

Effect of different soil water tensions and potassium fertilization on the production and quality of netted melon (*Cucumis melo* L.) in the Amazon area

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Abstract

The objective of this study was to evaluate the production and qualitative behavior of netted melon in a protected environment subjected to different soil water tensions and potassium doses, applied via fertigation. The experimental design was randomized blocks (RBD) in a 4 x 5 factorial scheme with 20 treatments and three replicates, consisting of five percentage doses of potassium (0, 50, 100, 150 and 200%) and four soil water tensions (15, 30, 45 and 60 kPa). The variables analyzed were average yield ($t\ ha^{-1}$), transverse and longitudinal diameter of fruits (mm), pulp thickness (mm), °Brix (%) and pH. Yield and fruit longitudinal diameter were decreased linearly with the increase in soil water tension. The best result for yield and fruit longitudinal diameter of 51.24 $t\ ha^{-1}$ and 127.7 mm were achieved, respectively, when irrigation performed at 15 kPa tension. The lowest value was found at the maximum tension (60 kPa). Regarding potassium doses, a quadratic model fitted to the data, with maximum values of yield and longitudinal diameter at the K_2O doses of 235.30 and 232.82 $kg\ ha^{-1}$, respectively. The interaction of T x K led to higher values of °Brix under 247.68 and 371.52 $kg\ ha^{-1}$ of K_2O with tension of 24.67 kPa, with no difference between both. The best result of fruit transverse diameter was observed under combination of 371.52 $kg\ ha^{-1}$ of K_2O and 15 kPa tension. Irrigation at tension of 15 kPa and K_2O dose of 247.68 $kg\ ha^{-1}$ can be indicated for the study conditions.

Keywords: *Cucumis melo* L.; tensiometry; fertigation; irrigation; fruit production.

Introduction

The melon tree (*Cucumis melo* L.) is a species belong to Cucurbitaceae family. It grows in tropical climate and is of great importance for the Brazilian market (Filgueira, 2008). Brazil occupies twelfth place in the world production scale, being the largest melon producer in South America (IBGE, 2012). The largest production of melon is concentrated in the Brazilian semiarid region, as it presents adequate soil and climatic conditions for cultivation and corresponds to about 95% of annual exports (Barros et al., 2019; Pinto et al., 2019).

There are several varieties of melon on the market, but the exploration of noble melon hybrids has been showing a growing trend in Brazil, as it is a very appreciated melon by the domestic and foreign consumer market. It has a greater added value, better aroma, texture, firmness, greater sweetness, and productive potential, compared to the yellow type, especially when irrigated (Santos et al., 2011; Cavalcante Neto et al., 2020). Despite the growing domestic consumption of noble melons, Europe still has the biggest consumers.

In view of the high productive demand for lace melon in the country, cultivation in a greenhouse with fertigation has been a technique capable of ensuring greater safety in the quality and production of the fruits, since vertical staking facilitates cultural treatments, control plant health and harvesting, enabling an increase in plant density. Protected cultivation also provides a reduction in pest attacks, greater

efficiency in fertigation and protection against heavy rains in the Amazon (Melo, 2009).

Despite the melon tree being a water demanding plant, studies have shown that irrigation must be carried out properly, as the excess and water deficit cause losses in production and fruit quality. However, many producers apply irrigation without a correct management of the necessary depth for the development of the crop. Monitoring soil moisture using tensiometers has been one of the most used strategies to define the ideal time for irrigation (Cabello et al., 2009; Carvalho et al., 2011; Marouelli et al., 2011; Oliveira et al., 2011).

Irrigation is a fundamental technique for melon cultivation, as in its absence, production is directly affected by the lack of water availability. Irrigation of melon should be mainly promoted by the drip system, avoiding wetting the aerial part of the plant, as it is a crop sensitive to pest attack. This system holds greater control in chemigation and water use efficiency, which should be provided with emitters spaced between plants and rows (Pereira et al., 2017; Guimarães et al., 2020; Pereira et al., 2021).

Potassium (K) is one of the most used nutrients in fertigation, as it is efficient due to its high mobility in the soil and its high solubility in water (Guerra et al., 2004). K, being as a nutrient most required by melon, regulates the stomatal opening during photosynthesis, balances the entry of CO_2 , enzyme activator and its deficiency can reduce the

photosynthetically active leaf area of plants and losses in fruit production and quality. However, for the better use by the culture the environment must present a good humidity condition (Hasanuzzaman et al., 2018; Bagagim, 2019). Therefore, this work aimed to evaluate the productive and qualitative behavior of lace melon, in a protected environment, submitted to different soil water tensions and potassium doses applied via fertigation.

Results

Behavior of water depths, soil water tensions and potassium doses

The initial water depth applied before the differentiation of treatments (Init), total water depth applied in each treatment (Irrig), number of irrigation events (NI), irrigation interval for each treatment (INT), as well as water demand (WD, total irrigated after differentiation of treatments/irrigated days) are shown in Table 1.

It is observed that the total irrigation depth showed a decreasing behavior as a function of soil water tension, being higher in treatments with lower tensions, with irrigation system being activated more often (NI), and with higher frequency of irrigation system activation, i.e., shorter irrigation interval (INT). Sensoy et al. (2007) and Morais (2008) indicated that irrigation management in melon crop with more frequent water applications conditions the soil to remain with an optimal water content, favoring better crop development. The variables fruit weight (FW), pulp thickness (PT), longitudinal diameter (LD), transverse diameter (TD) and °Brix (%) were influenced by soil water tension and potassium doses. On the other hand, the pH did not differ significantly (at 5% probability level) between the treatments used (Table 2)

Yield and fruit longitudinal diameter

The water tension treatments significantly affected the yield (Y) and fruit longitudinal diameter, causing linearly reduction as water tensions increased, whereas the best results achieved when irrigation was performed at 15 kPa tension, with 51.24 t ha⁻¹ and 127.7 mm, respectively. The lowest value obtained at maximum tension (60 kPa) (Figure 1A and 1C). Several studies have shown that melon is a sensitive culture when subjected to water deficit condition (Sensoy et al., 2007; Oliveira et al., 2008; Sousa et al., 2010).

The netted melon hybrid 'Pingo de mel' showed high water requirement for fruit development, since the treatment maintained with soil moisture closer to field capacity (15 kPa) had higher yield and fruit longitudinal diameter, while the lowest values were observed under water stress condition (60 kPa). Likewise, similar responses were reported by Lima (2015), who evaluated the response of melon to different soil water tensions and verified that the best fruit diameters were obtained with soil water tension of 15 kPa, the closest to the field capacity.

Yield and longitudinal diameter showed a quadratic polynomial variation as a function of the applied potassium dose, with maximum points of 55.28 t ha⁻¹ and 127.50 mm for K₂O doses of 235.30 and 232.82 kg ha⁻¹, respectively (Figure 1B and 1D). This yield value was above the national average (around 25 t ha⁻¹; Crisóstomo et al., 2003) and those obtained in experimental work (Rocha, 2015 obtained 13.250 kg hectare⁻¹, with the lowest dose 50% of K₂O; Queiroz, 2016 obtained 30341.494 kg ha⁻¹ corresponding to

a dose of 86.72 K and Guimarães et. al, 2020; 48.13 t ha⁻¹ was obtained with the application of 370 kg ha⁻¹ of K₂O). It was reported that the dose below the recommendation can impair the fruit development. This is probably due to the function of potassium in translocation of carbohydrates by phloem and defect storage in fruits (Medeiros et al., 2008). Excessive doses also affected the size and weight of the fruits, which may have been caused by antagonism with other nutrients such as Ca²⁺ and Mg²⁺, which can sometimes lead to a deficiency of these two nutrients, and consequent drop in production (Meurer, 2006).

Interaction (T x K)

There was significant interaction between tension and potassium dose (p<0.05) for the variables pulp thickness (PT), °Brix and fruit transverse diameter (TD).

The interaction tension of 38.5 kPa and potassium dose of 123.84 kg of K₂O ha⁻¹ (K50%) provided greater pulp thickness with economical dose (42.52mm). The best result of transversal diameter of the fruits (128.67 mm) was obtained in the combination of 371.52 kg ha⁻¹ of K₂O (K150%) and tension 15 kPa and the smallest values of pulp thickness, as well as diameter in the treatments with high doses of potassium, 495.36 kg ha⁻¹ of K₂O (K200%) and in the treatment without addition of potassium (K0%) were observed in the treatments with high doses of potassium (60 kPa) (Figure 2A and 2B).

Similar results were obtained by Silva et al. (2014) in Rafael hybrid red arrowing melon cultivation, under different potassium doses. They observed a maximum pulp thickness of 30.70 mm was obtained under 240 mg dm⁻³ dose of potassium while high- and low-dose reduced this characteristic. The greater thickness of the pulp is desirable, while it increases the weight and the edible part, improving the quality of the fruit (Coelho et al., 2003).

The treatments with high potassium doses did not show satisfactory response, probably because the low amount of water affected the absorption and translocation of the nutrient. Likewise, the treatment without potassium fertilization led to lower values, demonstrating the importance of this nutrient for melon crop. According to Raij (1991), potassium availability is greatly influenced by soil water content, especially due to the cation ratios.

It was observed that the interaction of soil water tension and potassium dose presented higher values of ° Brix (9.5%) under 247.68 kg ha⁻¹ of K₂O and 371.52 kg ha⁻¹ of K₂O with tension of 24.67 kPa, respectively, showing no difference between them (Figure 2C). The minimum established by international standards is 9% (Silva et al., 2008). In the treatment with the highest tension of water in the soil (60 kPa; 6.67%) and the one with the lowest tension (15 kPa; 6%) in interaction with K0%, the lowest values of °Brix of the fruits were observed. The °Brix of the fruits showed different behavior compared to that found in other studies. It should have been higher in fruits of plants subjected to the lowest irrigation depths, due to the increase in the concentration of sugars in fruit tissues (Andrade júnior et al., 2001; Fabeiro et al., 2002). Figueiredo (2014) studied the influence of irrigation depth and frequency on the melon crop grown on stakes in the lower São Francisco valley and found similar results that obtained in the present study, where the treatments that received lower irrigation depth had fruits with lower °Brix, a significant difference when compared to treatments that received greater amount of water.

Table 1. Soil water tensions at 0.30 m depth.

Tension (kPa)	Init (mm)	Irrig (mm)	NI (un)	Tot (mm)	INT (day)	WD (mm/day)
T15	52.22	4.55	34	206.92	1.5	2.97
T30	52.22	13.75	10	192.14	5.11	2.64
T45	52.22	19.44	7	188.30	7.6	2.61
T60	52.22	23.42	4	145.90	11.5	1.80

Irrigation depths applied before the differentiation of treatments (Init), irrigation depths applied after differentiation of treatments (Irrig), total water depths (Tot), irrigation shift after treatment differentiation (TR), number of irrigations (NI) and water demand (WD).

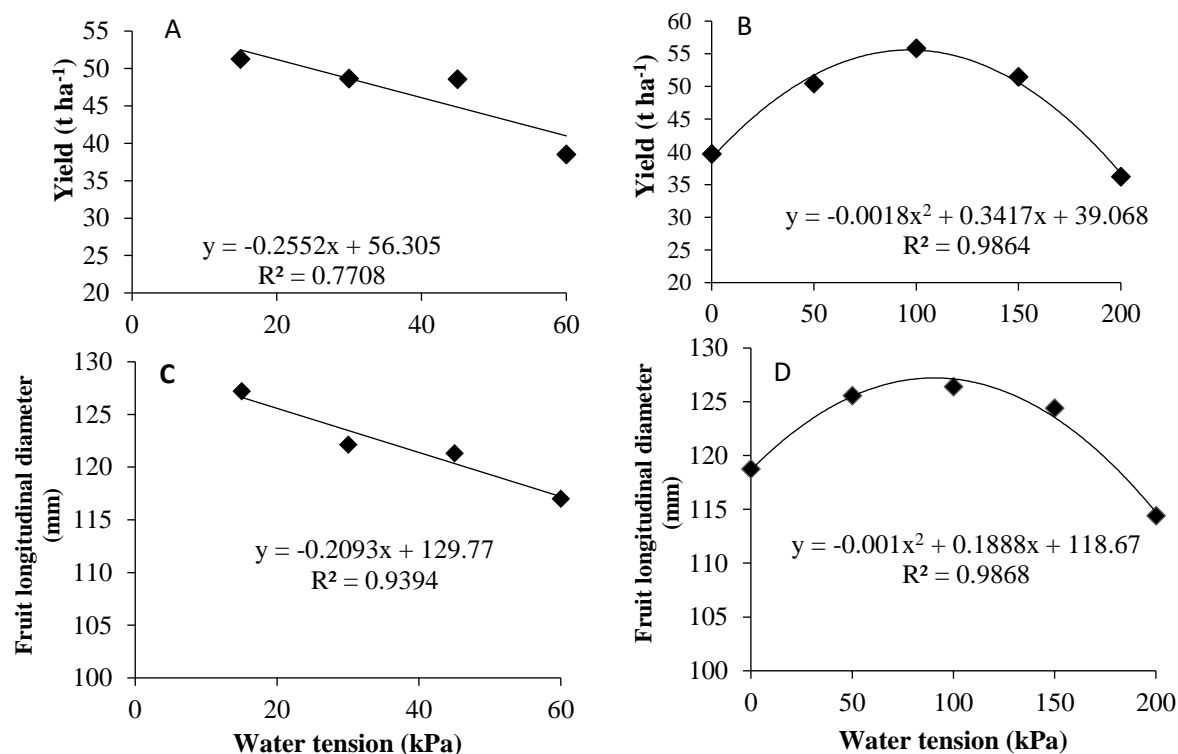


Figure 1. Yield (A); Fruit longitudinal diameter (C), as a function of different water tensions in the soil, in kPa; Yield (B); Fruit longitudinal diameter (D) as a function of different potassium doses in netted melon hybrid 'Pingo de mel'.

Table 2. Analysis of variance (F values) for average fruit yield (Y, t ha⁻¹), pulp thickness (PT, mm), longitudinal diameter (LD, mm), transverse diameter (TD, mm), °Brix (%) and pH (in water) in melon plants grown at different water tensions (T) and potassium doses (K) in the soil.

Source of variation	F values					
	Y (t ha ⁻¹)	PT (mm)	LD (mm)	TD (mm)	°BRIX (%)	pH
Block	1.20*	0.46 ^{ns}	3.07 ^{ns}	0.52 ^{ns}	0.78 ^{ns}	0.49 ^{ns}
Tension (T)	7.81*	9.27*	6.57*	68.88*	11.42*	1.60 ^{ns}
Potassium (K)	13.82*	11.25*	7.98*	129.66*	73.80*	1.11 ^{ns}
Interaction T x K	0.88 ^{ns}	3.83*	1.87 ^{ns}	42.09*	7.63*	0.92 ^{ns}
CV (%)	16.68	10.24	5.18	1.59	5.41	3.32

^{ns} – not significant by F test, * – significant at 5% probability level by F test.

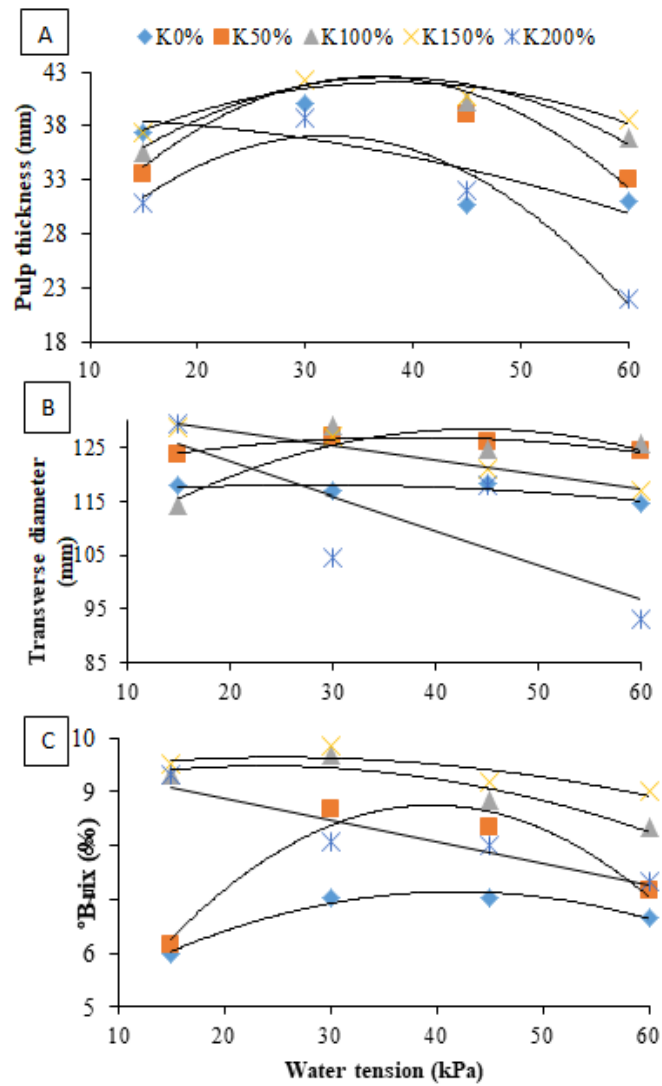


Figure 2. Interaction (T x K) effect on pulp thickness (mm) (A), °Brix (B) and fruit transverse diameter (mm) (C).

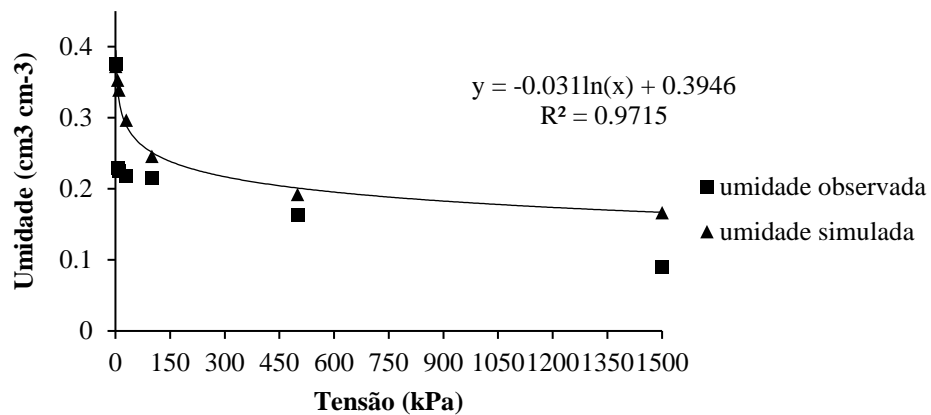


Figure 3. Soil water retention curve in the 0-30 cm layer.

Potassium is responsible for transporting photoassimilates to the fruits, hence promoting higher contents of soluble solids and sugar (Prado, 2008). Probably, the translocation of photoassimilates in the plants was negatively influenced by

water stress due to the difficulty in absorbing potassium under the low moisture condition, which led to lower values of °Brix at higher soil water tension (Faria, 1990; Katayama, 1993).

Materials and methods

Experiment location

The experiment was conducted in a greenhouse, covered by plastic film, from May to August 2019, installed in the experimental area of Federal Rural University of the Amazon (UFRA), located in the municipality of Igarapé-açu - PA, Brazil, at 39 m altitude and with geographic coordinates of 01° 07' 33" South and 47° 37' 27" West.

Plant material

The hybrid melon cultivar 'Pingo de mel' was sown in polyethylene trays with 128 cells, containing substrate based on açai fiber and black earth. At 20 days after sowing (DAS), the seedlings were transplanted to the definitive location. The experimental plots were 0.25 m wide by 2.5 m long (0.625 m²), and 0.15 m high. The spacing used was 1.20 m between beds and 0.50 m between plants. Each plot had five plants, and only the three central plants of each plot were considered for evaluations. In order to ensure good development of the seedlings, the differentiation of treatments was occurred only 20 days after transplantation (DAT). Plants were staked immediately after the production of the first tendrils, using bamboo and three rows of smooth wire no. 14, arranged parallel to each other at a distance of 50 cm. Nylon wire was used to attach the plants to the wire. Plants were grown on a single stake, vertically fixed using ribbons. Two secondary stems were left in each, at 50 cm height from the soil, and each stem formed one fruit, while the other fruits were thinned. Apical bud was removed when the main branch reached the third wire, with 2 m height. 20 days after flowering, the daily manual pollination began from 7 am to 9 am. When the fruits reached the size of an orange, they were supported with nylon nets. Fruit harvest was performed at 72 DAT, considering the harvest point as the formation of the abscission layer next to the peduncle and yellow rind color, characteristic of the cultivar.

Climate aspects

According to Köppen's classification, the climate of the study region is Ami, with an average annual rainfall of 2,500 mm and an average annual temperature of 25 °C. During the experimental period, the temperatures ranged from 26 to 30 °C and the average relative humidity ranged between 76 and 89%. The behavior of average temperatures was mostly within the optimal range for better growth and production of melon (between 20 and 30 °C) (Alvarenga and Resende, 2002).

Soil type and characteristics

The soil at the site was classified as Argissolo Amarelo Distrófico (Ultisol) with sandy loam texture. A composite soil sample was collected in the 0-20 cm layer. The following characteristics were found: pH (in H₂O) = 5.59; H + Al = 1.91 cmolc dm⁻³; V (%) = 70.6; m (%) = 0.43; CEC_{total} = 6.50 cmolc dm⁻³; CEC_{effective} = 4.61 cmolc dm⁻³; OM = 13.85 g kg⁻¹; N = 0.70 g kg⁻¹; Ca (cmolc dm⁻³) = 2.78; P = 26 mg dm⁻³; Na = 9 mg dm⁻³; K = 21.8 mg dm⁻³; Mg = 1.76 cmolc dm⁻³; Cu = 0.96 cmolc dm⁻³; Fe = 260.73 cmolc dm⁻³; Mn = 9.06 mg dm⁻³; Zn = 3.13 mg dm⁻³. Clay, silt and sand contents were 120, 96 and 484 g kg⁻¹, respectively.

Preparation of the area and fertilization

There was no need for liming in the area. Fertilizations were performed according to soil analysis and to the

recommendation of Sousa et al. (2011) for melon. The following doses were required: N = 140 kg ha⁻¹, P₂O₅ = 180 kg ha⁻¹ and K₂O = 247.68 kg ha⁻¹. At 10 days prior to transplanting, basal fertilization was performed in the planting furrow, consisting of 60% P (108 kg of P₂O₅ ha⁻¹), 20% N (28 kg N ha⁻¹) and 10% K₂O, applied according to the quantity recommended for each treatment (0, 50, 100, 150 and 200% of the recommended dose), applying along the furrow and subsequently covered with soil.

Three top-dressing fertilizations were performed, applied through the irrigation water, adding all the rest of N and P and applying the different potassium treatments. First fertilization was 50% N (70 kg ha⁻¹), 20% P (36 kg ha⁻¹) and 40% K; second fertilization was 20% N (28 kg ha⁻¹), 20% P (36 kg ha⁻¹) and 40% K; and third fertilization was 10% N (14 kg ha⁻¹) and 10% K.

Treatments and experimental design

The experimental design adopted was the Randomized Block Design (RBD), in a 4 x 5 factorial scheme, with three replicates. The treatments consisted of five percentage doses of potassium (0, 50, 100, 150 and 200%) considering the recommended dose for the crop, which corresponded to 0, 123.84, 247.68, 371.52 and 495.36 kg ha⁻¹ of K₂O, respectively, and four soil water tensions (15, 30, 45 and 60 kPa).

The plants were irrigated by a drip system through polyethylene drip hoses, with nominal diameter of 16 mm, operating pressure of 7.5 mwc at the end of the hose, flow rate of 1.20 L h⁻¹, and emitters spaced apart by 15 cm. The drip hoses were positioned in the planting row, and each drip hose per plot had 3.5 emitters per plant.

To monitor the energy state of the water in the soil, a set of twelve tensiometers were installed in the central block, three for each tension treatment, two at 0.30 m depth for irrigation monitoring, i.e., tensiometers for decision making, and one at 0.40 m depth to verify the occurrence of percolation, in each treatment, installed in the planting rows at 10 cm distance from the plant stems (Sousa et al., 2014).

Daily readings were performed in the tensiometers at 8 a.m., adopting the criterion of restarting the irrigations when the averages of the two tensiometers for decision making reached the critical tension. Irrigations were performed in order to increase soil moisture, obtained indirectly by the tensiometer, to the condition of field capacity, which corresponded to 10 kPa (0.3339 cm³/cm⁻³). Tensiometer readings were performed using a puncture tensiometer (digital). Irrigation management was based on the soil water characteristic curve obtained in the 0-30 cm layer (Figure 3), which was used to monitor the soil moisture contents in all treatments.

Evaluated characteristics and statistical analysis

The variables analyzed were transverse diameter (TD) and longitudinal diameter (LD) of fruits (mm), yield (Y) in t ha⁻¹, pulp thickness (mm), °Brix (%) and pH. These variables were subjected to analysis of variance by F test and, in case of significance, regression analyses were applied with R 3.5.0 program (R Development Core Team, 2018).

Conclusions

The present study shows that irrigation at tension of 15 kPa, used as a reference to start irrigation, and potassium dose around 100% of the recommended dose (247.68 kg ha⁻¹ of

K₂O) promoted higher fruit production and quality of the netted melon hybrid 'Pingo de mel'. Excessive potassium dose (495.36 kg ha⁻¹ of K₂O) and water stress condition (60 kPa) led to lower fruit production and quality.

Acknowledgments

The authors thank CNPq - National Council for Scientific and Technological Development, for the financial assistance to the scholarship holder and to the conduction of the present study, as well as the Federal Rural University of the Amazon - UFRA and the Working Group on Water and Soil Engineering in the Amazon - GTEASA.

References

- Alvarenga MAR, Rezende GM (2002) A cultura do melão. Lavras: UFLA/FAEPE, 149p.
- Andrade Júnior AS de, Frizzone, JA, Bastos EA, Cardoso MJ, Rodrigues BHN (2001) Estratégias ótimas de irrigação para a cultura da melancia. *Pesqui Agropecu Bras* 36(2):301-305.
- Bagagim JBC (2019) Marcha de absorção de macronutrientes do meloeiro (*Cucumis melo* L.) fertirrigado. Trabalho de Conclusão de Curso (Bacharelado em Agronomia) - Instituto Federal de Educação, Ciência e Tecnologia do Sertão Pernambucano, Petrolina.
- Barros VS, Santos TL, Silva EO, Sousa JÁ, Figueirêdo MCB. (2019). Agronomic and environmental performance of melon produced in the brazilian semiarid region. *Rev Caatinga*. 32(4):877-888.
- Cabello MJ, Astellanos MT, Romojaro F, Martinez, C, Ribas F (2009) Yield and quality of melon grown under different irrigation and nitrogen rates. *Agr Water Manage*. 96: 866–874.
- Carvalho JA, Rezende FC, Aquino RF, Freitas WA. de, Oliveira E C (2011) Análise produtiva e econômica do pimentão-vermelho irrigado com diferentes lâminas, cultivado em ambiente protegido. *Rev Bras Eng Agr Amb*. Campina Grande, PB. 15(6):569-574.
- Cavalcante Neto, JG, Ferreira KTC, Aragão FAS, Antônio RP, Nunes GHS (2020) Potential of parents and hybrids experimental of the yellow melon. *Ciênc Rural*. 50(2): 1-9.
- Coelho EL, Fontes PCR, Finger FL, Cardoso AA (2003) Qualidade do fruto de melão rendilhado em função de doses de nitrogênio. *Bragantia*. 62(2):173-178.
- Crisóstomo JR, Cardoso JW, Santos A, Vina FMP, Cardoso JE, Bleicher E, Rossetti AG, Lima RN, Freitas JG (2003) Avaliação da produção, da qualidade e da resistência à doenças e pragas, de híbridos de melão amarelo no Ceará e Rio Grande do Norte no período 1999/2000. Fortaleza: Embrapa Agroindústria Tropical. 12 p. (Embrapa Agroindústria Tropical - Circular Técnica 14)
- Fabeiro C, Olalla FMS, Juan JA (2020) Production of muskmelon (*Cucumis melo* L.) under controlled deficit irrigation in a semi-arid climate. *Agr Water Manage*. Fresno, 54:93-105.
- Faria CMB (1990) Nutrição mineral e adubação de melão. Petrolina: EMBRAPA, CPATSA, 26p. Circular Técnica, 22.
- Figueiredo RC de (2014) Lâmina e frequência de irrigação na cultura do melão tutorado no vale do baixo são Francisco. 65 f. Dissertação (Engenharia Agrícola) - Universidade Federal do Vale do São Francisco. Juazeiro.
- Filgueira FAR (2008) Novo Manual de olericultura. Viçosa, UFV. 402p.
- IBGE - Instituto Brasileiro de Estatística e Geografia (2012) Estados. Disponível em: <<http://www.ibge.gov.br/estados/>>. Acessado em: 07 de Dezembro de 2021.
- Guerra AG, Zanini JR, Natale W, Pavani LC (2004) Frequência da fertirrigação da bananeira prata-anã com nitrogênio e potássio aplicados por microaspersão. *Eng Agric Jaboticabal*. 24(1): 80- 88.
- Guimarães BR, Araujo ARR, Galvão JR, Pacheco MJB, Silva SB, Assis LFCT, Azevedo JC, Moraes KC (2020) Melão (*Cucumis melo* L.): interrelações entre adubação, nutrição mineral e produção. *Rev Iberoamericana de Ciênc Amb*. 11(1): 391-399.
- Hasanuzzaman M, Bhuyan MHMB, Nahar K, Hossain MS, Mahmud JA, Hossen MS, Masud AAC, Moumita FM (2018) Potassium: a vital regulator of plant responses and tolerance to abiotic stresses. *Agronomy*. 8: 1–29. <http://doi.org/10.3390/agronomy8030031>
- Katayama M (1993) Nutrição e adubação mineral de melão e melancia. In: Simpósio sobre nutrição e adubação de hortaliças, Jaboticabal, Anais. Piracicaba: Assoc Bras Pesqui Potas e do Fosf. p.219-226
- Lima EM (2015) Irrigação do meloeiro cultivado em ambiente protegido. In: Tese, LAVRAS – 53 p.
- Marouelli WA, Oliveira ÁS, Coelho EF, Nogueira LC, Sousa VF (2011) Manejo da água de irrigação. 157-232.
- Melo DM, Charlo HCO de, Galatti FS de, Franco AJ, Castoldi R, Braz LT (2009) Produtividade de híbridos de melão rendilhado em diferentes substratos alternativos. *Hortic Bras*. 27: S208-S213.
- Meurer EJ (2006) Nutrição mineral de plantas. 1 ed. Viçosa: SBCS, Cap. 5, p. 282-298.
- Morais AT de (2008). Irrigation frequencies in the yield and quality of the melon cantaloupe, in Mossoró-RN. 63 f. Dissertação (Mestrado em Irrigação e Drenagem) - Universidade Federal Rural do Semi-Árido, Mossoró.
- Oliveira EC, Carvalho JA, Silva WD, Rezende FC, Gomes LAA, Jesus MN (2011) Análise produtiva e econômica do pepino japonês submetido a diferentes lâminas de irrigação. *Rev Bras Eng Agr Amb*. 15(7):702-708.
- Oliveira FA, Medeiros JF de, Lima CJGS de, Dutra I, Oliveira MKT de (2008) Eficiência agrônômica da fertirrigação nitrogenada e potássica na cultura do meloeiro nas condições do semi-árido nordestino. *Rev Caatinga*. 21(5).
- Pereira FAL, Medeiros JF, Gheyi HR, Dias NS, Preston W, Vasconcelos CBL (2017) Tolerance of melon cultivars to irrigation water salinity. *Rev Bras Eng Agr Amb*. 21(12): 846-851.
- Pereira WB de, Possidio CEF de, Sousa JSC de, Simões WL, Santos CMG (2021) Produção e Qualidade de Melões Sob Diferentes Arranjos do Sistema de Irrigação e Coberturas do Solo. *Rev Bras Meteorol*. 36(2): 285.
- Prado RM (2008). Nutrição de Plantas, São Paulo: Editora Unesp, 407 p.
- Pinto MMF, Gonçalves JS, Souza ITN, Batista NV, Melo VLL, Firmino SS, Pinedo LÁ, Lima PO (2019) Utilização do melão (*Cucumis melo* L.) na alimentação de ruminantes: Uma revisão. *Braz J Dev*. 5(12):31466-31481.
- Queiroz ISR de (2016) Cultivo do meloeiro em sistema semi-hidropônico sob diferentes concentrações de Potássio na solução nutritiva. Universidade Federal Rural do Semi-árido Pró-reitoria de pesquisa e pós-graduação programa de pós-graduação em manejo de solo e água Mossoró – RN.

- Rocha CRT (2015) Crescimento e qualidade dos frutos do meloeiro sob diferentes lâminas de água e doses de Potássio fertirrigado com gotejamento subsuperficial. Tese de doutorado, Universidade Federal do Ceará centro de ciências agrárias departamento de engenharia agrícola programa de pós-graduação em engenharia agrícola.
- Raj BV (1991) Fertilidade do solo e adubação. São Paulo: Agron Ceres, 136p.
- Santos MF, Costa CC, Oliveira EM.; Barbosa JWS (2011) Avaliação de genótipos de melão amarelo em Paulista, PB. *Tecnol Ciên Agropec João Pessoa* 5(1):1-6.
- Sensoy S, Ertek A, Gedik I, kucukyumuk C (2007) Irrigation frequency and amount affect yield and quality of field-grown melon (*Cucumis melo* L.). *Agr Water Manage.* 88(1): 269-274.
- Silva EO, Alves RE, Santos EC dos (2008) Colheita e pós-colheita na produção integrada de melão. In: Braga Sobrinho, R.; Guimarães, J. A.; Freitas, J. de A. D. de; Terao, D. (org.). *Produção integrada de melão*. Fortaleza: Embrapa Agroindustria Tropical, p.273-284.
- Silva MC, Silva TJA da, Silva BEM, Farias LN do (2014) Características produtivas e qualitativas de melão rendilhado adubado com nitrogênio e potássio. *Rev Bras Eng Agr Amb, Campina Grande, PB.* 18(6):581–587.
- Sousa, AEC, Bezerra, FML, Sousa CHC, Santos FSS (2010) Produtividade do meloeiro sob lâmina de irrigação e adubação potássica. *Eng Agr.* 30(2):271-278.
- Sousa VF de, Marouelli WA, Coelho EF, Pinto JM, Coelho Filho MA (2014) *Irrigação e fertirrigação em fruteiras e hortaliças*. 2. Ed. Brasília, DF: Embrapa Informação Tecnológica.