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FUNCTIONAL - GENETIC PROFILES, CONCEPTUAL CONSIDERATIONS

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Abstract

In the development of the morpho functionality concept of the soil it is presented the idea about functional-genetic profile which can be defined as integrated produce of the interaction between pedogenetic regimes. The last one has the most decisive importance in migration – accumulation and substances differentiation in pedogenesis.

INTRODUCTION

According to current conceptions, pedogenesis consists of several particular processes which are more or less interrelated and supposed to be special profiles of substances differentiation. Within these profiles, the horizons of substances distribution not always coincide with genetic horizons.

The main factors that determine forming of soil profiles, in the meaning of differentiation of parent material into genetic horizons are, primarily, the vertical currents of substance and energy (descendent or ascendant - depending of the type of pedogenesis and the seasonal, annual or multiannual dynamic) and, secondly, the vertical distribution of vivid substance (root system of plants, the microorganisms, the soil fauna).

The structure of soil profile, or the character and consecutiveness of genetic horizons, are specific for every soil type. In the genetic profiles, the genetic horizons are in interaction, and therefore interrelated. This involves the idea of intern pedogenetic ambiance, being materialized into functional - genetic profiles.

MATERIAL AND METHODS

Conceptual - methodological framework is based on the concept about structural - functional hierarchy of the soil and on the hierarchy of pedogenetic process [1].

The soil, in terms of functional-genetic concept, appears as system of genetic horizons and functional-genetic profiles. Furthermore, within the profile there is distinguished two contours:

a) external materialized in vertical differentiation of substances and is represented by succession of genetic horizons;
b) internal materialized in vertical differentiation of pedogenetic ambiance.

Functional-genetic profiles denote the trend of evolution of pedogenetic process and the share\quantum of some elementary processes during the profile.

Functional-genetic profiles involve one pedogenetic ambiance with different ranks and degrees of activity and mobility of soil substances (organic, organic – mineral, and mineral), but in the same time different forms of soil substances organization.

In terms of structural – functional concept of hierarchy of every hierarchical level it define one functional – genetic type of profile (look in the next table).

Hierarchical level	**Functional – genetic profile**
Ionic – molecular	Profile of salts Profile of carbonates
Elementary particle	Profile of granulometry
Aggregate	profile of pedoaggregates
Horizont	Profile of settlement indices: a) lacunar b) of density

Within the functional-genetic profiles there are distinguished functional-genetic horizons which are defined as particular junctions of geochemical barriers.

Profile of carbonates is integrated result of eluviation, migration - accumulation and illuviation of carbonates. Therefore within it are distinguished three horizons: carbonates - eluvial, carbonates- migrational and carbonates - illuvial. According to the relations between this horizons, it distinguishes several types of carbonate profiles:

1. Batieluvial - carbonates are leachate from pedogenetic active layer. Within this carbonate profiles the balance of alkaline and alkaline - terros cations in the upper segment is negative and this balance implies low decalcification of soil adsorbtion complex. In the same time the decalcification is followed by eluviation processes of nonsilicate forms of Fe and Al, as well as of the argil.
2. Eluvial - carbonates are accumulated below the lower limit of humus horizon. Within it, the balance of alkaline and alkaline – terros cations is lightly unbalanced. The debasification processes of adsorbtion complex, and the mobilization – eluviation processes of colloids are in early stages.
3. Mezoeluvial - carbonates are eluviated from humus- accumulative horizon (A), but they are detected in the humus – cambic horizon (B). The balance of alkaline and alkaline - terros cations is well- balanced. Here are not found some signs which talk about the beginning of texture differentiation.

4. Normal - carbonates are eluviated from humus- accumulative horizon (A) and are detected in humus – transitive.
5. Incipient - eluvial, here the carbonates are detected in humus – accumulative horizon (A). Their dynamics is determined by hydrothermal conditions. At the pedological scale of the time, the balance of carbonates is easily negative.

The batieluvial and eluvial profiles has unidirectional character on carbonates eluviation, and on textural differentiation of the profile. The eluvial - moderate profile implies partial restoration of carbonates balance, and stability of humus layer. The normal and incipient - eluvial profiles favors one progressive accumulation of the humus in the upper layer.

The soils with batieluvial/eluvial profiles of carbonates, are characterized with extended humus layer (izohumic soils). The soils with normal and incipient - eluvial profiles are characterized with moderate-thick humus layer.

Pedogenesis, unlike geogenesis, implies the humus accumulation, so the organic profile appears as integrated index of pedogenesis at the elementary level particle. The term of organic profile started to be important in pedologic researches in the second half of last century [1, 2] and involves broader categories than the term of the humus profile. In this respect, this term refers to all humus substances of the soil including all mineral components of humic substances. Therefore the organic profile can be defined as conexial succession of some homogeneous areas (sections) of soil. Each of this areas are characterized with specific intensity of flux and reflux processes and transmission (mineralization and humification) of organic substances in pedogenesis [3, 4, 5, 6]. Дерчачева М.И. divided the organic profile of chernozems in two zones:

1) Superior (about 20 cm) within it predominates humification processes.
2) Inferior, during the general process of humification predominates migration of its products.

In functioning of the soil - plant system, the superior zone (here are done the transformation-humification processes) has a decisive role. This zone has accumulative potential increased and practically ensure whole the soil profile with humic substances. According to this, the physical and energy potential of this zone is going to be maintained in permanence compared to inferior zone. Therefore, the presence in permanence of fresh organic material in the soil, is the most important condition of normal activity of the ecosystem both in natural regime as well as agricultural regime.

Not less important is the transport function of superior zone of organic profile. Mobile humic substances, represented by fulva acids, ensure descendant migration of nitrogen, calcium, and other chemical elements, formed in the result of mineralization of organic residue.

In the inferior segment of the organic profile, the biophyl elements are transformed in available forms and are assigned in new biogeochemical circuits (through the descending currents of water or the root system).
Referring to carbonatic profile and organic profile, within genetic profile of chernozem, the horizons of humus accumulation and carbonatic accumulation (even if both are accumulative) are forming in different segments of the profile. But instead, the horizon of humus accumulation overlap with the horizon eluvial – carbonatic. With small deviations, the thickness of humus accumulation horizon and eluvial - carbonatic horizon is almost identical, this allow as to say that both horizons develops synchronous. The interesting point of this is that humus - accumulative horizon, by biogeochemical aspect, represent the accumulation layer of organic carbonat, while the eluvial - carbonativ represent the layer from where is leaching the mineral carbon.

The structural aggregate composition of the soil is one distinctive feature of pedogenesis, result of dynamic of the pedogenetic processes. Specially by structure the soil differs by other bioroutinist systems.

The forming of solid organic - mineral substances, approached by concept of hierarchy of pedogenetic process, constituted the beginning of the processes of substances differentiation and the limit of pedogenesis and soil-formation [8]. Ped formation has two phases:

a) aggregation
b) structuring

The aggregation implies multiple processes of soil substances coupling like agglutination, coagulation etc.

The structuring implies multiple processes determine by expansion - contraction and colloidal condensation, this gives for aggregates special features.

In this context, the pedoaggregat profile consist in ascending differentiation of structural aggregate processes, materialized in different features and functions of the peds (the form, size, density, porosity, specific area, capacity for water, etc.).

Indispensable of pedoagregatic profile is related the profile of settlement indices with decisive role in the ecosystem functionality (and materialized in different types of pedogenetic profiles).

CONCLUSIONS

1. The functional-genetic profiles represent the intern pedofunctional framework of development, evolution and functionality of soil. It provides one conceptual-applicative support of controlling the functional processes of the soil in anthropic regime.

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