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RESEARCH CONCERNING THE EVOLUTION OF PHYSICAL AND CHEMICAL PROPERTIES OF REDDISH PRELUVOSOIL FROM MOARA DOMNEASCA

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Abstract

The research conducted in the experimental field from Moara Domneasca showed changes in the physical and chemical characteristics of reddish preluvosoils. The measurements of chemical characteristics (reaction, base saturation degree, hydrolytic acidity, nitrogen, phosphorus and potassium content) showed a change in the application of agricultural technologies, while there were negative changes regarding the main physical properties (bulk density, total porosity, soil permeability, penetration resistance).

INTRODUCTION

The research conducted in the experimental field from Moara Domneasca showed that the following technologies are applied to a significant downward trend from 6.2 in soil reaction 15 years ago in 2009 to 5.1-5.4, while the humus content is low to very low and N, P, K content is also medium to small. Reddish preluvosoil has a clay-loam textures that influence the bulk density, soil permeability and soil penetration resistance. To follow the changes, comparisons were made between the main soil properties determined in tests conducted in 1995 and 2009 in the fruit trees plantation and the Agrotehnics experimental field.

MATERIAL AND METHODS

The research was conducted in 2009 in the Moara Domneasca experimental field on reddish preluvosoil, and soil samples were collected in disturbed and undisturbed state the depth of 0-20 cm, 20-40 cm and 40-60 cm to determine the main chemical and physical properties of soil: soil reaction, content of humus, N, P, K, base saturation degree, hydrolytic acidity, soil texture, bulk density, soil porosity, penetration resistance and soil permeability. Soil samples were collected from the fruit trees plantation, where works were carried raising up to 40 cm and from the Agrotehnics experimental field of plowing 20 cm. Soil samples were analyzed and interpreted according with the methodology ICPA, 1987. To follow the changes in the evolution of chemical and physical properties of the reddish

preluvosoil from Moara Domneasca, the physical-chemical characteristics of the control determinations were measured in 1995 by the specialization of Pedology.

RESULTS AND DISCUSSION

The climatic conditions recorded at the Moara Domneasca area in 2009 are characterized by deviations from the characteristic average multiannual values of the area.

In 2009, rainfall was well above the normal (566.4 mm) and an average annual temperature of 12.2^0C (Figure 1). During the vegetation season, the amount of rainfalls was 357.6 mm, exceeding the average multiannual values of 118.6 mm, and an average temperature of 20.9^0C, compared to 19.2^0C as it is normal for the respective area, i.e. an increase by 1.7^0C.

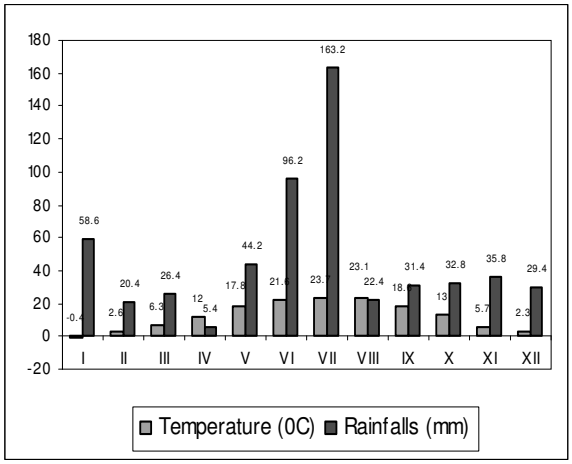

Fig. 1. Temperature and rainfalls values at the Moara Domneasca area in 2009

The analyses conducted to determine soil reaction showed a significant pH decrease of reddish preluvosoil, generally in the first 0-20 cm from 6.8 (slightly acid reaction) respectively at 5.4 and 5.2 (moderately acidic reaction). This is generally caused by mineral fertilizers with acid reaction that have long applied in the experimental field from Moara Domneasca. The closely related reddish preluvosoil pH values recorded a decrease of base saturation degree from 71.33% to 65.25 and 60.1% respectively (Figure 2).

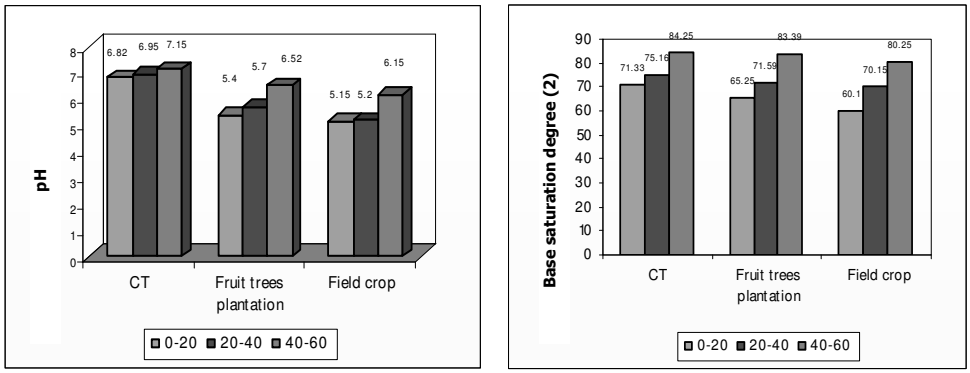

Fig. 2. Evolution of soil reaction and base saturation degree from Moara Domneasca experimental field

The decreasing base saturation degree increased the soil hydrolytic acidity from medium to high in the first 0-20 cm of soil (Figure 4). We consider that, to neutralize the acidity of reddish preluvosoil should, the apply to limestone amendments, a dose of 10-15 t/ha.

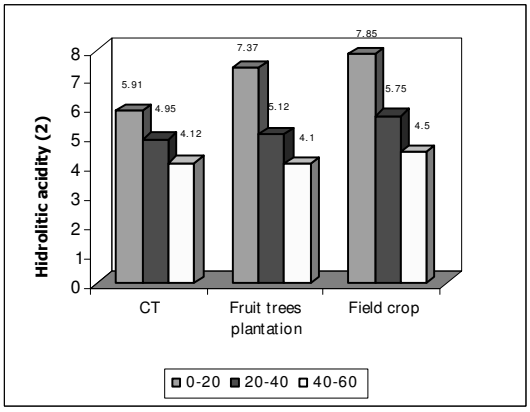

Fig. 4. The hydrolytic acidity value of reddish preluvosoil from Moara Domneasca experimental field

The organic matter content in the reddish preluvosoil is low in the first 0-20 cm and very low at 20-40 cm depth. Soil nitrogen supply is low during the first 20 cm, total nitrogen recorded low to very low at depths greater than 20 cm (Figures 5).
The state nutrient supply mobile and mobile potassium P indicates a good supply of reddish preluvosoil the first 20 cm, potassium and phosphorus content in soil is high (Figures 6).
The phosphorus and potassium content in soil has increased compared with 1995 due to mineral fertilizers applied lately to plants and fruit trees plantation.

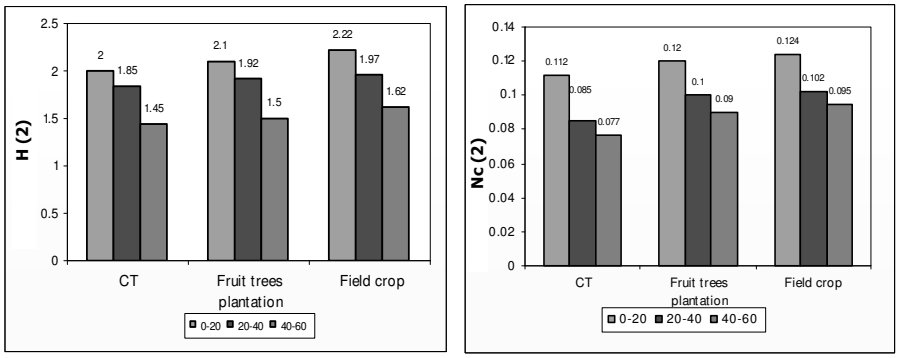

Fig. 5. The organic matter and nitrogen content of reddish preluvosoil from Moara Domneasca experimental field

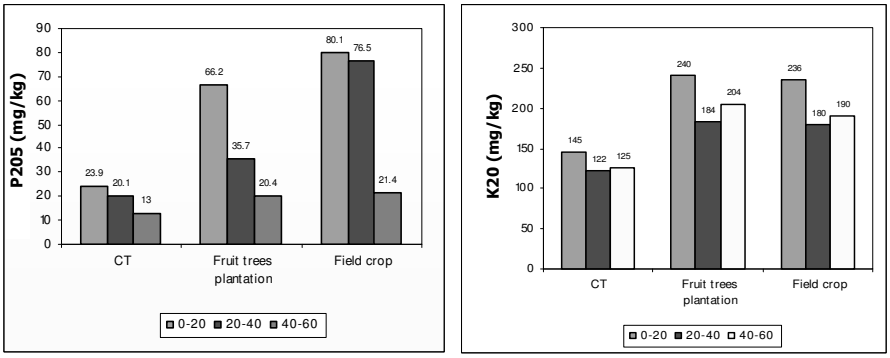

Fig. 6. The phosphorus and potassium content of reddish preluvosoil from Moara Domneasca experimental field

The physical characteristics of reddish preluvosoil are influenced generally by clay-loam texture with a clay content about 32% in the first 0-20 cm and to around 40% clay to 60 cm.

The results obtained up to 60 cm depth on the distribution of particle size fractions of sand, dust and clay showed that texture in the upper horizon (0-20 cm) is clay dust and clay on clay 20-40 cm and 40-60 cm which depth is increasing the resistance to penetration, the bulk density and total porosity decrease with increasing clay content in soil profiles (Figure 7).

The bulk density values in the fruit trees plantation indicates that the soil is non compacted the first 0-40 cm due to work performed before the fruit growing plantation establishment and in the field crops soil is non compacted in the first 0-20 cm, slight compacted between 20-40 cm and moderate compacted over the 40 cm depth.

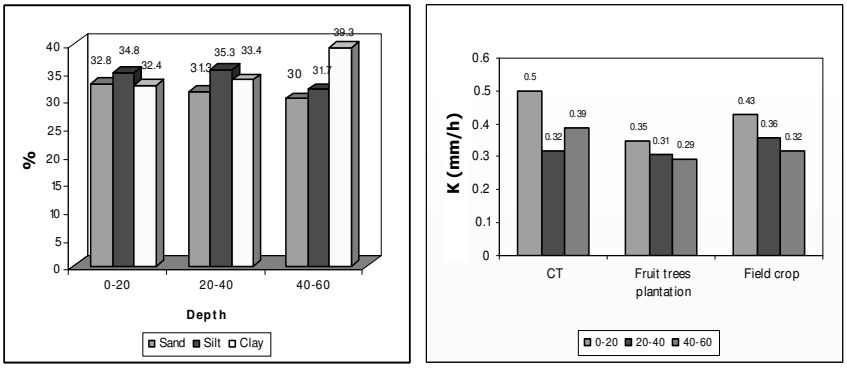

Fig. 7. The particle size distribution and soil water permeability of the reddish preluvosoil located at Moara Domneasca

The total porosity of reddish preluvosoil have higher values in growing trees and small to medium values of field crops which were recorded and higher values of bulk density (Figure 8).

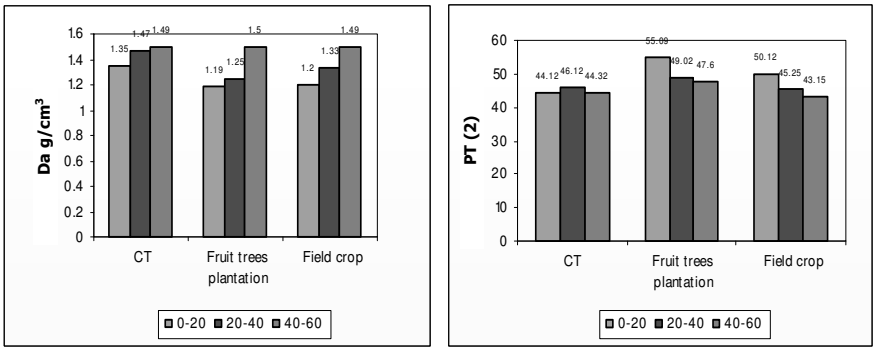

Fig. 8. The bulk density and total porosity of the reddish preluvosoil from Moara Domneasca experimental field

Soil penetration resistance has small amounts of fruit trees plantation and higher values in the experimental field due to higher values of bulk density and lower of total porosity. The penetration resistance values are affected by increasing clay content and the soil moisture profile. The value obtained 0.8-1 MPa, not adversely affect plant root system development (Figure 9). Under the pronounced decrease in soil moisture below 10% penetration resistance of reddish preluvosoil can touch around 2 MPa to 30-40 cm depth, which is a limiting factor for the development of plant root system.

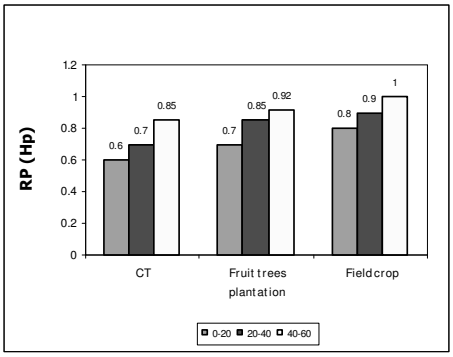

Fig. 9. Soil penetration resistance for management systems (July 2009)

CONCLUSIONS

1. The Reddish Preluvosol from the Moara Domneasca experimental field has a low humus content between 2.1-2.2% the first 20 cm.
2. Lately, reddish preluvosoil reaction underwent significant changes in the application of agricultural technology with values between 5.2-5.4, moderate acid reaction.
3. The decreased reaction and increase the hydrolytic acidity requires the application of limestone amendments.
4. The clay-loamy texture of soil determine a reduced of soil permeability which favors rain water stagnation on soil surface. To increase the soil permeability and disposal of soil compactation should apply organic fertilizers and agricultural work done during the optimum moisture.
5. Soil penetration resistance was reduced less than 1 MPa because there was an additional moisture during May-June when the tests were conducted.

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