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HYDROPHYSICAL PROPERTIES OF SOILS IN AREAS OF NATURAL FOREST REGENERATION

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Modeling the water regime of unsaturated soils is based on the concept of their water-retaining and water-conducting capabilities. To describe the waterretention capacity of soils, the function described by the van Genuch-tenequation [1] is widely used; the van Genuchten – Mualem equation [2] is used for the water conductivity function. Currently, for modeling the water regime of soils, the free software package HYDRUS-1D is used, which includes the «Rosetta» database, which allows setting the parameters of the water retention capacity of the soil based on pedotransfer functions based on data on the physical properties of soils.

The research was carried out on the territory of the Krasnovisherskoe forestry (Perm Territory, Russia) in the summer of 2018. The objects of research are the soils in the clear-cut areas of 10 years ago. Reforestation in felling areas occurs naturally without the use of assistance measures. The rates of overgrowing are sharply different, which is associated with the nature of the soil cover. Soil profile 1 is a sandy illuvial-ferruginous podzol on water-glacial deposits. It corresponds to a tree-lichen-moss plant group. The soil of profile 5 is deep podzolicgleyic heavy loamy on eluvium of mudstones with herbaceous-woody vegetation. Presumably, the differences in the rates of overgrowing are associated with the nature of the water regime of the soils in the felling areas.

Soil hydrophysical constants – the maximum hygroscopic water content, the field capacity (FC) – were determined for each genetic soil horizon by the thermostatic-weight method, the wilting point (WP) was calculated relative to the maximum hygroscopicitywater content. The soil texture was studied by the Kachinsky method. The transition from the domestic classification of grain size distribution to the FAO classification was made using graphical interpolation using cumulative curves. The parameters of the water retention capacity of the soil, namely θr, θs, α, n, Ks, were estimated using the «Rosetta» database based on the data on the particle size distribution,bulk density and moisture values at a soil water potential of -33 and -1500 kPa, corresponding to approximately the field capacity (FC) and wilting point (WP).

Soils differ sharply in granulometric composition. Podzol is characterized by a low content of particles with a diameter of <0.002 mm 2.0-4.0 %, slightly varying in the soil profile, and a high density of 1.34-1.45 g/cm^3. In deep podzolic soil, the fraction <0.002 mm is distributed according to the eluvial-illuvial type with an interval of values of 14-32 %. Bulk density 0.88-1.1 g/cm^3. The hydrological constants FC and WP have values of 0.26-0.42 and 0.006-0.015 cm^3/cm^3, respectively, for podzol and 0.26-0.37 and 0.06-0.12 cm^3/cm^3 for deep podzolic soil.

Table – Parameters of the Van Genuchten model

Horizon, depth, cm	Θr,cm3/cm3	Θs, cm3/cm3	α, cm-1	n	Ks, cm/day
Soil profile 1. Illuvial-ferruginous podzol on water-glacial deposits (4-year-old felling with herbaceous-woody vegetation)					
AE (4-8)	0.0325	0.4892	0.0375	5.0357	1355.0
E (8-39)	0.0328	0.4884	0.0376	5.0095	1185.2
EBf (39-56)	0.0332	0.4922	0.0383	4.9259	1272.6
BF (56-139)	0.0332	0.4922	0.0383	4.9259	1272.6
C (>160)	0.0329	0.4944	0.0383	4.9418	1592.2
Soil profile 5. Deep podzolic heavy loamy on mudstone eluvium (herbaceous-woody plant group)					
AE (7-25)	0.0341	0.5024	0.0039	1.6075	117.2
EL(25-45)	0.0212	0.5018	0.0379	1.3056	98.3
BELg (45-72)	0.0472	0.4832	0.0085	1.4552	33.7
Btg (72-110)	0.0598	0.4982	0.0076	1.4582	79.9
Cg>110	0.0442	0.5377	0.0320	1.3192	60.0

In the sandy podzol, the residual water content θr is practically constant in the profile and is 0.03 cm^3/cm^3, the saturated water content θs is 0.49 cm^3/cm^3 (table). In deep podzolic heavy loamy soil, θr increases down the profile from 0.2-0.3 to 0.5 cm^3/cm^3, the saturated water content θs 0.48-0.54 cm3/cm3. Slightly higher values of the θs index in loamy soil are associated with a decrease in density and an increase in porosity.

The parameter, associated with the air inlet pressure, naturally increases from heavy loamy soil to sandy soil and is, respectively, 0.004-0.038 and 0.38 cm-1. The parameter n, which affects the steepness of the water retention curve, increases with an increase in the proportion of sand and density from 1.32-1.61 in soil profile 5 to 4.92-5.04 in soil profile 1. The filtration coefficient Ks in the podzol profile is 1272-1592 cm/day, in loamy soil 33 cm/day in the BELg horizon up to 117 cm/day in the AE horizon.

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DETERMINATION OF CHERRY FRUIT RESISTANCE TO CRACKING

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The cracking of fruits in rainy weather is an urgent problem of cherry growing in the conditions of the Right Bank Forest-Steppe of Ukraine. In some years, damage due to cracking can completely destroy the crop [1]. The degree of cracking depends on humidity, temperature, size, fruit density and yield [2]. Resistance to cracking is largely determined by pomological variety and term of maturity (late-ripening fruits are more damaged), but the same varieties demonstrate themselves differently in different areas [3]. The reason of cracking is excessive absorption of water by the surface of the fruit under the action of osmotic pressure caused by sugars. There is the cracking index which is defined asthe period of time from immersion of the fruit in distilled water to the appearance of cracks. However, varieties with a higher index are small-fruited, low-yielding and with mediocre taste.

It is known that varieties differ in the intensity of absorption, the structure of the peel and its elasticity. In our studies, more cracked fruits were observed in late-maturing varieties than in early ones. This was affected by the amount of precipitations during the ripening period (in July they were more abundant than in June). However, fruits of the same varieties show different resistance to cracking in different areas [1].

The aim of the research was to establish the resistance of cherry fruits to cracking by immersing them in distilled water. And also to investigate the dependence of resistance to cracking on the cherry fruit peel thickness and elasticity.