PEDOLOGICAL AND CHEMICAL CHARACTERIZATION OF A BROWN – STAGNIC VERTOSOIL IN ORDER TO ESTABLISH THE FERTILIZATION PLAN

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ABSTRACT

The purpose of this paper has been the identification of the type of a soil located in the northern part of Mischii commune area, District Dolj (at the southern limit of Getic Plateau) and its characterization on the basis of pedological and chemical features in order to establish the fertilization plan. By using soil profile data there was identified a brown – stagnicvertosoil. Accounting the macro nutrients supplying the crop and the expected yield there was set up the fertilization plan for the current year.

INTRODUCTION

The object of the present paper was the soil which has been studied in relation with the environment factors that influence its evolution. The aim of the paper was the identification of the soil located in the northern part of Mischii locality which belongs to T8 plot (out of town land) and its characterization on the basis of physical and chemical properties.

The bedrock where the soil was formed within plateau and versants areas is represented by materials of disaggregation- alteration ‘‘in situ’’ or transported on a short distance constituted by silt, clay, swollen clay, loess or loess like deposits. The territory of Mischii locality belongs to the hydrographic basin of Olt river, the junction to this river being made through Teslui creek which crosses the locality from north to south and it has a meanders and a low flow, sometimes, during drought periods it dries.

The depth of the ground water is over 15-20 m, excepting high and low pitches where rainfall water is stagnant during rainy years.

As regard the climatic micro zones, the administrative territory of Mischii locality belongs to IIL - SA 66/7 micro zone (the climatic zone middle warm – semi humid, within lowland and alluvia with alluvial soils) and IIC - BP 53/5(the climatic zone middle warm – semi humid, within hilly zones with luvisoils).

According with climatic data taken from INMH – Meteorological Station of Craiova for 1961-2004 period, the territory of Mischii locality, after Koppen, belongs to C.f.a.x. clime type (temperate climate with Mediterranean influence, with mild winters and warm summers, with enough rainfall yet uneven distributed during the year, with moisture deficit and drought in march, july, august, september and october).

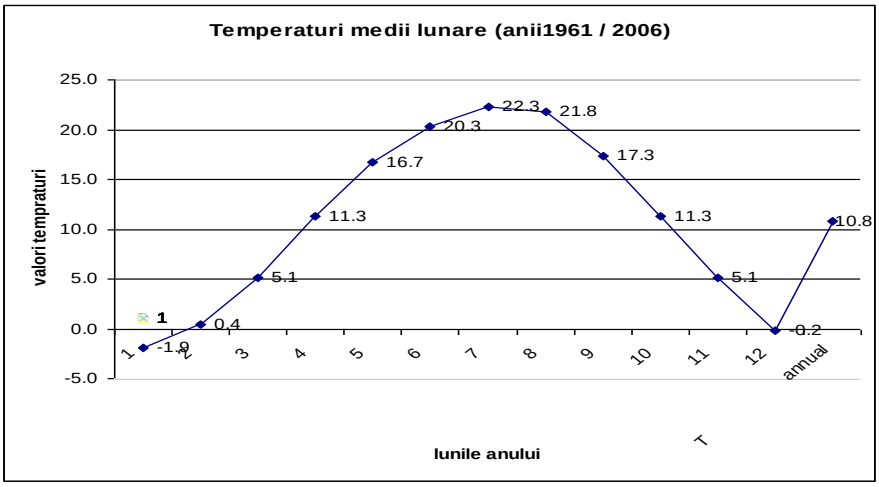

Figure 1. Average monthly temperatures for 1961-2004 period, after INMH, Craiova Station

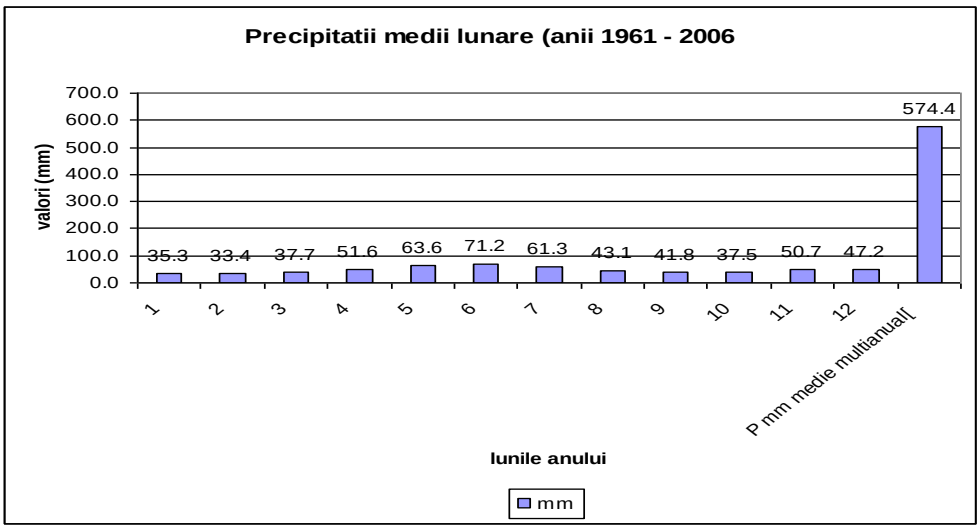

Figure 2. Average monthly rainfall for 1961-2004 period, after INMH, Craiova Station

MATERIALS AND METHODS

In order to achieve the proposed goal, there was dug a soil profile from which there were taken 4 soil samples that were analyzed as regard physical and chemical features that served to characterize the studied soil. The laboratory phase consisted on physical and chemical analyses for all soil samples after the following methods:

- pH in distillated water – potentiometric method;
- exchangeable bases sum (EBS) – Kappen method;
- total acidity (TA) – percolation method till exhaustion with solution of potassium acetate 1N;
- hydrolytically acidity (HA) – Kappen method;
- humus (5) – method Walkley-Blak modified byGogoaşă;
- total nitrogen (%) – Kjeldahl method;
- soluble phosphorus (ppm) - Egner-Riehm-Domingo method;
- soluble potassium (ppm) – extraction with ammonium chlorure;
- size particle analysys (5 fractions) – Kacinski method.

The optimal economical doses recommended for each crop have been calculated taking account of macro nutrient supplying (N,P,K) in soil, the expected yield on the basis of tables for calculus emitted by Ministry of Agriculture from 1983 on the basis of long term trials.

RESULTS AND DISCUSSION

By studying the soil profile there was identified the soil type as brown-stagnic, stagnogleysated, moderated, baticalcaric, very profound, with clay – loamy texture, formed on disaggregation – alteration material „in situ", represented by very fine materials (clay), meso basic rocks.

Morphologically, the soil has the following profile: Ap - Ay - Byw1 - Byw2 – C

Table 1.

Physical and chemical features of brown-stagnic vertosoil

PROFILE		pH in distillated water ratio 1:2,5	Humus (%)	Total nitrogen (N %)	NI	Soluble phosphorus (p.p.m)	Soluble potassium (ppm)	Ha (me/100g soil)	EBS (me/100g soil)	V%(bases saturation degree)	Analiza granulometrică					Texture
Horizon	Sampling depth (cm)										Thick sand (> 0,2mm)	Fine sand (0,2-0,02mm)	Loam I (0,02- 0,01mm)	Loam II (0,01-0,002mm)	Colloidal clay (< 0,002mm)	
Ap	0-22	6.52	2.62	0.154	2.4	89	364	3.0	32.0	91.4	4.3	24.1	10.3	12.1	49.2	AL
Ay	22-38	7.18	1.42	0.083	1.4	16	287	1.0	42.4	97.7	1.4	24.2	9.7	13.0	51.7	AL
Byw1	38-84	7.46	0.94	0.056	0.9	6	252	0.6	46.8	98.7	1.0	23.3	8.7	12.4	54.6	AL
Byw2	84-102	7.58	0.82	0.050	0.8	5	195	0.6	52.4	98.7	1.2	24.1	9.4	11.8	53.5	AL

The soil from the studied perimeter is characterized as follows:

- pH is low acid in shallow horizons and low alkaline deeper;
- the humus content is low in upper horizon and very low below;
- the total nitrogen content is moderate in the shallow horizon and very low deeper;
- the soluble phosphorus content is very high in the shallow horizon and very low deeper;
- the soluble potassium content is very high in the first horizon and high on the soil profile;
- the texture is clay-loam;
- the global drainage is imperfect;
- the compaction is high in deeper horizons.

On the basis of analyses made for the first horizon there has been made a agro chemical characterization. A modern agriculture take account technical measures by which there is obtained the increasing of yields as follows: the mechanization of agricultural works, the fertilization, herbicide use, fungicide use along with sowing material of good quality and a good planting material.

Along with these measures there must not be neglected the climatic factors (drought, hoar-frost, frost). Between all these factors there is a close interdependency and reciprocal conditioning and any changing or restriction of any factor modifies the interdependency relation with other factors. This explains why the efficacy of fertilizers applied in the same doses to same crops is different.

Taking account of the fact that the soil functions as an open system that receives and give energy and matter, as a permanent reservoir of nutrients for plants that, once consumed must be replaced, make the anthropic intervention necessary by mineral or organic fertilization.

Table 2.

Fertilization plan in function of expected yield and soil nutrient supplying

Plot	Surface, ha	Crop		Average values on plot			Optimal Economical Doses					
							N		P2O5		K2O	
		2016	Expected yield (kg/ha)	NI	P - AL (p.p.m.)	K - AL (p.p.m)	kg / ha	Total Tones/ha active ingredient	kg / ha	Total Tones/ha active ingredient	kg / ha	Total Tones/ha active ingredient
T 8	1.00	Maize	8,000	***2.4***	***89***	***364***	**157**	0.16	**45**	0.05	**0**	0.00
T 8	1.00	Sunflower	3,500	***2.4***	***89***	***364***	**103**	0.10	**32**	0.03	**0**	0.00
T 8	1.00	Winter wheat	6,000	***2.4***	***89***	***364***	**142**	0.14	**50**	0.05	**0**	0.00
TOTAL								**0.40**		**0.13**		**0.00**

CONCLUSIONS

The differentiated and rational applying of fertilizers or manure cannot be made without knowing soil supplying with nutrients.

Taking account of soil supplying by macro nutrients and the expected yield, for the land with the surface of 1 ha we recommend the following doses of fertilizers:

- for winter wheat crop, at an expected yield of 6,000 kg/ha there are needed the following doses of active ingredients: 142 kg/ha a.i. N; 50 kg/ha a.i. P2O5 and 0 kg/ha a.i. K2O;
- for maize crop at an expected yield of 8,000 there are needed the following doses of active ingredients:157 kg/ha a.i. N; 45 kg/ha a.i. P2O5 and 0 kg./ha a.i. K2O;
- for a sunflower crop, at an expected yield of 3,500 kg/ha there are needed the following doses of active ingredients: 103 kg/ha s.a.- N; 32 kg/ha s.a. - P2O5 şi 0 kg/ha s.a. – K2O.

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