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Soil Science

Peculiarities of Classification of some Soils of Western Georgia Based on Macromorphological Analysis

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ABSTRACT. This article presents the efficiency of correlation of some soils of Western Georgia and World Reference Base classification on the basis of the morphological analysis of the studied soils. The research covered the soil types prevalent in Western Georgia – red, yellow and yellow brown forest soils. Field survey was carried out with the profile method. Morphological signs of three profiles of each type of soil were described. General correlation between soil types and the WRB groups was carried out based on the genesis ideas and general approach. *© 2015 Bull. Georg. Natl. Acad. Sci.*

Key words: *soil classification, history, morphology, diagnostics.*

World Reference Base for Soil Resources (WRB) is the world's most popular and one of the most modern classification systems. It is based on the diagnostic horizons, properties and characteristics and the substrate, which should be explored in the field conditions [1]. Morphological characteristics of soils serve as the basis for their diagnosis and classification.

The research covered the soil types prevalent in Western Georgia – red, yellow and yellow brown forest soils. Field survey was carried out with the profile method. For each type of soil profiles three morphological signs were described. The material given in the article is generalized for each soil type and represents their diagnostic features, which make it possible to detect correlation between soil resources under study with WRB group. Macromorphological analysis was carried out according to the standards of WRB [2-6].

Red soils are fairly well studied [7-12]. They are found in the western part of the south-west at an altitude of 80 to -200 m, in hilly terrain-conditions [13]. Soils are formed on the base of effusive rocks (mainly andesites) and red color products of their derivatives weathering. Red soil profiles are characterized by fairly thick, well-marked reddish in color (7.5 YR3/6) humus horizon and blocky top horizon. Profile has a reddish tint: 5YR4/4.5; 5YR4/6; 5YR4.5/6. In some profiles some morphological signs with chromic interpretation were discovered: at 150 cm depth

Table 1. Morphological peculiarities of studied soils

Horizon depth, cm	Colour (according to Munsell)	Structure	Texture	Diagnostic horizon of WRB	Main qualifier of WRB	Name of soil	
						National	WRB
A – 0-18 AB – 18-40 B_1 – 40-62 B_2 – 62-80 BC – 80-100	10 YR3/6 10 YR4/6 5 YR4/4.5 5 YR4.5/6 5 YR4.5/6	blocky blocky blocky blocky blocky	Clay Clay Clay Clay Clay	Nitic	Chromic	Red soil	Nitisol
A – 0-16 AB – 16-30 B – 30-50 BC – 50-70 C – 70-90	10 YR3.5/4 10 YR4/6 10 YR5/4.5 10 YR5/4.5 10 YR5/6.5	blocky blocky blocky blocky-prism blocky-prism	Loam Loam Loam Loam Loam	Agjic	Ferric	Yellow soil	Luvisol
A – 0-10 AB – 10-35 B – 35-55 BC – 55-70 C – 70-95	10 YR3/3.5 10 YR4/6 10 YR4.5/6 10 YR5/6 10 YR5/6	Grain-blocky blocky blocky blocky blocky	Loam Loam Loam Loam Loam	Cambic	Gleic Stagnic	Yellow Brown Forest	Luvisol

from surface, at least 30 cm thick layer in which most of the color is redder than 7.5YR, while the intensity of the color is not lower than 4 (humid condition) [4].

The horizon Bt is characterized by clay granulometric composition, blocky texture, dramatically noticeable luster on the structural units, dense structure and clay cutans existence.

The red soil, according to the WRB criteria may belong to Nitisols. One of their main morphological features is a well-developed, quite thick, dark red or reddish-brown profile and gradual transition between horizons. They practically do not contain large iron concretions. The main diagnostic feature is clay-rich horizons nitic, which has a well-defined blocky structure and shiny faces [4].

Thus, in red soil profile, at 100 cm depth, nitic horizons were observed, the diagnostic criteria of which is the clay (sediment) content no less than 30%, well or average-expressed angular-blocky structure, clay iluviation signs, leading to glittering of structural units [14].

Nitisols are characterized by intense exhaustion, which is defined as ferralization, which is typical for ferralsols. However, we did not attribute red soil to this group due to the following parameters: the red soil profiles do not contain ferralic horizon. Studied red soil profiles do not belong to Alisol group either, as far as there is not sufficient migration of clay and therefore no fixed argic horizons in the profile.

Yellow soils, which are fairly well studied soils [7, 15, 12], are well-known in the humid sub-tropical zone at 100 to 700 m above the sea level, they are spread on fractured old marine terraces, low mountains and foothills. Soil-forming rocks are represented mainly by weathering products of acidic and moderately strong rocks (primarily shales) weathering products.

Humus horizons are characterized by yellow-brown color (10YR3.5/4), the rest of the profile is yellow with average capacity of clayzation. The thickness of the humus horizon makes 10-15 cm, its texture is granular. In the lower part of the horizon small iron-manganese concretions are observed. Iluvial horizon, in which clay cutanes can be observed on aggregates, is characterized by dark yellowish-brown or yellow-brown color (10YR5/4.5; 10YR4/6; 10YR 5/6), 20 cm thickness, dense structure, or blocky or blocky-prismatic structure. The transitional deep horizons are characterized by ill-defined structure and rock fragments, they are somewhat modified (color, structure, texture) as compared to subordinate hori-

zons.

Yellow soils can be attributed to Luvisol group, the diagnostic horizon of which is argic. The studied profiles are marked by ferric feature, which appears at 100 cm depth, large iron mottles or concretions (10YR5/8, 10YR6/8, 10YR8/8), sometimes with Mn (10YR2/1) [4].

Thus, Western Georgian yellow soils may be attributed to ferric Luvisols.

Yellow-brown soils were allocated as independent type in the 1960s [12, 16]. These soils are prevalent in Western Georgia's subtropical belt among yellow, red and brown soils, at the altitude of 400 - 500 m to 800 - 1000 m. Parent rocks are represented by old porphyritic neoeffusives (andesite, andesite-basalt) accompanied with denudative skin and their derivatives. In humus horizon (10YR3/3.5), the thickness of which is not less than 15 cm, we observed blocky-granular structure, loamy granulometric composition, mezofauna activity. Yellow-brown soil (10YR 4/4 and 10YR 4/4.5) B horizons, in comparison with the lower horizons, has blocky structure and relatively heavy texture.

Yellow-brown soil profiles in the study have the following diagnostic elements: cambic horizon, gleic and stagnic characteristics. Cambic is the middle horizon, the borders of which are located on the surface of the soil profile at a depth of 50 cm, it is different from lower horizon with its color and structure. Qualifier gleic indicates to the reductive of conditions, which is proved by diversity of colors in not less than 25%, as well as Fe and Mn compounds distribution [4].

Thus, the yellow-brown soils, due to the profile diagnostic criteria, can be attributed to gleic stagnic Luvisols.

Conclusions

This article presents the efficiency of correlation of some of the Western Georgia soils and WRB classification. The studied soil macromorphological characteristics and analytical data were compared to the world reference base for soil resources diagnostic criteria. It should be noted that the identity of all the criteria of certain diagnostic horizons and qualifiers was not observed, only some of the horizons and features were identified according to morphological features (color, structure, texture); General correlation between soil types and the world reference soil groups was carried out based on the genesis ideas and general approach.

The correlation revealed the following: the red soils may belong to Nitisols, which is related to the existence of nitic horizon and glittering of structural units on the background of ferralitic soil formation. In red soils were also revealed cromic and humic qualifiers. Yellow and yellow-brown soils may belong to Luvisols, due to argic horizon. In yellow profiles there were observed ferric properties; in yellow-brown soils we observed stagnic, ferric and molihumic qualifiers.

ნიადაგმცოდნეობა

დასავლეთ საქართველოს ზოგიერთი ნიადაგის კლასიფიკაციის თავისებურებანი მაკრომორფოლოგიური ანალიზის საფუძველზე

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სტატიაში განხილულია დასავლეთ საქართველოს ზოგიერთი ნიადაგისა და მსოფლიო მონაცემთა ბაზის ნიადაგური ჯგუფების კორელაციის ეფექტურობა საკვლევი ნიადაგების მორფოლოგიური ანალიზის საფუძველზე. კვლევის ობიექტებად შერჩეულ იქნა დასავლეთ საქართველოში გავრცელებული წითელმიწა, ყვითელმიწა და ყვითელ-ყომრალი ნიადაგის ტიპები. ნიადაგების საველე კვლევა განხორციელდა ე. წ. პროფილური მეთოდით. თითოეული ტიპის ნიადაგისთვის აღწერილ იქნა სამ-სამი პროფილის მორფოლოგიური ნიშნები. ნიადაგის ტიპებისა და მსოფლიო მონაცემთა ჯგუფების ზოგადი კორელაცია განხორციელდა საერთო გენეზისური მოსაზრებებისა და ძირითადი მიდგომის საფუძველზე.

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