Soil organic carbon accumulation is central to the improvement of many soil properties and functions. Biochar use and management could be particularly beneficial for soils with low organic carbon content. It’s known that many of soils in the world intrinsically exhibit little ability to retain water and nutrients due to their texture and mineralogy. Also, acquiring biomass for other than agricultural purposes can reduce the organic carbon accumulation and worsen the soil quality. Adding biochar to the soil can affect saturated hydraulic conductivity, water holding capacity and reduce soil erosion and mineral fertilization. It has been shown that saturated hydraulic conductivity depends on type of feedstock and pyrolysis temperatures used for biochar production and application dose but the results are inconsistent. Therefore, in order to explain the different biochar impacts, we propose in this study the use the physical-statistical model of B. Usowicz [4] for predicting the saturated hydraulic conductivity using literature data for various soils amended with biochars (from woodchip, rice straw and dairy manure), pyrolyzed at 300, 500 and 700 °C [2,3]. The method of estimating hydraulic conductivity of porous media based on physical-statistical model proposed by B. Usowicz is presented Fig 1.

In respect to soil medium the physical-statistical model based on terms of hydraulic resistance, capillars (Ohm’s law and Darcy’s two), two laws of Kirchoff and polynomial distribution was proposed.

\[
Q_c = \frac{\gamma v}{\eta} K - \frac{\gamma v}{\eta} K - \frac{\gamma v}{\eta} K - \frac{\gamma v}{\eta} K - \frac{\gamma v}{\eta} K.
\]

where: \( \gamma \) - capillary radius, \( \rho \) - liquid density, \( v \) - velocity of gravity, \( H \) - liquid viscosity. Inserting \( K \) and \( K_c \) into the equation for the total resistance of a parallel and series configuration of resistors and assuming that \( A \) corresponds to a mean surface areas \( \pi d^2 \) and \( A_0 \) equals, there are n unit serial connections in the length \( L \) after substituting, we arrive at an equation for the calculation of a mean hydraulic squared radius. Putting \( \pi d^2 \) together into the equation for \( K \) calculation with a mean hydraulic radius and following the method applied earlier for the model of electric conductivity, we can set down a general equation for hydraulic conductivity:

\[
P(x_{ij}) = \frac{f_i}{V_i / V_C}
\]

In the universal, the model probability \( P(x_{ij}) \) of the occurrence of a given configuration, the constituent elements of a porous media, should also be determined (Eq. 2). This was determined from the polynomial distribution \( P(x_{ij}) \).

**Results**

Verification of the physical-statistical model has been done by comparing the compatibility of calculation results from the model with the data measured.

**Conclusions**

The physical-statistical model was used for predicting saturated hydraulic conductivity of soils amended with different doses of biochar using measured water retention curve and saturated water content (Figs. 3 and 4a,b). It was found a good agreement between measured and the model-predicted hydraulic conductivity data for biochar amended soils (Table 1a,b). This indicates that the used variables and model parameters to predict the saturated hydraulic conductivities of the soils were chosen correctly. The different types and pyrolysis temperatures of biochars affected the soil water retention and the equivalent length of the capillaries that characterize the pore tortuosity in the soil (Table 1a,b).