THE STUDY OF BROWN – STAGNIC VERTOSOL FOR ORCHARD CULTIVATION

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ABSTRACT

The paper presents a study made outside Brabova locality, Dolj County, on the brown – stagnic vertosol in order to be cultivated as orchard. There were made physical and chemical analyses to soil samples taken from two soil profile. The bonitation of the land for natural condition have shown high values of the bonitation marks for apple tree and plum tree (BM = 73).

INTRODUCTION

The territory of Brabova commune is located in the North – Western part of Dolj County and it belongs to the Southern subunit of Getic Piedmont where there were identified wide plateaus that appear like broader or narrower strips with general orientation to North – East, fragments of torrential valleys bordered by versants with different orientations and declinations. As geological aspect, this area belongs to Pleistocene, the characteristically strata being formed by successions of clays, marl and sands located deep into the land.

MATERIAL AND METHOD

The field phase consisted of digging two soil profiles from where there were taken soil samples for each horizon. The physical and chemical analyses were made according with ICPA Bucharest methodology. There was made the evaluation of the land in natural conditions in order for land to be used as orchard.

RESULTS AND DISCUSSIONS

Within the plot that was chosen for study the dominant soil is brown – stagnic vertosol pseudogleysated, moderately levigated (decarbonatated), with a clay – loamy texture (AL)/ clay-loamy (AL) formed on sloppy altered materials having as underlying rocks (geological formations), non-consolidated silica rocks or weakly consolidated eubasic rocks. The usage is as orchard. The soil formula: VS br-st - W2 - K4 - AL/AL – Ssp – NB - Lp. The succession of horizon is: Ap = 0-21 cm; Ay = 21-42cm; Bt1yw = 42-72 cm; Bt2yw = 72-98 cm; B/C = 98-115 cm.

Table 1

Physical properties of soil samples taken from nr. 1 profile

Horizon	UM	Ap	Ay	Bt1yw	Bt2yw	B/C
Depth, (cm)	cm	0-21	21-42	42-72	72-98	98-115
Thick sand (2-0,2 mm)	%	1.6	1.1	0.9	0.9	0.7
Fine sand (0,2-0,02 mm)	%	29.1	29.2	28.7	30.5	30.6
Loam I (0,2-0,01mm)	%	7.8	7.5	6.3	8.8	8.3
Loam II (0,01-0,002 mm)	%	15.5	12.0	15	12.9	14.1
Colloidal clay (<0,002 mm)	%	46.0	50.2	49.1	46.9	46.3
Texture	AL	AL	AL	AL	AL	AL

Table 2.

Chemical properties of soil samples taken from nr. 1 profile

Horizon	UM	Ap	Ay	Bt1yw	Bt2yw	B/C
pH	Unit pH	6.08	6.48	6.77	6.99	7.07
Total carbonates (CaCo3)	%	-	-	-	-	0.8
Humus (H)	%	2.86	1.18	1.14	0.98	0.74
Total Nitrogen (N)	%	0.146	0.062	0.058	0.050	0.040
Soluble phosphorus (PAL)	ppm	12.2	2.6	1.9	1.8	1.6
Soluble potassium (KAL)	ppm	306	157	95	86	93
Sum of exchangeable bases (SB)	%	27.4	28.2	29.4	29.8	29.2
Hydrolitical acidity (Ah)	me/100 g soil	5.4	3.3	2.4	2.1	1.6
Bases saturation degree (V)	%	83.5	89.5	92.4	93.4	94.8
Soluble aluminum (AL)	me/100 g soil	-	-	-	-	-
Nitrogen index (IN)	%	2.4	1.0	1.0	0.9	0.7
C/N		13.25	12.88	13.30	12.72	12.52

The physical properties determine a clay – loamy texture of the soil on the entire profile. The soil reaction is low acid to neutral. The humus and nitrogen supplying status is average. There can be noticed a low soil supplying by soluble phosphorus while the potassium content is high in the first horizon and it decreases toward the middle of the next horizon. The basses saturation degree is high, beginning from 83% and reaching 94.8% at the base of the profile.

The formula for the second soil profile is: VS br-st - W2 - K4 - AL/AL – Ssp – NB - Lp. The horizon succession is: Ap = 0-17 cm; Ay = 17-33 cm; A/B =33-58; Bt1yw = 58-78 cm; Bt2yw = 78-105 cm; B/C = 105-120 cm.

Table 3.

Physical properties of soil samples taken from nr. 2 profile

Horizon	UM	Ap	Ay	A/B	Bt1yw	Bt2yw	B/C
Depth, (cm)	cm	0-17	17-33	33-58	58-78	78-105	105-120
Thick sand (2-0,2 mm)	%	1.3	1.2	1.0	1.0	1.1	0.9
Fine sand (0,2-0,02 mm)	%	28.8	29.7	29.1	27.9	26.9	27.1
Loam I (0,2-0,01mm)	%	9.2	8.7	7.2	8.4	8.6	8.5
Loam II (0,01-0,002 mm)	%	14.2	13.7	9.3	10.1	11.3	11.7
Colloidal clay (<0,002 mm)	%	46.5	46.7	53.4	52.6	52.1	51.8
Texture	AL	AL	AL		AL	AL	AL

Table 4

Chemical properties of soil samples taken from nr. 1 profile

Horizon	UM	Ap	Ay	A/B	Bt1yw	Bt2yw	B/C
pH	Unit pH	6.18	6.06	6.73	6.87	6.97	7.02
Total carbonates (CaCo3)	%	-	-	-	-	-	0.5
Humus (H)	%	2.68	2.74	1.88	1.64	1.52	1.54
Total Nitrogen (N)	%	0.168	0.174	0.088	0.064	0.052	0.054
Soluble phosphorus (PAL)	ppm	47.8	31	1.9	2.7	1.1	1.8
Soluble potassium (KAL)	ppm	370	364	230	120	107	103
Sum of exchangeable bases (SB)	%	29.6	29.4	28.8	29.2	29.2	30.6
Hydrolitical acidity (Ah)	me/100 g soil	5.8	5.9	2.8	2.4	2.1	1.7

Bases saturation degree (V)	%	83.6	83.3	91.1	92.4	93.3	94.7
Soluble aluminum (AL)	me/100 g soil	-	-	-	-	-	-
Nitrogen index (IN)	%	2.2	2.3	1.7	1.5	1.4	1.4
C/N		10.79	10.65	14.45	17.34	19.78	19.29

The high clay and loam contents determine a clay-loamy texture for this soil on the entire profile. The soil reaction is low acid toward neutral. The nitrogen and humus contents are average. The status of soluble phosphorus supplying is low and the one of potassium is high. The basses saturation degree is, also, high, over 83%.

After soil evaluation in natural conditions there resulted a good suitability of this soil for orchard cultivation.

Table 5.

Evaluation marks and suitability classes

Nr. of TEO	Use of TEO	Pas tures	Hay fields	M	Class of PH	Vineyards for wine	Vineyards for table	M	Class
1	Orchard	66	52	59	4	66	52	59	4
2	Orchard	73	58	66	4	73	65	69	4
Nr. of TEO	Use of TEO	Apple tree	Pear tree	Plum tree	Cherry tree	Apricot tree	Peach tree	M for orchard	Class for orchard
1	Orchard	66	58	73	58	58	58	64	4
2	Orchard	73	65	73	65	65	65	69	3

The limiting factors that determined this framing have been: the moisture deficit, thermal amplitude, vertic character of the soil, surface water excess and humus pool. The soil unit nr. 1 belongs to the IVth class of suitability as orchard and the second unit belongs to the IIIrd class for orchard cultivation. The studied land is suitable for all species of fruit trees. The highest evaluation marks have been obtained apple tree and plum tree.

Also, from evaluation there resulted a good suitability of this land for orchard.

Table 6.

Suitability classes for orchards

Nr. TEO	Apple tree		Pear tree		Plum tree		Cherry tree CS PC		Orchard	
	Mark	Class	Mark	Class	Mark	Class	Mark	Class	Mark	Class
1	66	IV	58	V	73	III	58	V	64	IV
2	73	III	65	IV	73	III	65	IV	69	IV

The land from TEO 1 belongs to the IVth suitability class, with an average mark of 64 points and the one of TEO 2 belongs to the IVth suitability class, too, with an average mark of 69 points.

CONCLUSIONS

From specialty literature there results that plum tree capitalizes very well most soil types from our country (soil with pH between 5.8 and 7.4), occupying the first place. The southern zone of Oltenia is a suitable area for plum tree and here, the combination of graft/rootstock has an important role to the yield, the effect being very positive significant (Cichi M., 2013).

The apple tree occupies the second place, after plum tree and it is cultivated on about 30% from the total area of orchard in our country. Some researches (Cichi M., 2016) have mentioned the apple tree and pear tree that their crop kinds have proven a very good growth in the clime conditions of Olt County, on reddish preluvisoil.

There must be complied with the requirements regarding the establishment conditions for an orchard as well as the proper technologies. Also, there must be cultivated suitable crop varieties for local conditions, with good qualitative and quantitative features.

The reconversion must regard to the suitability of each fruit tree variety for a specific zone (Funding for 4.1. measure „Investments in orchards" from National Program of Rural Development 2014-2020). This regulation stipulates:

„the aim of investments supported within this regulation is the increasing of competitivity of fruit tree exploitations by endowment with machineries and equipments, establishing and modernization and/or enlarging the processing facilities, establishing of orchards, the reconversion of existing plantations and the increasing of the surfaces occupied by fruit tree nurseries"

The objectives of 4.1. a regulation:

- the increasing of competitivity, the diversification of production, the increasing of quality of products and general improvement of orchard activity;
- the increasing of added value of products by supporting the processing of fruits at farm level and direct trade;
- the development of short chains of supplying;
- the streamline of production costs by promoting the usage of energy from regenerable sources within the farm and reduction of energy consumption.

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