

EVALUATION OF PHYSICAL AND CHEMICAL ATTRIBUTES IN SOIL OF THE APODI PLATEAU, CEARÁ, BRAZIL

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ABSTRACT: Soil attributes analyses can provide important for the sustainable planning of its natural resources and agricultural production. The objective of this work was to evaluate the physical and chemical attributes of a Cambisol of Apodi Plateau, Ceará, Brazil for the purpose of diagnosing fertility. For the present research, soil samples were collected from a native area of Apodi Plateau, Ceara, in the depth 0 – 0,20 m. The analyzes carried out in the laboratory were chemical: pH, electrical conductivity, organic matter, organic carbon, contents of nitrogen, phosphorus, potassium, calcium, magnesium, sodium, hydrogen and aluminum, sum of bases, cation exchange capacity, base saturation, aluminum saturation, exchangeable sodium percentage, and physical analyses: sand, silt, clay and natural clay. Five repetitions were performed for evaluation of parameters. The analyzes were carried out in the Soil and Water laboratory, Federal University of Ceará. With the physical parameters evaluated, it was also possible to identify the soil texture. In general terms, the soil presents good natural fertility, without risks of salinity and sodicity or impediment to infiltration, corroborating with characteristics intrinsic to the soils of the Cambisol class.

KEYWORDS: fertility, classification, characterization.

AVALIAÇÃO DE ATRIBUTOS FÍSICOS E QUÍMICOS EM SOLO DA CHAPADA DO APODI, CEARÁ, BRASIL

RESUMO: A análise dos atributos dos solos pode fornecer importantes informações para o planejamento sustentável dos seus recursos naturais e produção agrícola. Objetivou-se com esse trabalho avaliar os atributos físicos e químicos de um Cambissolo da Chapada do Apodi – Ceará, Brasil, para fins de diagnóstico de fertilidade. Para a presente pesquisa, foram coletadas amostras de solo de uma área nativa da Chapada do Apodi. As análises realizadas em

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laboratório foram químicas: pH, condutividade elétrica, matéria orgânica, carbono orgânico, teores de nitrogênio, fósforo, potássio, cálcio, magnésio, sódio, hidrogênio e alumínio, alumínio, soma de bases, capacidade de troca de cátions, saturação por base, saturação por alumínio, porcentagem de sódio trocável, e análises físicas: areia grossa, areia fina, silte, argila e argila natural. Cinco repetições foram realizadas. As análises foram realizadas no laboratório de Solo e Água, pertencente a Universidade Federal do Ceará. Com os parâmetros físicos avaliados também foi possível identificar a textura do solo. Em termos gerais o solo apresenta boa fertilidade natural, sem riscos de salinidade e sodicidade ou impedimento a infiltração, corroborando com as características intrínsecas aos solos da classe dos Cambissolos.

PALAVRAS-CHAVE: fertilidade, classificação, caracterização.

INTRODUCTION

Knowledge about physical changes and soil quality is important for the proper targeting of management strategies to be used when exploiting the soil by agricultural crops (ALENCAR et al., 2015). Studying the dynamics of soil properties is an important process in areas where the soil is subjected to different practices, as it can indicate management alternatives in addition to allowing estimates of responses of soil attributes (SANTOS et al., 2009).

The expansion of the agricultural area in Brazil is a fact. In this way, new areas have been incorporated into the agricultural production system, with this, the replacement of natural forests with annual and perennial crops has become an increasingly common (MOTA et al., 2015).

The Apodi Plateau is characterized as an important agricultural pole in the state of Ceará, Brazil. In this region, the soil classes of the Cambisols type are found, in a complex occurrence (BARROSO et al., 2012). For Jacomine (2001), Cambisol can be imperfectly drained and good drained with great variation in texture and their chemical properties depend on the source material and the climate.

The Apodi Plateau is inserted in the Potiguar Basin. The emerged part of the Potiguar Basin displays Jandaíra rock formations. The Jandaíra formation is characterized by the presence of calcite and dolomite, fine to medium grain limestones, which may be inter-bedded with cross-stratified sandy horizons (MOTA et al., 2008).

Although these soils are good for agricultural exploitation, it is necessary to monitor all factors related to them, to avoid environmental problems and drop in crop production. The

objective of this work was to evaluate the physical and chemical attributes of a Cambisol of Apodi Plateau in native forest, for the purpose of diagnosing your fertility.

MATERIAL AND METHODS

The soil was collected in area located in Apodi Plateau in city Limoeiro do Norte, 198 km away from the city Fortaleza, in the multinational Del Monte Fresh Produce, where there is production of various fruits. The collection was carried out from a native forest, existing in the area belonging to the company before the rainy season (Figure 1).



Figure 1. Place of collection of soil samples for physical and chemical characterization. Source: Autora (2015).

The soil used in this study is classified as Eutrophic Haplic Cambisol, according to the Brazilian Soil Classification System (EMBRAPA, 1997).

For soil collection, the vegetation cover was removed and afterwards and soil in the depth 0-0.20 m was collected. The samples were placed in plastic bags with a capacity of approximately 60 kg. After, they were transported to the greenhouse of the Department of Soil Science at the Federal University of Ceará. Subsequently, the samples were air dried and passed through a 2 mm mesh sieve.

The analyzes carried out in the laboratory were chemical: pH, electrical conductivity, organic matter, organic carbon, contents of nitrogen, phosphorus, potassium, calcium, magnesium, sodium, hydrogen and aluminum, sum of bases, cation exchange capacity, base saturation, aluminum saturation, exchangeable sodium percentage, and physical: sand, silt, clay and natural clay, according to the methodology suggested by Silva (2009).

The analyzes were carried out in the Soil and Water Laboratory, Federal University of Ceará. With the physical parameters evaluated, it was also possible to identify the soil texture. The values of the parameters were evaluated accordingly with results and classifications existing in literature.

RESULTS AND DISCUSSION

The physical and chemical attributes obtained in the analysis of soil samples from the 0 – 0, 20 m depth are shown in Table 1.

Table 1. Physical and chemical characteristics of the evaluated samples soil.

Chemical attributes	
pH (H ₂ O)	6,6
Organic matter (g kg ⁻¹)	27,68
Organic carbon (g kg ⁻¹)	16,06
Nitrogen (g kg ⁻¹)	1,65
Electrical Conductivity (dS m ⁻¹)	0,26
Phosphorus (mg kg ⁻¹)	18
Sodium (cmol _c kg ⁻¹)	0,16
Potassium (cmol _c kg ⁻¹)	0,36
Calcium (cmol _c kg ⁻¹)	6,30
Hydrogen + Aluminum (cmol _c kg ⁻¹)	2,31
Aluminum (cmol _c kg ⁻¹)	0,10
Cation - exchange capacity (%)	11,5
Base Saturation (%)	80
Aluminum Saturation (%)	1
Exchangeable Sodium Percentage (%)	1
Physical attributes	
Sand (g kg ⁻¹)	515
Silt (g kg ⁻¹)	173
Clay (g kg ⁻¹)	312
Natural clay (g kg ⁻¹)	212

The classification of the interpretation of the results of the determined physical and chemical parameters, according to Emater (1979); Mello (1983); Richards (1954); and Embrapa (1988) are shown in Table 2.

Table 2. Interpretation of the results of the physical and chemical analyzes of the evaluated soil.

Attributes	Interpretation
pH (H ₂ O)	<i>Practically neutral</i>
organic matter (g kg ⁻¹)	<i>High</i>
electrical conductivity (dS m ⁻¹)	<i>not saline</i>
phosphorus (mg kg ⁻¹)	<i>medium</i>
potassium (cmol _c kg ⁻¹)	<i>medium</i>
calcium (cmol _c kg ⁻¹)	<i>High</i>
sum of bases (%)	<i>High</i>
cation exchange capacity (%)	<i>High</i>
base saturation (V%)	<i>High</i>
exchangeable sodium percentage	<i>not sodic</i>
Textural Classification	<i>sandy clay - loam</i>

The Cambisols are characterized by little weathering, resulting in high cation exchange capacity, corroborating the result found in this study.

Base saturation resulted in value > 50%, classifying the soil as eutrophic. High value for base saturation (%) and sum of bases (%) is a fact also noted by Girão et al. (2014).

The high concentration of Ca²⁺ can be explained for limestone as its parent material. Despite this, the pH of the saturation extract resulted in values close to neutrality. These results corroborate with found by Lopes et al. (2012).

The electrical conductivity resulted in 0.26 dSm^{-1} and exchangeable sodium percentage was less than 15%. Due to the values, it can be inferred that the studied soil does not have salinity problems in the referred depth analyzed. Therefore, it is expected that cultivated plants do not develop toxicity problems or find an impediment to root growth. Similar results were found for Meireles et al. (2003) in Cambisol collected in native forest.

The parameters cation exchange capacity and organic matter resulted in values high. Given this result, it assumes that the soil has good fertility for agricultural activity. It is suggested that corrections be made considering the content of micronutrients.

CONCLUSION

Base saturation resulted in value $> 50\%$. The high concentration of Ca^{2+} can be explained has limestone as its parent material. The electrical conductivity resulted in 0.26 dSm^{-1} and exchangeable sodium percentage was less than 15%. The pH of the saturation extract resulted in values close to neutrality. The ability to exchange cations and the sum resulted in high values.

In general terms, the soil presents good natural fertility, without risks of salinity and sodicity or impediment to infiltration, corroborating the characteristics intrinsic to the soils of the Cambisol class.

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