

DYNAMICS OF AGROPHYSICAL PROPERTIES OF ARABLE CHERNOZEM UNDER THE EFFECT OF LONG-TERM USE OF MINERAL FERTILIZERS IN THE FOREST-STEPPE ZONE OF TRANS-URALS

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Soil agrophysical properties are considered as main indicators of soil fertility and if they change it inevitably is reflected on the productivity of arable land. Nowadays there is no consensus about the effect of mineral fertilizers on soil structure and other physical properties of soils. The aim of this study was to determine the effect of increasing rates of mineral fertilizers on the aggregate composition and porosity of arable chernozem of the Trans-Urals forest-steppe zone. The studies were conducted from 1995 to 2015 at the long-term trials of the Department of Soil Science and Agrochemistry of the State Agrarian University of the Northern Zauralye. As a result of long-term experiments it was established that the cultivation of crops on a natural agrophone in Western Siberia has led to a reduction of agronomically valuable aggregates (10.0-0.25 mm) content from 89 to 77% and to a decrease in the aggregate water resistance, despite of the regular application of chopped straw to the soil. The application of mineral fertilizers for the planned yield of grain crops of 4.0 t ha⁻¹ did not have a significant effect on the soil aggregate composition. The systematic application of fertilizers for the planned yield of 5.0 t ha⁻¹ and more lead to a deterioration of the soil structure and to a decrease in the soil aggregates water resistance. For 20 years the structural coefficient has decreased from 6.1–7.5 to 1.7 units, and the aggregate water stability – from 83 to 64%. The long-term use of high rates of mineral fertilizers on leached chernozem led to the dispersion of soil aggregates and a decrease in the volume of voids in the arable horizon. Over the years of the experiment, the porosity of aeration has decreased from 16-17 to 12-14% of the soil volume.

Key words: soil aggregate composition, aggregate water resistance, porosity, arable land, Western Siberia.

