JOJ Horticulture & Arboriculture
ISSN: 2641-8215

Research Article
Volume 2 Issue 3 - March 2019
DOI: 10.19080/JOJHA.2018.01.555587

JOJ Hortic Arboric

Effect of a Commercial Organic Fertilizer Re forced in the Development of the Cilantro (*Coriandrum sativum* l.) Under climatic Conditions of the Colombian Caribbean

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Submission: February 04, 2019; **Published:** March 18, 2019

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Abstract

We assessed the effect that produces a fertilizer organic trader in forced the development of coriander under conditions of house plants mesh (polisombra) of the University of Córdoba. I work with a complete experimental design at random with five treatments and three repetitions to have total 15 experimental units, each comprised of six floors, the analysis of variance and Tukey comparative tests were conducted with the statistical program SAS version 9.1. Each treatment represents different manure proportions commercial organic (Mega-organic) which were distributed with the following T1 = 100% of Mega-organic, T2 = 75% of Mega-organic, T3 = 50% of Mega-organic, T4 = 25% of Mega-organic, and T5 = 0% of Mega-organic. The response of the different variables evaluated in the field was marked by the treatment three which showed higher average values in the variables of interest, however, the treatment four was the one that the largest number of leaves per plant present (11,8 leaves), For the length of the Leaf the two treatment (26,2 cm) and the production was marked by the treatment three (12,3 grams per plant).

Keywords: Coriander; Mega-organic; Production

Introduction

According to MADR [1] publications, horticultural production in Colombia is around 1.6 million t/year and occurs in an area of approximately 100.000 hectares. According to the spatial distribution of the crops, the DANE [2] indicated that the department of Córdoba has 4.909 hectares in vegetable production of the 1.833.931 total hectares of agricultural vocation. Similarly, the MADR [3] notes that cilantro in our country is grown mainly in the department of Cundinamarca (1.963 ha/year). In the production processes of this vegetable, it is considered that the yields under optimum conditions range between 18 and 20 t/ha of green foliage, with a population density of 200 to 300 plants per square meter [4-6]. The Cilantro is a plant of the Apiacea family where several groups of medicinal, aromatic and seasoning plants of greater consumption are integrated at world level [7-10]. This vegetable stands out for its rapid and easy growth, it adapts to characteristics of full sun as well as it can develop under a partial shade too. Masabni & Lillard [11], found that the cultivation of coriander has better adaptation in temperate climate, where it achieves a higher yield, with temperatures that oscillate between 15 and 20ºC, rainfall of 350mm, relative humidity of 75%, light intensity 5-6 hours per day, an altitude of 2.200 meters above sea level and soil conditions ranging from texture sandy loam to loamy clay texture and pH 6,5 to 7,5 [12].

Estrada [13], states that the use of organic matter in horticultural production systems play an important role when it projects to sustainable agriculture, the application of organic matter to soil is necessary for the gradual supply of nutrients, which would guarantee a preservation of natural soil conditions. The use of a commercial organic product with additions of minerals in the composting process, has led to become one of the most used organic matters in the horticultural area of the department of Córdoba. This organic fertilizer contains minerals, phosphoric rock flours, minor and biological elements (mycorrhizal fungi inoculants, efficient microorganisms, nitrogen fixing bacteria and phosphorus solubilizes (Taken from SF advertising data sheet), a condition that makes credible the use of the product.

Based on the above, taking into account that Cilantro is best developed in temperate climate and in order to contribute to the food security of the Caribbean area (warm climate), this research was implemented within the project of alternative crops for food security, in which the use of commercial organic fertilizers in the development and adaptability of cilantro to warm conditions in the humid Caribbean is being evaluated, in which the yield components of this vegetable were evaluated.

Materials and Methods

This research was carried out in the Caribbean region under semi-controlled conditions in the experimental lots of the University of Córdoba, located in the Middle Zone of the Sinú Valley, at 80° 47 'LN and 75° 51' LW, with respect to the Greenwich Meridian, with a height of 15m.s.n.m. The ecological zone corresponds to transition from tropical dry forest (Bs-t) to tropical humid forest (Bs-h) with average temperature of 28°C., Relative humidity of 83% and annual precipitation of 1.200mm [14].

Establishment of the crop

Substrate disinfection (Soil and organic fertilizer) was carried out by means of solarization from where samples were taken to perform their respective analysis of substrates according to the methodologies proposed by the IGAC [15], then each treatment was prepared based on the proportion of organic fertilizer: Soil (100, 75, 50, 25 and 0%), this test was established in plastic pots with a capacity of 20 liters, after filling the pots a moistening was carried out initial stabilization of each treatment with 0,5 liters of water every 15 minutes, commercial green gold seed coriander was planted with four seeds per site at a distance of 15 by 11,5cm between plant and plant, the management of weeds in the crop was done manually when It was necessary, no fertilization was done, there were no pests and diseases at the economic level.

Experimental design

We worked with a randomized complete experimental design with 5 treatments (Table 1) and 3 repetitions. Each experimental unit consisted of pots of six plants each, with a volume of 20 liters and an area of 40 x 60cm.

Table 1: Treatments evaluated during the trial.

Treatments	Proportions (%)	
	Soils	Organic Fertilizer
T1	0	100
T2	25	75
T3	50	50
T4	75	25
T5	100	0

Evaluation of variables

The most important growth and development variables in this crop were evaluated: number of leaves (units per plant), length of the leaf (centimeters) and yield based on population of 2.000.000 plants / ha, as well as the absorption of nutrients by treatment (%).

Information analysis

The information was tabulated in Excel tables and processed with the statistical program S.A.S version 9.1. Variance analysis was done, and the average comparison test by Tukey with a reliability of 5%.

Results and Discussion

Characterization of substrates

Table 2: Results of the analyzes of the alluvial soil and organic substrate used in the test.

	pH	M.O	S	P	Ca	Mg	K	Na	Al+H	CICe
Substrate	1:1	%	mg/kg		cmol⁺/kg					
Alluvial soil	5,44	1,07	46,8	17,4	12,4	6,3	0,3	0,08	0,2	19,3
Organic substrate	5,34	6,28	886,8	2319,7	22,8	22,7	6,26	0,74	3,01	55,5

According to physicochemical analysis, it is observed that the inorganic substrate is acid reaction, with pH was 5,44, low content of oxidizable organic matter (MO = 1,07%), high sulfur content, exceeding 20mg/kg, amount that is not enough to lower the pH of the soil. It is a soil with average phosphorus content (15-30mg/kg), high calcium and magnesium contents, maintaining a good relationship between these elements (Table 2). Potassium is in a medium range (0,15 - 0,30 cmol(+)/kg) and without sodium problems, nor aluminum, in general terms it is a soil without chemical problems, with a medium nutritional supply, so it is

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considered as a soil of medium natural fertility. While commercial organic fertilizer is a substrate with greater amount of oxidizable Organic Matter (OM), much richer than alluvial soil, which is enriched with efficient microorganisms (EM) and minerals, including phosphate rock, which contributes to make it a material rich in minerals (Table 2).

Evaluated variables

Number of leaves per plant

The analysis of variance shows statistically significant differences at 1%, being T4 (25% organic fertilizer reforced) with an average of 11,8 leaves/plant, which does not differ from treatments T1, T2 and T3 containing 100, 75 and 50% reforced organic fertilizer, respectively (Table 3). This reflects the importance of application of organic fertilizer to the soil for crop development. Tukey's means comparison test groups them into two large groups: those with reforced organic fertilizer and one that does not have (Figure 1). This difference suggests that when adding degradable organic fertilizer, the amount of organic acids in the substrate increases, a condition that contributes to the solubilization of available nutrients for plants, at the same time, this organic fertilizer contributes to improve water retention and minimizes the losses of nutrients by washing action, which could be reflected in the best development of coriander plants.

Table 3: Mean squares of number of leaves (NLT), leaf length (LL), weight of the plant (WP) and yield (yield).

F.V	GL	NLT	LL	WP	YIELD
Tratamiento	4	5.40705**	65.2824**	37.4330**	1.497E+08**
Error	10	0.70608	10.7414	4.2144	1.686E+07
CV (%)	-	8.00	15.30	22.49	22.49

** Diferencia estadística significativa al 1% de probabilidad.

These results are similar to those reported by Torres [16] and Machaca [17], who state that the use of organic fertilizers (sheep manure, compost, humus and Bocashi) to the soil increases the amount of organic acids in the substrate, however, they do not influence the production of vegetable leaves and this was confirmed in celery cultivars, where the amount of leaves was not affected by the type and amount of organic fertilizer.

Length of the sheet

The analysis of variance show significant differences at 1% (Table 3), being T2 (75% of organic fertilizer reforced) who manages to have the longest leaf with 26,3cm, however, there are no differences between the treatments that have application of organic fertilizers, but between those who have and those who do not have, where it is possible to obtain the leaf with the smallest dimension in T5 (without application of reforced organic fertilizer) with 13,8cm (Figure 1). This reflects the importance of organic matter in the soil, since it facilitates the aeration of the substrate, decreases the losses by washing and leachates, and when it decomposes, it contributes, although in small quantities, part of the nutrients that the plant requires for its livelihood. This difference shows the positive effect of the production of organic acids in the decomposition of inorganic materials and mineral contributions to the substrate, since the T5 (without application of organic fertilizer), this treatment did not respond to the development of coriander plants, possibly the amount of nutrients available were not enough for the development of the coriander plant.

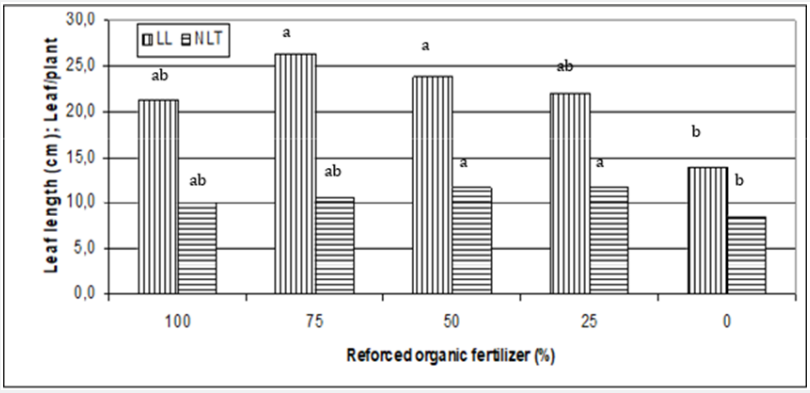

Figure 1: Length and number of coriander leaves at different proportions of reforced organic fertilizer. Equal letters do not differ statistically according to Tukey's 5% comparison test.

These results coincide with those reported by Ruiz [18] when evaluating the effect of several sources of organic fertilizers (manure, vegetable waste, stabilized urban waste) with different decomposition treatments (compost, compost and liquid bio-digested) in the growth of coriander plants, found that the application of large quantities of these organic materials have a positive effect on plant nutrition, as it provides major and minor elements vital to vegetables, also contributes to the release of phosphorus and potassium in the substratum. Similar results reported by Molina [19] in leafy vegetables when using organic

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fertilizers in the agronomic management of this crop and conceptualizes the importance of organic fertilizers in the facility that promotes the soil for air and water circulation.

Plant weight

The analysis of variance show significant differences between treatments with reforced organic fertilizer and without application of it (Table 3), being the best treatment the T3 (50% organic fertilizer) with 12,3g, harvested at 51 days after sowing, with a coefficient of variation of 22,49%, which could mask the differential effect of the doses of reforced organic fertilizer applied to the soil. Among the treatments that were made the incorporation of reforced organic fertilizer there were no differences, however it is noted that with 25 and 50% of organic fertilizer the best results are achieved. The worst of the treatments was where no reforced organic fertilizer (T5) was applied, whose plant weight was 3,3g. This difference reflects the importance of the use of organic fertilizers to improve soil properties: aeration, moisture retention, nutrient retention and nutrients, among others. All these benefits were positive for the development of coriander plant (Figure 2).

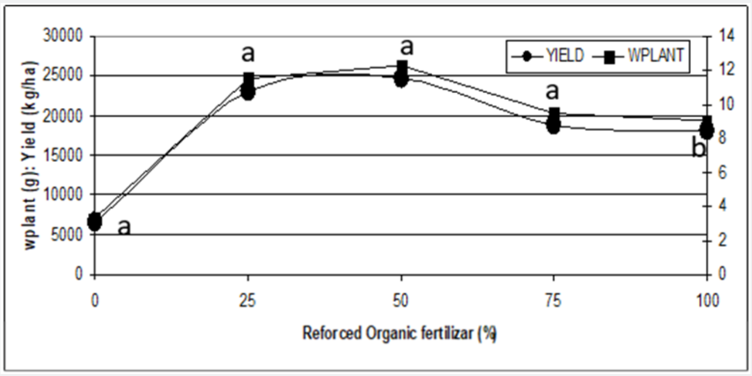

Figure 2: Weight of plants and yield of cilantro in warm weather to different proportions of reforced organic fertilizer. Equal letters do not differ statistically according to Tukey's test at 5%.

These results contrast with those reported by Fuentes and Rendón [20], when evaluating three types of biols at two densities of coriander planting, which states that the types of biols did not influence the weight of the coriander plant, however, the weight of 18,8 g achieved by this author exceeds those achieved in this essay.

Yield

The analysis of variance shows significant differences between the treatments, obtaining the best results when they added reforced organic fertilizer (Table 3). The best treatment was T3 (50% of organic fertilizer) with 24.666,7kg / ha, followed and without significant statistical differences by the treatment T4 (25% of reforced organic fertilizer) with 23.032,0kg/ha (Figure 2). The treatment with the least response was T5 (without application of reforced organic fertilizer) with a yield of 6.629,3kg/ha. This difference between the treatments with and without application of organic fertilizer reflects the importance of these in the soil, since they are soil conditioners, contributing to the best development of the plants that can finally be perceived in better conditions yields that are what the farmer seeks. This response may be justified to the extent that organic fertilizers contribute to the solubilization of minerals in the soil and also make contributions of nutrients to decompose, nutrients that are assimilated by plants for their metabolism. These results leave a clear teaching on the use of organic fertilizers and especially for very short cycle crops, such as coriander, since it requires good biological activity and immediate availability of nutrients, a condition that can be achieved with organic fertilizers at low environmental and economic cost.

In this sense Simbaña [21], who evaluated chemical versus organic fertilization in coriander cultivation and found that for these short-cycle cultivars, that with the use of organic fertilization the same results are achieved as when chemical fertilization is used, this leads to having less contamination of the soil and the environment as such.

Absorption of nutrients

Table 4: Percentage absorption of coriander nutrients at different concentrations of reforced organic fertilizer under warm weather conditions.

Tratamientos	Na	S	Mg	P	Ca	N	K
	%						
T1	0,03	0,15	0,28	0,49	1,00	3,23	8,24
T2	0,07	0,15	0,33	0,58	1,17	3,18	8,26
T3	0,12	0,14	0,30	0,77	1,05	3,00	8,27
T4	0,04	0,10	0,45	0,62	1,05	3,52	8,40
T5	0,06	0,12	0,46	0,46	1,25	2,11	6,23

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The absorption of sodium, sulfur, magnesium and calcium are similar, there is no tendency according to the amount of reforced organic fertilizer, while the absorption of nitrogen, phosphorus and potassium are higher in the treatments where it applied reforced organic fertilizer (Table 4), which corroborates that said material carries with it these elements and the microorganisms that they contain, help to solubilize the one found in the soil. This reflects that this organic fertilizer exerts important functions when applied to the soil, offering nutrients that the plant can take in larger quantities.

This table shows the amount of minerals contained in the foliar part of coriander plants, produced under the influence of different doses of commercial organic fertilizer reforced with mineral and biological additions. These results provide information that reflects that coriander plants respond to the nutritional offer of the soil and with them a foliage of better quality for the consumer is produced. In this sense Morales et al., (2015), indicate that nitrogen is one of the elements that this type of plants absorbs in greater quantity since it is the element that is usually in higher concentrations in the soil, however, in this In the test it was possible to see that potassium was absorbed almost three times more, since they are materials rich in this element. To the extent that there is more availability of nutrients, the plant develops much more, and this is reflected in the productivity and yield, which are the objectives that the vegetable producer seeks, with themselves, when the plant is well nourished, the probability of attack of pests and diseases. The relationship between the nutritional content of each substrate used and the absorption capacity of the plant directly influences the state of final storage that will be reflected in the yield of the coriander crop.

Conclusion

a) In warm weather conditions in the Colombian Caribbean, coriander can be produced, and the best responses are achieved when in proportions of 25 and 50% of reforced organic fertilizer are made.

b) The reforced organic fertilizer provided greater amounts of nitrogen and potassium, which were absorbed by the cilantro in greater proportions.

c) It is necessary to do this type of research at the field level with the purpose of evaluating the production of coriander in conditions of the Colombian Caribbean.

d) It is recommended to test with this crop open field with polisombra of different caliber that allows to regulate the intensity of light and at the same time obtain the approximate luminous intensity that the cilantro requires under the conditions of the Colombian Caribbean.

e) It is necessary to carry out tests to establish the minimum nutritional requirements of this vegetable, given that it is not known at this time for Colombian Caribbean.

References

1. MADR (2016) Informe rendición de cuentas del ministerio de agricultura y desarrollo rural. Ministerio de Agricultura y Desarrollo Rural.
2. Dane (2016) Encuesta nacional agropecuarias.
3. MADR (2009) Anuario estadístico de frutas y hortalizas, Ministerio de Agricultura y Desarrollo Rural 2004- 2008. Bogotá pp. 214-216.
4. Arcos L, Estrada I, Muñoz J (2002) Estabilidad de cinco cultivares de cilantro *Coriandrum sativum* L. en cinco niveles de nitrógeno y dos épocas de siembra. Trabajo de grado. Ing. Agrónomo. Palmira. Universidad Nacional de Colombia.
5. Estrada I (2000) El cultivo de cilantro UNAPAL Precoso. Programa de Investigación en Hortalizas. Trabajo de grado Ingeniero Agrónomo. Palmira. Universidad Nacional de Colombia p. 23.
6. Mejía S, Estrada E, Figueroa O (2008) Respuesta fisiológica del cilantro a diferentes niveles de potasio y nitrógeno. Acta agronómica. Universidad Nacional de Colombia sede Palmira 57(3): 4.
7. Taco Y (2011) Identificación del agente causal de la mancha foliar denominada peca en culantro (*Coriandrum sativum* L.,) y establecer la eficiencia de control mediante productos orgánicos. Trabajo de grado Ingeniero Agrónomo Escuela Superior Politécnica del Ejército Ecuador, pp. 2-4.
8. Marangoni C, Fernández de Moura N (2011) Antioxidant activity of essential oil from *Coriandrum sativum* L. in Italian salami. Ciencia y Tecnología de Alimentos 31(1): 124-128.
9. Rajeshwari U, Andallu B (2011) Medicinal benefits of coriander (*Coriandrum sativum* L). Spatula DD 1(1): 51-58.
10. Ramadan M, Kroh L, Morsel J (2003) Radical scavenging activity of black cumin (*Nigella sativa* L), coriander (*Coriandrum sativum* L), and Niger (*Guizotia abyssinica* Cass.) crude seed oils and oil fractions. J Agr Food Chem 51(24): 6961-6969.
11. Masabni J, Lillard P (2013) Jardinería fácil Texas A&M Agri-Life. Texas EE UU, pp. 1-3.
12. Morales I, Escalante W, Galdámez I (2015) Manejo agronómico del cultivo de Cilantro. Fundesyram El Salvador.
13. Estrada A (2010) Manual elaboración de abonos orgánicos sólidos, tipo compost. ICTA-CIAL Guatemala, pp. 1-2.
14. Palencia G, Mercado T, Combatt E (2006) Estudio agroclimático del departamento de Córdoba. Gráficas del caribe Ltda Montería p. 126.
15. Instituto Geografico Agustin Codazzi (2006) Métodos analíticos del laboratorio de suelos. 6ª edición. Santa Fe de Bogotá, p. 648.
16. Torres N, Arévalo Vallejo, Cástulo Lidio (2012) Efecto de tres abonaduras orgánicas en el cultivo de apio (*Apium graveolens*) en la zona de la Libertad Cantón Espejo, Provincia del Carchi. Trabajo de grado Ingeniero Agrónomo. Universidad Técnica de Babahoyo Facultad de Ciencias Agropecuarias, p. 27.
17. Machaca M (2007) Efectos de niveles de estiércol de ovino en el rendimiento de variedades de apio (*Apium graviolens* L.), bajo ambiente protegido en el municipio de el Alto. La Paz-Bolivia. Universidad Mayor de San Andrés, p. 42.
18. Ruiz N (2004) Efecto de la Aplicación de Composta, Lombri-composta y Bio-digestados Líquidos en el Crecimiento, Rendimiento y Calidad de follaje en el Cultivo de Cilantro (*Coriandrum sativum,* L.). Universidad Autónoma Agraria Antonio Narro. Buenavista, Saltillo, Coahuila, México, p. 13.
19. Molina M, Mónica Yolanda (2014) Comportamiento agronómico de las hortalizas de hoja col china, (*Brassica campestris* Var) y perejil

How to cite this article: Danielle A Smith, Desmond G Mortley, Aniel Rochester, Heshmat A Aglan. Impact Forces During Postharvest Handling Influence Internal and External Bruising of Vegetables. JOJ Hortic Arboric. 2019; 2(3): 555586. DOI: 10.19080/JOJHA.2018.01.555587

(*Petroselinum crispum*) con dos fertilizantes orgánicos en el centro experimental la Playita de la UTC ext. Universidad técnica de Cotopaxi Ecuador p. 36.

20. Fuentes J, Rendón V (2014) Comportamiento agronómico del cultivo de cilantro (*Coriandrum sativum* L.) con dos densidades de siembra, utilizando tres tipos de bioles de residuos ganaderos, en la zona de Babahoyo. Tesis de grado Universidad técnica de Babahoyo. Ecuador p. 43.

21. Simbaña A (2012) Evaluación agronómica del cultivo del cilantro (*Coriandrum sativum* L.), con tres densidades de siembra utilizando fertilización química, fertilización orgánica y sin fertilización en la provincia de Pichincha, Cantón Quito, parroquia de Tumbaco. Tesis de grado. Universidad Estatal de Bolívar Ecuador, p. 89.

How to cite this article: Danielle A Smith, Desmond G Mortley, Aniel Rochester, Heshmat A Aglan. Impact Forces During Postharvest Handling Influence Internal and External Bruising of Vegetables. JOJ Hortic Arboric. 2019; 2(3): 555586. DOI: 10.19080/JOJHA.2018.01.555587