METHOD OF OBTAINING WATER-PHYSICAL PROPERTIES OF SOILS WITH THE USE OF LABORATORY STUDY OF THEIR GRANULOMETRIC COMPOSITION

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Abstract. The method of obtaining hydro-physical properties of soils (basic hydrophysical characteristics (BHC) and moisture conductivity function) is presented. These properties, or functions, allow us to describe the vertical movement of moisture in unsaturated soils as one of the components of the expenditure item of the water balance. They are widely used in the substantiation of water reclamation and in the modeling of moisture transfer in the soil. The method is based on laboratory studies of soil samples taken in the field on the granulometric composition. The results of laboratory tests now in Ukraine are usually obtained by the method of Kaczynski with two components, the percentage of clay and sand. They are graphically, with the help of integral (cumulative) curves, which are transformed into data corresponding to the international classification - with three components: the content of sand, dust, clay. The latter fractional distribution is used by the world community of soil scientists. Therefore, using data on the content of sand, silt, clay, using a computer program with open access "Rosetta" USDA (United State Department of Agriculture) the water-physical properties in the form of water constants: the saturated soil moisture, the residual soil moisture, the saturated hydraulic conductivity, and the coefficients of the equations of the mathematical model of van Genuchten are calculated.

The main objectives of the publication are to explain the essence of the method with its illustration on the example of several soils. At the same time, the comparison of different methods was not the task of this article.

The publication presents examples of calculation of water-physical properties of soils by the presented method of dark-chestnut soils of Kherson region and ordinary chernozems from Cherkasy region.

Soil samples for the soils of the experimental plots were taken from several soil profile horizons: arable, subsoil and the horizon of the parent rock. New values of the

content in the soil of fractions of particles of different sizes (sand, silt, clay) are obtained from the integral curves. Result curves are shown in the figure. According to the international classification, chernozem soil from Cherkasy region is silty loam (grade 12), and soil from Kherson region is sandy loam (grade 8). A new distribution of granulometric compositions of sample soils is shown in the table. There are also experimentally obtained soils densities in the table.

For the soils of the experimental plots, the results of calculations of water constants and coefficients of the van Genuchten curves are given in the publication in tabular form. The fundamental constant the field capacity (FC) was also calculated according to the method proposed in the literature using our method for calculating hydro-physical properties.

The reliability of the results obtained by the described method, which is confirmed by the use of granulometric composition data by standardized laboratory methods and transformation of laboratory test results to the international classification by the tested graphical method. Further calculation of hydro-physical properties carries out by a computer program Rosetta recommended by the US Department of Agriculture.

The advantages of the proposed method include the low complexity of experimental studies, the availability of analyzes and the presence of a large number of experimental studies of the granulometric composition of soils, including in literary sources, for example in the “Atlas of soils of Ukraine”.

As a development of the research direction, the author shows the application of the obtained dependences for modeling moisture transfer during water reclamation (irrigation in irrigation control systems). Regarding the directions of future research, the publication proposes to compare the accuracy of obtaining hydro-physical properties of soils by different methods, as well as obtaining an important water constant - the field capacity (FC) as the lowest field moisture content.

Key words. Soil properties, integral (cumulative) curves of distribution of soil fractions, computer program "Rosetta" USDA, total moisture content, the lowest hygroscopic moisture content, filtration coefficient, field capacity.