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THE VALUE OF WATER IN THE FERTIRRIGATED MELON PRODUCTION SYSTEM

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1 RESUMO

O trabalho tem por objetivo avaliar o valor da água no sistema de produção do melão em diferentes manejos de irrigação. O experimento foi realizado em um lote localizado no DIBAU, no qual todos os tratos culturais foram iguais diferindo apenas quanto ao uso da água. Os manejos de irrigação avaliados foram dois, M1 e M2 comandados pelo sistema Ômega que utiliza a evaporação do tanque Classe A, que adotam kt igual a 1,0 e 0,75, respectivamente e o M3 por uma planilha com esquema de irrigação usada pelos produtores locais. O custo total (CT) de produção foi em média de R$ 27.897,41 ha^{-1}, com variação de R$ 276,06 entre os manejos, embora o M1 tenha utilizado menos da metade da água do M3. Os custos fixos, com insumos e mão de obra, representam mais de 90% do custo total. Já os custos que envolvem a irrigação (água + energia) representaram de 1 a 2% do CT entre os tratamentos. Conclui-se que o sistema de produção requer um considerável investimento para cobrir os custos de produção e que embora a água seja um recurso essencial aos sistemas irrigados, esta tem pouca expressividade sobre o CT, independente dá quantidade de água aplicada.

Palavras-chave: Manejo de irrigação, *Cucumis melo* L., Custo de produção.

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2 ABSTRACT

The objective of this work was to evaluate the value of water in melon production systems under different irrigation management practices. The experiment was carried out in a plot located in DIBAU, in which all the culture treatments were the same and differed only in terms of water use. The evaluated irrigation management practices were as follows: M1 and M2 controlled by the Ômega system, which uses evaporation from a Class A tank and adopts kt values equal to 1.0 and 0.75, respectively; and M3 controlled by a spreadsheet with an irrigation scheme used by local producers. The total cost (TC) of production averaged R$ 27,897.41 ha^{-1}, with a variation of R$ 276.06 between management practices, although M1 used less than half the water of M3. Fixed costs, with inputs and labor, represent more than 90% of the total cost. The costs involving irrigation (water + energy) represented 1 to 2% of the total cholesterol (TC) between treatments. It is concluded that the production system requires a considerable investment to cover production costs and that although water is an essential resource for irrigated systems, it has little impact on TC, regardless of the amount of water applied.

Keywords: Irrigation management, *Cucumis melo* L., Production cost.

3 INTRODUCTION

The production of melon in Brazil has increased, almost doubling in 18 years, from 350,000 Mg in 2003 to 607,000 Mg in 2021 (Vendruscolo *et al.*, 2018; IBGE, 2022). This production is practically concentrated in the Northeast region, mainly in the state of Rio Grande do Norte, which accounts for approximately 60% of the production, followed by Ceará, which accounts for approximately 258 thousand tons; that is, more than 40% of the production is exported, which generates greater profitability for the producer (Kist; Carvalho; Beling, 2022). The melon plants produced in the Northeast region are internationally competitive, both because of the good quality of the fruits and because of the reduced cycle length (~60 days), which allows for up to three harvests per year (Landau *et al.*, 2020).

Melon cultivation has higher production costs (Araújo; Correia; Aleluia, 2005); therefore, it is important for producers to obtain not only good productivity but also significant profitability, given investment risks.

Irrigation is the main consumer of water in this region and is the main limiting factor for production in the region (Queiroz *et al.*, 2018); irrigation is aggravated by recurring periods of dry years that compromise the continuity of production systems (Ximenes; Sampaio, 2018).

Thus, this work aimed to evaluate the cost of water in a fertigated melon production system in the Baixo Acaraú Irrigation District (DIBAU) subjected to different management practices.

4 MATERIALS AND METHODS

The experiment was conducted on a plot located in the Baixo Acaraú Irrigation District (DIBAU), in the municipality of Marco, CE. The region has an Aw ' type climate and a rainy tropical climate according to Köppen. The average annual rainfall is 1,190 mm, concentrated between the months of January and May. The average air temperature is 26.7°C, with a relative humidity of 84% in the wet period and 70% in the dry period, with an average wind speed of 3.2 ms $^{-1}$ (INMET, 2022; FUNCEME, 2022).

The yellow melon hybrid used was Goldex F1, which was constructed at a spacing of 0.3 m between plants and 2.0 m between rows, with one plant per hole. The experimental plots had five rows 6 m long, with 20 plants in each row and a total area of 60.0 m². The central line was considered a useful plot; two plants were discarded at the ends, resulting in a useful area of 9.6 m², with 16 plants.

randomized block design (DBC), with three treatments and four blocks (replications). The treatments consisted of three irrigation management practices: M1 and M2, which used the Omega irrigation management system (Valnir Júnior *et al.*, 2017); M1, which used daily evaporation from the class "A" tank as input parameters and a tank coefficient; kt, which was equal to 1; and M2, which also used daily evaporation from the class "A" tank, with kt adjusted by relative humidity, average wind speed and tank border. M3 management was carried out using the producer's irrigation programming spreadsheet, correlating the pressure and its respective flow.

A single harvest was carried out at 65 days after emergence (DAE), at which time all cost analyses were carried out regarding the melon production system under the different irrigation management practices. When surveying the investment cost for a 1.0 ha drip fertigation system, the same culture treatments were applied to all the treatments, while the irrigation management costs were computed individually.

All costs were determined according to the methodology adapted from Castro Júnior *et al.* (2015), in which the total cost of melon production for each of the irrigation management methods (CTi) is now expressed according to equations 1, 2 and 3.

$$CTi = Cf + C_{Wi} + Vwi \qquad (1)$$

$$Cwi = C_{Wa} \, . Wi \qquad (2)$$

$$Vwi = 0{,}01Wi \times tw + k2 \qquad (3)$$

where Cf is the sum of the basic costs associated with production (Co) and the capital costs related to investment in irrigation equipment (Cc), as well as the costs of maintenance, conservation and repair of equipment (CMCR), and labor of work (MO); Cwa is the cost of the irrigation depth, R$ ha $^{-1}$ mm $^{-1}$; Wi is the gross irrigation depth required for each management, mm ha $^{-1}$; Cwi is the cost related to pumping water in each management, R$; Vwi is the cost of water used in each irrigation management, R$ 1000 m $^{-3}$; tw is the water tariff, R$1000 m $^{-3}$, R$18.52 (COGERH, 2022); and k2 is the water distribution fee from the irrigation district, R$ ha $^{-1}$, with R$ 19.00, information obtained from the district and the producer.

The analysis was comparative between the percentages of each cost variable, mainly water, in each management practice and the total cost of melon production.

5 RESULTS AND DISCUSSION

During the period during which the experiment was conducted, atypical events occurred, such as the occurrence of nematodes in the area, which may have increased the final costs of the irrigated melon cultivation system. However, the problem was found in all the treatments studied, and the control was carried out equally between the treatments.

Fixed costs represented almost the entire system, with percentages ranging from 98 to 99%, even though management M1 used less than half the water for management M2 and M3. The total production cost averaged R$ 27,897.41 ha $^{-1}$, which is equivalent to US$ 5,300.57 ha $^{-1}$

(US$ 1.00 = R$ 5.263) [1]. This value was approximately 40% lower than that observed by Rodrigues *et al*. (2020), whose production cost with arugula was US$7,612.00 for the period November 2017 (US$1.00 = R$3.26). However, Araújo, Correia and Aleluia (2005) recorded a cost of approximately 26% of that observed in this work for 1.0 ha of melon irrigated by furrow.

The basic costs associated with production (Co) related to soil preparation, seeds, fertilizers and agrochemicals represented an average of 69% of the total production cost. The items with the greatest impact on the total cost of production include seeds, fertilizers, weeding labor and agrochemicals, which represent, on average, 33.5%, 23.5%, 17.5% and 10.5%, respectively. of CT, respectively.

Araújo, Correia and Aleluia (2005) reported that these same inputs were those that presented the highest percentage of the production cost of melon irrigated in a furrow irrigation system, with percentages of 21.4%, 15.3%, 13.5% and 5.2% for seeds, agrochemicals, fertilizers and labor, respectively. Rodrigues *et al.* (2020) obtained a labor cost for weeding at a percentage of 13.6% of the CT, a value very close to that of this work. The increase in costs for seeds, fertilizers and agrochemicals is related to international trade factors, which include an increase in the costs of these inputs, mainly fertilizers.

The costs involving water (irrigation) were not significant, representing less than 2% of the total cost. This fact can be weighted both positively and negatively. Positively, a lower impact on production costs provides the population with greater access to purchasing fruits. However, in a region such as the semiarid region of Ceará, where the main limiting factor in production, water (Queiroz *et al.*, 2018), is scarce and subject to recurring cycles of drought (Ximenes; Sampaio, 2018), this means that its efficiency is low. A small percentage of water above the CT has also been observed in other studies, such as Vilas Boas *et al.* (2011) and Rodrigues *et al.* (2020).

The average melon production across management practices was 23,521 kg ha $^{-1}$, which was slightly lower than the national average melon productivity in 2021 (25,444 kg ha $^{-1;}$ IBGE, 2022), with an average sale price at CEASA-Fortaleza of approximately R$2.90 kg $^{-1}$ in the months of November and December (Agrolink, 2022). This lower productivity observed in relation to the national productivity is due to only one harvest being carried out; in general, two or more harvests are carried out on commercial plantations (Carmo *et al.*, 2017). Based on national average productivity values, the average revenue for 1.0 ha of melon would be R$73,787.60; however, the price paid to the producer is generally a percentage of the value that reaches consumer and distribution centers such as the CEASA. Thus, the producer's minimum selling price to cover all costs would be R$1.09 to R$1.11 for the management measures evaluated. This producer's minimum sales value represents 37.6% of the melon's sales value at CEASA, which represents a significant margin of approximately 62% to cover packaging, transport and marketing costs.

6 CONCLUSIONS

Afertigated melon production system requires investment in inputs and labor that represent more than 90% of the total cost. Water resources, although essential to irrigated systems, have little impact on the final cost of production, even for irrigation systems that use twice as much water.

[1]Average dollar exchange rate in the period 10/03 to 12/01/2022.

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