 92 mg kg⁻¹, respectively. The experiment was conducted in three types of the seven-field field crop rotation: 1) green manure (Lupin) – winter crops – barley + perennial grasses; 2) barley + perennial grasses – perennial grasses 1st year – grasses 2nd year; 3) potato – spring rapeseed – green manure (Lupin). The two-factor scheme of the experiment included annual application of mineral fertilizers for all crops and periodic application for winter wheat, barley and potato. It was established in the experiment that the use of the new organo-mineral fertilizer in the system of the soil fertilization improved the complex of physico-chemical and agrophysical properties of the soil. Application of 1 t ha⁻¹ of the fertilizer resulted in the increased pH_{KCl} (by 0.036) and the amount of exchange bases (by 0.048 mmol 100g⁻¹ soil). Significant changes in the majority of the agrophysical properties of the soil were associated with the introduction of the new organo-mineral fertilizer in high rates 7–17 t ha⁻¹. Heavier granulometric composition of the soils, related to the enhancement of biological destruction and mineral formation, is expressed in an increase in the proportion of silt and physical clay fractions by 17–46 and 6–12%, respectively. Due to the optimization of the acid-base properties, the increase in the arrival of fresh organic matter, and the reloading of some of the colloids, the structural and water resistance coefficients averaged from 0.69 to 1.18–1.69 and from 0.55 to 0.76–0.85, the moisture capacity of the soil increased from 20.6 to 21.6–22.7%, and the range of active moisture – from 14.2 to 14.7–15.5%. All that led to a marked improvement in the soil water regime. As a result, it was possible to increase the productivity of the seven-field field crop rotation from 1.91 kg s.C.ed. m⁻² to 4.87–5.31 kg z.ed. m⁻².

Key words: agrophysical properties, sod-podzolic soil, hidden degradation, reproduction of fertility, microfield experiment, soil structure, new organo-mineral fertilizer, agronomic efficiency, crop rotation.

