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AGROCHEMICAL STATE OF BROOMRAPE AFFECTED CHERNOZEMS OF CENTRAL AND SOUTH REGION OF THE REPUBLIC OF MOLDOVA

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Abstract

Fertility is a soil genetic trait, the interaction and dynamics of elementary processes product, which occurs at various levels of structural-functional organization of the soil ecosystem. Through this ideas prism may be expressed by functional status (physical, biochemical, agrochemical, etc.) which represent forms of integration, content, mobility thresholds and soil substances accessibility, materialized in plants supply degrees with all necessary. Thereat, the driving force of soil ecosystem functionality is represented by the abiotic and biotic factors interactions.

Key words: *soil fertility, soil processes dynamics, agrochemical ecosistem state, evolutionary process of humus state.*

INTRODUCTION

Despite the fertility, as pedogenesis product and its performance precondition is unmeasurable feature in contemporary agropedology and ecopedology and for its evaluation are used 30-36 parameters, depending on soil type and subtype.

Starting from simplistic approach of soil fertility, confusing by ecosystems productivity, had been used for this purpose special parameters, emphasis being placed on their subsequent optimization, according to crop needs, agrochemical and agro-technical methods. Meanwhile, recent evaluations have shown that for most agricultural crops yield formation in the region, about 92-93% is natural soil production potential. The last is the interaction and biotic and abiotic dynamics processes product that arising in the soil and which biological activity is the "engine" of system soil" (Florea et al., 2014).

The necessary to carry out these processes energy is ensured by organic debris resulting from biological activity and transformed soil by contributing the humus formation and nutrients producing. Humus and mineral products resulting from biocatalytical alteration and soil microorganisms ensure bioproductive soil function.

Organic matter as a source of humus, unlike mineral base material is incorporated into the soil continuously in annual installments. Thus, nature, quantity, composition and its incorporation mode in soil may change relatively quickly in time, depending on ecosystem biocenosis and biotope evolution. At the same time weather conditions dynamic (seasonal, annual) has an impact on the soil processes dynamic. This entails dynamic processes that determine soil bio-productive capacity, suggesting that ground potential is indicated for the evaluation of physical, chemical, physico-chemical, redox, biochemical and agrochemical ecosystem functioning.

Dynamics and arable soil status is influenced by pedogenetic factors (Dudal et al., 2002).

The conducted analysis, seen through pedogenetic factors conception consider that this factor is not a binding factor in the pedogenesis achievement (Jigău, 2009), its role being reducing only to partial climate change and greater to biological factor.

A greater role on the natural tipogenic processes rests to anthropogenic factor, involving new types of reactions and processes (Jigău, 2009).

MATERIALS AND METHODS

The research involved the field and laboratory studies application. In the field applications were collected soil samples from 0-30cm arable layer infected with broomrape, according to the instructions in force. Each field was divided

into elementary plots, surface 12 hectares (Jigău et al., 2007). Within each plot 30 samples were collected on individual plots, which were subsequently formed mixed samples.

Laboratory studies were performed under the Republic of Moldova standardized methods.

Table 1. Assessment methods of soil agrochemical indices determination

Nr.	Determined parameters	Measurement units	Determining methods	STAS
1.	The humus content	mg/100g of soil	Tiurin în modificare TINAO Tiurin modification in TINAO	26213-91
2.	P_2O_5 content		Macighin	26205-91
3.	K_2O content			26423-85
4.	N-NH_4 content		TINAO	26489-85
5.	N-NO_3 content		ionometric	26951-86
6.	pH values		potentiometric	26423-85

RESULTS AND DISCUSSIONS

By the agrochemical assessment, the humus content interest is explained by several nutrients backup substance function.

According to calculations, humic substances provides to soil more than 20% of nitrogen content, about 35 to 65% of the total phosphorus content, and on the soil desalted up to 70% of the sulfur, thus, by mineralization an important contribution to the necessary mineral crop nutrition (Ianoş and Goian, 1995). Therefore, the the agrochemistry literature is frequently used as an indicator of the evolutionary trend of soil fertility.

In this regard, the calculations made in this research shows the predominance in both regiion: the center and south of Republic of Moldova soils with moderate humus content (78-81%) values are ranged in 2-4% (Tables 2 3, 4, 5).

Soils containing humus in relatively optimal levels (4-5%) are 7-8%. The humus content less than 2% is represented by 12-14%**.**

We conclude that the evolutionary processes of the chernozems humus state in space between the Prut and Nistru rivers lead to the blurring of genetic distinctions between moderat and low humus tipical chernozems of the central zone and carbonate and weak humus in the south.

It must be concluded that both contemporary cernozems developments in central and southern areas is determined by the same factors and the same process.

The main mentioned factor is, significantly reducing of the organic plant waste falling in pedogenesis.

Over the last 80 years, as a result of bicenosis substitution with agrocoenoses, ecological communities have been significant changes.

Therefore, in this stage of pedogenetical process, the annual loss of humus due to mineralization processes are not compensated by the contribution of newly formed humic substances.

A stable culture practicing that did not provide humus mineralized offset by newly formed humus, annual decreases, were thereby determine the decrease of humus content to the critical level of 3%, and in some cases the values are lower (Burlacu, 2000).

The phenomenon is not newly, being defined as in other regions as a consequence of traditional to intensive agriculture shift. (Ковда, 1983; Dobrovoliskii, 2000; Ianoş and Goian, 1995), associated with humus enhancing mineralization by increasing the aeration of arable layer (Jigău, 2009).

For areas with rugged terrain, another reason constitutes areal and linear erosion. Thus, B.A. Ковда claims that anthropogenic factors, by altering the ecological balance of the landscape has turned slow geological erosion into accelerated erosion leading to soil degradation (Ковда, 1985).

Recent research has shown that was reduced the formation of arable chernozems humus due to aerohidric regime and hidrotermical degradation (Jigau, 2015).

Table 2. Agrochemical indices of moderately and poorly humus typical chernozem of central region of Republic of Moldova (0-30 cm layer)

Distict, Settlement	The soil solution reaction		Humus content		Total azote content		Azote insurance		Mobile phosphorus insurance		Exchangeable tassium Insurance	
	pH	Specifi cations	%	Specifi cations	%	C:N	IN	insurance	mg/ 100g	Specifi cations	mg/ 100g	Specifi cations
Telenești, Verejeni	7.50	moderate alkaline	2.25	moderate	0.24	medium	2.25	medium	5.9	increased	60.6	very increased
Telenești, Căzănești	8.00	alkaline	1.85	low	0.31	high	1.85	low	9.3	very increased	64.0	very increased
Telenești, Brînzeni	7.80	alkaline	2.95	moderate	0.28	high	2.95	medium	2.7	moderate	51.6	increased
Orhei, Ciocâlteni	7.80	alkaline	3.65	moderate	0.26	medium	3.65	medium	1.5	low	29.0	optimal
Criuleni, Izbiște	7.80	alkaline	2.55	moderate	0.24	medium	2.55	medium	3.5	optimal	25.8	optimal
Dubăsari, Holercani	8.05	very alkaline	3.55	moderate	0.22	medium	3.55	medium	2.4	moderate	27.0	optimal
Dubăsari, Molovata veche	7.60	moderate alkaline	3.55	moderate	0.22	medium	3.55	medium	3.0	optimal	26.4	optimal
Mun. Chișinău, **Bacioi**	7.70	moderate alkaline	2.50	moderate	0.19	medium	2.50	medium	3.2	optimal	21.4	medium
Mun. Chișinău, **Sângera**	7.30	low alkaline	3.70	moderate	0.20	medium	3.70	medium	1.2	low	28.2	optimal
Anenii-Noi, Floreni	7.95	very alkaline	2.00	low	0.15	medium	2.00	low	0.8	very low	18.2	low
Hâncești **Bușteni**	8.20	very alkaline	3.05	moderate	0.19	medium	3.05	medium	1.5	low	30.2	optimal
Hâncești, **Sărata-Merești**	7.40	low alkaline	2.65	moderate	0.26	medium	2.65	medium	3.8	optimal	26.6	optimal
Hâncești, **Fundul-Galbenei**	7.40	low alkaline	2.65	moderate	0.16	medium	2.65	medium	1.4	low	25.8	optimal
Strășeni,**Rassvet**	7.90	alkaline	4.05	optimal	0.16	medium	4.05	good	1.9	low	50.0	increased

Humus formation and accumulation processes in this region (central and south region of Republic of Moldova) are influenced by the contemporary landscape evolution involving aridity-desertification elements (Jigău, 2015).

Central and southern region are endowed with soils containing moderate values of total nitrogen, limit being 86 and 84% on the evaluated areas. However, the central area about 14% of soils are high nitrogen content and 16% southern area of the land is characterized by low content of total nitrogen.

Thus, we may conclude that total reduced nitrogen content in the process of pedogenesis with organic debris consists the bordering factor in forming humus process.

Aceasta se datorește faptului că culturile leguminoase au fost excluse practic din asolamentul culturilor în republica Moldova. Anume prin aceasta agrofitocenozele cultivate se detașează radical de biocenozele naturale.

It happens because were practically excluded from crop rotation leguminous cultures. Notably through this, agrocoenosis grown radically detaches by natural biocensis.

Carried research highlight the mobile phosphorus high variability degree of both chernozems in the central and south region of the republic as caused by landscape-anthropogenic pedogenetic natural evolution By litogenetic point of vieux, central area soils were formed on clay-loam and loam-clay deposits, while those in the south were formed mainly on silty loess deposits. Accordingly, investigated soils is characterized by a diverse phosphate potential. At the same time other 2 factors had been significantly engaged - the carbonates content and soil pH.

Table 3. Agrochemical indices of moderately and poorly humus typical chernozem of south region of the Republic of Moldova (0-30 cm layer)

Distict, Settlement	The soil solution reaction		Humus content		Total azote content		Azote insurance		Mobile phosphorus insurance		Exchangeable potassium Insurance	
	pH	Specifi cations	%	Specifi cations	%	Specifi cations	IN	Specifi cations	mg/ 100 g	Specifi cations	mg/ 100g	Specifi ctions
Cazangic, Leova	7.45	low alkaline	3.30	moderate	0.15	medium	3.30	medium	1.3	low	21.4	moderate
Gura-Galbenei, Cimişlia	7.80	alkaline	4.00	relatively optimal	0.14	low	4.00	medium	0.6	wery low	14.8	Very low
Grigorievca, Căuşeni	8.00	very alkaline	2.60	moderae	0.14	low	2.60	medium	4.3	increased	53.4	increased
Ermoclia, Ştefan-Vodă	8.00	very alkaline	3.45	moderate	0.22	medium	3.45	medium	3.7	relatively optimal	24.6	moderate
Talmaza, Ştefan-Vodă	8.05	very alkaline	1.40	low	0.24	medium	1.40	low	9.6	foarte sporita	54.0	increased
Congaz, Comrat	8.30	low alcalină	2.00	low	0.22	medium	2.00	low	1.2	low	20.6	Moderate
Chirsova, Comrat	8.30	low alcalină	2.30	moderate	0.18	medium	2.30	medium	1.6	low	24.6	Moderate
Beşalma, Comrat	8.20	very bazică	2.50	moderate	0.18	medium	2.50	medium	4.0	sporita	29.4	Moderate
Svetlîi, Comrat	8.25	low alkaline	2.30	moderate	0.18	medium	2.30	medium	1.8	low	23.4	Moderate
Carabetovca, Basarabeasca	8.30	low alkaline	1.80	moderate	0.18	medium	1.80	low	1.4	low	19.0	low
Corteni, Ceadîr-Lunga	8.30	low alkaline	2.15	moderate	0.16	medium	2.15	medium	1.6	low	22.2	Moderate
Taraclia, Taraclia	8.30	low alkaline	2.80	moderate	0.14	medium	2.80	medium	1.4	low	23.2	Moderate
Alexanderfild, Cahul	7.75	alkaline	3.45	moderate	0.16	medium	3.45	medium	4.2	increased	32.0	relatively optimal
Manta, Cahul	7.75	alkaline	3.25	moderate	0.24	medium	2.35	medium	3.9	relatively optimal	19.0	low
Slobozia-Mare, Cahul	7.90	very alkaline	3.25	moderate	0.24	medium	3.25	medium	8.0	very increased	25.0	moderate
Crihana-Veche, Cahul	7.80	very alkaline	2.10	moderate	0.21	low	2.10	medium	4.8	increased	59.4	increased

Table 4. Surfaces share with different degrees of macroelements content(%) and humus assurance of moderate and low humus typical chernozems of the Republic of Moldova central region

Category	Humus content, %	Total azote total, %	Azote insurance	Mobile phosphorus insurance mg/100g of soil	Exchangeable potassium Insurance mg/100g of soil
Very low	-	-	-	-	-
Low	14	-	14	36	7
Moderate	78	86	78	14	8
Relatively optimal	8	-	8	22	57
Increased	-	14	-	7	14
Very increased	-	-	-	7	14

Table 5. Surfaces share with different degrees of macroelements content(%) and humus assurance of moderate and low humus typical chernozems of the Republic of Moldova south region

Category	Humus content, %	Total azote content, %	Azote insu-ramce	Mobile phosphorus insurance mg/100g of soil	Exchangeable potassium Insurance mg/100g of soil
Very low	-	-	-	6	6
Low	12	16	12	44	13
Moderate	81	84	81	-	56
Relatively optimal	7	-	7	12	6
Increased	-	-	-	26	19
Very increased	-	-	-	12	-

The southern soils formed on loess-clay deposits are rich in carbonates due to this fact it is less phosphorus mobility and the soil solution reaction is strongly alkaline (pH 7.8 to 8.2).

Following this the southern area of about 50% of investigated soils is characterized by low (44%) and very low (6%) content of mobile phosphorus.

Half of south studied area are characterized by relatively optimal (12%) or increased (26%) level of mobile phosphorus, while the central area are characteristic only 14% land supply increased and very phosphorus increased and the optimal supplied 22%.

So, the soils phosphorus difference is highly influenced by the human factor, which shows that the previous phosphorus fertilizers use was sometimes inadequate. Moreover, analyzing the current situation, on supply phosphorus state, we decide that the effect of applied in the past phosphorus fertilizers is limited in time. Thus, couldn't form large mobile phosphorus reserves that can be maintained a longer period in soil.

Potassium content is more stable due to the nature and origin of this element circuit. The total reserves of potassium in the soil comes from parental rocks, primary and secondary minerals, organic waste and in the last 80 years of mineral fertilizers. Its passage by inerting state to colloidal network by dissociation and diffusion in roots, exchangeable potassium is the direct source for plant nutrition.Opposed to phosphorus, potassium weak influence the carbonate content and soil solution reaction.

Research rezults shows that more than 80 percent of the soils are supplied at the optimum, high or very high level of potassium. So, the vast majority of soils spontaneously regenerate mobile potassium content on account of primary and secondary minerals of potassium adsorption. This process is facilitated by roots by deeper soil horizons potassium translocation. Therefore, according to research, we conclude that, physicochemical mechanism for mobile potassium recovery even more evident as the soil condition assuring mobile potassium is better (Ковда, 1973).

This often involves the idea that this region chernozems do not require potassium interventions. But according to calculations chernozems had lost about 41% of initial potassium reserves, thus potassium fertilization is indicated (Носко и др., 1983).

CONCLUSIONS

Cernozems evolution current stage between the Nistru and Prut rivers area is characterized by a humus and total nitrogen tense regime, caused by significantly changing the humus formation and accumulation process, but also due to aerohidric, hydrothermal and redox soil regimes changes.

Soil supply status with phosphorus is due to parental rocks and is determined by the carbonates content of and soil solution reaction. Phosphorus endowment is determined by anthropogenic involvement.

Investigated soils retain regenerative capacity of potassium plant accessible reserves and potassium regime as a result central and southern Moldova's chernozems has anthropogenic involvement low limit.

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