STUDIES ON THE CHARACTERIZATION OF THE MAIN SOILS OF VARNIŢA, ARAD COUNTY

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Abstract

Varniţa, is one of the few Romanian villages still village reminiscent of the early century. XX, which although is only 12 km from Lipova and 3,7 km from Dorgoş, was never electrified. The village has as coordinates:46°1'22"N21°48'30"E46°1'22"N21°48'30"E.

This village is situated in the southern part of Arad county, at a distance of 48 Km south-east from county capital, and 386 km from the capital of Romania. Neighbors are Ususău 5 Km N; Dorgoş to 3.7 Km N-NE, Labăşinţ 7 km S; Pătârş to 4.4 Km to 5.3 Km Şiştarovăţ SE V-SW. It is now almost completely depopulated. At the 2002 census there were only 6 people.

Key words: study, soil, fertility, reaction soil

INTRODUCTION

Varniţa is a village located in the central part of the Western Hills. The locality is situated in the Hills of Lipova at an altitude of 165 m.

Village as the name implies was founded nearly two centuries ago (1820) by villagers who oversaw production of lime, since the area is rich in limestone. Taking into account that the lime was highly sought after at the time when they started construction of stone and brick village soon had a great development.

Village which before the war belonged to the common Dorgoş, after new territorial division was imposed by the communist party the village belonged to the common Şiştarovăţ.

MATERIALS AND METHODS

The Researches were carried starting from the pedological study methodology and from the Standards for soil analysis laboratories. The Following analysis were made in the laboratories of the Soil Science and Agri-Chemical Study Office of the Faculty of Agriculture in Forum:

- Determination of particle size composition was performed by the method Kacinski.
- Soil solution pH after the potentiometric method in aqueous extract year 1:2,5;
- Mobile P and mobile K were extracted in acetate and ammonia dairy. They were determined from flam photometric point of view;

- Humus was determined by the Walkley Black method dichromatic;
- Total N rating was made by the Kjeldahl method;
- Carbonate content was determined from the gas volumetric point of view by the Scheibler method;
- Total cation change capacity (T) method was determined by the Bower;
- Bases saturation degree (V) was calculated on the ground of SB and SH.

RESEARCH RESULTS

The main soil types and subtypes identified in the village Varnița, Arad county were albic luvosol, soils skeletal and eutric cambisols.

1. Soil taxonomic unit: albic luvisol plan, gleyic stagnosols on clay, dusty-loam / loam-clay.

Albic Luvisols, plan, Gley-stagnation, on clays, dusty-loam/loam-clay.

Profile: Ap-Ea-EaW-BtW-B/CW-CW

Morphological characters:

Horizon Ap - is 0-20 cm thick, textured clay-dust, gray-white color, grain structure, small porous medium compact, colloidal silica, moist, smooth transition;

Horizon Ea - 20 -33 cm loam powder, yellowish, whitish gray, small porous medium compact, colloidal silica, moist, smooth transition;

Horizon EaW2 - 33 -47 cm, texture clay-dust, rust spots and whitish purple, lamellar structure, brittle, porous medium, low compact contains colloidal silica, small manganese concretions, moist, presents a clear;

Horizon E/BW3 - 47 - 60 cm-clay loam, yellowish brown-gray with purple spots, average subangular polyhedral structure, weak, small porous compact containing colloidal silica and manganese concretions small, wet, sharp transition;

Horizon Bt1W3 - 60-84 cm, clay-loam texture, yellowish brown or brown with purple spots, average angular polyhedral structure, moderately developed, very little porous, very compact, has manganese concretions, moist, smooth transition;

Horizon Bt2W4 - 84-108 cm, clay-loam texture, dark brown, light purple, angular polyhedral structure, well developed, very small, porous, very compact, has manganese concretions, moist, with gradual transition;

Horizon B/CW4 - 108-127 cm, clay-loam texture, color blackish brown, slightly purple, massive, very compact, has manganese concretions, moist, the gradual transition;

Horizon CW4 - 127-147 cm-clay loam, yellowish brown, slightly purple, massive, very compact, has manganese concretions, moist, smooth transition.

Table 1

Chemical and physical properties of Albic Luvisols from Varniţa, Arad County

Horizon	**Ap**	**Ea**	**EaW_2**	**E/BW_3**	**Bt_1W**	**Bt_2W_4**	**B/CW_4**	**CW_4**
Depth (cm)	*0-20*	*20-33*	*33-47*	*47-60*	*60-84*	*84-108*	*108-127*	*127-147*
Coarse sand (2 to 0.2 mm)%	3,0	3,3	2,3	2,1	1,7	1,5	2,0	2,5
Sand (0.2 to 0.02 mm)%	36,4	35,6	34,8	30,4	26,3	27,7	27,3	30,6
Dust (0.02 to 0.002 mm)%	17,4	17,1	18,1	15,5	11,5	11,9	13,5	10,5
Clay (<0.002 mm)%	27,2	26,7	28,6	36,0	50,2	46,0	45,4	44,1
Texture	PL	PL	PL	LA	AL	AL	AL	LA
Density (g/cm^3)	-	2,47	2,55	2,51	2,48	-	-	-
Aprent density (g/cm^3)	-	1,47	1,42	-	1,43	-	-	-
Total porosity (%)	-	40,5	44,4	-	42,4	-	-	-
Aeration porosity (%)	-	6,89	11,76	-	8,32	-	-	-
Degree of compaction	-	16	9	20	-	-	-	-
pH in H_2O	6,60	6,25	5,20	5,15	5,40	5,60	5,90	6,30
Humus (%)	1,92	1,80	0,68	0,49	-	-	-	-
Total N (%)	1,73	1,57	0,52	0,35	-	-	-	-
Mobile P (ppm)	2,0	1,4	2,0	1,4	1,4	1,4	1,4	1,4
Mobile K (ppm)	74	52	46	46	93	68	72	60
Reserve of humus (0-50 cm)	106 t/ha							
Bazelor SB amount me/100 g soil	13,68	11,84	10,22	9,80	14,70	16,32	20,22	18,9 8
SH hydrogen amount me/100 g soil	4,61	5,18	7,70	9,00	9,96	8,59	9,29	5,47
Ah me/100 g soil	-	-	1,97	23,67	-	-	-	-
The mobile me/100 g soil	-	-	1,23	2,32	-	-	-	-
T me/100 g soil	18,29	17,0 2	17,92	18,80	24,66	24,91	29,51	24,45
V degree of base saturation (%)	74,80	69,56	57,13	52,13	59,13	65,51	68,52	77,63
Hygroscopicity coefficient (%)	-	4,95	5,22	7,14	10,94	-	-	-
Field capacity (%)	-	22,87	22,99	23,45	24,34	-	-	-
Useful water capacity (%)	-	13,48	12,93	10,80	6,72	-	-	-
Conduct. Hydraulic (mm / hour)	-	1,8	2,9	-	0,5	-	-	-
Wilting coefficient (%)	-	9,39	10,06	12,65	17,62	-	-	-
Minimum threshold humidity (%)	-	16,1 3	16,52	18,05	20,98	-	-	-

Coarse sand content is between 1.5% and 3.3%, the maximum being in the horizon it, and the minimal Bt2W4 horizon.

Sand content is 26.3% in the horizon BTW and 36.4% in the Ap horizon

Dust content has ranged between 10.5% and 18.1% being the minimum and the maximum horizon to horizon CW4 It.

Clay is found in trace amounts in the Ap horizon or 27.2 and the maximum horizon BTW, 50.2 respectively.

Based on the data obtained and the diagram triangular texture, soil texture has studied middle between 0-47 cm, 47-60 cm and medium fine in between 127-147 cm, 60-127 cm fine between.

Bulk density is average, with values between 1.42 g/cm3 and 1.47 g/cm3 EaW2 the horizon the horizon It.

Total porosity is small, the values ranging between 40.5% and 44.4% in the horizon It EaW2 the horizon.

Aeration porosity is very low in the horizon It (6.89%) and BTW horizon (8.32%) and is lower in the horizon EaW2 (11.76%).

Degree of compaction has values between 9% ° n EaW2 both horizontally and 20% in both horizontally E/BW3 being poorly compacted between 33-47 cm, moderately compacted between 20-33 cm and 47-60 cm strongly compacted between.

In terms of reaction, acid soil is poor in the first 33 cm and moderately acid in between 33-127 cm.

Percentage of humus is low in Ap horizons and very small She EaW2 and E/BW3 horizons.

Supply nutrients studied vary by item. Thus nitrogen supply is high, while the phosphorus is extremely small.

Potassium supply is small and very small.

Field capacity is average, minimum value recorded in the horizon and the maximum horizon Ea btw.

Wilting coefficient has values in between 9.39% Ea horizon and 17.62% in horizon Btw, the middle between 20-60 cm and 60-84 cm very large between.

Degree of soil base saturation indicates mesobasic the first 47 cm, oligomezobazic between 47-60 cm, 60-127 cm and eubazic mesobasic between between 127-147 cm.

1.Rendzinic skeletal soil taxonomic unit on compact calcareous, sandy loam / sandy clay.

Skeletal - rendzinic Leptosols

Morphological characteristics:

Horizon Am - 0 - 18 cm, sandy loam, dark gray, glomerular structure, porous medium with multiple roots at the base.

Horizon AR - 18 to 30 cm, sandy loam, grayish brown, glomerular structure, porous medium, often skeletal material.

Horizon Rn - 30 - 60 cm, compact limestone rock, light.

Physical and chemical properties of skeletal rendzinic are presented in Table 2.

Table 2.

The physical and chemical properties of Skeleti-rendzinic Leptosols from Varniţa, Arad County

Horizont	**Am**	**AR**	**Rn**
Depth (cm)	*0-18*	*18-30*	*30-60*
Coarse sand (2 to 0.2 mm)%	24,2	18,4	
Sand (0.2 to 0.02 mm)%	38,2	44,8	
Dust (0.02 to 0.002 mm)%	12,9	20,8	
Clay (<0.002 mm)%	24,7	16,0	
Texture	**LN**	**LN**	
pH in soil	5,70	5,72	
Humus %	5,70	5,92	
Mobile P (ppm)	0,9	3,9	
Mobile K (ppm)	48	52	
Instead bases (SB me/100g ground)	12,15	12,29	
Exchangeable hydrogen (SH me/100 g	3,23	2,29	
Cation exchange capacity (T Me)	15,38	14,58	
Degree of base saturation (V%)	79,00	84,29	

Coarse sand has higher values in the horizon Am, respectively 24.2% and decrease to the profile, the horizon AR 18.4% respectively. The fine sand has lower values in the horizon Am 38.2% they ar horizon increasing to 44.8%.

Dust is low in the horizon Am of 12.9%, which increased to 20.8% across the horizon profile AR.

Clay has values of 24.7% in the horizon Am and 16.0% respectively in the horizon AR.

After studying the triangular diagram texture, texture is sandy loam type throughout the profile.

Soil reaction is moderately acidic with pH values of 5.70 to 5.72 respectively horizon and the horizon Am, AR.

Humus content is medium, with values of 5.70% in the horizon Am, or 5.92% in the horizon AR.

The phosphorus content is extremely low values in the horizon Am 0.9 ppm, 3.9 ppm in the AR horizon.

The potassium content is very low, 48 ppm and 52 ppm horizon horizon AR.

Exchange bases (SB) show values by 12.15 m.e./100 g soil in horizon Am and respectively 12.29 g m.e./100 soil in horizon AR.

Exchangeable hydrogen (SH) is low, ie 3.23 g soil horizon me/100 Am and 2.29 g soil horizon me/100 AR.

Cation exchange capacity (T) is higher in the horizon Am with values DE15, 38 me/100 g soil horizon decreases from 14.58 AR me/100 g soil.

Degree of base saturation (V%) have values between 79.00% in horizon Am, 84.29% in horizon AR. We can say that we have a submezobazic ground.

2. Soil taxonomic unit: eutricambosol Gleize weak stagnogleizat moderate, moderately soiled on clay, luto-prăfos/argilo-lutos

Morphological characters:

Horizon Ap - 0 - 13 cm, silty, dusty structure disturbed by tillage, loose.

Horizon Ao -13 to 27 cm, silty-clayey brown grain structure, very low porosity.

Horizon ABtyw - 27 - 45 cm horizon transition intermediate characters between Ao and Bty.

Horizon Btyw - 45 - 98 cm, clay-silty, yellowish-purple, metallic luster, very low porosity, the sides oblique slip.

Horizon BC - 98 - 122 cm, clay-silty, brown-yellow, contains rare concretions of calcium carbonate and efflorescence.

Horizon Cg - 122 - 160 cm, parent material, clay-loam texture, is weak effervescence.

Physical and chemical properties of eutricambosolului amfigleic of Varnița are presented in Table 3.

Eutricambosolul formed on parent materials with fine granular compositions (clay or clay deposits fluvial-lacustrine).

Texture is clay-Dusty first 13 cm, loamy average between 13-27 cm, medium clay loam, 27 to 45 cm, clay-loam up to 84 cm and becomes loam-clay medium in depth.

Bulk density has values between 1.50 and 1.59 g/cm3. Total porosity 42.30% respectively high values in Ao horizon and decreases to 39.49% in horizon Btyw.

Humus content is low, with values ranging from 1.92% to 0.62% respectively Ap horizon and the horizon AByw.

The soil has a very low supply in mobile phosphorus and mobile potassium.

Soil reaction has values between 5.85 and 7.30, the acid in the upper horizons and weakly acid to neutral in the lower horizons.

Degree of base saturation is 70.86% in the Ap horizon and reaches 86.03% in horizon Btyw.

Table 3.

The physical and chemical properties of Gley-eutric cambisol of Varnița

Horizon	**Ap**	**Ao**	**AByw**	**Btyw**	**Btyw**	**BC**	**Cg**
Depth (cm)	*0-13*	*13-27*	*27-45*	*45-77*	*77-98*	*98-122*	*122-160*
Coarse sand (2 to 0.2 mm)%	2,3	1,1	1,9	1,1	1,1	1,0	1,5
Sand (0.2 to 0.02 mm)%	33,4	35,8	28,4	28,4	31,4	29,3	29,7
Dust (0.02 to 0.002 mm)%	33,7	34,3	32,5	23,1	20,7	24,7	24,0
Clay (<0.002 mm)%	30,6	28,8	37,2	47,4	46,8	45,0	44,8
Texture	**LP**	**T**	**T**	**AL**	**AL**	**AL**	**AL**
Density (g/cm^3)		2,60	2,60	2,12			
Aprent density (g/cm^3)		1,50	1,59	1,55			
Total porosity (%)		42,30	38,84	38,49			
Aeration porosity (%)		-1,99	-22,63	-49,90			
Degree of compaction		14,86	23,92	26,99			
Coef. The hygroscopicity (CH%)		6,22	9,33	12,57			
Coef. of wilting (CO%)		9,33	12,49	18,85			
Field capacity (CC%)		29,53	38,66	57,02			
Total capacity (TC%)		28,20	24,43	24,83			
Useful water capacity (with%)		20,20	26,17	38,17			
pH in H_2O	5,85	5,85	6,70	6,30	6,55	7,25	7,30
Humus (%)	1,92	1,24	0,62				
Index of nitrogen (IN)	1,67	1,10	0,58				
Mobile P (ppm)	100,4	55,4	15,3	12,6	5,6	3,6	6,7
Mobile K (ppm)	161	151	129	141	125	92	127
Instead bases (SB me/100 g soil)	13,38	13,16	16,22	20,72	22,54		
Exchangeable hydrogen (SH me/100 g soil)	5,50	4,97	3,69	4,61	3,66		
Cover. cation exchange (T me/100 g soil)	18,88	18,13	19,91	25,33	26,20		
Degree of base saturation (V%)	70,86	75,28	81,46	81,80	86,03		

CONCLUSIONS

The main soil types and subtypes identified in the village of Arad Varnița are:

- Luvosol albic;

- Rendzinic skeletal;
- Eutricambosolul.

This soil has medium natural fertility, to low, is generally covered by forests, meadows and hayfields and some of the soils are planted with wheat, corn, alfalfa, and clover ghizdei.

Also quite significant areas (48.6 ha) are occupied with fruit (plum, apple, walnut) and less with vines.

REFERENCES

1. Blaga Gh, F. Filipov, I. Rusu, S. Udrescu, D. Basil, 2005, Soil, Ed AcademicPres, Cluj - Napoca.
2. Bocuse S., 1945, Roads and crossroads, volume edited by John Dimitri Suciu, Bucharest.
3. Bucur N., Gh. Lixandru, 1997, Fundamentals of Soil Science: formation, evolution, physics and chemistry of the soil, Ed Dosoftei, Iasi.
4. Canarache A., 1990, Physical soil, Ceres Publishing House, Bucharest, 1990.
5. Drăgan I., I. Rusu, 1990, Soils Romania, Lithography USAMVB Timisoara.
6. Florea N., I. Muntean, 2012, Romanian System of Soil Taxonomy. Ed SITEC, Craiova.
7. Filipov F., 2005, Pedology. Ed. from Brad, Iasi.
8. Ghinea D., 2000, Romania's geographical encyclopedia, Encyclopedic Publishing House, Bucharest.
9. Ianos GH., M. Goian, 1995, Soils Banat - Evolution and agrochemical characteristics, Ed Mirton, Timişoara.
10. Ianos GH., I., Shotgun, M. Goian, 1997, Soils Banat - natural conditions and fertility, Ed Mirton, Timişoara.
11. Rogobete Gh., 1993, Soil Sciences, Ed Mirton, Timişoara.
12. Mihut Casiana, K. Lațo, 2006, Pedology. Practical work. Ed Agroprint, Timişoara.
13. Mihut Casiana, K. Lațo, 2007, Pedology. Methods of analysis. Ed Gutenberg universe Arad.
14. Mihut Casiana, Isidora Radulov, 2012, Soil sciences. Ed Eurobit, Timişoara.
15. Niță L., 2004, Soil. Ed Eurobit, Timişoara.
16. Niță L., 2007, Soil. Ed Eurobit, Timişoara.
17. Olariu M., 1997, City Guide Lipova and surroundings. Ed Gutenberg universe, Arad.
18. Ștefan V., 2002, Mineralogy and Pedology. Publishing Horizons University, Timisoara.
19. Varga, E., 2002, Statistics census as mother tongue or nationality, Arad County from 1880 to 2002.
20. www.virtualarad.net/county/Varnita/virtual_varnita_home.htm