



GROWTH AND EXTRACTION OF MACRONUTRIENTS BY MINE-WATERMELON GROWN IN PROTECTED ENVIRONMENT

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ABSTRACT: This study aimed to evaluate the growth and extraction of macronutrients mine-watermelon hybrid Smile in protected environment. The experiment was conducted in a greenhouse of the ESALQ - USP, Piracicaba - SP, (22 ° 42'30"S, 47 38'00"W). It was used the experimental design fully randomized complete block with five treatments and four replications. The treatments consisted of sampling times for the 26, 36, 43, 52 and 61 days after transplanting (DAT). It was found that the leaf area, the dry mass showed continuous growth over the cycle. The biggest increase in the absorption of macronutrients occurred after the early fruiting, between 52 and 61 DAT.

KEYWORDS: *Citrullus lanatus*, plant nutrition, growth

INTRODUCTION: In Brazil it is still a little expressive production of mine watermelon, and also does not have information this crop in protected environment in commercial scale. A good pay to the producer of mine watermelons is justified by the trend of the market for prefer little fruit. The system of protected environment enables achieve the desired sustainability, which includes: clean production in the environmental aspect, with low-input, minimum risk of economic failure, generating employment and the use of the structure of production in a more continuous. The efficiency of use of fertilizer depends on the knowledge of the demand of each nutrient in each phase of the cycle of culture, the improvement in technology, irrigation and the efficient use of irrigation water and fertilizer. This is essential to maintaining agricultural production in balance with the increasing demand for land environmentally healthy (PAPADOPOULOS, 1999). While the march of absorption of nutrients is affected by the weather, cultivars, and cultivation system, in general the nutrients are absorbed throughout the cycle, and the absorbed differences in the speed of absorption and depending on the cycle and the translocation of the leaves and the stems and the reproductive organs (COELHO, 1994). GRANGEIRO & CECILIO (2004) and GRANGEIRO & CECILIO (2005), studied the motion of absorption of watermelon on the field and observed an initial growth slow, stepping up from 30 days after planting. According to author or the accumulation of dry matter at the end of the cycle was from 1800 g plant⁻¹, and 31% constituted by the party vegetative and fruit by 69%; similar behavior was absorbed for the accumulation of nutrients.

METHODOLOGY: The work was conducted in the period from august 21 to october 20, 2007, in a greenhouse of the Department of Rural Engineering of the ESALQ - USP,

Piracicaba - SP, located at 22° 42'30"S, 47°38'00"W and 576 m in altitude. In a greenhouse with an area of 400 m², comprising two vain, with galvanised metal structure, whose height is 4.6 at the central me on the side of 3.0 m, covered with transparent film of high-density polyethylene, with additive Ultraviolet, thickness of 1.50 mm. Counting even with a reflective screen type "aluminete" installed to 3.0 m high. The side sealed with plastic screen type anti-afidios. The structure is provided with energy and treated water. It was used the experimental design fully randomized complete block with five treatments and four replications. The treatments consisted of sampling times for the 26, 36, 43, 52 and 61 days after transplanting (DAT). It was used to hybrid "Smile" that produces fruit, green and dark green stripes, red pulp-intensive, and round, and weight ranged between 0.7 to 2.5 kg. The seedlings were prepared in trays and transplanted at the issue of the second definitive leaf. The cylindrical vessel of polyethylene, with a capacity of 20 L, were prepared with 18 L of substrate granules of coconut yarn, fine texture. Spaced between plants of 0.70 m and 1.5 m between rows, where each row was a block. The plants were vertically conduced in cotton yarn, pending the wire row, with 2.10 high. The pruning and conduct of the plants were adapted the technique adopted by BRANDÃO FILHO & CALLEGARI (1999), with the following procedure: the plants were vertically conduced upright with a rod, with a thread of cotton, and left three leaves on each side shooting. To avoid wastage, the thinnings were charged after the definition of the third sheet of the branch. The fruits have developed in the main branches between 8 and 14 inter knobs. The shoots of fruit have been left axilla with four leaves. The pruning was done with apical height of 2.0 m, between 18 and 24 of inter knob. To support fruits were used mesh and yarn plastic. The system of drip irrigation was used with two drippers per pot. The amount of water was determined with help of lisymeters drainage and humidity of the substrate was monitored and tensiometers. The moisture in the soil was always kept near the capacity of container, which was 50% based on volume. The supply of nutrient solution was conducted through fertilizer presented in Table 1, applied via fertigation, with flow rate of 4.0 Lh⁻¹. Were used as a source of nutrients the following nutrients: KNO₃, CaNO₃, MAP, MgSO₄, NH₄NO₃, K₂SO₄ and made Hidrococktail trade as a source of micronutrients.

Table 1. Total of fertilizers (g Plant⁻¹) applied at each stage, and the cumulative total of macronutrients at the end of the vegetative cycle.

Phases of the cycle	N	P	K	Ca	MG	S	Micros
1 ^a (21/08 to 7/09)	0.84	1.06	0.64	0.78	0.23	0.19	0.07
2 ^a (8/09 to 26/09)	1.20	0.52	1.91	0.86	0.24	0.34	0.11
3 ^a (27/09 to 12/10)	2.47	0.77	3.68	1.28	0.36	0.29	0.16
4 ^a (13/10 to 20/10)	4.87	1.51	11.77	2.52	0.71	2.11	0.32
Total (g pl ⁻¹)	9.39	3.85	18.00	5.43	1.54	2.93	0.65

Four plants were collected by repetition, to measure the levels of macronutrients. The plants were collected without roots, with the cut surface of the ground, the leaf area was measured with the help analyzer LI 3100 (LI-COR, Lincoln, Nebraska). In Place in oven at 60 ° C to achieve weight stable. After drying the material was heavy for determining the accumulation of dry matter. And then

forwarded to the laboratory for analysis of plant tissue to determine the amounts of N, P, K, Ca, Mg and S.

RESULTS AND DISCUSSION: The Figure 1 represents the results concerning the growth of plants of mine watermelon, expressed in the rate of increase of leaf area (AF), and accumulation of dry matter (DM). The rate of increase of AF in the initial phase of 305 cm² was in the day, while at the stage of formation of fruit dropped to 100 cm² day⁻¹. When the parameter of growth is the accumulation of dry plants started with growth rate of 2.7 g day⁻¹ and at the stage of formation of fruit that rate increased to 6.3 g day⁻¹. The change of behavior on a reverse in the two curves, almost the same time, coincides with the beginning of the development of fruit. This amendment is related to the strength of drains in the plant, begun with the entry of the same in the reproductive process, because at that stage occurs largest translocation of carbohydrates and other compounds from the leaves to the fruit, as explained GRANGEIRO & CECILIO (2005). The rate of absorption of nutrients by plants, represented in Figure 2, was also low during the first 26 days after transplanting seedlings (DAT), when the plant accumulated only 12% of the nutrients. The largest coinciding with the period of lower accumulation of dry matter. The biggest increase in the absorption occurred after the start of the fruit, from 52 and 61 DAT, a period that the plant absorbed 39% of total accumulated nutrients. The potassium was the most part absorbed, its highest rate of absorption occurred between 43 and 70 DAT, caused by the prevalence of reproductive stage. The absorption of nutrients by a mini watermelon "Smile" in the following sequence: K> N> Ca> P> Mg> S. These results were similar to those obtained by GRANGEIRO & CECILIO (2005), with the reversal of the order between the phosphorus with magnesium.

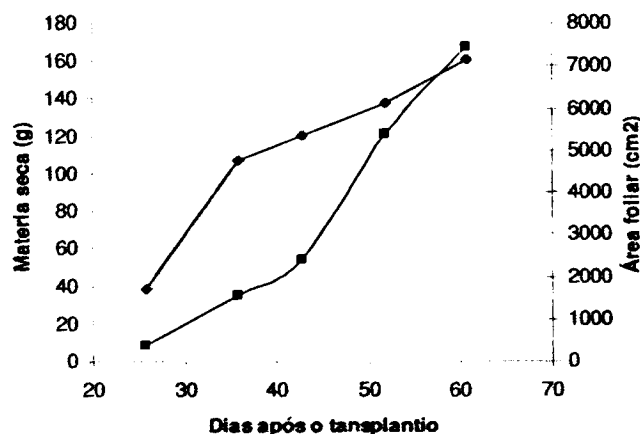


FIGURE 1. Increase in leaf area ($AF = 0.273x^3 - 39.1x^2 + 1923.3x - 26621$ and $R^2 = 0.99$) and accumulation of dry matter ($DM = 0.0773x^2 - 2051x + 8844$) in plants of mine watermelon, hybrid Smile with fruits.

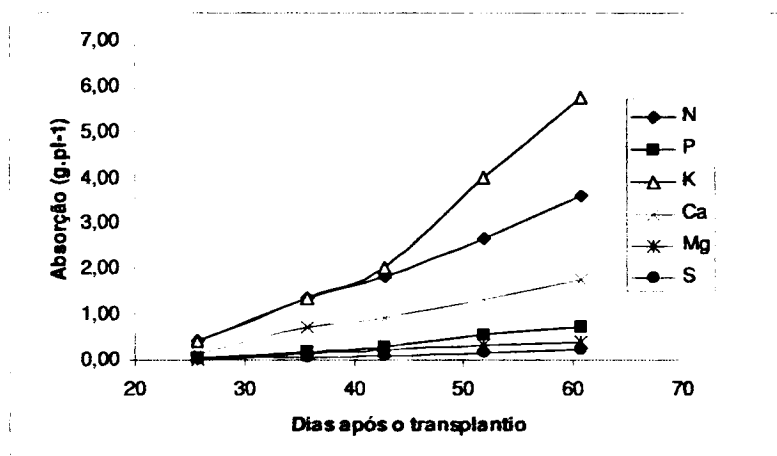


FIGURE 2. Absorption of nutrients by plants of mine-watermelon, hybrid Smile with fruits

CONCLUSIONES: It was found that the leaf area, the dry mass showed continuous growth over the cycle. The biggest increase in the absorption of macronutrients occurred after the early fruiting, between 52 and 61 DAT.

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