academicJournals

Vol. 11(49), pp. 4964-4969, 8 December, 2016
DOI: 10.5897/AJAR2016.11743
Article Number: 079556F62027
ISSN 1991-637X

http://www.academicjournals.org/AJAR

African Journal of Agricultural Research

Full Length Research Paper

Use of cattle waste on the farm

Lunara de Sousa Alves[1], Mário Leno Martins Véras[2], José Sebastião de Melo Filho[2], Nelto Almeida de Sousa[2], Lucimara Ferreira de Figueiredo[2], Rosinaldo de Sousa Ferreira[2], Rayane Amaral Andrade[1], Leandra de Melo Cavalcante Sousa[2], Alvaro Carlos Gonçalves Neto[3] and Thiago Jardelino Dias[2]

[1]Universidade Federal de Campina Grande, Pombal-PB, Brasil.
[2]Universidade Federal da Paraíba, Campus II, Areia-PB, Brasil.
[3]Universidade Federal da Paraíba, Campus III, Bananeiras-PB, Brasil.

Received 22 September, 2016; Accepted 14 October, 2016

Lack of fertile soil is among the main problems in world agricultural production areas, mainly in vegetable crop production areas. In this sense, we aimed to evaluate the the production of chili (*Capsicum annuum* L.) using cow urine as an organic fertilizer. The survey was conducted from June to September 2014 at the School State of Primary and Secondary Nossa Senhora da Conceição, Belém de Brejo do Cruz – PB, Brazil. The experimental design was completely randomized (DIC), in 5 x 2 factorial scheme of 40 plants, with seven repetitions. There was a total of 10 treatments. The effects of 5 cow urine doses were studied: 0, 25, 50, 75 and 100 ml, applied to soil combined with fertilizers: A1 = wood powder + cattle manure + sand washed (1:1:1) and A2 = cattle manure + sand washed (2:1)). There was a significant effect at 1% probability in F test for cow urine doses in all variables. Except the fruit length and number of unmarketable fruits, organic fertilizers statistically influenced the level of p <0.01 in all variables. There was no significant response to the interaction doses × organic fertilizers. 100 ml of cow urine provided good results in the production of chili. The organic manure fertilizer bovine + washed sand is great for chili culture. it is not recommended to incorporate wood powder organic fertilizers.

Key words: Agroecology, *Capsicum annuum* L., cow urine.

INTRODUCTION

Chili culture is adapted to tropical climate, requiring high temperature. Its cultivation requires good chemical and physical characteristics of soil, developing well in organic production. Good productivity can be obtained by combining with mineral organic fertilizer (Albuquerque et al., 2012). Proper management of agricultural activities such as fertilization is essential for this practice, so that producers can use it throughout the nation in a rational and economical way.

Organic agriculture is a sustainable alternative for small

*Corresponding author. E-mail: mario.deus1992@bol.com.br.

Table 1. Chemical attributes of cow urine used in chili experiment. Belém do Brejo do Cruz - PB, 2014.

Specifications	Value
pH	-
ECw (dS m^{-1})	-
NUTRIENTS	(g L^{-1})
Nitrogen (%)	2.80
Phosphorus (mg / dm^3)	4.80
Potassium (cmol $_c$ L^{-1})	10.00
Calcium (cmol $_c$ L^{-1})	0.30
Magnesium (cmol $_c$ L^{-1})	0.40
Sodium (cmol $_c$.dm^{-3})	-
Sulphur (cmol $_c$.dm^{-3})	-

and large producers; as its use has no greater sustainability due to preservation of natural resources found on farms, as well as reduced application of chemicals. In this regard, organic fertilizers provide physical improvement to soil, which are storage, aeration, improved internal structure and soil drainage, reducing sudden changes in temperature of the soil. They also affect the biological processes of soil and infiltration of nutrients in plant (Trani et al., 2013).

Cow urine is considered an organic fertilizer as a byproduct of livestock activity; it is available in most rural properties. It is rich in minerals, example Nitrogen and Potassium. Thus it provides nutrients and other essential elements for healthy plant growth. Their use presents no health risk to those who handle them. Another advantage with their use is the possibility of joining the livestock farming horticulture, allowing a reduction in spending on crop production as it reduces the costs of fertilizers.

The use of organic fertilizers with suitable characteristics for plant species leads to reduction of cultivation time and consumption of inputs such as chemical fertilizers, pesticides and labor-intensive. Among the most organic fertilizers used and the ones thar are easily acquired and rich in various nutrients, N, P and K stand out.

In this sense, we aimed to evaluate chili production *(Capsicum annuum* L.) under the application of cow urine functioning as organic fertilizer.

MATERIALS AND METHODS

The survey was conducted from June to September 2014 at the School State of Primary and Secondary Nossa Senhora da Conceição, Belém de Brejo do Cruz – PB, Brazil. Its geographical coordinates are: 60 28'12 "South, 370 20'32" west of Greenwich longitude with an elevation of 176 m. The climate of the city, according to Köppen classification, is BSWh type.

The experimental design was completely randomized (DIC), in 5 x 2 factorial scheme of 40 plants, with seven repetitions. There was a total of 10 treatments. The effects of 5 cow urine doses were studied: (0, 25, 50, 75 and 100 ml); they were applied together in the soil with fertilizers: (A1 = wood powder + cattle manure + sand washed (1:1:1) and A2 = cattle manure + sand washed (2:1)). The planting was done in pots with 5 L capacity.

The water used for irrigation showed electrical conductivity of 0.9 dS m^{-1}. The water analysis was carried out by the Irrigation and Salinity Laboratory (LIS) of the Center for Technology and Natural Resources of the Federal University of Campina Grande - UFCG. It had the following chemical characteristics: pH = 7.50; Ca = 2.45 (cmol $_c$/dm^3). Mg = 1.26 (cmol $_c$/dm^3); Na = 3.50 (cmol $_c$/dm^3); K = 0.03 (cmol $_c$/dm^3); Chloride = 3.20 (cmol $_c$/dm^3); Carbonate = 0.45 (cmol $_c$/dm^3); Bicarbonate = 3.35 (cmol $_c$/dm^3); RAS = 2.58 (mmol $_c$ $L^{-1})^{1/2}$.

The cow urine used in the experiment was collected from lactating cows, dairy herd of Agrotécnica Cajueiro School - EAC municipality of Catolé do Rocha-PB. To obtain the nutrient fertilizer solution cow urine was diluted to a concentration of 1% applied to the soil.

Treatments with cow urine began 21 days after emergence (DAE), then an interval of eight days between applications; making it 6 applications. Chemical analysis of cow urine is given in Table 1. Chemical analysis of the manure comprised the following attributes: pH = 7.75; P = 56.15 mg.dm³; K = 23.46 mg.dm³; Ca = 7.70 cmol $_c$ .dm $^{-3}$; Mg = 15.90 cmol $_c$ .dm $^{-3}$; Al + H = 0.0 cmol $_c$ .dm $^{-3}$; In = 9.18 cmol $_c$ .dm $^{-3}$ and Organic matter = 384.1 g kg^{-1}.

Sowing was done in pots, using four chili cv seeds. They wew all big, distributed and spaced equidistant at a depth of 2 cm. 15 days after sowing (DAS) seedlings were thinned, in order to make them more vigorous. During the experiment, hand weeding was done as the maintenance needs of free culture weed.

Number of fruits per plant, average fruit weight, length and width, number of commercial fruits, weight commercial fruit, pH, total acidity (titration with NaOH 0.1 mol/L) and ascorbic acid were evaluated.

The number of fruits was obtained by counting the fruits. The fruits were weighed in order to obtain the average fruit weight. The length and width of fruits was measured with a digital caliper. The number of commercial fruits was counted by sorting the fruits based on the length and diameter, based on Correia (1984) and Ceagesp (2015), with minor modifications. To get the weight of unmarketable fruits, commercial fruits were weighed on a scale.

The pH analysis, total acidity (titration with NaOH 0.1 mol/L) and ascorbic acid (reduced Tillmans solution) were obtained according to the methods proposed by the Instituto Adolfo Lutz (Zenebon et al., 2008).

The data were analyzed and interpreted from the analysis of variance (F test), by using the statistical program SISVAR, the confrontation of averages Tukey test at 0.05 significance level (5%) and 0.01 (1%) probability according to Ferreira (2011).

RESULTS AND DISCUSSION

There was a significant effect at 1% probability level in the F test for cow urine at all doses in terms of different variables except pH, total acidity (titration with NaOH 0.1 mol/L) and ascorbic acid. They were influenced statistically, except the length of the fruit number of unmarketable fruits, pH, total acidity (titration with NaOH 0.1 mol/L) and ascorbic acid. Organic fertilizers statistically influenced the level of $p < 0.01$ in all variables. No significant response was observed for the interaction doses x organic fertilizers.

The highest number of fruits was found in 100 ml of cow urine. There was an average value of 7.62 fruits as

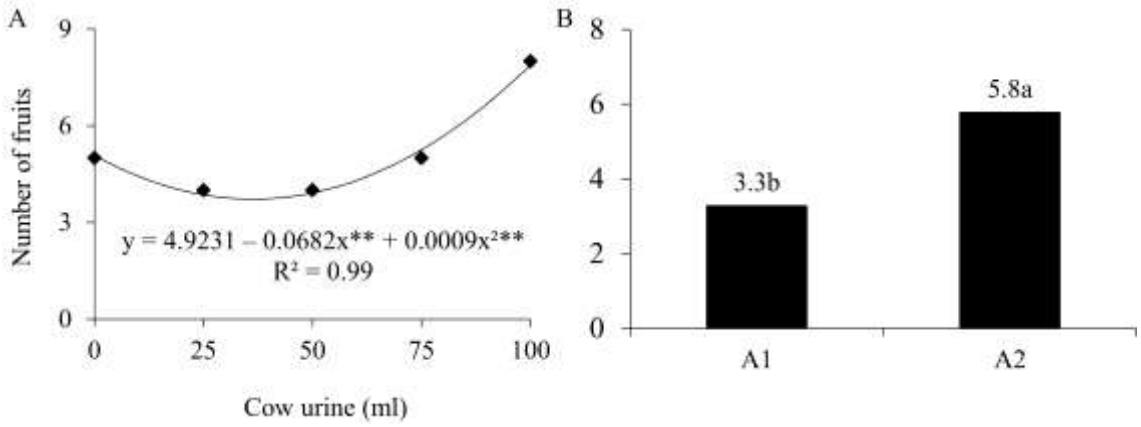

Figure 1. Effect of cow urine doses of (A) under the number of fruits of chili in fertilizer function (B). *,**Significant at the 5 and 1% probability, respectively.

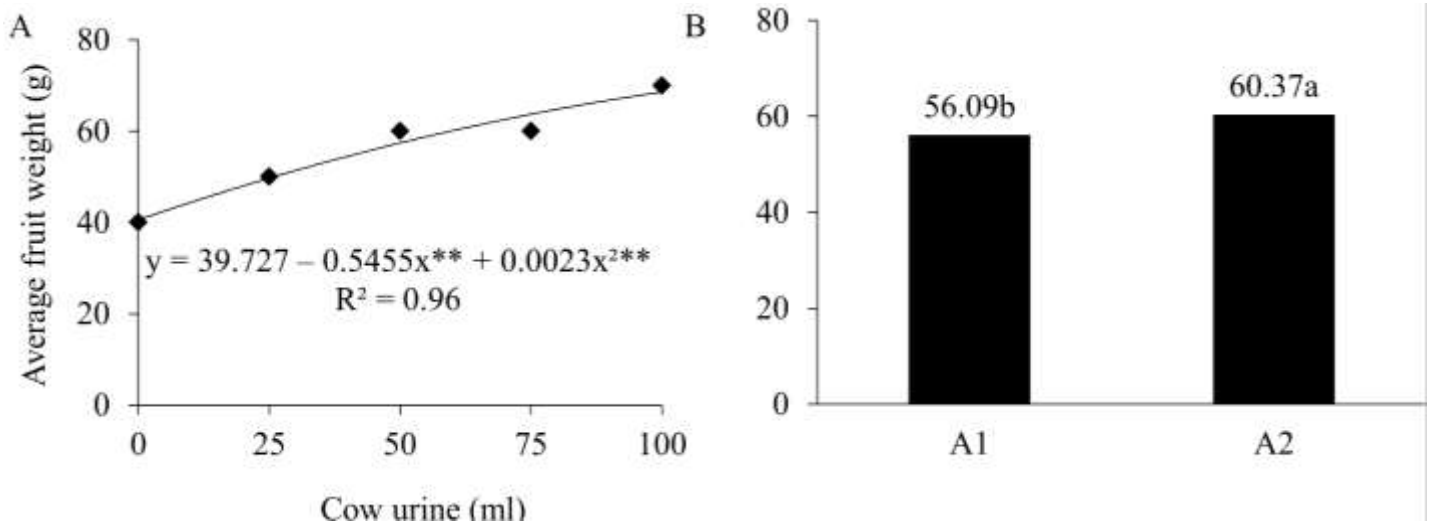

Figure 2. Effect of cow urine doses of (A) under the average fruit weight of chili in fertilizer function (B) *,**Significant at the 5 and 1% probability, respectively.

cow urine increases in dose, with a correlation coefficient of 0.99 (Figure 1A). Perhaps this result is explained by the greater number of nutrients found in cow urine promoting greater fruit production.

For organic fertilizers, it was observed that the best results were obtained with organic fertilizer comprising manure + washed sand in the ratio 2: 1 v / v, with an average of 5.8 fruits (Figure 1B). The use of waste provides several benefits, in terms of environment and expenses: it enables the reduction of spending on mineral fertilizers, and as a result make producers to seek fertilization alternatives to reduce costs and increase productivity (Bonfim Silva et al., 2011).

It was observed for the average weight of fruits quadratic growth, as the cow urine increased there was increase in the average fruit weight, where the maximum dose (100 ml) corresponded to average 72.55 g plant^{-1} (Figure 2A). Regarding organic fertilizers, the combination of cattle manure + sand washed in a 2: 1 v/v excelled to wood dust + manure + sand washed in a 1: 1: 1 v/v (Figure 2B). This explains the greater quantity of manure , the organic fertilizer, as well as the toxic effect of the wood powder.

The use of bovine manure as fertilizer is a viable alternative; in addition, organic feedstock stabilizse the availability of nutrients and increased productivity of crops (Melo et al., 2011; Silva et al., 2011).

The fruit length was adjusted to a quadratic regression model (Figure 3), the maximum length of the fruit (39.15 mm plant^{-1}) was obtained at a dose of 100 ml of cow urine, and the R^2 value = 0.72; the average obtained for the fruit length is outside the standard average (8-13 cm)

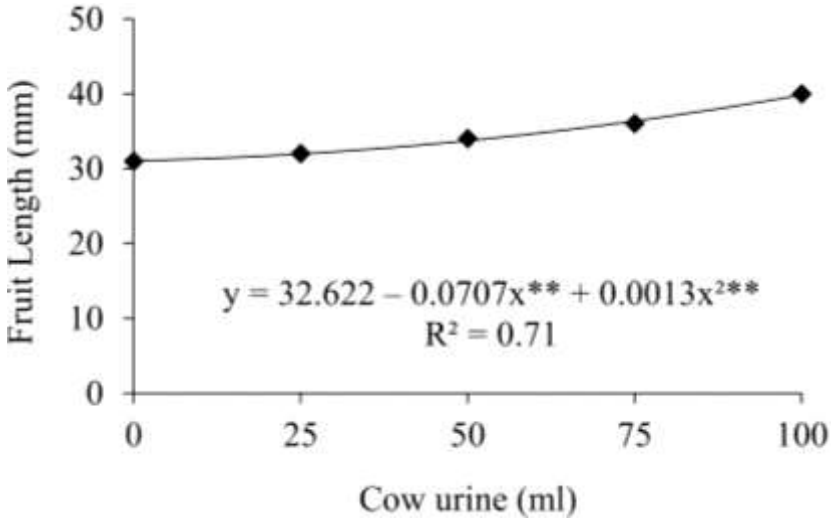

Figure 3. Effect of cow urine doses in the length of chili fruits. *,**Significant at the 5 and 1% probability, respectively.

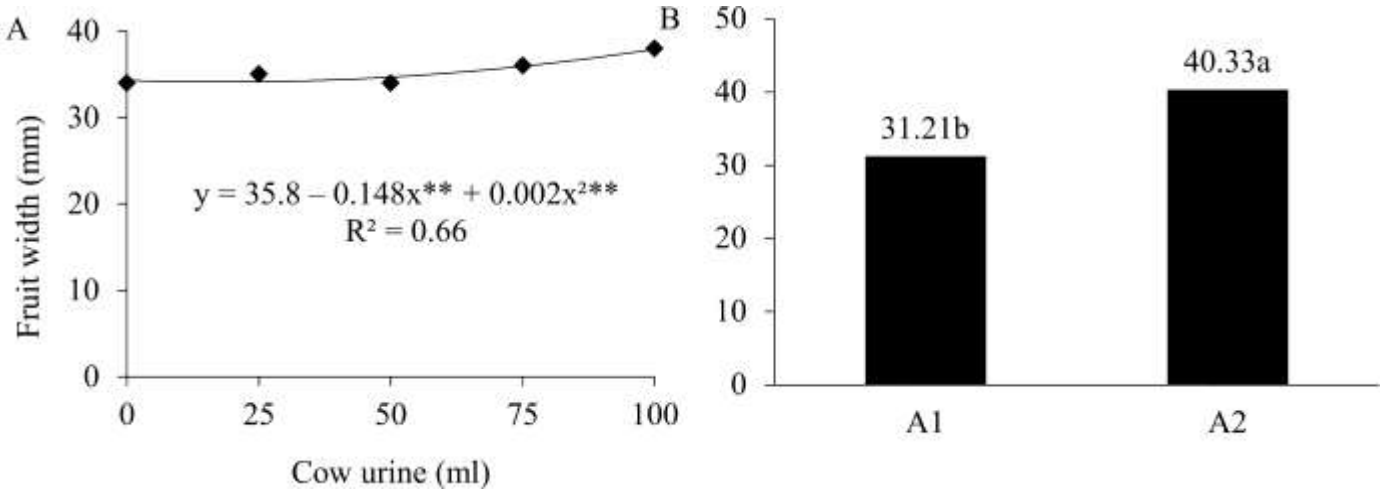

Figure 4. Effect of cow urine doses of (A) in the width of fruits of chili in fertilizer feature (B), *,**Significant at the 5 and 1% probability, respectively.

for this variety. No significant effects were observed for the treatments with organic fertilizers.

It was found that the width of chili fruits obtained a quadratic growth, where best results were obtained at a dose of 100 ml of cow urine (Figure 4A). With regard to the effects of fertilizers on width of chili fruit, it was observed that the optimum fertilizer was composed of manure + sand washed corresponding width of 40.33 mm plant $^{-1.}$ Possibly the toxic effect of this wood powder on the manure (A1) led to a reduction in the width of chili fruit (Figure 4B).

The cattle manure is one of the richest organic fertilizers in nitrogen, and when used for several consecutive years, enables the organic nitrogen accumulation in the soil, and as a result increases the potential mineralization and its availability to plants (Oliveira et al. , 2010).

As the cow urine dose increased, there was increase in the number of marketable fruits (Figure 5). For organic fertilizers, there was no observed significant responses.

In the quadratic growth in the weight of marketable fruits, it was observed that as cow urine dose increased, there was an increase in the weight of marketable fruits (Figure 6A). The organic fertilizer manure + sand washed in a 2: 1 v/v excelled to wood dust + manure + sand washed in a 1: 1: 1 v/v (Figure 6B). Silva et al. (2011) observed that the use of increasing doses of organic compound in chili crops in the rainy season provided a

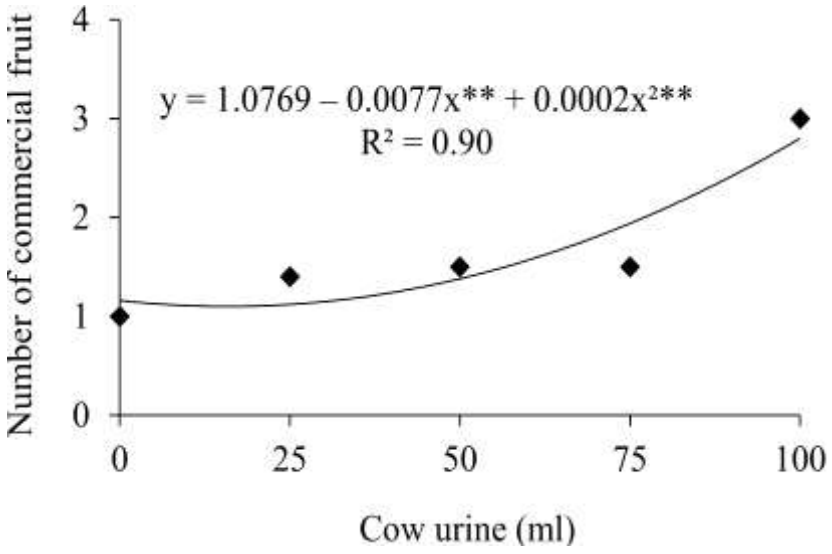

Figure 5. Cow urine doses effect on the number of commercial fruits of chili. *,**Significant at the 5 and 1% probability, respectively.

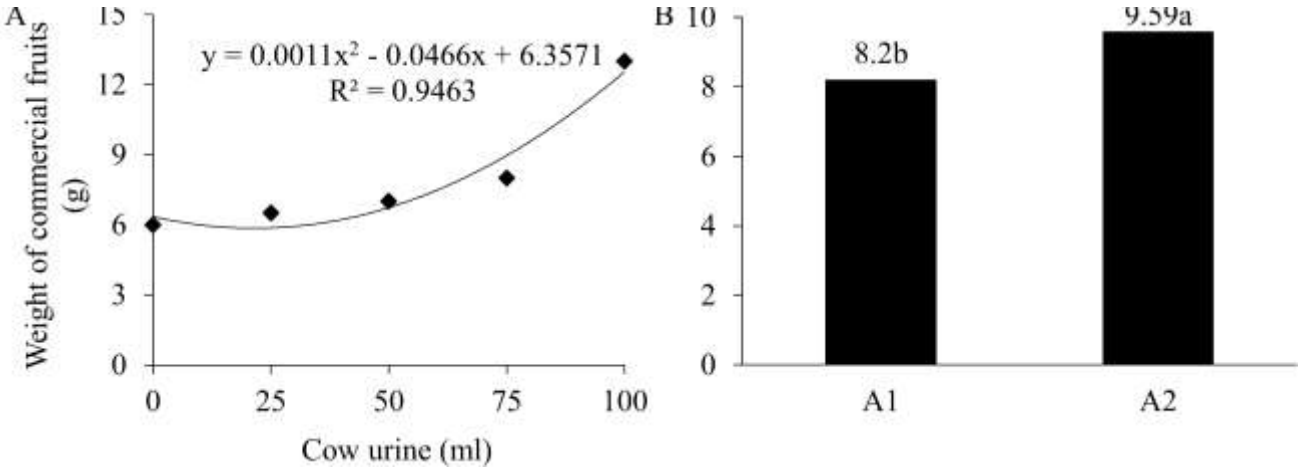

Figure 6. Effect of cow urine doses of (A) in weight commercial chili fruits in fertilizer feature (B), * and ** significant at the 5 and 1% probability, respectively.

linear increase in the average weight of commercial fruits.

Conclusion

The dose of 100 ml of cow urine gave good results in the production of chili. The organic manure fertilizer bovine + washed sand is great for chili. It is not recommended to incorporate wood powder in organic fertilizers.

Conflicts of Interests

The authors have not declared any conflict of interests.

REFERENCES

Albuquerque F, Silva EFF, Neto EB, Souza AER, Santos AN (2012). Nutrientes minerais em pinhão fertirrigados sob lâminas de irrigação e dose de potássio. Hortic. Bras. 30(4):681-687.

Bonfim-Silva EM, Silva TJA, Guimarães ACP (2011). Desenvolvimento e produção de Crotalária juncea adubada com cinza vegetal. Enciclopédia Biosfera 7(13):371-379.

Ferreira DF (2011). Sisvar: A computer statistical analysis system. Ciênc. Agrotecnol. 35(5):1039-1042.

Melo AV, Galvão JCC, Braun H, Santos MM, Coimbra RR, Silva RR, Reis WF (2011). Extração de nutrientes e produção de biomassa de aveia-preta cultivada em solo submetido a dezoito anos de adubação orgânica e mineral. Semina: Ciênc. Agrár. 32(2):411-420.

Oliveira AP, Santos JF, Cavalcante LF, Pereira WE, Santos MDCC, Oliveira ANP, Silva NV (2010). Yield of sweet potato fertilized with cattle manure and biofertilizer. Hortic. Bras. 28(3):277-281.

Silva GPP, Resende FV, Souza RB, Albuquerque JO, Vidal MC,

Souza JMM (2011). Cultivares e adubação de pimentão para cultivo orgânico de verão. Hortic. Bras. 29:4601-4609.
Silva TO, Menezes RSC, Alves RN, Primo DC, Santos Silva GBM (2011). Produtividade de grãos e frações nitrogenadas do milho submetido a manejo de adubos orgânicos na região semiárida. Semina: Ciênc. Agrár. 32:1735-1744.
Trani PE, Terra MM, Tecchio MA, Teixeira LAJ, Hanasiro J (2013). Adubação Orgânica de Hortaliças e Frutíferas. Campinas (SP), Brasil 16 p.
Zenebon O, Pascuet NS, Tiglea P (2008). Métodos físico-químicos para análise de alimentos. 4. ed. Instituto Adolfo Lutz: São Paulo 1020 p.