

Soil evaluation for pineapple cultivation (*ananás comosus*) in the municipality of Teotônio Vilela, Alagoas**Avaliação do solo para cultivo de abacaxi (*ananás comosus*) no município de Teotônio Vilela, Alagoas**

DOI:10.34117/bjdv5n11-016

Recebimento dos originais: 07/10/2019

Aceitação para publicação: 01/11/2019

Cosme Ângelo da Silva

Agronomy course student at Federal University of Alagoas (UFAL), Center of Agrarian Sciences (CECA), Rodovia Br 104, s/n – km 85, Rio Largo, AL, CEP: 57072-97, Brazil.

E-mail: ccosmo92@hotmail.com

Aldo Luiz Maximino Romeiro

Forest Engineering student at Federal University of Alagoas (UFAL), Center of Agrarian Sciences (CECA), Rodovia Br 104, s/n – km 85, Rio Largo, AL, CEP: 57072-97, Brazil.

E-mail: aldo.luiz18@gmail.com

Thamyres Valeriano Teixeira

Animal Science Student at Federal University of Alagoas (UFAL), Center of Agrarian Sciences (CECA), Rodovia Br 104, s/n – km 85, Rio Largo, AL, CEP: 57072-97, Brazil.

E-mail: thamyres.valeriano@hotmail.com

Maria José de Holanda Leite

Teacher of Federal University of Alagoas (UFAL), Center of Agrarian Sciences (CECA), Rodovia Br 104, s/n – km 85, Rio Largo, AL, CEP: 57072-97, Brazil.

E-mail: maryholanda@gmail.com

Pedro Henrique de Melo Cavalcante

Agronomy course student at Federal University of Alagoas (UFAL), Center of Agrarian Sciences (CECA), Rodovia Br 104, s/n – km 85, Rio Largo, AL, CEP: 57072-97, Brazil.

Roberta Patrícia de Sousa Silva

Postgraduate student in Forest Sciences, Federal University of Campina Grande (UFCG), Rural health and Technology Center (CSTR), Av. universitária, s/n, Bairro – Santa Cecília, Patos-PB, CEP:58708-110, Brazil.

E-mail: robertapatriciasousa1@hotmail.com

Sérvio Túlio Pereira Justino

Postgraduate student in Forest Sciences, Federal University of Campina Grande (UFCG), Rural health and Technology Center (CSTR), Av. universitária, s/n, Bairro – Santa Cecília, Patos-PB, CEP:58708-110, Brazil.

E-mail: serviojustino@outlook.com

Gabriela Gomes Ramos de Sousa

Postgraduate student in Forest Sciences, Federal University of Campina Grande (UFCG), Rural health and Technology Center (CSTR), Av. universitária, s/n, Bairro – Santa Cecília, Patos-PB, CEP:58708-110, Brazil.

E-mail: gabrielaagomees@gmail.com

Ediglécia Pereira de Almeida

Postgraduate student in Forest Sciences, Federal University of Campina Grande (UFCG), Rural health and Technology Center (CSTR), Av. universitária, s/n, Bairro – Santa Cecília, Patos-PB, CEP:58708-110, Brazil.

E-mail: ediglecia.almeida@hotmail.com

Amanda de Lira Freitas

Postgraduate student in Forest Sciences, Federal University of Campina Grande (UFCG), Rural health and Technology Center (CSTR), Av. universitária, s/n, Bairro – Santa Cecília, Patos-PB, CEP:58708-110, Brazil.

E-mail: amanda.27.lira@gmail.com

Nathany Alves de Andrade

Postgraduate student in Forest Sciences, Federal University of Campina Grande (UFCG), Rural health and Technology Center (CSTR), Av. universitária, s/n, Bairro – Santa Cecília, Patos-PB, CEP:58708-110, Brazil.

E-mail: nathanyandradee@gmail.com

Elisson Teixeira da Silva

Agronomy course student at Federal University of Alagoas (UFAL), Center of Agrarian Sciences (CECA), Rodovia Br 104, s/n – km 85, Rio Largo, AL, CEP: 57072-97, Brazil.

E-mail: elisson.teixeira@gmail.com

Patrícia da Silva Santos

Agronomy course student at Federal University of Alagoas (UFAL), Center of Agrarian Sciences (CECA), Rodovia Br 104, s/n – km 85, Rio Largo, AL, CEP: 57072-97, Brazil.

E-mail: p.fera.pp@gmail.com

ABSTRACT

Soil fertility is one of the crucial factors for agriculture, which has as its main objective the increase of its production. This is why it is extremely important to know the nutritional requirement of the cultivar. The present study aimed to evaluate soil fertility in the municipality of Teotônio Vilela – Alagoas, in the Laudelino farm, emphasizing the quantification of the nutrients needed to guarantee the agricultural productivity for the pineapple crop (*Ananás comosus*). For this purpose, a random sampling of soil was initiated in the area 1.0 hectare in the layer of 0-20 cm of depth. Fifteen samples were collected (each sample with approximately 0.5 DM³ of soil) from simple collection were mixed to compose a single composite sample and, from this, 1.0 kg of soil was withdrawn for posterior soil fertility analyses. Carried out in the soil Laboratory of the Agrarian Sciences Center (ECSC) of the Universidade Federal de Alagoas (UFAL) located in the municipality of Rio Largo, AL. We analyzed the potential hydrogenionic (pH), phosphorus (P) and potassium (K +) accessible; Calcium (Ca + 2) and magnesium (Mg + 2) exchangeable; Exchangeable aluminum saturation (m%), CTC cation exchange capacity at pH 7.0 (T); Base sum (V%) and Organic matter (OM). It was observed that the results showed the following values: Ca + 2 contents (3.42 Cmolc/DM³), CTC (T) (10.73 Cmolc/DM³); K + (110 mg/DM³), Mg + 2 (2.53 Cmolc/DM³), Al + 3 (0.03 Cmolc/DM³), MO (14.1 g/kg), P (5.0 mg/DM³), M% (0.0), pH (5.6) and V% (59.0). From the results found, it is concluded that it will not be necessary to apply limestone to increase the base saturation to 60%, because 59% as found in the soil already satimakes nutritional need of the culture in question. In addition to this correction, it

is also recommended the dosage of 160 kg of P₂O₅ and 40 kg of nitrogen (N) per hectare, through the incorporation in the soil of 800 kg/ha in the formulation 05-20-0. However, organic fertilization between 30 and 50 t/ha of curable corral manure, if possible 30 days before planting can elevate redendimento of the cultivar. It is noteworthy that its application is inexpensive to the culture by promoting better development to the plant and the fruit.

Key words: fertilization, fertilization, nutrients, productivity.

RESUMO

A fertilidade do solo é um dos fatores cruciais para a agricultura, que tem como principal objetivo o aumento de sua produção. É por isso que é extremamente importante conhecer as necessidades nutricionais da cultivar. O presente estudo teve como objetivo avaliar a fertilidade do solo no município de Teotônio Vilela - Alagoas, na fazenda Laudelino, enfatizando a quantificação dos nutrientes necessários para garantir a produtividade agrícola da cultura do abacaxi (*Ananás comosus*). Para tanto, foi iniciada uma amostragem aleatória do solo na área de 1,0 hectare na camada de 0-20 cm de profundidade. Quinze amostras foram coletadas (cada amostra com aproximadamente 0,5 DM³ de solo) da coleta simples foram misturadas para compor uma única amostra composta e, desta, 1,0 kg de solo foi retirado para análises posteriores da fertilidade do solo. Realizado no laboratório de solo do Centro de Ciências Agrárias (CECA) da Universidade Federal de Alagoas (UFAL), localizado no município de Rio Largo, AL. Foram analisados os potenciais hidrogeniônicos (pH), fósforo (P) e potássio (K⁺) acessíveis; Cálcio (Ca²⁺) e magnésio (Mg²⁺) permutáveis; Saturação de alumínio intercambiável (m%), capacidade de troca catiônica CTC a pH 7,0 (T); Soma base (V%) e matéria orgânica (MO). Observou-se que os resultados mostraram os seguintes valores: conteúdo de Ca²⁺ (3,42 Cmolc / DM³), CTC (T) (10,73 Cmolc / DM³); K⁺ (110 mg / DM³), Mg²⁺ (2,53 Cmolc / DM³), Al³⁺ (0,03 Cmolc / DM³), MO (14,1 g / kg), P (5,0 mg / DM³), M % (0,0), pH (5,6) e V% (59,0). A partir dos resultados encontrados, conclui-se que não será necessário aplicar calcário para aumentar a saturação por base para 60%, pois 59% encontrados no solo já saturam a necessidade nutricional da cultura em questão. Além dessa correção, recomenda-se também a dosagem de 160 kg de P₂O₅ e 40 kg de nitrogênio (N) por hectare, através da incorporação no solo de 800 kg / ha na formulação 05-20-0. Entretanto, a adubação orgânica entre 30 e 50 t / ha de esterco curável, se possível 30 dias antes do plantio, pode elevar o rendimento da cultivar. Vale ressaltar que sua aplicação é indissociável à cultura, promovendo melhor desenvolvimento da planta e do fruto.

Palavras-chave: fertilização, fertilização, nutrientes, produtividade.

1 INTRODUCTION

High yields of pineapple depends on good fertility or a well-programmed fertilization plan (TEIXEIRA et al., 2002; SPIRONELLO et al., 2004), since the culture demands large amounts of nutrients and variable factors in the Edaphic function, management practices, soil conservation, cultivation, planting density adopted (SILVA, 2006). Most of the productivity is carried out by small farmers with (< 5 ha) without irrigation with adapted cultivars.

Potassium and nitrogen are the nutrients required in greater quantities by the culture cited for performing isolated functions and important role in the development, growth, productivity and quality of the fruit (RAZZAQUE; HANAFFI, 2001; VELOSO et al., 2001; TEIXEIRA et al., 2002; MALEZIEUX; BARTHOLOMEW, 2003; SPIRONELLO et al., 2004; SOARES et al., 2005).

Although its success is motivated by several factors such as, by the sources, doses, forms and times of application of the fertilizer used in the fertilization (CHOAIRY et al., 1990; RAZZAQUE; HANAFFI, 2001; TEIXEIRA et al., 2002; SPIRONELLO et al., 2004; SOARES et al., 2005; TEIXEIRA et al., 2011).

Based on the premise that the fertilizer recommendations for agricultural crops have been shown to be efficient, because it comprehensively encompasses the highest number of responses involved in the crop to fertilizer levels (OLIVEIRA et al., 2005), which allows for greater Efficiency and performance in the improvement of the cultivar (SANTOS et al., 2008).

Thus, the aim is to evaluate the level of soil fertility for recommendation of fertilization and or liming for pineapple crop in the municipality of Teotônio Vilela, AL.

2 MATERIAL AND METHODS

2.1 CHARACTERIZATION OF THE STUDY AREA

The present work was conducted in the city of Teotônio Vilela, AL along with students and professors in the period of 2019, which supported the supply of technical reports of soil fertility. Data collection was carried out at the Laudelino Farm area of 1ha.

Teotônio Vilela is located in the Mesoregion region of the east of Alagoas, with latitude 09° 54' 22" and longitude 36° 21' 08" West, at 156 meters of altitude and 101 km of the state capital's range. The climate is classified according to Koppen and Geiger, with an average temperature of 24 ° C and precipitation in annual average is 1134. It presents wavy or gently wavy relief being fragile and susceptible to erosion due to its slope of (5 to 10% slope) (Agência Embrapa de Informação Tecnológica). The soils of the region have several characteristics in their pedological nature, such as Oxisols and podzolic in high and high residues; With Podzolic Fragipã, Podzolic Plinticos and Podzois in low depressions in the plane, by the concrecion Podzólocos in dead and dry areas and slope and gleissolos and alluvial soils in the lower areas (JOÃO DE CASTRO MASCARENHAS et al., 2005).

2.2 SOIL COLLECTION AND ANALYSIS

Soil fertility evaluation was performed from soil samples collected from the arable layers of 0-20 cm depths, in which 15 simple samples were made to compose a compound (EMBRAPA, 2014). Then labeled and forwarded to the laboratory of the Federal University of Alagoas-Center of Agrarian Sciences (CECA) located in the municipality of Rio Largo, AL.

The parameters established for fertilities classifications of soil and available nutrients were: pH in water, soil class for clay, calcium, magnesium, sodium, potassium, phosphore, exchangeable

aluminum, organic matter, base saturation, saturation Aluminum and lime need for pH elevation and base saturation to 60%.

The results obtained from the chemical analyses were interpreted and inserted in the Excel program to better analyze the quantities of elements to be recommended, according to the Manual of agricultural chemicals fertilizers and fertilization (MALAVOLTA, 1981)

According to the values of the elements presented in the soil were classified in low, medium and high. The amount of pH in soil was classified according to its range (≤ 5.0 ; 5.5; 6.0; > 6.0). The amount of saturation V% per base was classified as low, medium and high according to its saturation range (< 45 ; 65; 80; > 80). Aluminum saturation changed in the range of (< 1 ; 10.1; 20; > 20) was classified as low, medium and high. CTC T was classified (≤ 5.0 ; 5.1; 15.0; > 15.0), corresponding to low, medium and high. The texture class The Phosphore was classified as one, two, three and four (≤ 20 ; 40; 60; > 60). The phosphate contents were classified according to clay content in the range of (≤ 2.0 ; 4.0; 6.0; 12.0 > 12.0) which corresponds to very low, low, medium, high and very high. The phosphate contents in class two were classified in the range of (≤ 3.0 ; 6.0; 9.0; 18.0 > 18.0) corresponding to very low, low, medium, high and very high. For class three, the Phosphore was classified as band patterns (≤ 4.0 ; 8.0; 12.0; 24.0 > 24.0) which corresponds to very low, low, medium, high, very high. In class four, the Phosphore was classified as (≤ 7.0 ; 14.0; 21.0; 42.0 > 42.0) respectively classified as very low, low, medium, high and very high (CHEMICAL and SOIL FERTILITY COMMISSION-RS/SC, 2004)

In the determination of the potassium element took into consideration the CTC of the soil. Thus, the soil CTC of > 15.0 were classified as (≤ 30 ; 60; 90; 180 > 180) which corresponds to very low, low, medium, high and very high. In CTC with 5.1 to 15.0 the potassium form classified in the standard of (≤ 20 ; 40; 60; 120 > 120) corresponds in very low, low, medium, high, very high. For CTC of ≤ 5.0 The Potassios were classified in the fixed (≤ 15 ; 30; 45; 90 ≥ 90) where it is equivalent to very low, low, medium high and very high. The amount of calcium was classified in the range of (≤ 2.0 ; 4.0; > 4.0), where it is characterized as low, medium and high. For magnesium were classified in ranges of (≤ 0.5 ; 1.0 > 1.0) which corresponds to low, medium and high. Organic matter contents were classified as ranges (≤ 2.5 ; 5.0; > 5.0), which were in the low, medium and high standard (CHEMICAL and SOIL FERTILITY COMMISSION-RS/SC, 2004)

3 RESULTS AND DISCUSSION

The results refer to the chemical characteristics of soil fertility of the area, where corn was cultivated, in depth of 0-20 cm. the table below 1.

Table 1. Chemical peculiarity of soil fertility in the area where corn was previously cultivated.

Depth	pH	mg/dm ³	cmol _c /dm ³ of soil							%	g/kg
			H ₂ O	P	K ⁺	Ca ⁺	Mg ⁺	Al ³⁺	H+Al		
0-20 cm	5.6	5	110	3.42	2.53	0.03	4.41	20	6.35	59	14.1
						10.72				0	

According to the pH value observed in table 1, the depth of 0-20 cm showed that there was soil acidity with a mean pH (5.5 to 6.5), which is excellent for most crops. Thus, having a higher level of chemical control of the elements in the soil, with greater response in fertilization and nutrient utilization by the culture, it is essential to maintain essential levels for a good development and total potentialization of Plant. (Santos et al., 2008). With absence of soil acidity there is great use of the minerals contained therein. The negative loads of the soil is a crucial permanent or temporary fact that depends on the pH, which favors the growth of plants and roots by the search for nutrients and water more efficiently in the soil (BERNADO VAN RAIJ, 1981)

The phosphorous content (P) found was classified as low (≤ 6 mg/dm³), considering a soil of argilae that in the property there is no management of phosphate fertilization. One of the crucial factors for the availability of phosphorous phosphorus is pH, its maximum availability is around 6.0 to 6.5 however when the value is lower it favors the formation of Fe phosphate and low solubility Al (MALAVOLTA, 1981). It is known that plants need phospholia for normal growth and maturation. The element has raw functions in respiration, photosynthesis, division, energy, storage and transportation among other activities. It is necessary that the plant is well supplied with Fosphorus to complete its production cycle (MOURO RESENDE et al. 2014).

Potassium K was classified as high respectively to have (≥ 91 mg/dm) This soil shows that it has a large amount of potassium in the soil due to the material of origin that suffered degree of temperalism over time, thus releasing the amount of potassium in the Soil. The availability of the mineral in the soil and its absorption by the plants is associated with the concentrations of Ca and Mg ions relating it to atoms linked to the exchange (Goedert et al., 1975). The same is the second element required by plants mainly in the fruiting period, which stands out for presenting functions of enzymatic activation and water conservation in the plant. The amount of potassium to be applied in the fertilization will depend on the production to be achieved and how much to the soil and how much the plant extracts from it (CUNHA et al., 2010).

Exchangeable calcium (Ca²⁺) levels were classified as medium (85%). The levels of magnesium (Mg²⁺) were considered high (253%), thus the use of fertilizers for the correction of soil acidity is of fundamental importance for agricultural production by providing the minerals needed

for growth and Development of plants mainly in the development of root and stiffness of the cell walls of the high crops (CHEMICAL and SOIL FERTILITY COMMISSION-RS/SC, 2004)

The contents of Al aluminum saturation were very low 0%, these factors present a soil free of toxicity by exchangeable aluminium that prevents the development of plants and root. The reduction of the face of root growth of plants has been mainly due to the toxic effect of aluminum that shakes the elongation, this effect prevents water absorption and nutrients from the basement, because of this leaves the roots more superficial Making it difficult to search for water and nutrients in the deepest parts of the soil. The toxic effect of aluminum in soil solution appears in PH in water below 5.5. Thus it is known that as low pH increases Al activity in the soil potentializing its phytotoxic effect in the plant (EMBRAPA, 2006)

The base saturation index (V%) was low 73%. Whereas in the soil before corn was planted, it was observed that the presence of exchangeable aluminum showed good conditions for agricultural practices. Thus the base saturation with a value of 60% promotes the ability of a good plant development mainly the possibility to the normal growth of the root system of crops, which needs a larger volume of soil to be explored in depth in Water and nutrient search (MIGUEL et al., 2010)

The CTC at pH 7.0 (T) was classified as 66% the peculiarity of ion exchange active in numerous natural substances such as rocks or artificials as corrective or organic matter. CTC is the capacity of cations that a soil can retain per unit of volume (VAN RAIJ, 1991).

Organic matter (OM) was low with 1.4%. It is noteworthy that organic matter has a great influence on soil behavior and soil management, aiming at sustainable strategy that preserves the soil reducing the impact of agricultural practices. Organic matter has a great influence on the physical, chemical and biological characteristics, which aims to improve the soil aspect and increase agricultural productivity (ROSCOE, 2002; PICCOLO,1996; CHRISTENSEN, 2000; CARTER, 2001)

4 CONCLUSION

From the results, it was found that it is not necessary to apply limestone to increase the base saturation to 60%, because 59%, because the value found in the soil satisfies the nutrient requirement of the pineapple culture. However, a dosage of 160 kg of P₂O₅ and 40 kg of nitrogen (N) per hectare is recommended, through the incorporation into the soil of 800 kg/ha in the formulation 05-20-0, as well as the organic fertilization between 30 to 50 t/ha of cattle manure, if possible 30 days before the plant for better use.

REFERERENCES

ARRUDA, M. R.; MOREIRA, A.; PEREIRA, J. C. R. Amostragem e cuidados na coleta de solo para fins de fertilidade. Embrapa Amazônia ocidental Manaus, AM, 2014.

COMISSÃO DE QUÍMICA E FERTILIDADE DO SOLO – RS/SC. Manual de adubação e decalagem para os Estados do Rio Grande do Sul e Santa Catarina. 10. ed. Porto Alegre; Sociedade Brasileira de Ciência do Solo, Núcleo Regional Sul; Ed. UFRGS, 2004.

CUNHA, J.F. da; CASARIN, V.; PROCHNOW, L.I. Balanço de nutrientes na agricultura brasileira. Informações Agronômicas, n. 130, p. 1-11, 2010.

EMBRAPA - EMPRESA BRASILEIRA DE PESQUISA AGROPECUÁRIA. Centro Nacional de Pesquisa de Solos. Sistema Brasileiro de Classificação de Solos. 2. ed. Rio de Janeiro, 2006. 306p.: il.

GOEDERT, W. J.; COREY, R.B.; SYERS, J.K. The effects on potassium equilibria in soils of Rio Grande do Sul, Brazil. Soil Science, v.120, p.107-111, 1975.

JARBAS, T.; SÁ, I. B.; PETRERE, V. G.; TAURA, T. A. Agência Embrapa de informação e tecnologia. Agência de informação, 2019. Disponível em:http://www.agencia.cnptia.embrapa.br/gestor/bioma_caatinga/arvore/CONT000g5twggzh02wx5ok01edq5snbmwc3w.html. Acessado em 16 de fev. de 2019.

MASCARENHAS, J. C.; BELTRÃO, B. A.; JUNIOR, L. C. S. Diagnóstico do município de senador Teotônio vilela. CPRM-Serviço geologia do brasil, 2005.

MALAVOLTA, E. Manual de química agrícola adubos e adubação. Ed. Agronômica Ceres, SP, 1981. 3ed.

MIGUEL, P. S. B.; GOMES, F. T.; WANDSON, S. D.; MARTINS, C. E.; CARVALHO, C. A.; OLIVEIRA, A. V. Efeito tóxicos do alumínio no crescimento das plantas: mecanismo de tolerância, sintomas, efeitos fisiológicos, bioquímico e controles genéticos. CES Revista, v. 24, juiz de fora, 2010.

OLIVEIRA, F.H.T.; NOVAIS, R.F.; ALVAREZ V., V.H. & CANTARUTTI, R.B. Desenvolvimento de um sistema para recomendação de adubação para a cultura da bananeira. R. Bras. Ci. Solo, 29:131-143, 2005.

RAIJ, B. van. Fertilidade do solo e adubação. Piracicaba: Ed. Agronômica Ceres, POTAFOS, 1991. 343p.

RAZZAQUE, A.H.M.; HANAFI, M.M. Effects of potassium on growth, yield and quality of pineapple in tropical peat. Fruits, Paris, n.56, p. 45-49, 2001.

RESENDE, M.; CURI, N.; REZENDE, S. B.; CORRÊA, G. F.; KER, J. C. Pedologia base para distinção de ambientes. Ed. Ufla lavra MG, 2014. 6 ed.

ROSCOE, R. Soil organic matter dynamics in a Cerrado Oxisol. 156 p. Tese (Doutorado) - Wageningen University, Wageningen. 2002.

SANTOS, A. C.; SALCEDO, I. H.; GALVÃO, S. R. S. Relações entre uso do solo, relevo e fertilidade do solo em escala de micro bacia. Revista Brasileira de Engenharia Agrícola e Ambiental, Capina Grande, PB, V12, n.5 p.458-464, 2008.

SILVA, A.P. Sistema para recomendação de fertilizantes e corretivos para a cultura do abacaxizeiro. Viçosa, MG, Universidade Federal de Viçosa, 2006. 181p. (Tese de Doutorado)

TEIXEIRA, L.A.J.; SPIRONELLO, A.; FURLANI, P.R. & SIGRIST, J.M.M. Parcelamento da adubação NPK em abacaxizeiro. R. Bras. Frutic., 24:219-224, 2002.