THE PEDOLOGICAL AND AGROCHEMICAL FEATURES OF AN ENTIANTROSOIL FROM THE GANGUE DUMP ROSIA QUARRY, GORJ COUNTY

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Abstract

Our country has important inferior coal reserves that, by their features, can by extracted from the soil surface. After the extraction processes large surface of land can not be cultivated; they are represented by the excavation and depositing surfaces as sterile dumps. These surfaces must be cropped again. In this respect there is need to know their main pedological and agrochemical characteristics in order to establish the most suitable measures for cropping.The paper presents the main agropedological features of the sterile dump from Rosia, District Gorj, in order to set up the most suitable strategy of its recovery.

Key words:sterile dumps, total nitrogen, humus.

INTRODUCTION

In the case of the surface mining quarries from the Rovinari coal basin, the environment impact was higher than in other such places. Through the mining process the soil has disappeared either by mixing with the sterile material or by separated extraction. The lithological materials that form the RovinariMiningBasin are different as geological age and lithology. On the other hand, the sterile dumps must be capitalized by recropping. This is the reason why the pedological and agrochemical features of these materials must be known. For this purpose, in the Rosia sterile dump, District Gorj, there have been made two soil profiles and there have been done pedological and agrochemical analyses in order to establish the most proper measures for cropping them.

MATERIAL AND METHOD

The Rosia sterile dump belong to the Rosia quarry that is located in the hilly zone comprising the tertiary formations (Dacian, Levantin, Cuaternar). The depth of the layer that was removed from the Rosia quarry is between 22-45 m, sometimes higher. The soil samples have been analyzed pedologically and agrochemically.

- The granulometricalanalisys was made by separating the soil fractions through sieving and pipetting after carefully removing the organic matter with perhydrol and the dispersion of the clay using sodium pyrophosphate by Kacinski method.
- pH of the water solution in soil : water ratio of 1:2.5 potentiometrically, using the Mettler Toledo device.
- The Sum of the Exchangeable Bases by Kappen method (EB), me/100 g soil
- The sum of the exchangeable hydrogen by exhaustive percolation, me/100 g soil.
- The carbonates content by gazvolumetric method, %.
- The Capacity of cationic exchange T me/100 g soil = SB +SH
- The humus content by Walkley and Black method (modified by Gogoasa), H %.
- The total nitrogen content by mineralization, distillation and dosing, Nt %
- The soluble phosphorus content by Egner Rhiem Domingo (P_{ppm}) and colorimetrically by UV – VIS.

RESULTS AND DISSCUTIONS

- The soluble potash content by Egner Rhiem Domingo (K_{ppm}) and

photometrically at flame using FLAPHO – 4 device.

- Soil texture.

The experimental results are written in the tables 1 and 2.

Table 1

The granulometric composition of the sterile material (Rosia sterile dump)

Profile nr.	Layers (cm)		Granulometric analysis					
			Thick sand %	Fine sand %	Silt %	Physical clay %	Colloidal clay %	Texture
1	S_1	0-24	22,4	47,3	19,0	23,0	11,3	NL
	S_2	24-55	22,1	44,5	20,4	24,2	13,0	NL
	S_3	55-78	25,0	44,6	19,5	21,9	10,9	N-NL
	S_4	78-100	14,0	52,0	22,4	23,8	11,4	NL
	S_5	100-155	23,1	72,2	17,0	21,1	10,8	N-NL
2	S_1	0-21	4,0	8,7	61,4	67,4	25,9	AL
	S_2	21-53	14,7	6,0	45,6	66,1	33,7	AL
	S_3	53-80	14,5	5,0	40,3	69,0	40,2	A
	S_4	80-100	22,1	14,6	29,7	51,3	33,6	LA
	S_5	100-130	24,2	14,1	25,6	54,8	36,1	LA
Minimal values			**4,0**	**5,0**	**17,0**	**21,1**	**10,8**	**NL**
Maximal values			**25,0**	**72,2**	**61,4**	**69,0**	**40,2**	**A**

Profile nr. 1

General conditions of formations

Name: spolicentiantrosoil

Relief: sterile dump

Bedrock: silt, sand, pebbles

Depth of the water table: over 10 m.

Vegetation:herbaceous associations

Morphological description

S_1: 0-20 cm; unstructurated; silt – sandy texture; very rare violet spots; frequent roots; porous; weak compact and dry; slow passing.

S_2: 24-55 cm: yellow rusty color; unstructurated, sandy- silt texture, frequent roots, porous, weak compact and dry, slow pasing.

S_3: 55-78 cm: yellow rusty color; unstructurated, sandy- silt texture, very rare roots, porous, weak compact, slow passing.

S_4: 78-100 cm: rusty color with yellow hues; unstructurated; sandy – silty texture; porous and dry; slow passing.

S_5: 100-155 cm: yellow color; unstructurated; sandy-silt texture; no roots; porous and dry.

The first profile has moderated colloidal clay content, uniform on the soil profile, 10.8 – 13.0%, fine sand 44.5-72.1% and thick sand 14.0 – 25.0 %.

Profile nr. 2

General condition of formation

Name: spolic entiantrosoil AL/LA

Relief: sterile dump

The bedrock: subiacent rocks (clay)

Depth of the water table: over 10 m

Vegetation: Oak forests

Morphological description

The depth of the A horizon differs between 0-21 cm.

S_1: 0-21 cm: Browny black color with violet spots; unstructurated, clay-silt texture; $CaCO_3$ within the soil mass and coal debris, weak effervescence, fine porous, medium compacted, moist, obvious passing.

S_2: 21- 53 cm : brown-violet color; unstructurated, clay-silt texture; coal debris; fine porous; medium compacted; moist; obvious passing

S_3: 53-80 cm: brown violet color with rusty and yellow spots; unstructurated; clay texture; coal debris; fine porous; medium compacted; moist; obvious passing

S_4: 80-100 cm: brown black color; unstructurated, clay-silt texture, obvious effervescence; fine porous; medium compacted; slow passing.

S_5: 100-130 cm: brown violet color with rusty and black spots;

unstructurated; $CaCO_3$ and coal debris within the soil mass; fine porous; medium compacted.

Profile nr. 2 has a colloidal clay percent that vary between 25.9-40.2%, fine sand 5.0-14.6% and the thick sand 4.0-24.2%. Also here there can be recorded a high variety of the materials on the soil profile (table 1). The main chemical features of the material deposited in the Rosia sterile dump are presented in the table nr. 2. The pH value of the materials is between 6.5 – 7.5, the reaction being acid to weak alkaline. The $CaCO_3$ content is between 1.98 – 2.41 %. As regard theorganic carbon content it varies between 0.020 – 4.176%. In some places within this sterile dump the coal fragments are more frequent on the soil profile determining a higher organic carbon, respectively 3.016 – 4.176%. The nitrogen indicator is very low excepting the higher values of the organic carbon determined by the coal fragment son the soil profile, the soil being very low supplied with nitrogen. As regard the phosphorus content there are recorded low values between 6.27 – 11.66 P ppm. The potash content has values between 19.89 – 106.11 K ppm, indicating a low to average supplying. The cantity of bases from the colloidal complex is between 10.34-18.73 me/100 g soil. The absorbed hidrogen cations have low values, of 0.45 – 2.00 me/100 g soil. The bases saturation degree has values between 89.58-93.12% that indicates a saturation with bases.

CONCLUSIONS

Within the Rosia quarry the spolicentiantrosoil that have resulted from the surface mining has the following characteristics : 4-25-34% thick sand, 5-72.2% fine sand, 19-61.4% silt and 21.1-69% physical clay, that determine a sand-silt or clay-silt texture, the reaction is weak acid to weak alkaline (pH=6.5-7.5), low supplied with nitrogen (H=0.03-1.065%), has a high organic carbon, very scarce in phosphorus (6.27-11.66 ppm P), weak to average supplied with potash (19.89-106.11 ppm K). The sterile dump that was studied can be cropped with cereals or technical crops and the needed fertilizer doses in order to get the expected yield can be calculated using the supplying status after the table nr. 2.

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Table.2

The main chemical features of the deposited materials (The Rosia sterile dump)

Profile #	Depth (cm)	Chemical features											
		pH (H_2O)	$CaCO_3$	C organic %	Humus %	SB me/100g sol	SH me/100g sol	Na me/100g sol	$V_{8,3}$ me/100g sol	V_{Ah} me/100g sol	IN %	P ppm	K ppm
1	0-24	6,5	-	0,18	0,310	12,84	1,61	1,42	88,81	90,23	0,28	8,06	30,63
	24-55	6,6	-	0,09	0,170	12,51	1,35	1,25	90,23	90,91	0,15	6,97	24,04
	55-78	6,5	-	0,05	0,090	11,79	1,46	1,37	88,93	89,58	0,08	6,88	19,89
	78-100	6,5	-	0,02	0,040	12,01	1,46	1,31	89,12	90,16	0,03	6,27	20,53
	100-155	6,6	-	0,03	0,050	10,76	1,05	0,93	91,05	92,04	0,04	6,90	24,87
2	0-21	7,5	2,32	1,485	2,560	10,34	0,45	-	95,83	100	2,560	9,28	49,74
	21-53	6,6	-	3,155	5,439	15,25	1,82	1,18	89,33	92,83	5,049	11,66	59,68
	53-80	6,6	-	4,176	7,199	18,73	2,00	1,38	90,35	93,12	6,703	10,63	63,00
	80-100	7,4	2,41	3,016	5,199	16,21	0,79	-	95,36	100	5,199	8,63	101,13
	100-130	7,3	1,98	3,158	5,444	16,55	0,68	-	96,02	100	5,444	8,15	106,11