THE DETERMINATION OF THE MAIN PHYSICAL PROPERTIES OF LUVISOILS IN THE LUGOJ LOCALITY PERIMETER, TIMIȘ COUNTY, AT THE LETTUCE AND CUCUMBER CROPS

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Abstract *The paper refers to the determination of the main physical properties of luvisoils, namely the determination of density, apparent density and soil porosity of the Lugoj locality perimeter, Timis county, for the lettuce and cucumber crops over a period of two years, namely 2014 and 2015. Similar surveys have been completed by NITA L., I. Rusu, V. Stephen (1999) on haplic chernozems within SD Timisoara, by applying chemical fertilizers of different dosages in maize. The material and research methods used are the ones specific for the soil Physics laboratories. In general, the results showed close values of soil density, apparent density and porosity, during the two years of research, for the lettuce and cucumber crops. Lower values were recorded in March and higher in October, thus the soil density registered values ranging from 2.43 g/cm^3 for lettuce and 2.48 g/cm^3 for cucumbers. The soil apparent density registered values ranging from 1.12 g/cm^3 for the lettuce crop, in March 2014, and 1.20 g/cm^3, for the cucumber crop in October. The total porosity registered values of 50% for the lettuce crop in March 2014. The aeration porosity, had values of 14.40% for cucumbers during the month of March 2015. The paper is of great practical significance, because by knowing the physical properties of the soil, one can intervene, if necessary, so that the recorded values can be in accordance with the requirements of the plants. The paper also has scientific relevance, many authors consider that it is far more important to know the physical properties of soils than the chemical ones, since the latter's correction can easily be undertaken through fertilization and amendment. The work is a continuation of other studies and research achieved in soil physics, on soils with different properties, contributing to the knowledge of the properties of each type and subtype of soil, thus determining which crops are recommended for each soil, taking into account each species as well the physical properties of the studied soils.*

Key words: *soil; culture; physical properties; fertility; density; porosity*

INTRODUCTION

Generally, fertility is the result of the soil formation and evolution state, the sum of its physical composition and properties, physical, chemical and biological processes happening in the soil. Agricultural practice shows that, indeed, production capacity and therefore yields may increase, by certain measures, such as use of high-tech machinery and agricultural aggregates; use of fertilizers, amendments and control substances; works of irrigation, drainage, embankment, which prevent and combat soil erosion; improving labor and human knowledge through the application of the results of scientific research etc.

As such, the soil as an open ecologic system, is linked to the environment through a continuous flow of matter and energy. In its long evolution under the influence of natural and agricultural crop factors, the soil tends to a stationary state, characterized by equalization trends of of energy and substance imports and exports.

Problems of increasing the soil fertility state should be viewed both in terms of current requirements to increase agricultural production, improve the quality of primary production

(and not only) and increase yields in agriculture, as well as in terms of the harmonious blending of their main physical and chemical soil parameters, which are interrelated.

Faget town is located in the south-west of Romania, in the contact area of the Lugojului Plain with the Lugojului Hills on the Upper Bega.

MATERIAL AND METHODS

The luvosoil is located within the town of Faget, Timis County. On this type of ground, cucumbers and lettuce were cultivated. In this paper, we aimed to determine the main physical soil properties on soil samples collected from a natural environment at two varying depths, respectively: 0-10 and 10-20 cm in two different periods of the year, either in early spring, during March or in autumn during October. The research was conducted for two years, namely 2013 and 2014, the following analyzes being carried out, while using the following methods:

Soil density (cm3) using the pycnometer using distilled water;

The apparent density (cm3) using the metal rolls, in a natural environment;

The total porosity PT (%) was calculated using the formula:

$$PT = \left(1 - \frac{DA}{D}\right) x100$$

PA aeration porosity (%). In order to determine this calculation we used the values of hydro and physical indices:

PA = PT - CC x DA

CC - water capacity in the field.

RESULTS AND DISCUSSIONS

To calculate the density of the soil, soil samples were collected at two depths (0-10 cm and 10-20 cm), both in the first year (2013) and in the second year (2014), the data on soil density value being shown in table 1. figures 1 and 2.

Table 1.

Determination of soil density (g / cm3), the luvosoil

Crop	Month	Depth (cm)	Year	
			2013	2014
Cucumbers	March	0-10	2.42	2.43
		10-20	2.43	2.44
	October	0-10	2.45	2.46
		10-20	2.46	2.47
Lettuce	March	0-10	2.44	2.43
		10-20	2.45	2.45
	October	0-10	2.45	2.46
		10-20	2.47	2.47

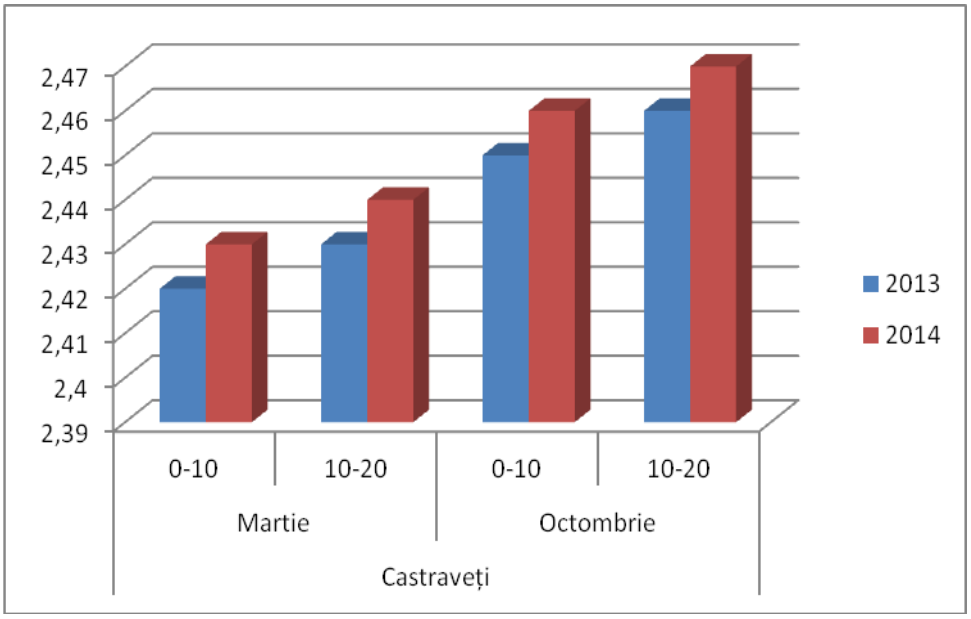

Figure 1. Determination of soil density (g / cm3), the culture of cucumber

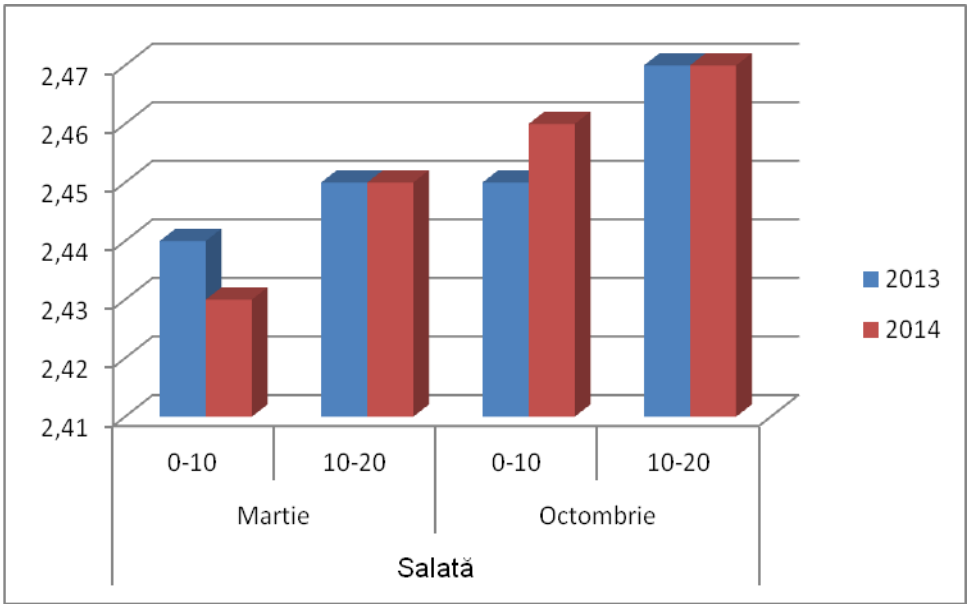

Figure 2. Determination of soil density (g / cm3), the culture of lettuce

Soil density recorded values between 2.43 g / cm3 at the 0-10 cm depth in both crops and 2.48 g / cm3 at a 10-20 cm depth, for the cucumber crop in October 2014.

The soil apparent density value is of particular importance for assessing the chemical composition and the degree of soil compaction and to determine porosity and supply various components specific to soils. In Table 2, we present the values of the apparent density.

Table 2.

Determination of the apparent density of the soil (g / cm3), the luvosoil

Cr	Month	Depth (cm)	Year	
			2013	2014
Cucumbers	March	0-10	1.15	1.14
		10-20	1.17	1.17
	October	0-10	1.18	1.17
		10-20	1.20	1.20
Lettuce	March	0-10	1.12	1.13
		10-20	1.14	1.15
	October	0-10	1.14	1.14
		10-20	1.16	1.16

Soil apparent density recorded values between 1.12 g / cm3 at a 0-10 cm depth for the lettuce crop, in March 2013, and 1.20 g / cm3 at a 10-20 cm depth, for the cucumber crop, during the month of October.

Between the apparent density and the porosity there is a correlation which can be used to classify soils in porosity classes. Soil porosity is a very important feature, because plants and microorganisms can find better living conditions only within certain limits of aeration and capillary porosity. Total porosity values are shown in Table 3 and Figures 5 and 6, and the aeration porosity values are shown in Table 4.

Table 3.

Determining soil porosity (%), the luvosoil

Crop	Month	Depth (cm)	Year	
			2013	2014
Cucumbers	March	0-10	49	47
		10-20	47	46
	October	0-10	46	45
		10-20	45	44
Lettuce	March	0-10	50	49
		10-20	48	47
	October	0-10	46	45
		10-20	44	44

The total porosity of the soil ranged between 44% for the lettuce crop at both depths, in October 2013 and 2014, and 50% in lettuce, at the depth of 0-10 cm during the month of March 2013.

Soil aeration porosity ranged between 13.30% for the lettuce crop at 10-20 cm depth, in October 2013 and 14.40% for the cucumber for the lettuce crop, at the 0-10 cm depth in the month March 2014.

Table 4.

Determination of aeration porosity (%), the luvosoil

Culture	Month	Depth (cm)	Year	
			2013	2014
Cucumbers	March	0-10	14,30	14,40
		10-20	13,70	13,90
	October	0-10	13,90	14,10
		10-20	13,40	13,30
Lettuce	March	0-10	14,20	14,30
		10-20	13,60	13,70
	October	0-10	13,80	14,10
		10-20	13,30	13,40

CONCLUSIONS

I n geographic terms, the town Faget is located in the south-west of Romania, in the contact area of the Lugojului Plain and Lugojului Hills on the Upper Bega.

From the data presented, one can draw the following general conclusions:

Soil density (D g / cm3) showed values ranging from 2.43 g / cm3, at the depth of 0-10 cm for the two crops and 2.48 g / cm3, at the depth of 10-20 cm for the cucumber crop in October 2014.

Soil apparent density (DA g / cm3), registered values ranging from 1.12 g / cm3 at the 0-10 cm depth for the lettuce crop, in March 2013, and 1.20 g / cm3 at a depth of 10- 20 cm for the cucumber crop in the month of October.

Soil total porosity (PT%) ranged between 44% for the lettuce crop at both depths, in October 2013 and 2014 and 50% for the lettuce crop, at the depth of 0-10 cm during the month of March 2013.

Soil aeration porosity (PA%) ranged between 13.30% for the lettuce crop at 10-20 cm depth, in October 2013 and 14.40%, for the cucumber crop, at the depth 0-10 cm during the month of March 2014.

In conclusion, many authors, including CHILDERS (1973), TROCME and GRAS (1977), KANIVET (1960), consider that knowledge about the physical properties of soils is much more important than of the chemical ones, whose correction can be easily undertaken through fertilization and amendment.

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