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Vegetative growth of radish in different organic substrates

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***Abstract*—** *The present work had like objective to evaluate the effect of different organic substrates on the vegetative growth of radish cultivar Crimson Giant. It was utilized a completely randomized design with five treatments and four replications . the substrates rated were T0 - washed sand + sawdust ; T1 - washed sand + sawdust + vermicompost ; T2 - washed sand + sawdust + 'Quixabeira soil '; T3 - washed sand + sawdust + cattle manure and T4 - washed sand + sawdust + broiler litter . were rated the plant height - AP (cm), fresh matter weight of the aerial part – MFA (g), dry matter weight of the aerial part - MSA (g), fresh matter weight of the root – MFR, dry matter weight of the root - MSR (g) and root diameter - DR (cm). observed that there were a significant effect of the treatments , in which the best vegetative growth was obtained in the T4 substrate.*

I. INTRODUCTION

The radish (*Raphanus sativus* L.) is an annual vegetable belonging to the Brassicaceae family and has been gaining prominence among vegetable growers, due to its attractive characteristics (rusticity, small size and short cycle). Produced mainly by small and medium farmers and with little expressive production in Brazil, it concentrates greater production in the south and southeast regions. In the northeast region, the states of Bahia and Pernambuco concentrate the largest number of producers [1].

It is characterized by being a short cycle plant (25 to 35 days), however, it needs high amounts of nutrients, responding positively to potassium fertilization even in soils with high potassium content [2].

It is a crop widely produced under conventional management, which includes sowing in the definitive location, use of soluble mineral fertilizers and cattle manure as the main organic matter added.

However, there is a need to adapt the production system to the reality of each region and to the different profiles of farmers. This need is the great incentive to carry out studies

on alternative management, such as the use of substrates for production in pots or beds on shallow soils, use of substrates in soils with low cation exchange capacity and water retention, use of substrate for seedling production and studies on the use of alternative organic materials.

Earthworm humus, Quixabeira soil, cattle manure and poultry litter are materials with great potential for use in radish production, providing nutrients and increasing water retention capacity. It is important to emphasize that the chemical composition of these materials is variable and therefore they can present different responses when added to the soil or substrate [3] [4] [5] [6] [7].

In this context, it is important to explain in a special way that the Quixabeira soil is a material made up of the litter of the tree Bumelia sertorium, popularly known as Quixabeira. This is a species that provides organic matter with great potential to improve soil properties [8].

Based on the above, the present work aimed to evaluate the effect of different compositions of organic substrates on the vegetative development of the radish cultivar Crimson Giant.

II. METHOD

The experiment was carried out in a greenhouse, at the Universidade do Estado da Bahia, UNEB, Campus XXII of Euclides da Cunha-BA . The municipality of Euclides da Cunha/Ba is located at 10º 30' 27" south latitude and 39º 00' 57" west longitude of Greenwich, with an altitude of 472 meters above the sea. The area is part of the " Drought Polygon ". According to the Köppen classification, the climate of the region is sub-humid, with a dry winter. The average annual temperature is 22ºC. The hottest month is October, with temperatures up to 38ºC and the coldest is July, with average values close to 20ºC. Annual rainfall varies from 500 to 750 mm.

The design used was completely randomized with five treatments and four replications. The evaluated treatments consisted of five different substrate compositions, being T0 – washed sand + sawdust in the proportion of 1:1; T1 – washed sand + sawdust + earthworm humus in the proportion of 1:1:2; T2 – washed sand + sawdust + quixabeira soil in the proportion of 1:1:2; T3 – washed sand + sawdust + cattle manure in the proportion of 1:1:2 and T4 – washed sand + sawdust + poultry litter in the proportion of 1:1:2. In each treatment the materials are mixed and homogenized.

Crimson Giant radish seeds from the Feltrin company were used, sown at a depth of approximately 2 cm in disposable cups (200 ml) containing the substrates for each treatment . The humidity in the substrates was maintained with manual irrigation throughout the experimental period, according to the water needs of the crop.

At 22 days after emergence (DAE) the following parameters were evaluated: plant height - AP (cm), fresh mass - MFA and shoot dry mass - MSA (g), fresh mass - MFR and root dry mass - MSR (g) and root diameter - DR (cm).

The collected data were submitted to analysis of variance and the means were compared by the Scott - Knott test at 5% probability. Statistical analyzes were processed using the statistical program SISVAR 5.6 [9].

III. RESULTS AND DISCUSSION

A significant effect of treatments was observed at the 5% level for all variables analyzed at 22 DAE. The highest values for plant height (AP) were obtained in substrates T1 (washed sand + sawdust + earthworm humus), T2 (washed sand + sawdust + quixabeira soil) and T4 (washed sand + sawdust + poultry litter) with an average of 4.52 cm; 5.10cm and 5.92cm respectively (FIGURE 1).

Means followed by the same letter in the column do not differ from each other by the Scott-Knott test at 5 % probability.

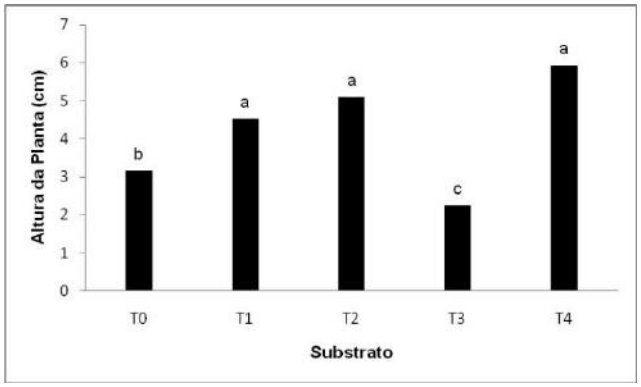

Fig.1 – Plant height (AP) of radish cultivar Crimson Gigante cultivated under different organic substrates.

The greatest increase for the fresh mass (MFA) and shoot dry mass (MSA) variables was provided by the T4 substrate, in which averages of 2.06g and 0.18g were obtained, respectively (FIGURE 2).

Means followed by the same letter in the column do not differ from each other by the Scott-Knott test at 5 % probability.

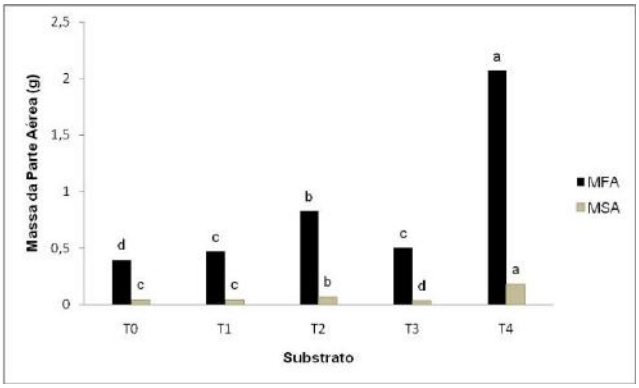

Fig.2 – Fresh matter weight of the aerial part (MFA) and dry matter weight of the aerial part (MSA) of radish cultivar Crimson Gigante cultivated under different organic substrates.

Substrate 4 favored greater development of the radish root system in the initial phase of growth, in which the average values expressed for the variables root fresh mass (MFR), root dry mass (MSR) and root diameter (DR) were 1.77g; 0.45g and 0.75cm respectively (FIGURE 3 and 4).

Means followed by the same letter in the column do not differ from each other by the Scott-Knott test at 5 % probability.

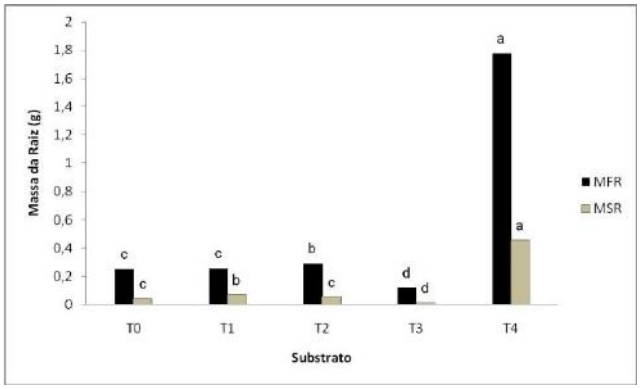

Fig.3 – Fresh matter weight of the root (MFR) and dry matter weight of the root (MSR) of radish cultivar Crimson Gigante cultivated under different organic substrates.

Means followed by the same letter in the column do not differ from each other by the Scott-Knott test at 5 % probability.

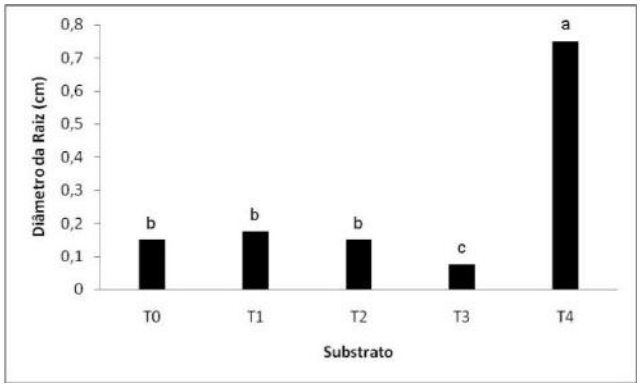

Fig.4 – Root diameter (DR) of radish cultivar Crimson Gigante cultivated under different organic substrates.

This response to the T4 substrate (Figure 5) indicates the most effective action of the poultry litter in the development of the radish, although the analyzes were carried out in the vegetative stage of the culture, it is acceptable to infer that the substrate composed of washed sand, sawdust and poultry litter has the potential to promote greater development of the culture, also in the productive phase.

It is important to emphasize that higher values of MFA and MFR indicate greater photosynthetic capacity and water and nutrient absorption, fundamental processes for plant growth and development.

Fig.5 – Radish cultivate Giant Crimson (Raphanus) sativus L.) 25 days after sowing . (A) - T0 (washed sand + sawdust); (B) - T1 (washed sand + sawdust + vermicompost); (C) - T2 (washed sand + sawdust + 'Quixabeira soil '); (D) - T3 (washed sand + sawdust + cattle manure) and (E) - T4 (washed sand + sawdust + broiler litter). Pimenta et al. (2018)

This more effective T4 substrate response may be related to the higher levels of nutrients present in poultry manure, mainly NPK. Araujo et. al. (2009), working with urea, cow and chicken manure, observed that the application of chicken manure compost, at the lowest dose (1 kg m^{-2}), was sufficient for the greatest increase in dry mass production in Brachiaria decumben [5].

In a study on the application of increasing doses of natural phosphate in radish, Cláudio (2018) observed an increase in plant height, shoot fresh and dry mass, root fresh and dry mass and root diameter [10]. The same behavior was observed by Bonela et. al (2015) who, when evaluating different sources of organic matter for the cultivation of

lettuce, obtained a greater increase when using chicken litter [11].

IV. CONCLUSION

The T4 substrate – washed sand + sawdust + poultry litter in the proportion of 1:1:2 favored the best vegetative development of the Crimson Gigante radish.

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REFERENCES

[1] IBGE – Brazilian Institute of Geography and Statistics. 2021. Systematic Survey of Agricultural Production. Available at: https://sidra.ibge.gov.br/Tablea/524#resultado. Accessed on: 16 Aug. 2021

[2] Castro, B. F., dos Santos, L. G., Brito, C. F., Fonseca, V. A., & Bebé, F. V. (2016). Produção de rabanete em função da adubação potássica e com diferentes fontes de nitrogênio. Revista de Ciências Agrárias, 39(3), 341-348.

[3] Bonela, G. D., Santos, W. D., Sobrinho, E. A., & Gomes, E. D. C. (2017). Produtividade e qualidade de raízes de rabanete cultivadas sob diferentes fontes residuais de matéria orgânica. Revista Brasileira de Agropecuária Sustentável, 7(2), 66-74.

[4] Cotta, J. A. D. O., Carvalho, N. L. C., Brum, T. D. S., & Rezende, M. O. D. O. (2015). Compostagem versus vermicompostagem: comparação das técnicas utilizando resíduos vegetais, esterco bovino e serragem. Engenharia Sanitária e Ambiental, 20, 65-78.

[5] de Araujo, F. F., Tiritan, C. S., & de Oliveira, T. R. (2009). Compostos orgânicos semicurados na adubação de pastagem degradada de Brachiaria decumbens. Revista Ciência Agronômica, 40(1), 1-6.

[6] das CHAGAS, P. S. M., Costa, C. A. C., & Teixeira, L. B. (2003). Composição química de húmus de minhoca vermelha da califórnia (Eisenia foetida). Revista de Ciências Agrárias Amazonian Journal of Agricultural and Environmental Sciences, (39), 87-94.

[7] MALAVOLTA, E. (2002). Adubos e adubações. São Paulo: NBL Editora.

[8] da Silva, A. N., dos Santos, A. M., Bortolotto, R. P., de Olinda, R. A., de Carvalho, J. C. R., & Reichardt, K. (2011). Avaliação da "Terra de Quixabeira" (Bumelia sertorium L.) no melhoramento da qualidade do solo. Brazilian Journal Of Agriculture-Revista de Agricultura, 86(2), 155-161.

[9] Ferreira, D. F. (2011). Sisvar: a computer statistical analysis system. Ciência e agrotecnologia, 35, 1039-1042.

[10] Claudio, M. V. C. D. A. (2018). Características fitométricas e produtivas do rabanete adubado com fosfato natural Bayóvar. Trabalho de conclusão de curso, Universidade Federal de Mato Grosso, Rondonópolis, MT, Brasil. Available at: https://bdm.ufmt.br/handle/1/1003. Accessed on: 16 Aug. 2021

[11] Bonela, G. D., Souza, H. O., Guimarães, R. R., & Gomes, E. J. C. (2015). Resposta de cultivares de alface a diferentes fontes de matéria orgânica. Revista Brasileira de Agropecuária Sustentável (RBAS), 5(2), 89-95.