THE MANAGEMENT OF SOIL RESOURCES FROM THE JIMBOLIA LOCALITY PERIMETR, TIMIȘ COUNTY

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Abstract. *This scientific paper is based on a selective evaluation of specilaity literature data on fundamental, general and particular aspects regarding soil resources of the Jimbolia locality perimeter and the establishment of these soils' fertility. The paper objectives are as follows: caracterization of the natural frame; identification of soil resources and determination of soil fertility.*
Soil resources identified within the researched perimeter are generally very fertile, belonging to the Chernisoil class. There are brown soils tending towards dark brown and black. Two main chernozem types occur: the slightly gleyed classic Chernozem with insertions of carbonic, phreatic-humid and vermic Chernozems and the cambic Chernozem, often associated with psamosoils. On reduced surfaces, mollic gley soils and white alkali soils also occur. The researched perimeter is located in the western part of Romania. Within the borders of the Timiş county, it is located in the western extremity, at a 39 km distance from Timişoara city. As a geographic position, it is situated in the Banat Plain, at the contact point between the Timişului Plain and the Mureşului Plain, at an average altitude of 82 m. From a climatic point of view, it corresponds with the temperate-continental climate type specific for Central Europe, where sub-Mediterranean influences can be registered. From an agro-climatic point of view, certain restrictive factors are signaled regarding the insufficient precipitation quantity, especially during the warm season, and the relatively high frequency of droughts. Underground water can be found at a 3-5 m depth.

Key words**:** *soil, resources, fertility, pedogenetic processes, fertilization, Jimbolia*

INTRODUCTION

Within the borders of Timiş county, the locality occupies the 4th place as inhabitant number after Timişoara, Lugoj and Sânnicolau Mare, providing 1.5% of the total county population and 2.5% of its urban population. The localty lies at the intersetcion of important communication axes, which connect Romania and the ex-Jugoslav space, constituting an important border crossing, train and traffic point, at the Roamnian-Serbian border. In regional and microregional context, the location of Jimbolia presents a series of advantages, significant being the ones refering to its location under the framework of a multicultural tradition area, still active from an economic, social and cultural point of view.

MATERIAL AND METHODS

As material, we studied the soil resources form the perimeter of the Jimbolia locality, in Timiș county, respectively the main types and subtypes of soils and their properties; and depending on these properties, the respetive soil fertility was established.

In the paper, we used data collected in the field, as well as taken over from OSPA Timisoara and the Jimbolia Mayor Hall and Forestry, Timiș county.

The main determinations of the following soil physical and chemical properties were the following:

Soil texture – determined through the Cernikova method

Soil density (cm^3) – with the help of the picnometer, using distilled water;

Apparent density, total porosity and aeration porosity were determined through calculaiton;

The soil humus content (%) – through titrimetric methods, respectively the Tiurin method;

Total Nitrogen dosage – was carried out with the help of the the Kjeldhal method; Mobile phosphor – determined through Egner-Rhiem-Domingo on a UV – VIS spectrophotometer;

Assimilable potassium – was extracted in a lactate ammonium acetate and was determined with the help of the atomic absorption spectrophotometer;

The total cationic exchange capacity (T) – determined through the Bower method, by saturating the soil with Na from the Na acetate 1N to pH – 8.2.

The alkali saturation degree (V%) was calculated.

RESULTS AND DISCUSSIONS

The main pedogenetic processes which occur in the soils specific for the studied area are: bioaccumulation, eluviation-illuviation, specific alteration, gleification, stagnogleification, salinization, alkalization, vermic and andic processes.

As a result of the research and field study, two main types of chernozem were identified, namely the slightly gleyed classic Chernozem with insertions of carbonic, phreatic-humid and vermic Chernozems and the cambic Chernozem, often associated with psamosoils. On reduced surfaces, mollic gley soils and white alkali soils also occur.

The ***slightly gleyed chernozem***, occupies the largest surface in the research perimeter, also being the most important soil type, due to the large surfaces it covers, as well as its natural fertility. In table 1 .,the physical and chemical properties of the slightly gleyed chernozem type from Jimbolia are presented.

The content in corse sand is extremely reduced, with values ranging from 0.2% in the A/Ccaac horizon and 0.5% in the C/Go_4 horizon. However, fine sand is well represented, with values ranging between 39.3% C/Go_4 and 48.6% in the C/Go_3 horizon. Dust presents values between 22.7% in the Aţk horizon and 26.2% in the C/Go_3 horizon. Argil presents values between 24.9% in the C/Go_3 horizon and 32.0% in the Cgo_4 horizon.

According to the granulometric composition, the respective soil fits under the "medium texture" class, subclass medium clay.

The Apparent density (DA) value is extremely low in the surface Aţk horizon, with a 1.10 g/cm^3 value, very low foarte in the 18-75 cm interval, and low in the Amk_2 horizon with a 1.35 g/cm^3 value.

Soil reaction is slow to moderate alkali, with values ranging from 7.92 in the Aţk horizon and 8.62 in the $Ccaac_1g_2$ horizon. Up to a 50 cm depth, the soil is slightly to moderate carbonated with values between 3.15% and 5.55% $CaCO_3$, after this depth it becomes highly carbonated with values ranging from 17.4% to 22.4% $CaCO_3$. The soil humus content values vary from 2.92% in the Amk_2 horizon to 3.82% in the Aţk horizon, the soil sporting a medium humus content. The soil is well provided with mobile P and lowly provided with mobile K. The cationic change capacity (T) presents medium values, ranging from 22.19 me/100 g soil to 33.94 me/100 g soil.

Typical slighltly gleyed chernozem fertility. Medium texture and glomerular strucutre in the surface horizon (Am) insures a good aeration and water and air permeability, a good useful water retaining capacity and a low resistance to land works, which confers this soil the highest production potential.

Still, being located in a area with low and unequally distributed precipitations, it firstly needs irrigation arangements.

Organic and mineral fertilization is necessary to maintain and recover soil fertility in theis case.

Table 1.

Physical and chemicla properties of the slightly gleyed chernozem type from Jimbolia, Timiș county (after OSPA, 1997)

Horizont	Aț	Amk_1	Amk_2	A/Ccaac	$Ccaac_1g_2$	C/Go_3	C/Go_4
Depth (cm)	*0-5*	*5-18*	*18-50*	*50-75*	*75-140*	*140-165*	*165-200*
Coarse sand (2,0-0,2 mm)%	0.3	0.4	0.3	0.2	0.3	0.3	0.5
Fine sand (0,02-0,02 mm)%	46.7	48.0	45.8	45.3	43.6	48.6	39.3
Dust (0,02-0,002 mm)%	22.7	22.9	23.8	23.5	25.7	26.2	23.2
Clay (sub 0,002 mm)%	30.3	28.7	30.1	31.0	30.4	24.9	32.0
TEXTURE	LL	LL	LL	LL	LL	LL	LL
Density of soil (D g/cm^3)	2.53	2.55	2.53				
Apparent density (DA g/cm^3)	1.1	1.35	1.24	1.14			
Coef. Hygroscopicity (CH %)	6.40	5.99	6.19	7.26			
pH (in H_2O)	7.92	8.01	8.32	8.46	8.62	8.59	8.51
Carbonates ($CaCO_3$%)	3.15	3.31	5.55	17.4	22.4	21.7	20.4
Humus (%)	3.82	3.53	2.92				
P mobile (ppm)	71	72					
K mobile (ppm)	66	62					
Head. Cationic exchange (T me/100 g sol)				33.94	22.19		
Ca^{2+} (me/100 g sol)				0.65	0.53		
Mg^{2+} (me/100 g sol)				0.50	0.77		
K^+ (me/100 g sol)				0.013	0.103		

Table 2. presents the physical and chemical properties of the cambic chernozem from Jimbolia.

The corse sand is in low proportion, 0.5-0.3%, and the dust in a normal proportion, respectively 26%. Upper horizons show a uniform granulometric structure, with added fine elements determined by soil works. This soil presents medium-fine texture, which leads to a slightly lower water and air permeability compared to the typical chernozem. Lacking a textural differentiation, the cambic horizon was defined by the structural aggregation way, but also the change in colour of the soil material.

Table 2.

Physical and chemical properties of the slightly gleyed cambic chernozem from Jimbolia, Timiș county (after OSPA, 1997)

Horizont	Ap	Am	A/Bv	Bv	Cca	Ccag
Depth (cm)	*0-16*	*-32*	*-45*	*-63*	*-85*	*-150*
Coarse sand (2,0-0,2 mm)%	0.5	0.4	0.2	0.3	0.3	0.7
Fine sand (0,02-0,02 mm)%	34.1	32.6	30.8	32.8	31.5	32.1
Dust (0,02-0,002 mm)%	26.4	26.8	28.1	26.3	28.5	23.8
Clay (sub 0,002 mm)%	39.0	40.2	40.9	40.6	39.7	43.4
TEXTURE	TT	TT	TT	TT	TT	TT
Density of soil (D g/cm^3)	2.69	2.73	2.68	2.75		
Apparent density (DA g/cm^3)	1.50	1.39	1.35	1.34		
Total porosity (PT%)	44.23	49.08	49.62	51.27		
Porosity of aeration (PA%)	11.09	15.26	15.71	17.43		
Coef. Hygroscopicity (CH%)	8.59	8.90	9.12	9.17		
Wiping coefficient (CO%)	12.88	13.35	13.68	13.75		
Field Capacity (CA%)	22.09	24.33	25.11	25.25		
Useful water capacity (CU%)	9.21	10.98	11.43	11.49		
Total water capacity (CT%)	29.49	35.31	36.76	38.26		
PH in water	6.16	6.46	6.47	7.18	8.10	8.42
Carbonates (CaCO3%)					13.1	15.7
Hydraulic conductivity (K = mm / h)	0.72	1.25	1.50	1.60		
Humus%	2.68	2.31	2.18	1.73		
Bases	25.19	26.66	23.90			
Changeable hydrogen	15.1	14.3	15.8			
Cationic exchange capacity	30.0	31.43	28.07			17.40
Saturation degree in bases (V%)	83.96	84.82	85.14			

Soil density presents a quite high value of 2.69 g/cm^3 in the Ap horizon. This value inidicates a high degree of organic matter mineralization (especially duue to humus oxidation) and an accentuated melanization of the upper horizon.

Apparent density shows the highest values in the Ap horizon, respectively 1.50 g/cm^3, a value due to the accentuated distruction of the processed horizon structure (by eliminating non capillary pores), due to repeated passings and works performed at various soil humidity stages.

Total porosity displays medium values, respectively 44.23% in the upper horizon, these values rise up to 51.27% in the lower horizon.

Aeration porosity is low in the Ap horizon, namely 11.09%, and where the anthropic intervention is no longer present (Bv), the value increases to an average level of 17.43%, which represents a normal value.

The hygroscopicity coeficient varies proportionally with the granulometric fraction percentage, ranging from 9.17% in the Bv horizon to 8.59%, in Ap. The wilting coeficient shows values ranging between 12.88% and 13.75%, falling under the framework of the medium towards the large interval fo this indices. Field capacity varies from 22.09% (Ap) to 25.25% (Bv), the indices falling under the medium interval. Useful water capacity, presents values ranging from 9.21% to 11.49%. This indices being quite low, it falls under the low (Ap) toward medium (Bv) class. Total water capacity represents the maximum water quantity contained by the soil at one point, which, in our case, sports values ranging from 29.49% to 38.26%. These values fall under the medium interval for the upper horizon and the large interval for the lower horizons.

Soil reaction may be defined as slightly acid in the upper horizon (Ap = 6.16) and neutral to slight alkali in the lower horizons (Bv = 7.18; Cca = 8.10).

The humus content is of 2.68% in the Ap horizon; 2.31% in the Am horizon and drops to 1.73% in the Bv horizon. Overall, we can say the the humus provision is low, falling under the smaller interval of this indices.

The alkali saturation degree is qquite high, with a 83.96% value in Ap and 84.82% in Am, due to calcium carbonate leaching and a slight dealaklinization of the coloidal complex.

CONCLUSIONS

Within the studied perimeter, agriculture ocuppies a significant share. Thus, the land fund includes 9,735 ha agricultural land, of which 92% tillable land and 8% is occupied by grass and hay land.

They are generally fertile soils, esepcially the ones in the chernisoil class, respectively chernozems, that carry a high production potential. Of the crop plants, corn is the predominant one, followed by wheat with production surpassing the national average.

A low fertility occurs in the Hygric soil class, respectively mollic Gley soil and the salsodisoils, respectively white alkali, but this cover small surfaces and are usually occupied by grass and hay land.

The soil fertility in the Jimboia locality perimeter, Timiş county, was established following a close analysis of the main properties of these soils, taken over from OSPA Timişoara. W econsidered the most important properties the following: texture, reaction (respectively pH values), humus content, nutritive element (N, P, K) content and alakli saturation degree.

The fertility of the soils in the studied area shows the following values:

Typical slightly gleyed chernozem. Medium texture and glomerular structure in the surface horizon (Am) insures a good aeration and water and air permeability a good useful water retaining capacity and a low resistance to land works, which confers this soil the highest production potential. Still, being located in a area with low and unequally distributed precipitations, it firstly needs irrigation arangements. Organic and mineral fertilization is necessary to maintain and recover soil fertility in theis case.

Cambic chernozem. These soils have a high production potential, being considered among the best soils from the point of view of physical, hydro-physical and chemical properties, after typical chernozems. They do well for most crop plants.

Mollic gley soil usage for agricultural crops is limited by the humidity excess. When these soils are included in the agricultural circuit, they present a medium to low fertility, being recommended to be used as grass and hay land, a situation that renders them qualitatively superior. Gley soils present a low fertility due to diminished microbiological activity. The improvement of these soils can be achieved through the following works: drainage asociated with underground drain; deep furrow; deep aeration oriented perpendicular to drainage lines; organic and mineral fertilization.

Slightly salinized white alkali. The presence of solluble salts at a low depth determined the occurence of salinization pfenomena, which accentuatedly limit soil fertility and the array of crops that can be planted in this soil. They only occur insularly, on small surfaces, on micro- and nanorelief forms, where the leaching process is more accentuated, falling under the 5^{th} fetility class and being occupied ony by rare grass land of low productivity.

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