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EFEITOS DOS DIFERENTES TIPOS DE ADUBAÇÃO ORGÂNICA NO DESENVOLVIMENTO DA RÚCULA

MARIA FERNANDA DA SILVA VIEIRA¹, JOAQUIM MAURO DE MOURA NETO², ANDRÉ ARAÚJO DO NASCIMENTO², MARISA PORFÍRIO GOMES SOARES² E MARCOS ANTÔNIO VIEIRA BATISTA³

¹ Estudante de bacharelado em Engenharia Agrícola, Instituto Federal de Educação, Ciência e Tecnologia do Ceará (IFCE), Rodovia Iguatu/Várzea Alegre, km 05 s/n, BR-122, 505, 63500-000 - Cajazeiras, Iguatu - CE, maria.fernanda.silva07@aluno.ifce.edu.br.

² Estudante de bacharelado em Engenharia Agrícola, Instituto Federal de Educação, Ciência e Tecnologia do Ceará (IFCE), Rodovia Iguatu/Várzea Alegre, km 05 s/n, BR-122, 505, 63500-000 - Cajazeiras, Iguatu - CE.

³ Professor orientador, Instituto Federal de Educação, Ciência e Tecnologia do Ceará (IFCE), Rodovia Iguatu/Várzea Alegre, km 05 s/n, BR-122, 505, 63500-000 - Cajazeiras, Iguatu - CE, marcosvieira@ifce.edu.br.

RESUMO: A adubação orgânica representa uma prática agrícola sustentável e eficiente, trazendo benefícios significativos tanto para o solo. Esta abordagem agrícola visa enriquecer o solo com nutrientes fundamentais para o desenvolvimento das plantas. A rúcula (*Eruca sativa*) é uma hortaliça herbácea folhosa pertencente à família Brassicaceae, caracterizando-se por seu rápido crescimento vegetativo e ciclo curto, a rúcula é amplamente cultivada e apreciada em todo o mundo. Nesse contexto, o objetivo deste trabalho foi avaliar a eficiência da aplicação de diferentes adubos orgânicos no crescimento e produção de rúcula. O experimento foi conduzido no Instituto Federal do Ceará, em Iguatu-CE, em condições de ambiente protegido por um período de 40 dias, para realização deste experimento foram conduzidos cinco tratamentos constituídos da aplicação isolada ou combinada de diferentes resíduos orgânicos com um fertilizante comercial, sendo divididos como, testemunha, esterco de aves, esterco bovino, esterco de aves + AMINO plus® e esterco bovino + AMINO plus. O delineamento experimental empregado foi inteiramente casualizado, no qual foram realizadas quatro repetições de três plantas em cada uma. Os resultados obtidos indicaram que o tratamento com cama de frango foi o mais eficiente para a variável altura de planta, enquanto os demais tratamentos não apresentaram diferenças significativas.

Palavras-chaves: *Eruca sativa*, Esterco, AMINO plus®.

EFFECTS OF DIFFERENT TYPES OF ORGANIC FERTILIZER ON THE DEVELOPMENT OF ARUCULA

ABSTRACT: Organic fertilizer represents a sustainable and efficient agricultural practice that significantly benefits both soils. This agricultural approach aims to enrich the soil with essential nutrients for plant development. Arugula (*Eruca sativa*) is a leafy herbaceous vegetable belonging to the Brassicaceae family and is characterized by rapid vegetative growth and a short cycle. Originally from southern Europe and western Asia, arugula is widely cultivated and appreciated throughout the world. In this context, the objective of this work was to evaluate the efficiency of applying different organic fertilizers on the growth and production of arugula. The experiment was conducted at the Federal Institute of Ceará, in Iguatu-CE, under protected environmental conditions for a period of 40 days. To carry out this experiment, five treatments, consisting of the individual or combined application of different organic residues with commercial fertilizer, were used: control, poultry manure, cattle manure, poultry manure + AMINO plus® and cattle manure + AMINO plus. The experimental design used was completely randomized, in which four replications of three plants were carried out each. The results obtained indicated that the chicken litter treatment had the greatest effect on the plant height variable, whereas the other treatments did not significantly differ.

Keywords: *Eruca sativa*, Manure, AMINO Plus®.

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1 INTRODUCTION

Vegetable production is widespread in all parts of the world. Arugula (*Eruca sativa*) is a leafy vegetable belonging to the Brassicaceae family. This plant has distinct characteristics, making it a very popular choice for consumption. In terms of nutritional parameters, arugula stands out among other vegetables in Brazil, regardless of the other crops having higher productivity, because it has a superficial root system, arugula requires more regular irrigation (Silva; Crivelari; Correa, 2021). According to Amorim Neto (2019) and Bonett *et al.* (2019), vegetable crops are produced by family farmers, as this type of cultivation uses little space, few inputs, and a very short cycle.

Arugula is a cultivar that adapts better to mild climate conditions. In adverse conditions, it can cause production problems. According to Leite *et al.* (2022), growing arugula in areas with high temperatures and luminosity requires the use of shade nets. This makes it a less attractive crop for producers in the semiarid region of Brazil. It is more consumed and cultivated in the southern and southeastern regions. However, its consumption tends to increase in other regions of the country due to its strong flavor in salads along with softer leaves (Alves; Santos, 2018). However, it is essential to consider environmental and soil conditions when growing arugula. In regions with high temperatures and low water availability, adequate irrigation management and balanced fertilization are essential to ensure good plant development and leaf quality.

In the semiarid region of Brazil, the use of manure for soil fertilization is very common, with the goal of reducing the costs of synthetic fertilizers and because it is highly available in the region. Thus, organic fertilization with animal manure and/or organic compounds is carried out. This practice has been widely used in the production of arugula, with the aim of benefiting from the reduction of mineral fertilizers and being able to improve the physical, chemical and biological quality of the soil (Salles *et al.*, 2017).

Foliar fertilization is an agricultural technique in which plant nutrition is achieved by applying nutrients directly to aerial parts, especially leaves. Foliar fertilization provides faster use of nutrients, in addition to allowing the correction of deficiencies observed in a short period of time (Pereira *et al.*, 2021). AMINO Plus® is an organic foliar fertilizer available on the market, which, according to the manufacturer, has a major difference compared to others, due to the amino acids present in its composition, which play an important role in enhancing the absorption of nutrients and other compounds, stimulating plant growth, and making the crop more resistant to adverse conditions. The applications of foliar fertilizers have increased rapidly due to the need for producers to achieve high productivity in crops of economic interest (Silva *et al.*, 2020).

The objective of this work was to evaluate the efficiency of the application of different organic fertilizers on the growth and production of arugula under the edaphoclimatic conditions of the municipality of Iguatu-CE.

2 MATERIALS AND METHODS

The experiment was conducted in the greenhouse of the Federal Institute of Education, Science and Technology of Ceará (IFCE), located in the municipality of Iguatu-CE, at geographic coordinates of 6° 23'31" south latitude and 39° 15'59" west longitude, at an average altitude of 220 m. The climate of the region is classified as BSw', according to the Koppen system, which is characterized as hot semiarid. The average annual potential evapotranspiration is 1,988 mm, whereas the average historical precipitation in the municipality of Iguatu is 864 ± 304 mm (average from 1932--2013). The study was carried out in a completely randomized design (CRD) with 5 treatments and 4 replicates, in which different types of fertilizers were applied, including pure materials and mixtures. Initially, the plots were assembled via 16-L plastic pots and substrate, followed by sowing 14 days after preparation. The treatments that received AMINO Plus® received fertilization according to the dosage recommended by the

manufacturer and were dissolved in water. At the end of the experiment, the samples were taken to the Water, Soil and Plant Tissue

Laboratory (LABAS), which is located at the Iguatu Campus of the IFCE.

Table 1. Relationship between the division of treatments and dosages of organic fertilizers for the production of arugula.

TREATMENTS	DOSES
(T1) Witness	-
(T2) Cattle manure	25 g/L
(T3) Poultry manure	12.5 g/L
(T4) Cattle manure + AMINO Plus®	25 g/L + 2.5 ml/L
(T5) Poultry manure + AMINO Plus®	12.5 g/L + 2.5 ml/L

Source: Author.

The irrigation of each of the 20 replicates was performed manually, using a watering can, with the aim of keeping the soil moist without causing it to become saturated. After 21 days of planting, thinning was carried out, with only three plants per pot remaining to ensure the necessary space for the healthy development of the selected seedlings. Forty days after sowing, the plants were harvested. The variables analyzed in the experiment included fresh mass of the aerial part (MFPA), dry mass of the aerial part (MSPA), number of leaves (NF) and plant height (ALT).

The plants of interest were carefully harvested and subsequently weighed individually. Plant productivity was assessed by measuring the fresh mass via a properly calibrated analytical balance. During weighing, each plant was carefully cleaned to remove residues and unusable parts, ensuring that the recorded value accurately reflected the fresh mass of each individual. The dry mass of the aerial part was determined after drying in a forced air circulation oven at 65°C for 72 hours, after which the mass was measured via an analytical balance. The leaf number counting procedure was carried out meticulously, covering all healthy and distinct leaves found

on each selected plant. During counting, bracts and dead leaves were excluded to obtain an accurate estimate of the number of leaves present on each individual. The height of the plants was measured in centimeters with a ruler. The starting point for the measurement was the plant's neck, and the reading was extended to the tip of the longest leaf present in each individual. Each measurement was made vertically to ensure the accuracy of the values obtained. The results obtained were subjected to analysis of variance, and the means were compared via the Tukey test at 5% probability.

3 RESULTS AND DISCUSSION

The results obtained from the analysis of variance revealed that the only variable that presented positive results for the use of organic fertilization was the height (ALT) of the plants. Organic fertilization, especially with animal manure, is highly beneficial for the cultivation of vegetables that have delicate roots and are demanding the physical aspects of the soil. Cattle manure and chicken litter are the organic residues with the greatest potential for use as fertilizers (Guimarães, 2015).

Table 2. Summary of analysis of variance (ANOVA), fresh shoot mass (MFPA), dry shoot mass (MSPA) and number of leaves (NF) data for height (ALT), fresh shoot mass (MFPA), and dry shoot mass (MSPA) of arugula plants subjected to different organic fertilizers. Iguatu, Ceará, 2022 ¹.

Causes of variance	GL	ALT	MFPA	MSPA	NF
Treatment	4	3.40 *	1.76 ^{ns}	0.481 ^{ns}	0.234 ^{ns}
Block	3	2.26	0.14	0.11	0.90
Residue	12	(-)	(-)	(-)	(-)
CV%	(-)	9.08	19.72	17.11	12.57
Overall average	(-)	27,795	939.35	65,967	155.40

GL, degrees of freedom (*), significant at 5% probability; (**), significant at 1% probability; (ns), not significant according to the F test.

Source: Author.

As shown in Table 3, the plant height variable (ALT) significantly differed among the applied treatments. We found that the use of poultry manure is beneficial for the production

of arugula because of its potential to partially or fully meet the nutritional requirements and increase the productivity and quality of several vegetables (Pelá *et al.*, 2017).

Table 3. The results of the statistical analyses of the variables included plant height (ALT), fresh mass of the aerial part (MFPA), dry mass of the aerial part (MSPA) and number of leaves (NF) in relation to the fertilizer sources used in the experiment.

TREATMENTS	ALT	MFPA	MSPA	NF
T1 (Witness)	17.28a	28.55a	6.47a	8.87a
T2 (Cattle manure)	22.08ab	50.86a	8.25a	10.37a
T3 (Poultry manure)	24.85b	77.21a	9.89a	11.87a
T4 (EB + AMINO Plus®)	19,18ab	45.92a	8.02a	9.50a
T5 (EA + AMINO Plus®)	24,31ab	44.03a	7.49a	8.87a

¹ Means followed by distinct letters in the column differ from each other according to the Tukey test at 5% probability; DMS, minimum significant difference.

Source: Author.

By using cattle or poultry manure on farms, it is possible to reduce or even completely eliminate the use of external inputs, such as fertilizers, resulting in the accumulation of organic nitrogen and increasing its mineralization potential and nutrient availability for plants (Guimarães, 2015). The use of manure is a practice that has been increasingly incorporated into agriculture, especially family farming, since small producers do not have access to other means of fertilization. Currently, organic production has also been gaining prominence, giving enormous value to crops subjected to these types of treatments.

4 CONCLUSIONS

These results suggest that poultry manure may be a more effective option for promoting plant height growth than the other fertilizers tested, but poultry manure did not have a significant effect on other aspects of plant growth evaluated in the experiment. Therefore, the use of poultry manure as an organic fertilizer can be recommended for vegetable growers who wish to produce arugula organically and who have easy access to this residue.

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