

## PECULIARITIES OF CHERNOZEMS THAT LIE ALONG THE SOUTH-EASTERN DISTRIBUTION BOUNDARIES OF CHERNOZEM LEACHED ON THE LEFT-BANK PART OF UKRAINE

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Chernozems properties of transition zone between subzones chernozem leached (northern) subtypes and chernozem typical in the Left-Bank Forest-Steppe of Ukraine, particularly on the south-eastern lands of Chernigiv were considered. It was established that the transition zone lies in south Priluky, in Varvinsky district and in the south-east direction from the village Sribne, where it includes regraded soils.

It is shown that the characteristic features of chernozems typical, low-humus which are widespread (as opposed to classical), is sufficiently high unsaturation of humus horizon on  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  and hyperacidity. Many arrays of chernozem typical low-humus and chernozem regraded are needed to be limed.

**Key words:** *chernozems typical, bases saturation, humus horizon.*

**Introduction.** The northern subzone of the Forest-Steppe in the Left-Bank region is acknowledged as much more differentiated in chernozem subtypes than other chernozem subzones are. When working over new soil classification the significant thing is to provide the possibility to definite the soil nature more precisely on the one hand and to describe the soil taxonomically and take into account it's agronomical features and importance for land-use on the other hand. The first point's significance is mainly geographical, the last one's – agronomical, for soil is the main mean of production in agriculture.

Our former studies of the Chernigiv region chernozems [1, 2, 3] have shown that chernozem leached subtype is the dominating one amongst unpodzolized chernozems of northern chernozem belt. The latitude capacity of those soils is 100–110 km. This subzone includes the belt that lies to the south of the Wooded District border (left bank of the Desna river, mainly the flat plate of the Desna-Dnipro Riss terrace (Bobrovitsy-Bahmatsk agrisoil region [4])), and also the high planes upon the loess islands on the plateau of the right aboriginal Desna bank (Chernigiv-Novgorod-Siversky agrisoil region). Amongst the soils of this subtype the low-humus light-loam varieties are dominating. On the furthest south of the subzone the leached low-humus chernozems lie. Those are found also on the furthest north of the chernozem area that is in the high planes upon the loess islands on the right Desna river plateau.

The distinct features of those chernozems are: low- and middle-acid reaction inside the humus horizon, essential and high insaturation with  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  (85–70 %), deep line of effervescence from HCl (in the parent rock, at the depth of 120–150 cm). Those soils contains low quantities of nitrogen and potassium, they are rich but in phosphate. Therefore the soils need liming and systematical application of nutrients – mainly nitrogen and potassium. The agrichemical and physical-chemical characteristics given here came from the generalized results of the large-scale soil survey [5].

Everything mentioned before points towards separating out the leached chernozems together with the podzolized ones as the single agriproductional group.

Our last researches show that in the south of the subzone (to the south of the Pryluky) the typical chernozems are widespread, but with acid reaction inside their humus horizon. When coming up to the highest (moraine) terrace (in the Varva region) we found a typical chernozem with humus horizon rather acid (pH salt. 5,1) and insaturation rather high – 76 %, but with especially high line of effervesce from HCl (less than 45 cm) [3]. Both of its transitional horizons are calcareous. This territory belongs to the Pryluky-Dmytrivka agrisoil region – the south-eastern corner of the Chernigov district situated as far as on the Poltava plane. Considering the above-mentioned significant features of the transitional zone chernozems we decided to accomplish also a more detailed study of the chernozems next to the subzone of the leached chernozems to the east along the same latitude in the Sribne vicinity.

**Objects and methods.** The researches were carried out in the extreme south-eastern "corner" of the Chernigiv region – in the Pryluky-Dmytrivka agrisoil region, in the Sribne vicinity as it was mentioned above. This agrisoil region makes a west border of the Poltava plane which is represented by the oldest and highest fifth (moraine) terrace of the Dnipro river plane [6]. Its formation is generally attributed to the Mindel time. Taking into account the fact that this territory's absolute marks over the sea level are rather high in comparison with the flat Riss Dnipro terrace and consequently the terrain is deeply intersected the moraine terrace is also considered as the left aboriginal bank of Dnipro.

For this region, as well as for the Left-Bank as a whole, zonal borders are not stretched along the latitudes but at some angle to them, which is from south-west to north-east. This is caused by the effect of the Middle-Asia dry anticyclone pushing the arid climate further into higher latitudes in the eastern parts of Ukraine.

Our recent work [3] shows that the subzone of the north leached soils includes also lands around the small town of Sribne. We have carried out field researches to the north-east of Sribne along the Sribne-Sumy highway which is the general direction towards the steppe reservation "Michailivska virgin land" with its deep (classical) typical chernozems. The general object of the survey was to find the bounds of the leached chernozem subtype spreading in that direction and to study the adjoining kinds of chernozems. The field survey was accomplished during the dry period of 2013 (July), the soils were dry down to the parent rock.

The macromorphological structure is studied on the soils profile while the granulometric composition, physical-chemical and agrichemical properties are determined in the composite samples of genetic horizons. The tests were carried out by the analytical facilities of the Chernigiv branch of the State Institution "Soils protection institute of Ukraine".

**Results and discussion.** When traveling along the Sumy highway and crossing the valley of little river Lysogir with its tribute Detiukivka among the oak-wood sites at 5 - 6 km from the Sribne town we find already chernozems with a high line of calcareousness (35-49 from the surface). Such chernozems advance also out of the Chernigiv Region borders inside the Sumy Region along the whole water-shed between the river valleys Lysogir - Detiukivka on the one side and Olava on the other side for more than 20 km. Next to the river valleys the regraded chernozems lie, which is quite logical in view of the presence of the podzolized soils in the oak-wooded valleys. Over general part of the water-shed territory typical chernozems are widespread. So the south-east extreme of the Chernigiv leached chernozem subtype

reaches only the Lysogir and Detiukivka rivers` valleys` border. Tables 1 and 2 show some of the analysis data.

**Table 1. Granulometric composition of chernosems of the Poltava plateau west outskirts (Sribne vicinity near the Sumy Region) , 2013.**

Horizon	Soil layer, sm	The granulometric fractions content , %, by size, mm							
		>0,25	0,10-0,25	0,05-0,10	0,01-0,05	0,005-0,01	0,001-0,005	<0,001	Physical clay , <0,01 mm
<i>Test pit 73. Highly regraded chernozem over loessy loams, v. Berezivka</i>									
He	0-20	-	0,2	7,6	65,1	3,4	6,8	16,9	27,1
HP/ik	50-60	-	0,1	7,0	65,3	4,4	6,5	16,7	27,6
HPik	80-90	-	0,1	6,0	64,8	4,0	6,9	18,2	29,1
Phk(i)	120-130	-	0,1	8,3	63,9	4,6	6,7	16,4	27,7
<i>Test pit 74. Typical chernozem, low-humus, light-loam over loess, v. Kharkove</i>									
H	0-20	-	0,1	5,1	67,5	3,5	6,2	17,6	27,3
Hpk	50-60	-	0,1	5,5	67,6	3,5	5,5	17,8	26,8
PHk	80-90	-	0,1	5,7	67,3	3,4	5,4	18,1	26,9
Phk	120-130	-	0,1	6,7	66,2	3,9	5,9	17,2	27,0

**Table 2. Agrichemical and physical-chemical characteristics of chernosems of the Poltava plateau west outskirts, 2013.**

Horizon	Layer, sm	Humus %	pH		Exchangable		Hydrolitic acid	Saturati on in Ca <sup>2+</sup> and Mg <sup>2+</sup> , %	Available (by Chirikoff)		N by Corn-field
			water	salt	Ca <sup>2+</sup>	Mg <sup>2+</sup>			P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	
							meq/100g of soil				
<i>Test pit 74. Typical chernozem, low-humus, light-loam over loess, v. Kharkove</i>											
H	0-20	3,59	6,7	5,5	11,6	1,79	2,21	85,9	80	52	111
Hpk	50-60	2,84	-	-	-	-	-	-	32	47	69
PHk	80-90	2,35	-	-	-	-	-	-	33	47	-
Phk	120-130	1,66	-	-	-	-	-	-	-	-	-
<i>Test pit 75. Typical chernozem, low-humus, light-loam over loess, v. Lavirkove</i>											
H	0-20	3,98	6,8	5,9	12,4	1,98	1,89	88,4	109	63	118
Hpk	50-60	2,95	-	-	-	-	-	-	77	56	74
PHk	80-90	2,48	-	-	-	-	-	-	78	52	-
Phk	120-130	1,65	-	-	-	-	-	-	-	-	-
<i>Test pit 73. Highly regraded chernozem over loessy loams, v. Berezivka</i>											
He	0-20	3,27	6,8	5,9	10,6	1,59	1,78	87,1	60	70	98
HP/ik	50-60	2,38	-	-	-	-	-	-	45	51	62
HPik	80-90	1,79	-	-	-	-	-	-	44	49	-
Phk(i)	120-130	1,29	-	-	-	-	-	-	-	-	-
<i>Test pit 76. Highly regraded chernozem over loessy loams, v. Lavirkove</i>											
He	0-20	3,06	5,7	4,8	9,2	1,65	4,12	72,5	125	72	95
HPik	50-60	2,28	-	-	-	-	-	-	65	49	58
HPik	80-90	1,71	-	-	-	-	-	-	42	47	-
Phik	120-130	1,28	-	-	-	-	-	-	-	-	-

The data in table 1 confirm that the soils under investigation are of light loam composition. The typical chernozems` profile is monotonous in respect of it's granulometric composition. Their physical composition is monotonous also. Typical chernozems spread along to the east and inside the Sumy Region including territories of the nature reserve "Michailivska virgin land". As the whole-country soil maps show, in the Sumy Region typical chernozems are widespread at higher latitudes also. In our opinion this is the influence of the above-mentioned Middle-Asia dry anticyclone. Judging by the humus content (more than 3 % in the tillage layer) and the transitional

horizons` humus rate (table. 2), we classify those chernozems as typical (deep) low-humus ones.

The regraded soils show some illuviation in the lowest part of their profile. This conforms with the corresponding horizons` higher density and granular-crumb structure (nutty-crumb structure).

Unlike classic chernozems the characteristic feature of the typical low-humus chernozems adjoining to the leached chernozem subzone is their comparatively high insaturation in calcium and magnesium. The humus horizon has also considerable acidity. As it was already mentioned the highest acidity we observed in these soils to the south of Pryluky [6], even in the Varva region, for example in the test pit 72 (pHsalt 5,1 in the tillage layer), hydrolytic acidity is 3,56 while the calcareous line stands high. Consequently some of the typical chernozem sites of the belt adjoining the leached chernozems subzone need liming. Effect of this technique upon such soils is confirmed with the results of the many-years field experiment of the Chernigiv branch of the State Institution "National soil protection" near the Gujivka village.

The regraded chernozems we found belong to the highly regraded type, which means they have high line of effervescence with HCl. But some of them, though situated far enough from human habitations, have high acidity and great insaturation of humus horizon (test pit 76). Such kinds of regraded soils were insufficiently ameliorated in the past and need liming.

Regraded chernozems contain less of humus than typical low-humus chernozems do. Though, humus content in the tillage layer is over 3 %. The available phosphate and potassium apparently much depends upon applied nutrients rate, as for nitrogen – it is in deficiency everywhere.

## Conclusions

1. In the Cernigiv region at the town Sribne latitude the spreading of the leached chernozem subtype to the east is bound with the Lysogir and Detiukivka river valleys.

2. Typical low-humus chernozems adjoining the subzone of leached chernozems as well as highly regraded chernozems have humus horizon insufficiently saturated with calcium and magnesium. Amongst such soils sites are found the acidity rate of which necessitates liming.

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