

EVALUATION OF CHERNOZEMS FROM BALTA ALBA AREA, BUZAU COUNTY

Mircea MIHALACHE, Leonard ILIE, Daniela MIHALACHE, Ana Maria GHINEA

University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Agriculture
59 Marasti Blvd, District 1, 011464, Bucharest, Romania

Corresponding author email: mihalachemircea@yahoo.com

Abstract

The research were carried to detemined influence of cultivation technologies upon physico-chemical properties of chernozems from Balta Albă, Buzău. Soil samples were collected from six plots were determined humus content, nitrogen, phosphorus and potassium supply, bulk density, total porosity and soil penetration resistance. Were recorded significant decreases of soil reaction and the phosphorus content of soil and increase the soil compactness of the area studied.

Key words: chernozem, evaluation, physico-chemical properties.

INTRODUCTION

Chernozems occupies in Romania an area around 4.2 million hectares and are considered the most productive soils, however a series of restrictive factors that may give lower yields such as: moisture deficit, soluble salts, Na high content, moisture excess derived from the ground water, low nutrients content etc.

Wide distribution area have led to the formation of several subtypes of chernozems according to Romanian System of Soil Taxonomy 2012, such as: calcic, forest, leptic, haplic, greyic, luvic, vertic, fluvic, gleyic, hyposalic, hyposodic, skeletal (Florea et al., 2012). In the last years as a result of agricultural technologies some properties of soil have been affected in a negative way - humus content, soil reaction, compaction, the degradation of structure.

Researches showed a degradation of the main physical properties under the influence of applied technology (Dumitru et al., 1999). Also, inadequate use of chemical fertilizers led to decreased reaction in the horizon from soil surface (Gata et al., 2004, 2005; Mihalache et al., 2012).

MATERIALS AND METHODS

The research were carried in 2013 to determine the influence of cultivation technologies on physico-chemical properties of chernozem

from Buzau area. For this aim were collected soil samples from six plots at 0-20 cm depth, in the disturbed and undisturbed state (with metal cylinders, 100 cm³ volume). Were made the following determinations: texture by wet sieving method, bulk density, total porosity and compaction degree.

To characterize the soil from studied area, also were collected soil samples for chemical analysis: organic carbon content, total nitrogen, C/N, phosphorus and potassium mobile content, soil reaction, electrical conductivity and nitrogen index.

Organic carbon was determined using Walkley-Black-Gogoasa method, mobile phosphorus content was evaluated by spectrophotometric molybdenum blue method, using ammonium acetate-lactate (AL) as extractive solution, at pH 3.7 (Egner-Riehm-Domingo method). The mobile form of potassium was quantified in the same extract (AL) by flame photometry technique.

Total form of nitrogen was determined using Kjeldahl method, meanwhile total phosphorus was assessed spectrophotometrically (as molybdenum blue) and potassium using flame photometry method. Nitrogen index was determined by calculation.

The reaction of soil and sewage sludge (pH) was carried out through potentiometric method, in an aqueous suspension, 1:2.5 (w/v).

RESULTS AND DISCUSSIONS

The research were carried in the Balta Albă area, located in the eastern part of the Buzau county.

The main type of soil in this area is chernozem, with a surface over 80% of the arable land (Figure 1).

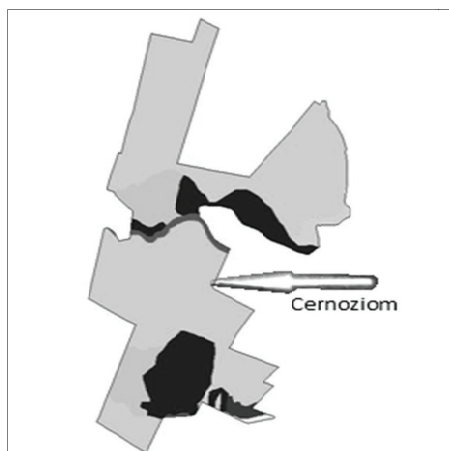


Figure 1. Chernozems distribution on the studied area

Generally, the investigated chernozems have very favorable characteristics for plant growth. The texture is loamy, with a clay contain below than 20% in the upper part of soil, has a good air and water permeability (Figure 2).

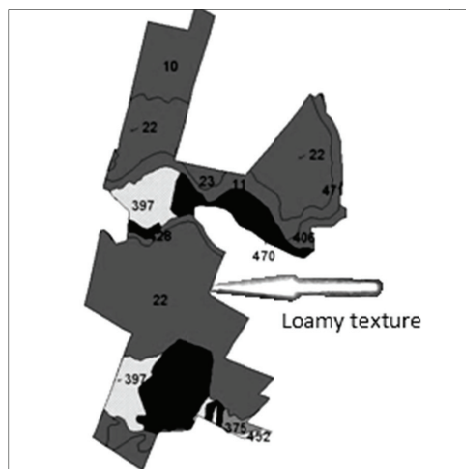


Figure 2. Texture of the investigated chernozem

The main physical properties of chernozems are presented in the Table 1.

Table 1. The main physical soil properties

Plots	Bulk density (g/cm^3)	Total porosity (%)	Compaction degree (%)	Penetration resistance (Mpa)
1	1.35	51.12	-4.51	1.29
2	1.32	50.79	-3.68	1.24
3	1.30	49.85	-1.92	1.12
4	1.42	44.12	9.72	1.65
5	1.45	46.23	5.47	1.50
6	1.37	52.11	-6.54	1.23

Soil bulk density values, to 0-20 cm depth, ranges from $1.30 \text{ g}/\text{cm}^3$ on plot no. 3 (low) to $1.45 \text{ g}/\text{cm}^3$ on plot no. 5 (medium). The soil compaction degree shows that the soil is very low on plots 1, 2, 3, 6 and low compacted on plots 4 and 5 (Hakansson, 1992).

Soil penetration resistance is ranges from low to medium, higher values are recorded in plot no. 4 (1.65 MPa) and 5 (1.50 MPa). At points where the soil is low compacted required deeper work to increase soil air porosity.

The chernozem has a surface horizon rich in humus, but the organic matter content depending on the agricultural technologies applied, it varies very widely. Humus content of the analyzed samples is average, with values between 3.12 to 3.78% and the soil humus content of plot no. 6 is medium with values of 2.94% (Figure 3).

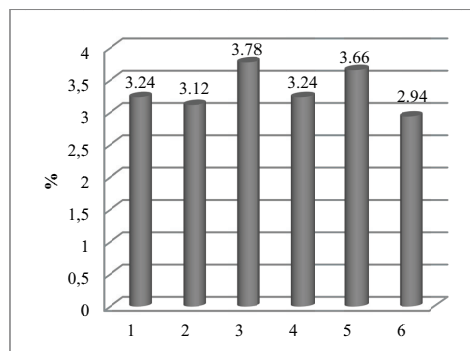


Figure 3. The humus content

Total nitrogen supply status is average, with values between 0.15-0.17%, and the plot no. 6 soil nitrogen supply is poor with the nitrogen content of 0.143% (Figure 4).

A large variation was recorded for soil phosphorus content, from 10 mg/kg to 81 mg/kg. Plots 4, 5 and 6 are very poorly supplied with phosphorus reflecting lately that have not applied phosphorus fertilizer.

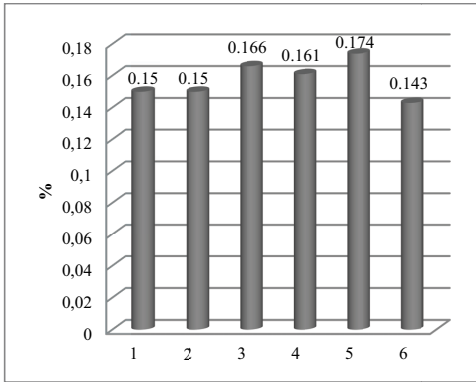


Figure 4. The total nitrogen soil content

The content of phosphorus is very good (81 mg/kg) for plot no. 1 (Figure 5).

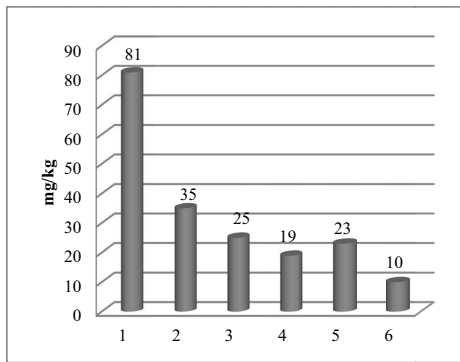


Figure 5. The phosphorus soil content

The soil potassium content is very good to plots 1 and 5 (262-264 mg/kg), and good to the other analyzed samples (177-206 mg/kg) (Figure 6).

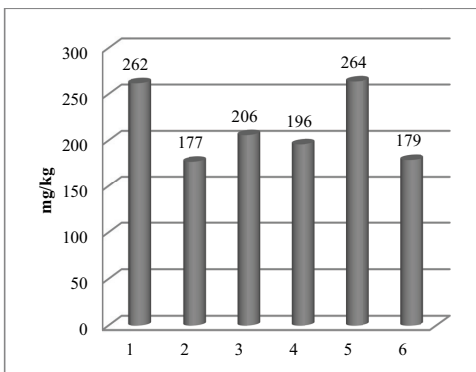


Figure 6. The potassium soil content

Although in the last period have not applied potassium fertilizer on the chernozems from the

studied area, are well supplied with the potassium.

Significant changes of soil reaction as a consequence of used nitrogen fertilizers with physiologically acid reaction were recorded on plots 2, 3, 5 and 6 (Figure 7).

On these plots should apply lime amendments and avoid further fertilization with ammonium nitrate.

In case of plots 1 and 4, the soil reaction is slightly alkaline (pH = 7.32-7.64).

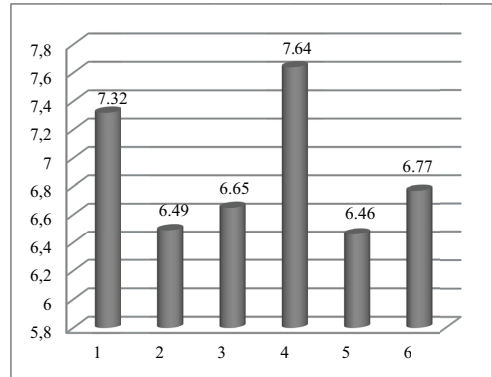


Figure 7. The soil reaction

Analysis of soluble salts show that there are not high concentration, the all soil samples has a low electrical conductivity, with values ranging from 89.8 to 136.5 $\mu\text{S}/\text{cm}$ (Figure 8).

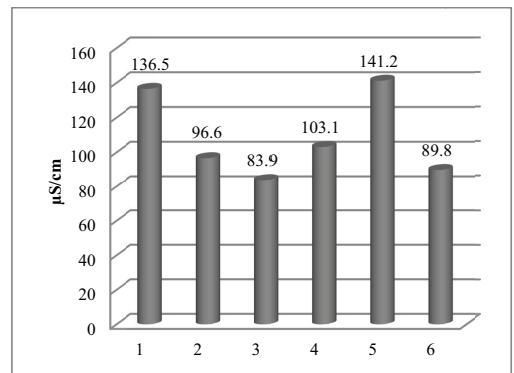


Figure 8. The soil electrical conductivity

CONCLUSIONS

The chernozems from investigated area is well supplied with humus, low supplied with phosphorus and nitrogen and the potassium content is average.

Agricultural technologies applied on the chernozems from Balta Albă area determined a decrease of soil reaction in most studied plots.

In case of plots with slightly acid reaction is necessary to apply lime amendments.

A significant increase of soil compaction degree, low total porosity of soil influence the air and water permeability.

The chernozems from studied area are classified on second class of quality, with 79 points of evaluation.

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