

RELATIONSHIP OF «OPTIMUM BULK DENSITY» WITH SOIL MOISTURE AND BARLEY YIELD**A. A. Konishchev¹, N. V. Perfilyev², I. I. Garifullin¹**¹ Agriculture Research Institute of Ivanovo, branch of FGBNU «Verkhnevolzhskaya FASC»,
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The paper proposes a technique to determine the optimal soil bulk density based on the use of mathematical apparatus, and presents the results of the technique application on dark gray forest heavy loam clay soil during the growing season for spring barley with different soil moisture content. The hydrothermal coefficient of G. T. Selyaninov was used as a characteristic of the soil moisture regime for the first four decades of the growing season counting from the date of sowing. The technique allowed to calculate the optimal soil bulk density value based on the results of agro-technical experiments where the effect of soil tillage practice on the barley yield was studied. The number of compared treatments should be at least 5. It has been established that with an increase in the hydrothermal coefficient from 0.515 to 3.736, the maximum barley yield is ensured with a decrease in the soil bulk density from 1.340 to 1.201 g cm⁻³ in 10–20-cm soil layer. In 20–30-cm soil layer an increase in the soil bulk density above 1.378 g cm⁻³ led to a decrease in barley yield at any studied soil moisture content. It was recommended to maintain the soil bulk density in the 20-30-cm layer at the level not higher than 1.365 g cm⁻³. At the studied range of hydrothermal coefficient values, the variation of the soil bulk density in the combined layer of 10–30 cm within 1,395 –1,233 g cm⁻³ was necessary to obtain maximum barley yield. At all values of the optimal soil bulk density in the studied soil layers, similar values of aeration porosity were measured, which was 27.7% for the 10–20-cm soil layer, 22.8% – for the 20–30-cm layer, 24.9% – for the 10–30-cm layer, while the total porosity varies within 4–6%. The relationship between the optimal soil bulk density and the soil moisture were not affected by the amount of applied fertilizer.

Keyword: soil density, soil moisture, barley yield, hydrothermal coefficient of G. T. Selyaninov, aeration porosity.

