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POTENCIAL DE CRESCIMENTO E PRODUÇÃO DO FIGO FERTIRRIGADO SOB CULTIVO INTENSIVO NA CHAPADA DO APODI, CE

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RESUMO: O objetivo com este trabalho foi avaliar o potencial de crescimento e produção da cultura da Figueira cv. Roxo de Valinhos cultivada sob alta densidade de plantio e submetida a diferentes níveis de macronutrientes na fertirrigação. O experimento foi realizado na Chapada do Apodi, CE, em delineamento experimental de blocos casualizados, com parcelas subdivididas no tempo, correspondentes aos dias após a poda - DAP (58, 94 e 129). Foram avaliadas três doses de adubação com macronutrientes (D1 - 50%, D2 – 100% e D3 – 150%) aplicadas em cobertura, através de fertirrigação. O crescimento da planta foi contínuo, no entanto, ocorreu a estabilização do número de folhas a partir da segunda avaliação (96 DAP). Sob as condições em que o experimento foi realizado, as doses de adubação não influenciaram significativamente as características de crescimento e de produção da cultura da figueira. A produção de 20 frutos por ramo ou 13,7 frutos por metro de ramo demonstrou o potencial do cultivo da Figueira fertirrigada nas condições de clima e solo da Chapada do Apodi, CE.

Palavras-chaves: *Ficus carica*, macronutrientes, fertirrigação

GROWTH AND YIELD POTENTIAL OF FERTIGATED FIG UNDER INTENSIVE CULTIVATION IN CHAPADA DO APODI, CEARÁ STATE, BRAZIL

ABSTRACT: The aim of this study was to evaluate the growth and yield potential of 'Roxo de Valinhos' figs cultivated at high planting density and subjected to different levels of macronutrients via fertigation. The experiment was carried out in Chapada do Apodi, CE, in a randomized block design, with plots subdivided in time, corresponding to the days after pruning (58, 94 and 129). Three doses of macronutrients (D1 - 50%, D2 - 100% and D3 - 150%) applied in coverage through fertigation were evaluated. The plant growth was continuous; however, the number of leaves stabilized after the second evaluation (96 DAP). Under the conditions in which the experiment was carried out, the fertilizer dose did not significantly influence the growth or production characteristics of the fig crop. The production of 20 fruits per branch or 13.7 fruits per meter of branch demonstrated the potential of fertigated fig cultivation under the climate and soil conditions of Chapada do Apodi, CE.

Keywords: *Ficus carica*, macronutrients, fertigation

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1 INTRODUCTION

The characteristics of fig cultivation allow for a certain flexibility in management, making it possible to adapt the production system to the conditions of the Northeast Region of Brazil under irrigation conditions, with the goal of obtaining higher yields in shorter cycles, but this may require highly efficient nutrient management.

Fertilization recommendations for fig (*Ficus) cultivation. The application rates* of **Carica* L.* vary according to the region, with little information available for the conditions of the Northeast Region. In the states of Rio Grande do Sul and Santa Catarina, where the recommended planting density is 800 plants ha^{-1} (2.5 × 5 m), according to Embrapa Clima Temperado (Medeiros, 2002), the recommended postplanting doses of N, P_2O_5, and K_2O are 50, 100, and 30 g, respectively^{-1}. During the production phase' for the state of São Paulo and other states, the recommended doses of N, P_2O_5, and K_2O can reach 300, 200, and 240 g per plant, respectively (Medeiros, 2002; Raij *et al*., 1985). However, when edaphoclimatic conditions are favorable, plants can be cultivated more intensively, which should affect their source/sink relationships, nutrient demand, and productive potential. In this sense, through the application of nutrients via irrigation water (fertigation), greater productive efficiency can be sought in crop production systems.

Thus, the objective of this study was to evaluate the effects of different macronutrient levels on the growth and production of fig trees under an intensive production system in Chapada do Apodi, Ceará, Brazil.

2 MATERIALS AND METHODS

The experiment was conducted at Dani Frutas Farm, in the Jaguaribe-Apodi irrigated perimeter, State of Ceará, located at coordinates 5° 08'38" S and 37° 59' 44' W. The characteristics of the topsoil (0 to 20 cm), determined according to Silva (2009), are presented in Table 1. It has the following granulometric composition: 564, 118 and 318 g kg^{-1} of sand, silt and clay, respectively.

Table 1, layers from 0 to 20 cm.

MO	pH	P	K	Here	Mg	In	Al	H+Al	CE
g. kg $^{-1}$		mg.dm $^{-3}$	----------		mmolc.dm $^{-3}$	----------			dSm $^{-1}$
18.28	7.8	23	8.22	78.3	20.0	5.90	0.0	0.0	0.58

[1]M.O. = organic matter. pH in water (1:2.5). Chemical extractants: Mehlich-1 for P, K, and Na; 1 N KCl for Ca, Mg, and Al; and calcium acetate at pH 7.0 for H+Al. The electrical conductivity (EC) was obtained from the soil saturation extract.
Source: Authors.

Irrigation was carried out using two drip tapes in each row and emitters spaced 0.30 m apart. Production pruning of the crop was performed 50 cm from the ground, leaving two branches (parallel to the trellis rows), and from there, only two branches per branch were trained (4 branches per plant). The start of the production cycle for data collection in this experiment began after pruning, on October 30, 2022, with measurements and collection of plant material at 58, 94, and 129 days after pruning (DAP).

Three doses of macronutrient fertilization were evaluated (D1-50%, D2-100% and D3-150%), with D2 corresponding to 63, 35, 84, 21 and 7 g plant^{-1} cycle^{-1} of N, P2O5, K2O, Ca and Mg, respectively.

In addition, approximately 0.14 g plant-1 of B was applied to all treatments, along with three applications of 2.25 ml of RESTORER® (containing 6% N; 6% P_2O_5; 6% K_2O; 0.5% B; 0.10% Cu; 0.5% Fe; 0.10% Mn; 0.01% Mo; and 0.10% Zn) per plant. The fertilizer application, whose distribution is shown in Table 2, was carried out by fertigation through a diversion tank ("buffer") connected to the irrigation network.

Table2. Distribution percentage of nutrients during fertigation, starting from pruning.

Week	N	P	K	Here	Mg	B
0 to 10	35%	30%	20%	20%	25%	20%
10 to 14	35%	35%	40%	35%	35%	35%
15 to 19	30%	35%	40%	45%	40%	45%

Source: Authors

The experiment was conducted in a randomized block design in a split-plot arrangement with four replications. Each experimental plot consisted of 8 plants in the same row, with one useful plant from each plot being randomly selected for evaluation. A middle branch from each of the selected plants from the experimental plots was used, and the length (in cm) and diameter of the base of one of the branches (in mm) were measured, after which the leaves and fruits were counted.

The results were subjected to analysis of variance, using the F test at the 5% significance level, and the computer program System for Analysis of Variance (SIVAR), version 5.3 (Ferreira, 2010), was used to compare the means using Tukey's test at the 5% probability level.

3 RESULTS AND DISCUSSION

Significant differences were observed only for the evaluation periods (Table 3). The absence of differences between the fertilization doses implies that the lowest dose adopted was sufficient for the growth and development of the crop under the conditions in which this study was conducted.

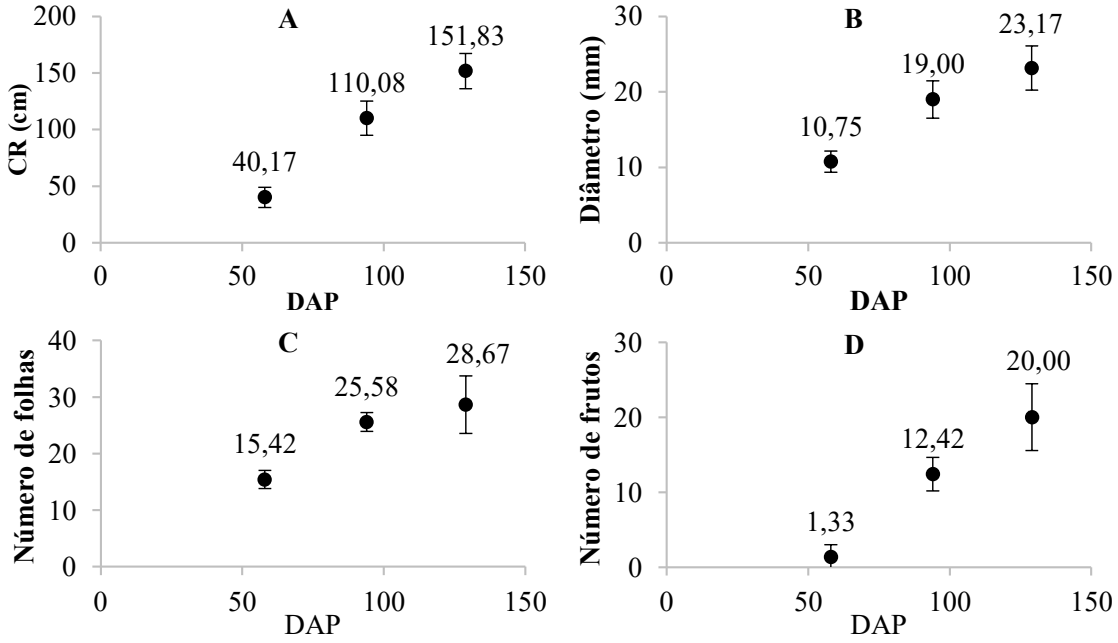
Table 3 Summary of the analysis of variance of growth by the fig tree cv. Roxo de Valinhos in Chapada do Apodi: height, diameter, number of leaves (**NFo**) and number of fruits (NFr). 2023.

FV	GL	Height	Diameter	NFo	NFr
			Medium Square		
Block	3	339,806 *	7,213 ns	7,185 ns	10,546 ns
Dose	2	34,361 ns	2,528 ns	10,528 ns	0.333 ns
Error a	6	58,694	5,380	7,713	11,741
DAP	2	38201,694 **	479,194 **	576,861	1057,583 **
Dose x	4	58,069 ns	8,278 ns	5,986 ns	0.667 ns
Error b	18	244,759	5,102	12,870	11,009
CV a (%)		7.61	13.15	11.96	30.46
CV b (%)		15.54	12.81	15.45	29.49

FV – source of variation; GL – degrees of freedom; CV – coefficient of variation; *Significant at 5%; **Significant at 1%; ns – Not significant.
Source: Authors.

Continuous growth was observed in all three sampling phases, regardless of the fertilization dose, except for the number of leaves, where the increase between 94 and 129 DAP was not significant (Figure 1). This can be explained by changes in the source–sink relationship, with greater mobilization of assimilates to the fruits.

Figure 1leaves (C) and fruits (D) of the Fig tree cv. Roxo de Valinhos in Chapada do Apodi. 2023. Vertical bars represent the upper and lower limits corresponding to the values of one standard deviation plus and minus, respectively.



Source: Authors.

In the present study, the final branch growth, 151.83 cm (Figure 1A), was slightly greater than that obtained by Ecker. *et al.* (2018), 138 cm at 126 DAP, when different plant spacings were evaluated for the cv. Roxo de Valinhos in Chapecó, SC. However, in the aforementioned study, the branch length already exceeded 90 cm at 58 DAP, whereas in the present study, the average was only 40.17 cm, considering that short pruning was adopted.

The adoption of production pruning, with only four shoots remaining, combined with favorable weather conditions for crop development, likely influenced the results of this study. When different pruning methods for fig cultivation (Cultivar Sabz) were evaluated, Zare (2021) reported that plants subjected to drastic annual pruning develop great vegetative vigor, with positive effects on branch length and diameter.

The diameter of the branches, 23.17 mm (Figure 1B), was similar to that observed in a study conducted by Silva *et al.* (2017) in Mossoró-RN, where the greatest value was 21.13 mm at 91 days of evaluation, with the same cultivar. The authors observed 25.79 leaves per branch at 56 DAP, which stabilized thereafter, with a difference of only 1.35 leaves up to 91 DAP, unlike in the present study, which showed an increase of 10.16 leaves between 58 and 96 DAP, despite the similar number of leaves at 96 DAP (25.58) (Figure 1C). In addition to the differences in branch training, the pruning time can influence the phenology of the crop, altering the period and rate of leaf abscission (Zare, 2021).

The measurements taken at 58, 94, and 129 DAP corresponded, respectively, to the end of the vegetative period; the beginning of ripening—fruits larger than 30 mm—and full harvest (> 2 ripe fruits/branch), being slightly earlier than those observed by Silva *et al.* (2017), in a study conducted in Mossoró-RN, between July and December 2015, where the beginning of ripening and the beginning of harvest were observed at 116 and 130 DAP, respectively.

Evangelista *et al*. (2019) reported an average time of 49 DAP for the development of the first infructescence, 83 DAP for the beginning of ripening, and 119 DAP for the beginning of harvest (in August 2018). The results of this study were explained by the plant's phenological response to changes in precipitation patterns in the semiarid region. The data from this study, along with those from the aforementioned research, confirm the precocity of fig cultivation in semiarid regions.

Furthermore, they highlight the good adaptability of the crop, consolidating it as a promising option in these regions (Silva *et al.,* 2017).

The average production of 20 fruits per branch at 129 DAP (Figure 1D), with 13.7 fruits per meter of branch, demonstrates the production potential of this crop for the Chapada do Apodi region. Notably, in this study, the plants were grown with only four branches, which likely influenced the productive potential per plant. This was done to preserve the productive potential of the branches and facilitate cultural practices within the adopted spacing. (Giacobbo) *et al*. (2007) reported an inversely proportional relationship between the number of fruits per meter of branch and the planting density, with a maximum of 12.21 fruits per branch (2 m spacing between plants).

The production rates reported in this study can be attributed to both the way the branches were trained and the high luminosity of the Chapada do Apodi region, as well as the optimization of water and nutrient supply through fertigation.

However, the high relative humidity during the rainy season can compromise the quality of ripe fig production because of the incidence of rust (Mezzalira). *et al* ., 2015). Another factor that should be considered in the production of ripe figs is temperature, which, when above 40°C, promotes ripening, altering the consistency of the peel, in addition to reducing the size of the fruits (Caetano *et al*., 2012).

4 CONCLUSIONS

The plant growth was continuous; however, the number of leaves stabilized from the second assessment onward (96 DAP).

Under the conditions in which the experiment was conducted, the fertilization dose did not significantly influence the growth or production characteristics of the fig tree crop.

fertigated fig cultivation under the climate and soil conditions of Chapada do Apodi, CE.

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