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INFLUÊNCIA DE MANEJOS NOS ATRIBUTOS QUÍMICOS DO SOLO NA COMUNIDADE SÃO DOMINGOS

JOÃO VICTOR RODRIGUES SOUSA[1]; MARIA CRISTINA MARTINS RIBEIRO DE SOUZA[2]; JOILSON SILVA LIMA[3]; FRANCISCO WALISSON DO NASCIMENTO COSTA[4] E PEDRO HENRIQUE ELEOTERIO DE ASSIS[5]

[1]Graduando Bacharelado em Agronomia, IFCE/Campus Sobral, Av.Dr. Guarany,317-Derby Clube, CEP.62042-030, Sobral-CE, Brasil https://orcid.org/0009-0008-7996-550, e-mail: victor.rodrigues61@aluno.ifce.edu.br
[2]Professora do IFCE/Campus Sobral, Av.Dr. Guarany,317-Derby Clube, CEP.62042-030,Sobral-CE,Brasil, https://orcid.org/0000-0001-9094-6585,Sobral-CE,Brasile-mail: cristina2009@ifce.edu.br
[3] Engenheiro Agrônomo do IFCE/ Campus Sobral, Av.Dr. Guarany,317-Derby Clube, CEP.62042-030,Sobral-CE,Brasil, https://orcid.org/0000-0001-8312-0005, e-mail: joilson.lima@ifce.edu.br
[4] Graduando em Agronomia, IFCE/Campus Sobral, Av.Dr. Guarany,317-Derby Clube, CEP.62042-030, Sobral-CE, Brasil,https://orcid.org/0009-0007-6133-7247 , e-mail:francisco.walisson.nascimento08@aluno.ifce.edu.br
[5]Mestre em Geografia vinculado ao Programa de Pós-Graduação em Geografia PROPGEO/UVA,Av. da Universidade 850, Sobral-CE,Brasil, https://orcid.org/0000-0002-7404-4167 ,e-mail: pedrosaodomingo345@gmail.com

RESUMO: O objetivo deste trabalho foi analisar a influência de diversos manejos edáficos nos atributos químicos do solo buscando as causas e consequências do processo do uso inadequado destes e as possíveis causas da degradação em área de produtores na comunidade de São Domingos-Sobral-Ce. O experimento foi composto por 3 tratamentos (parcelas):composto por áreas preservadas, manejo convencional do e manejo mínimo do solo. Para a avaliação da fertilidade dos solos, foram coletadas amostras e a realização da análise química no laboratório de Análise de Solos e Água para a irrigação do IFCE - Campus de Sobral. O uso dos manejos empregados tem influência nos processos e provocou alterações nos atributos químicos do solo.

Palavras-chave: Tratamentos, Fertilidade, Produtores

INFLUENCE OF MANAGEMENT ON SOIL CHEMICAL ATTRIBUTES IN THE SÃO DOMINGOS COMMUNITY

ABSTRACT: The objective of this work was to analyze the influence of several types of soil management practices on the chemical attributes of the soil, determine the causes and consequences of the process of inadequate use of these materials and the possible causes of degradation in the area of producers in the community of São Domingos Sobral-CE. The experiment consisted of 3 treatments (plots): preserved areas, conventional soil management and minimal soil management. For the evaluation of soil fertility, samples were collected, and chemical analysis was carried out in the Laboratory of Soil and Water Analysis for Irrigation of the IFCE - Sobral Campus. The use of management has an influence on processes and causes changes in the chemical attributes of the soil.

Keywords: Treatments,Fertility,Producers

1 INTRODUCTION

It is estimated that by 2100, the world population will surpass the 10.0 billion mark, reflecting a greater global demand for food and consequently intensive land use (ONU, 2017). However, production to meet this demand must be based on sustainable agricultural production systems aimed at promoting low environmental impacts (Sarkar *et al.*, 2017) and (Rakshit, 2019). Thus, the growing global demand for food requires that degraded lands be used for agricultural production through ecological practices (Abhilash *et al.*, 2016) and (Sarkar *et al.*, 2017), such as monitoring the chemical, physical and biological qualities of the soil system.

Soil quality monitoring allows for better

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planning for the implementation of soil and water management and conservation practices, which contributes to improving the environmental quality of the soil system (Lanillo *et al.*, 2013). According to Embrapa (2003), soil management consists of simple and indispensable practices for the good development of crops and includes a set of techniques that, when used rationally, provide high productivity but, if used incorrectly, can lead to soil degradation in the short term.

The study of soil attributes over time allows us to quantify the magnitude and duration of changes caused by different management systems. Because they are sensitive, these attributes are important for determining whether there has been degradation or improvement in soil quality in relation to a given management system (Reichert *et al.*, 2009).

Thus, the objective of this work was to evaluate the influence of management on the chemical attributes of the soil, determine the causes and consequences of the process of inadequate use of these materials and the possible causes of degradation in producer areas in the community of São Domingos - Sobral -Ce.

2 MATERIALS AND METHODS

The area in question is located at the community site of São Domingos, a community composed of family farmers and small animal breeders located in the municipality of Sobral, State of Ceará. The geographic coordinates of the area are 330273.00 m E (east) and 9580202.00 m S (south). The local lithology consists of rocks belonging to the Jaibaras groups, with the Pacujá Formation, with a predominance of sandstones intercalated with siltstones and claystones where Litholic Neosols generally occur (Gomes; Carvalho; Falcão Sobrinho, 2021). Four (four) agricultural properties in the rural area of the community of São Domingos - Sobral - Ceará were selected for the study. The experimental design was randomized blocks, with the treatments organized in a plot subdivided by space. The first plot included the management practices presented in Table 1.

Table 1. Description of the management applied

Treatments	Description
Conventional Management	Cultivated areas where conventional soil management was carried out by four producers without performing soil analysis and without recommending fertilization and liming and without irrigation management, cultivated only in winter seasons.
Minimum Management	Cultivated areas where minimum soil management by four producers was carried out, with the application of organic or chemical fertilizers, and/or soil correction with some recommendation made by technicians, agronomists or indication made by the reseller where the inputs are purchased and with irrigation management
Preserved Areas	Preserved areas with forest fragments (not used for agricultural production) or virgin or rest areas in the last 3 years, in the four areas selected for the study.

Source: Author himself (2023)

The second subplot will be at the depths of soil sample collection (0–20; 20–40 cm). Four replicates (producer areas) were used. A total of 24 soil samples were collected. After the samples were collected, they were dried in a forced-air oven at 150°C and then labeled and sieved for weighing on a semianalytical scale with a precision of 0.01 g, thus beginning the chemical analyses carried out in the Soil and Water Analysis Laboratory for Irrigation at the IFCE - Sobral Campus.

The chemical analyses included the following: soil reaction (pH) in water and potassium chloride (KCl 1 mol L^{-1}). For this determination, a soil:liquid ratio of 1:2.5 was used, according to Teixeira *et al. (2017).* The

soil electrical conductivity (EC) of the extract obtained from the saturation paste was determined via direct measurement with a conductivity meter. The exchangeable calcium (Ca^{2+}) and magnesium (Mg^{2+}) cations were extracted with potassium chloride (KCl 1 mol L^{-1}), and the determination of calcium (Ca^{2+}) and magnesium (Mg^{2+}) contents was performed via complexometry, according to Teixeira (2017). With the data in hand, normality was initially verified via the Shapiro–Wilk test at 5%. The data were subsequently subjected to analysis of variance and Tukey's mean test at 5% significance. All analyses were performed via the software R: A Language and Environment for Statistical Computing, R version 4.3.2 (R Core Team, 2023) with the packages AgroR: Experimental Statistics and Graphics for Agricultural Sciences, version 1.3.5 (Shimizu; Marubayashi; Goncalves, 2023).

3 RESULTS AND DISCUSSION

According to the results in Table 1, no significant effect was found for the interaction between management and depth; however, a significant difference was observed for the management factor.

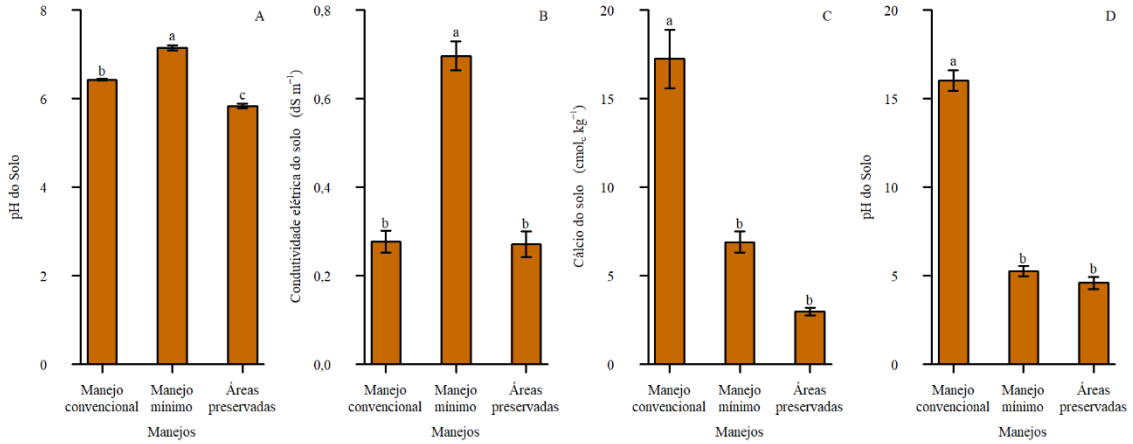
Table 1. Summary of the analysis of variance for the variables pH, electrical conductivity, soil calcium and magnesium with the values of mean square, degrees of freedom (GL), coefficient of variation (CV) for depth (Prof) and management factors.

Sources Variation	GL	Mean Square			
		pH	EC	Here	Mg
Prof	1	0.0002 ns	0.0262 ns	1.92 ns	4.50 ns
Block.	3	0.0244 ns	0.0490 *	38.00 **	2.00 ns
Error	3	0.0585	0.0047	0.29	3.07
Management	2	3.4620 **	0.4751 **	434.25 **	329.07 **
Prof x Management	2	0.0289 ns	0.0091 ns	13.77 ns	6.42 ns
Error(b)	12	0.0463	0.0119	24.41	3.59
CVa (%)		3.74	16.65	6.01	20.35
CVb (%)		3.33	26.37	54.74	22

*F value significant at the 5% level; **F value significant at the 1% level; ^{ns} F value not significant (P >0.05).
Source: Author himself (2023)

On average, the pH value of the areas under minimum soil management remained neutral, whereas the values for the other management systems presented a more acidic pH (Figure 1A). Soil acidity is caused mainly by the washing of Ca and Mg from the soil by rainwater or irrigation, especially in sandy soils, and by the removal of nutrients by crops (Novais; Smyth; Nunes, 2007).

Figure 1. Influence of management on pH (A), soil electrical conductivity (B), soil calcium (C) and soil magnesium (D).



The means followed by the same lowercase letter do not differ from each other according to the Tukey test.
Source: Author's own (2023)

Minimum soil management caused an increase in soil electrical conductivity in relation to the other treatments, possibly due to the resulting use of fertilization and soil corrections (Figure 1B). The areas where conventional management was used presented relatively high levels of calcium (Ca) and magnesium (Mg) (Figure 1C and D); these results are possibly related to the use of the technique of burning dead vegetation. In a study carried out by Sampaio *et al*. (2003), the burning procedure consumed 36.3% of the initial biomass and produced 5.5 Mg ha $^{-1}$ ash with significant amounts of nutrients, especially Ca, Mg and K. Since plants absorb only mineralized nutrients, it is natural for them to grow more quickly in burned areas.

4 CONCLUSIONS

On the basis of these results, all management methods influence the soil, but minimum management is the most appropriate method for sustainable agricultural practices. It offers a balance between productivity and conservation, ensuring less environmental impact and preserving soil resources. On the other hand, conventional management, despite its initial benefits, has negative impacts in the medium and long term, while preserved areas are essential for maintaining ecological balance. It was concluded that all management methods directly influenced the chemical attributes of the soil, causing changes and alterations in its processes.

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