AGROPHYSICAL AND BIOLOGICAL PROPERTIES OF SOD-PODZOL SOIL UNDER DIFFERENT TYPES AND TIMING OF TILLAGE FOR BARLEY

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The different types and timing of the basic tillage for barley were studied on sandy loam sod-podzolic soil typical for the Upper Volga region. Two methods of basic soil tillage were compared - moldboard and flat-cutting to the same depth of 20–22 cm, as well as two periods of their implementation - autumn and spring. For moldboard cultivation, a PLN-3-35 plow was used, while the flat-cutting was carried out using a cultivator-flat-cutter-subsoiler KPG-2.2 without turning the soil. The aim of the research was to reveal the influence of different tillage methods and the timings of basic tillage on the agrophysical and biological properties of the soil, plant development, weed infestation and barley yield. As a result, a decrease in the bulk density of the tilled soil layer was observed after the basic tillage - both in autumn and in spring. Higher soil moisture was measured in flat-cutting tillage treatment compared to moldboard ploughing, which most likely was related to absence of the soil turnover. High soil porosity (49.8%) and degree of aeration (52.6%), but lower number of macrostructural and water-stable aggregates were found before sowing barley after spring plowing. A lower bulk density (1.17 and 1.19 g cm^{-3}) and hardness (8.8 and 9.0 kg cm^{-2}) of the arable soil layer was recorded after the implementation of the spring basic tillage, which affected the uniformity of the seed embedding depth and reduced the field germination by 2.8 and 4.8%. A high percentage of linen decomposition (20.6 and 21.0%) and the highest production of carbon dioxide by the soil (52.1 and 52.4 mg $C\text{-}CO^2$ m^{-2} h^{-1}) were noted in the treatments with spring basic tillage. The best development of barley plants, as well as higher plant density (485 pieces m^{-2}), safety (77.3%) and survival (68.2%) were revealed under autumn plowing. Flat-cutting basic tillage was less effective in terms of reducing weed infestation of barley crops compared to moldboard. The highest yield of barley was obtained under the autumn plowing (2.59 t ha^{-1}). The productivity indicators were lower under autumn flat-cutting plow compared to moldboard, but higher in comparison with spring flat-cutting tillage (by 0.14 t ha^{-1}) and spring plowing (by 0.18 t ha^{-1}).

Key words: tillage type and timing, agrophysical and biological properties, sod-podzol soil, weediness, productivity.