Original Research Article

SPONTANEOUS SPECIES FROM THE BRAZILIAN SEMIARID (*Senna uniflora* plus *Calotropis procera*) AS ORGANIC FERTILIZER IN CORIANDER PRODUCTION.

ABSTRACT

Aims: Vegetable farming is widely practiced by farmers in the semi-arid region who use spontaneous species as organic fertilizer.
Place of Study: The experiment was conducted in a greenhouse at the Department of Agricultural and Forestry Sciences, in the region of Mossoró, RN, Brazil, using soil classified as argisol, with the objective of evaluating spontaneous species, woods pasture (*Senna uniflora* L.) plus rooster tree (*Calotropis procera*) in different quantities in the production of coriander in the semi-arid region of Brazil.
Study Design and Methodology: The design used was completely randomized, with five treatments and four replications, with the treatments consisting of the following amounts of the mixture of woods pasture (*Senna uniflora* L.) plus rooster tree (*Calotropis procera*) (0.0; 1 .2; 2.4; 3.6 and 4.8 kg m^{-2} of area). The coriander cultivar "Frevo" was used, adapted to the edaphic and climatic conditions of the semi-arid region.
Agronomic characteristics of coriander: plant height (expressed in cm $plant^{-1}$); number of stems (expressed in units $plant^{-1}$); productivity (expressed in grams m^{-2} of area); number of bunches (expressed in units $plant^{-1}$) and dry mass (expressed in grams m^{-2} of area).
Conclusions: The mixture of woods pasture plus rooster tree in the amounts of 4.8 kg m^{-2}, obtained the highest productivity and number of sauces, with values of 868 g m^{-2} and 17.3 units of coriander sauces, respectively. Spontaneous species from the semi-arid region constitute an organic fertilizer alternative for farmers.

Keywords: Woods pasture, rooster tree, organic production, family farming.

1. INTRODUCTION

The organic vegetable production system is an activity with great growth at national level, given the need to protect the health of producers and consumers, and this system is used by farmers who work in the family farming regime where Various agricultural products are produced with less dependence on external resources [1].

In these agroecosystems, the soil has remained productive over time with greater balance due to organic materials that have been used to the detriment of conventional crops that use chemical fertilizers that cause environmental damage [2].

In this context, many vegetable crops have been produced using organic fertilizers existing within the properties, such as coriander cultivation, widely produced and consumed in the region of Mossoró, RN, Brazil [3]. Coriander is a crop with a short cycle (30 to 35 days after sowing), being widely used in nature as a seasoning for various dishes [4], with its production carried out by family farmers who use small areas for planting.

According to [5], this type of agriculture is widely used by farmers with a low technological level and who do not have the resources to provide adequate productivity to

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guarantee the sustainability of the system, considering that, on many occasions, there is a need to purchase sources of fertilizers from animal origin (bovine and goat manure), which increases production costs, affecting the producer's profitability.

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Within the Brazilian semi-arid region, there are many spontaneous species that appear during the rainy woods pasture (*Senna uniflora* L.) and rooster tree (*Calotropis procera*) that can be used as green fertilizer in the production of vegetable crops and greatly contribute to reducing costs production [6].

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Given the importance of seeking alternatives for producers who produce vegetables in the family farming system, the objective was to study the spontaneous species woods pasture (*Senna uniflora* L.) in addition to rooster tree (*Calotropis procera*) in different quantities in the production of coriander in the semi-arid region of Brazil.

MATERIAL AND METHODS

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CHARACTERIZATION OF THE EXPERIMENTAL AREA

The experiment was conducted in a greenhouse at the Department of Agricultural and Forestry Sciences, for this purpose, an argisol was used according to the [7], which was collected at a depth of 20 cm, corresponding to the physical space where it was contains the largest volume of roots in the coriander crop. The soil was packed in pots measuring 0.4 x 0.3 m, with an area of 0.12 m^2.

The climate of the region where the experiment went carried out, according to the Köppen Geiger classification, is BShw, dry and very hot, with two seasons: a dry one, which generally occurs from June to January, and a rainy one, from February to May [8].

Before setting up the experiment, 10 soil samples were taken and homogenized to remove a composite sample that was sent to the soil laboratory for the following characteristics: pH (water 1:2.5) = 6 .45; Ca = 1.84 cmolc dm^{-3}; Mg = 0.37 cmolc dm^{-3}; K = 0.14 cmolc dm^{-3}; Na = 0.12 cmolc dm^{-3}; P = 3.40 mg dm^{-3} and M.O. = 0.55%.

EXPERIMENTAL DESIGN AND TREATMENTS

The design used was completely randomized, with five treatments and four replications, with the treatments consisting of the following amounts of the mixture of woods pasture (*Senna uniflora* L.) plus rooster tree (*Calotropis procera*) (0.0; 1 .2; 2.4; 3.6

and 4.8 kg m^{-2} of area). The coriander cultivar "Frevo" was used, adapted to the edaphic and climatic conditions of the semi-arid region.

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The spacing used was 0.1 x 0.05 m with five plants pit^{-1}, corresponding to 1000 plants m^{-2} of area, according to the recommendation of [9], which corresponds to the density of plants used by family farmers in the region of Mossoró, RN, Brazil. In each pot, five holes were opened per planting line, with three planting lines with eighteen holes, corresponding to ninety pot^{-1} plants.

Irrigations were carried out in the morning and afternoon with the aim of keeping the soil in ideal conditions for the good development of the plants, this practice being of great importance in the vegetable production system. As cultural treatment, spontaneous plants that emerged due to the seed bank present in the soil used in the experiment were removed. As this work followed the principles of organic production, chemical pesticides were not used.

Woods pasture (*Senna uniflora* L.) mixed with rooster tree (*Calotropis procera*) was used as organic fertilizer, from which five samples were taken and chemical analyzes were carried out with the following values: 510 g kg^{-1} of carbon (W); 21.5 g kg^{-1} of nitrogen (N); 10.3 g kg^{-1} of phosphorus (P); 10.2 g kg^{-1} of potassium (P); 9.8 g kg^{-1} of calcium (Ca); 9.6 g kg^{-1} of magnesium (Mg) and carbon-nitrogen ratio of 23.7 (C/N) (Figure 1).

A B

Figure 1. Woods pasture (*Senna uniflora* L.) (A) and rooster tree (*Calotropis procera*) (B), spontaneous species from the Brazilian semi-arid region. **Photograph:** Researcher PhD Paulo César Ferreira Linhares.

Thirty-five days after sowing, analyzes of the agronomic characteristics of the coriander crop were carried out, with the evaluation of the height of the plants in the experimental area, measuring thirty plants in plot^{-1}, with a millimeter ruler, with the results expressed in plant centimeter^{-1}.

MEASUREMENT OF AGRONOMIC CHARACTERISTICS OF CORIANDER

After harvesting in the field, the plants were sent to the Post-Harvest laboratory of the Department of Agricultural and Forestry Sciences to evaluate the following characteristics: number of stems (by counting stems from a sample of thirty plants, expressed in units plant^{-1}); productivity (weighing of all plants within the useful area of the plot on a 1.0g precision scale, expressed in grams m^{-2} of area); number of bunches (to determine this characteristic, the weight of the green mass was divided by 50g, a value corresponding to one unit of coriander bunch) and dry mass (a sample of thirty plants per experimental plot was used, weighed with an accuracy of 1,0g, placed in an oven with air circulation at 65ºC until constant mass, with the results expressed in grams m^{-2} of area).

STATISTICAL ANALYSIS

Statistical analysis was performed according to conventional methods of analysis of variance [10], using ESTAT statistical software [11]. The response curve fitting procedure was performed using the ESTAT Software [12].

RESULTS AND DISCUSSION

The different amounts of the mixture of *Senna uniflora* plus *Calotropis procera* contributed greatly to the increase in all characteristics evaluated, with a linear adjustment of the observed data. This upward adjustment of characteristics is probably due to the need to apply larger quantities that promote greater availability of nutrients for the radish crop.

For each kilogram of *Senna uniflora* plus *Calotropis procera* added to the soil, there was an increase of 2.94 cm plant^{-1}, with a maximum value of 20.7 cm plant^{-1} in the amount of 4.8 kg m^{-2} (Figure 2). Plant height is an important characteristic, as it is related to the marketing of coriander, considering that consumers prefer plants above 15 cm plant^{-1}, which are produced by family farmers in the Brazilian semi-arid region [13]. [14], studying the agroeconomic performance of coriander at different sowing densities, found a maximum height of 16.1 cm plant^{-1} for a density of 10 g m^{-1}, which is lower than the aforementioned research. Already, [15], studying the effect of mineralization of native legume phytomass on the production of leafy vegetables in a low-humic gley soil, found a plant height of 20.0 cm plant^{-1}.

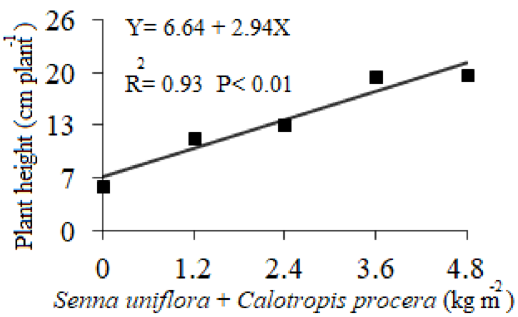

Figure 2. Plant height of coriander under amounts of *Senna uniflora* plus *Calotropis procera* incorporated into the soil.

For the characteristic number of stems, there was an increase of 4.6 stems plant^{-1} due to the treatment without fertilization and the amount of 4.8 kg m^{-2}, with a maximum value of 8.0 stems plant^{-1} (Figure 3). This characteristic highlights the appearance of coriander, which influences its marketing. Meanwhile, [16], studying the effect of mineralization of native legume phytomass on the production of leafy vegetables in a low-humic gley soil, found a maximum number of 3.4 stems plant^{-1}. [17], studying organic fertilizer sources in the coriander and arugula consortium in Cruz das Almas-BA, found a number of stems of 7.22 plant^{-1} units with the application of 30 t ha^{-1} cattle manure, a value lower than that of the aforementioned research. This inferiority is probably due to the incorporation period preceding coriander planting.

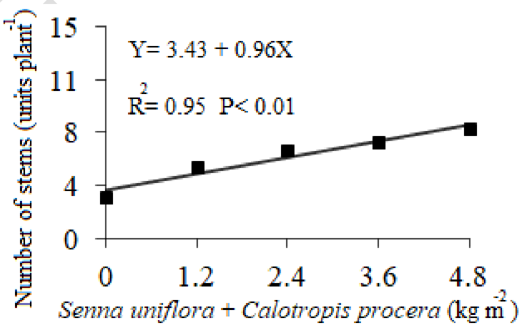

Figure 3. Number of stems of coriander under amounts of *Senna uniflora* plus *Calotropis procera* incorporated into the soil.

In productivity and number of bunches of coriander, there was an increase for both characteristics, with maximum values of 868 g m^{-2}, corresponding to 17.3 units m^{-2} in the amount of 4.8 kg m^{-2} (Figure 4). Probably the greater availability of nutrients in this quantity was what provided the increase in productivity. The number of bunches is the most important characteristic for coriander producers, which is how the crop is sold [18]. [19], studying the agroeconomic performance of coriander at different sowing densities, found fresh mass of coriander of 962 g m^{-2} at a density of 5.4 g m^{-1}, which is higher than the aforementioned research. Probably, the greater density was what contributed to such expressive productivity. Already, [20], studying sources of organic fertilizer in the coriander and arugula consortium in Cruz das Almas-BA, found a fresh mass of coriander area of 316.8 g m^{-2}, with fertilization with poultry manure, lower than the aforementioned research. Possibly the amount of manure added to the soil was what promoted the lower productivity.

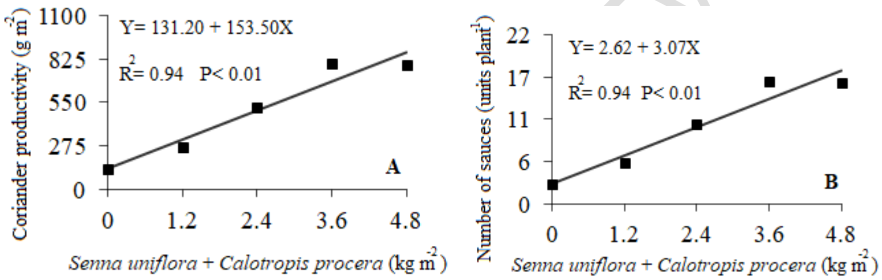

Figure 4. Productivity (A) and number of bunches (B) of coriander under amounts of *Senna uniflora* plus *Calotropis procera* incorporated into the soil.

There was an accumulation of dry matter due to the different amounts of *Senna uniflora* plus *Calotropis procera*, with a maximum value of 104.6 g m^{-2} in the amount of 4.8 kg m^{-2} (Figure 5). For each kilogram of fertilizer incorporated into the soil, there was an increase of 18.15 g m^{-2} of dry mass. Dry mass is an important characteristic as it reflects plant growth [21]. [22], studying organic fertilizer sources in the coriander and arugula consortium in Cruz das Almas-BA, found a dry mass of the coriander area of 32.2 g m^{-2}, with fertilization with poultry manure, lower than the aforementioned research. Possibly the amount of manure added to the soil was what promoted the lower productivity.

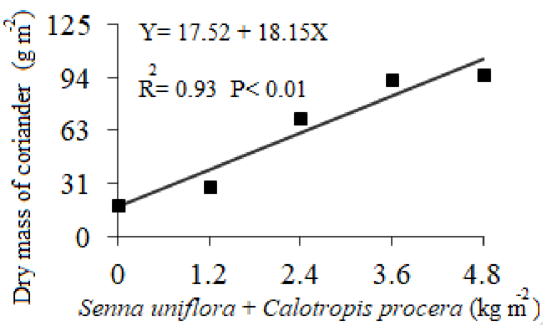

Figure 5. Dry mass of coriander under amounts of *Senna uniflora* plus *Calotropis procera* incorporated into the soil.

CONCLUSION

The mixture of woods pasture (*Senna uniflora* L.) plus rooster tree (*Calotropis procera*) in the amounts of 4.8 kg m^{-2}, obtained the highest productivity and number of sauces, with values of 868 g m^{-2} and 17.3 units of coriander sauces, respectively.

Spontaneous species from the semi-arid region constitute an organic fertilizer alternative for farmers.

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