

CONDITIONING OF SEEDLINGS OF PEPPERS (*CAPSICUM ANNUM* L.), INFLUENCED BY THE HYDROPONIC SYSTEM "FLOATING"

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1 ABSTRACT

The aim of this research to assess the development of pepper seedlings under different nutritional conditions, under the influence of the "Floating" aiming system, a new production, alternative for larger producers' safety in producing sustainably, ensuring the production of healthy food and income generation. The production of seedlings occurred in polyethylene plastic trays, where they were placed 2/seeds paprika cells of Yolo Wonder cultivar. After the emergence of seedlings was thinning. The experimental design was completely randomized design, containing 5 treatments with 4 replications. The treatments were T1-trays remained out of the "floating", receiving water irrigation 2 times a day; T2-trays of floating, remained out more irrigation the same solution of the "floating" 3 times a week, using 500 ml of solution per Pan; T3-were pans 12:00 are in "floating" and 12:00 am out; T4-trays remained throughout the period of the test in the "floating"; T5-trays remained throughout the period in the "floating", except in the last week. The solution was composed of soluble fertilizer, calcium nitrate, potassium chloride, Triple Superphosphate and Urea, and was changed every Ten days. The parameters analyzed were height of the plant; Root length; Fresh matter weight of shoot; Weight of fresh root matter; Dry matter weight of shoot; Root dry matter weight; Diameter of the stem. All parameters analyzed were submitted to analysis of variance and averages compared by Tukey test to 1% in the case of significance. The treatment proved to be more feasible was the T4, as this medium to larger variables introduced height, stem diameter, plant fresh mass aerial and aerial dry mass.

Keywords: Nutrient solution, production, safety, productive Alternative.

**MELO, A. R. P.; SOUSA, J. F. F.; CONCEIÇÃO, C. N. E OLIVEIRA, M. R. A.
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INFLUENCIADAS PELO SISTEMA HIDROPÔNICO "FLOATING"**

2 RESUMO

Objetivou-se com esta pesquisa avaliar o desenvolvimento de mudas de pimentão submetidas a diferentes condicionamentos nutricionais, sobre influência do sistema “Floating” visando, uma nova alternativa de produção, para propiciar aos produtores maior segurança em produzir sustentavelmente, para com isso garantir a produção de alimentos saudáveis e geração de renda. A produção de mudas ocorreu em bandejas de polietileno plástico, onde foram colocadas 2 sementes/célula de pimentão da cultivar Yolo Wonder. Após a emergência das plântulas, foi feito o desbaste. O delineamento experimental foi Inteiramente Casualizado, contendo 5 tratamentos com 4 repetições. Os tratamentos foram: T1- As bandejas permaneceram sempre fora do “floating”, recebendo irrigação de água 2 vezes ao dia; T2 – As bandejas permaneceram fora do floating, mais irrigação da mesma solução do “floating” 3 vezes por semana, usando 500 ml da solução por bandeja; T3 – As bandejas ficaram 24 h em “floating” e 24 h fora; T4 - As bandejas permaneceram todo o período do ensaio no "floating"; T5 - As bandejas permaneceram todo o período no "floating" ", exceto na última semana. A solução foi composta pelos fertilizantes solúveis, Nitrato de Cálcio, Cloreto de potássio, Superfosfato Triplo e Ureia, e foi trocada a cada Dez dias. Os parâmetros analisados foram: Altura da planta; Comprimento da raiz; Peso da matéria fresca da parte aérea; Peso da matéria fresca da raiz; Peso da matéria seca da parte aérea; Peso da matéria seca da raiz; Diâmetro do caule. Todos os parâmetros analisados foram submetidos à análise de variância e as médias comparadas pelo teste de Tukey a 1% no caso de significância. O tratamento que se mostrou mais viável foi o T4, pois este apresentou maiores médias para as variáveis altura da planta, diâmetro caulinar, massa fresca da parte aérea e massa seca da parte aérea.

Palavras-chave: Solução Nutritiva, Alternativa de Produção, Segurança produtiva.

3 INTRODUCTION

Pepper cultivation is still one of the best examples of family agriculture and small farmer-agribusiness integration, where productivity, most of the time, is linked to the production of seedlings. In addition, this is the step where the producer will have a greater economic return and productive security (COELHO et al., 2017).

Obtaining seedlings of good quality is an important step in the production of vegetables, because it results in better production planning and contributes to enriching the knowledge of producers to meet an increasingly competitive (ALVES et al., 2012).

With the advancement of research and new technologies related to the productive chains of vegetables were

emerging methodologies for seedling cultivation, evolving from construction sites in the soil to produce in containers. Among the most containers used in the production of seedlings of Peppers is the use of polyethylene plastic trays (RODRIGUES et al., 2010).

According to Minami (1995), to have quality seedlings must be taken strictly in various stages of the production system, including nutrition, which will directly influence on the performance of the changes and your resistance. Verdial (2000) states that we must give even greater attention, for supplemental nutrition, when these are produced in cells or trays, due to the scarcity of substrate of containers. Thus, it is necessary to use According to According to nutritional conditioning as a solution to this issue.

The seedling production system with nutritional conditioning can be done by adopting the following methodology: the seedlings undergo fertilization, soon after the emergence of seedlings, produced in styrofoam trays or polyethylene. One of the ways to offer this conditioning the seedlings is hydroponics, where plants are grown in the nutrient solution, using fertilizers and water in a rational way and using fewer pesticides (TORCHELSEN, 2013).

The term hydroponics (from the Greek: hydro = water and ponds = work) means work with water. The hydroponics of type "Floating" takes its name because in it there are no channels for cultivation, there is, however, a table of cultivation where is placed a blade of nutrient solution. Differs from other hydroponic systems for containing a thick layer with a nutrient solution (approximately 4 to 5 cm). On this blade are put styrofoam trays, and nutrient solution down to propitiate the development of seedlings (BEZERRA NETO; BARRETO, 2012).

In view of the above, this study aimed to assess the development of pepper seedlings under different nutritional conditions, under the influence of the Floating system.

4 MATERIAL AND METHODS

The survey was developed in the agricultural field of the IFMA Campus Codó-MA, situated 5 km from the seat of the municipality of Codó-MA and 290 km from the State capital, São Luís, with geographical coordinates of 4° 26 ' 51 " S, 43° 52 ' 57 " W and height of 48 m (CASTRO JÚNIOR, 2012). During the period January 2017 April 2018. The climate of the region is according to the classification of Koppen AW type, humid and sub-humid dry winter.

The seeds were planted in polyethylene trays of 128 cells, where they

were placed 2 chili seeds of Yolo Wonder cultivar per cell. As a substrate was used from the worm farm located in IFMA Campus Codó-MA. Seven days after planting the rough leaving the more vigorous seedling. Then, the trays were subjected to different nutritional conditions with the aid of the "FLOATING" System.

The location chosen for the installation of the tank received solar incidence during all day. The sides of the tank were assembled using styrofoam plates, 16 with the following dimensions 100 x 25 x 5 cm each. Resulting in a rectangular tank measuring 3.5 m in length, 3.0 m wide and 10 cm depth, was waterproof with plastic canvas black. The tank was filled with 100 liters of water and installed an air compressor for oxygenation of the aquarium water. Then, styrofoam plates were placed under water for trays containing the seedlings. The system housed 12 trays containing 128 cells, totaling 1536 seedlings.

The mineral solution prepared in the laboratory of soils of the IFMA Campus born was composed by: calcium nitrate fertilizers $\text{Ca}(\text{NO}_3)_2$, Triple Superphosphate (TSP), urea $((\text{NH}_2)_2\text{CO})$ and Potassium chloride (KCL), based on the recommendation: (mg. L^{-1}) N = 152, P = 29, K = 245, Ca = 20 (OLIVEIRA et al., 2014). The doses used were calcium nitrate (1.05 g/L), Triple Superphosphate (0.63 g/L), Potassium Chloride (4.08 g/L), urea (3.37 g/L). The mineral solution prepared in the laboratory of soils of the IFMA Campus born was composed by: calcium nitrate fertilizers $\text{Ca}(\text{NO}_3)_2$, Triple Superphosphate (TSP), urea $((\text{NH}_2)_2\text{CO})$ and Potassium Chloride (KCL), based on the recommendation: (mg. L^{-1}) N = 152, P = 29, K = 245, Ca = 20 (OLIVEIRA et al., 2014). The doses used were calcium nitrate (1.05 g/L), Triple Superphosphate (0.63 g/L), Potassium Chloride (4.08 g/L), urea (3.37 g/L).

After the preparation, the solution was mixed with water in the tank and then withdrawing a sample and taken to laboratory for analysis of pH and electrical conductivity, where values were obtained: S.cm⁻¹ 28 (Siemens per centimeter) for electrical conductivity and 5.75 for Ph. Adapting these to the average required 5.5-6.5 pH and 25-28 S.cm⁻¹ conductivity. After the certainty that the system could use, the trays were transferred to the same.

Completed 10 days a new measurement and observed change of pH of the solution (pH 5.2), there was a need for an exchange of same. Then, going on the renewal of the floating plants remained for over 20 days in the system, and there are periodic measurements for monitoring of pH and conductivity.

The experimental design used was the completely randomized design (DIC), containing 5 treatments with 4 replications each. T1-trays remained out of the "floating", with water irrigation twice a day; T2-trays remained out of the "floating", with the same irrigation solution

of "floating" three times a week, with 500 ml of solution per Pan; T3-were pans 24 h in "floating" and 24 h off; T4-trays remained throughout the period of the test in the "floating"; T5-trays remained throughout the period in the "floating", except in the last week.

The parameters analyzed were height of the plant; Root length; Fresh matter weight of shoot; Weight of fresh root matter; Dry matter weight of shoot; Root dry matter weight; Diameter of the stem. All parameters analyzed were submitted to analysis of variance and averages compared by Tukey test the 1% significance.

5 RESULTS AND DISCUSSION

For the height of the plant, stem diameter and fresh pasta from the shoot minimum significant difference 1% level of probability. To root length, root fresh mass, dry mass, root dry mass, there was a minimum significant difference.

Table 1. Average values for evaluation parameters of the production of seedlings of peppers, concerning the plant height (CPH), length of root (LR), stem diameter (SD), fresh pasta from the shoot (FPS), root fresh mass (RFM), shoot dry mass (SDM), root dry mass (RDM).

Treatments	Parameters Evaluated						
	CPH (cm)	LR (cm)	SD (cm)	FPS (g)	RFM (g)	SDM (g)	RDM (g)
T1	15,8 c	7,7 a	1,9 a	0,45 b	0,25 a	0,08 a	0,03 a
T2	20,0 b	7,26 a	2,45 a	1,19 a	0,45 a	0,17 a	0,04 a
T3	25 a	7,03 a	3,20 a	1,45 a	0,32 a	0,16 a	0,07 a
T4	26,7 a	7,13 a	3,11 bc	1,74 a	0,50 a	0,23 a	0,04 a
T5	23,9 a	6,43 a	2,75 bc	1,18 a	0,58 a	0,16 a	0,04 a
CV (%)	5,85%	7,08%	7,62%	23,63%	70,13%	40,08%	77,77%

Medium followed by the same letters in the same column does not differ statistically between themselves by Tukey test a 1% probability.

Second Filgueira (2013), following the recommendation about height ideal for transplanting of, considered the height of 10 cm seedlings aged 30 to 45 days. Being that these can be kept longer under Fertigation

to present further development, explaining as well, the significant results for this variable in the T4 treatment when the plants were exposed for longer (mineral solution 40 days) since these showed an average

value of 26.67 cm. Gordin et al. (2010) in studies with seedlings of Chinese cabbage (*Brassica pekinensis*), plant height increase observed in response to fertilizer doses added via fertirrigation, as these increased concentrations of all nutrients essential for developing plants.

In relation to LR, the treatments T1, T2, T3, T4 and T5 did not show a difference between the minimum themselves. It is possible that a good development of the roots has occurred due to correct oxygenation in all treatments and the absence of toxicity, since nutrient ratios were calculated correctly in order to balance the saltiness, electrical conductivity and pH of the solution.

In the production of pepper seedlings fertirrigadas with different nutritional solutions, Oliveira et al. (2014) divided the results obtained in 2 groups, the first with LR ranging from 8.21 to 7.02 cm for different cultivars tested. And so, observe that the results gained for LR chili packed in a floating system, are considered satisfactory because the averages reached the treatments were between 7.74 cm to 6.43 cm, corroborating the data presented by the author in this study.

As for the SD, the treatments T4 and T5 were quantitatively superior to treatments T1, T2 and T3. This fact can be explained because the treatments T4 and T5 remained for a longer period in contact with the nutrient solution being positively influenced by the availability of nutrients. In studies conducted by Alves et al. (2012), evaluating the quality of tomato seedlings with different nutritional solutions, the stem diameter (SD) was positively affected by the concentration of nutrients in the nutrient solution, being observed increased until a certain level of nutrients and the average for this variable was 1.8 mm. Thus demonstrating that the results regarding the chili seedlings in a floating system, were satisfactory and above.

With respect to fresh pasta from the shoot (FPS) treatments, treatments T4 (1, 74 g) and T3 (1.45 g) demonstrated greater quantitative averages and the treatment showed lower quantitative average was the T1 (0.45 g), also of statistically too much. T3 and T4 treatments that were in contact with the nutrient solution presented bigger medium-sized compared to T1, in response to the concentration of nutrients. Batista et al. (2010) in a study on effects of different levels of fertirrigation in morphological characteristics of seedlings of chicory, observed that the averages related to fresh pasta from the shoot (FPS), showed sharp growth in response at doses of fertilizer, with 2.04 g growth in the rate of 14.8 gL⁻¹ of fertilizer.

In relation to the root fresh mass (RFM) there were no differences between treatments minimum T1, T2, T3, T4 and T5, this can be explained by this parameter be water sensitive, and as all treatments were being supplied with water regularly, not only those within the system but also those who were flushed manually may have interfered in the medium related to this variable. Santos et al. (2018), working with green chives biomass production in response to water slides and synthetic fertilization levels, in analysis on root fresh mass, observed that negatively influenced irrigation blades to the accumulation of fresh matter, while fertilization levels resulted in an increase in the same variable.

How to dry pasta from the shoot (SDM), T4 treatment (0.23 g) expressed greater quantitative average compared with other treatments. These fact could be due to the longer exposure in these seedlings remained in contact with the nutrient solution. According to Taiz and Zeiger (2009), the best way to evaluate the growth of a plant is the dry mass (SDM), fresh pasta is a very variable vulnerable to water changes, as most of the vegetables is made up of water, an important constituency for

the hydrogen supply will be responsible for the production of organic matter.

The treatments T1, T2, T3, T4 and T5 did not differ statistically between them, with respect to the root dry mass (RDM), however with the T3 treatment (the trays were 24 h in "floating" and 24 h off) expressing greater quantitative average as compared to too much, it may be related to significant changes in the environment, and may have caused stress in plants by influencing the development accelerated in the cells of the roots. According to Costa et al. (2015) roots with appropriate development can withstand the environment changes, because the root system of plants allows greater contact area with the ground, justified by the greater root dry matter.

6 CONCLUSIONS

The treatment proved to be more feasible was the T4, as this has shown higher averages for the variable height, stem diameter, plant fresh mass of air and part of the shoot dry mass, being important parameters that should be taken into consideration, because influence directly in the production of healthy and sturdy seedlings. The use of floating system should be made throughout the period of production of seedlings of peppers (*Capsicum Annum* L.) to achieve the best results of plant growth.

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