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SCIENTIFIC ARTICLE

Biometry of *Luffa cylindrica* M. Roem., 1846 (Cucurbitaceae) and its ecological relations with visiting insects in two different nutritional systems

Biometría de *Luffa cylindrica* M. Roem., 1846 (Cucurbitaceae) y sus relaciones ecológicas con insectos visitantes en dos sistemas nutricionales diferentes

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ABSTRACT

This research aimed to analyze the morphological development and biological cycle of *Luffa cylindrica*, in different types of fertilization (basalt powder and NPK), as well as to identify the visiting entomofauna. Research was made in Canoinhas, Santa Catarina State, in a 450 m² area, held in nine flowerbeds: three with basalt powder, three with NPK and three with no fertilization (control test). Evaluations were carried out fortnightly, and variables tested were: number of germinated seeds, plant height (cm), leaves and flowers length and width (cm), fruits length (cm), number of flowers and fruits, damaged fruits (presence or absence) and, finally, collection of visiting insects. The species germinated at 60 days, its leaves can reach 18.67 cm long and 16.72 cm wide; 10 flowers, measuring on average 6.67 cm, and 11 fruits with 24.50 cm in length. Basalt powder efficiency was higher for plant height and number of damaged fruits. For flowers number, length and width of flowers, NPK was more efficient, in the other variables there was no significant difference. Thus, basalt powder is a sustainable fertilizer alternative, avoiding conventional products.

Key-words: Fertilization, Morphological Aspects, Vegetable Bush

RESUMEN

Esta investigación tuvo como objetivo analizar el desarrollo morfológico y el ciclo biológico de *Luffa cylindrica*, en diferentes tipos de fertilización (polvo basáltico y NPK), así como identificar la entomofauna visitante. Fue realizado en Canoinhas/SC, en un área de 450 m², organizado en nueve camas: tres con polvo de basalto, tres con NPK y tres sin fertilización (testigo). Las evaluaciones se realizaron quincenalmente, midiendo las variables: número de semillas germinadas, altura de la planta (cm), largo y ancho de hojas y flores (cm), largo del fruto (cm), número de flores y frutos y la presencia o ausencia de frutos dañados y, finalmente, la recolección de insectos visitantes. La especie germinó a los 60 días, sus hojas pueden alcanzar 18,67 cm de largo y 16,72 cm de ancho; 10 flores midiendo en promedio 6,67 cm y 11 frutos de 24,50 cm de largo. Hubo mayor eficiencia del polvo de basalto para altura de planta y número de frutos dañados. Para el número de flores, largo y ancho de flores, el NPK demostró ser más eficiente, en las demás variables no hubo diferencia significativa. De esta forma, el polvo de basalto es una alternativa sostenible para la fertilización, evitando los productos convencionales.

Palabras clave: Fertilización, Aspectos morfológicos, Lufa vegetal

INTRODUCTION

The species *Luffa cylindrica* (L.) M. Roem. (Cucurbitaceae), is popularly known as loofah or vegetable sponge. Is phylogenetically close to melon, watermelon, chayote, cucumber and pumpkin (Carvalho, 2007; Vieira, Sá y Randáu, 2019). With an annual cycle and, although classified as herbaceous, its growth habit is indeterminate. It has large leaves and yellow flowers, with numerous male ones, arranged in clusters whereas female ones are solitary, with short cable (Matos, 1997). The fruits are berries, cylindrical to trigonal, long with ovals; colored green when young, yellow when mature and dark brown when dry, morphologically and biometrically variable, due to their origin or access place. Tendrils production ishandled commercially in conduction system, which consists in placing pieces of wood along with the stem, in order to support and aid its growth (Joshi et al., 2010; Siqueira, Santos, Martinez y Cecon, 2009).

First records of using *L. cylindrica* date from 600 B.D. in Egypt (Aguiar, Gonçalves, Guidetti Zagatto Paterniani y Sant'Anna Tucci, 2014), currently extending to several regions worldwide, mainly in Asia. Widely applied in alternative (natural) medicine, by its leaves, fruits and seeds, suitable for: amenorrhea, anemia, nephritis, hydrops, liver diseases, chronic bronchitis, asthma, skin conditions, hemorrhages and verminoses due to its emmenagogue, carminative, anthelmintic, diuretic, laxative and tonic properties (Partap, Kumar, Sharma y Jha, 2012).

When green, its fruits are edible and, when ripe, its vascular fibers are rigid, widely used as sponge in personal and exfoliating natural hygiene. In the industrial field, it composes filters and dampers, cleaning utensils, packaging materials, acoustical, making crafts in general (Bal et al., 2004; Silva, Ranil y Fonseka, 2012), production of slippers, baskets, shoes, carpets, among other products (Lee y Yoo, 2006). The world's largest producers are: China, El Salvador, South Korea, Thailand, Guatemala, Colombia Venezuela and Costa Rica (Aguiar et al., 2014), as well as India, Japan and Central America (Stephens, 2009). Records indicate that its appearance in Brazil occurred during Portuguese colonization, which later became widespread in all regions (Melo y Moreira, 2007), which explains its wide distribution.

Botanically, it is classified as vegetable, less used for culinary purposes by Brazilians, but widely consumed in Asia. As a typical family farming plant, is cultivated in various Brazilian regions, predominantly in smaller production areas in small commercial scale Larger scales are found in the states of Espírito Santo, Minas Gerais, Rio de Janeiro and São Paulo for its climate, favorable to development (Vieira et al., 2019).

However, in Brazil's Northeast, vegetal bush appears often in backyards, near residences, front fences and riverbanks. At the socio-economic field the species has its highlight, as it keeps the family in the field, generates jobs and income, and promote social inclusion, particularly women. Because it is a natural, biodegradable organic product, it makes a strong appeal to consumers looking for environmentally friendly products (Satyanarayana, Guimarães y Wypych, 2007).

The vegetal bush is a sustainable and economical alternative for synthetic petroleum sponges, due to its biodegradable structural characteristics. In the automotive industry, the call for sustainability created the need to use natural products in the lining of upholstery, providing a line of "green and sustainable" cars. This line of thinking can generate examples to be implemented in other sectors of the consumer goods industry (Aguiar et al., 2014).

The cucurbits are demanding high concentration of light (at least eight hours), temperature between 20 and 30 °C which makes the tropical regions conducive to growing (Cruz et al., 1997; Davis, 1994; Silva et al., 2012). Therefore, they require high water demand, especially in their early stages of development, since their roots are superficial and water storage occurs in low quantity (Siqueira et al., 2009). These stages require rainfall above 1200 mm x year, well distributed throughout the year (Carvalho, 2007; Marouelli, Silva y Lópes, 2013).

The vegetal bush develops in soil with pH 6 to 6.8, with high concentrations of Potassium (K) and Phosphorus (P). Good development close to vegetation and well-drained soil, pronounced in sandy soil. The optimal germination temperature at 25 ° C and irrigation are essential for good results during periods of drought (Bal et al., 2004).

In an attempt to find a fertilizer that contains both macro and micronutrients, and especially low cost to small producers, compounds such as manure of mixed corral and bone meal (Carvalho, 2007) have been tested. Among the alternatives, basaltic rock (Knapik y Angelo, 2007), with basic pH and an important material in soil origin, contributes to fertility due to the predominance of easily weatherable and cation rich minerals, such as calcium or sodium feldspars (Resende, Curi, Batista de Rezende, Corréa y Ker, 2014), correcting or enhancing soil pH (Knapik y Angelo, 2007), slow release of nutrients and low risk of leaching, trophobiotic balance nutrients supply, decrease of phosphorus fixation and source of essential and useful micronutrients. It is easy to apply and, apparently inexhaustible, basalt is well distributed in Brazilian regions, also facilitating nutritional balance and resistance of plants to insects and pathogens (Knapik et al., 2007). According to the last author farmers who used the basalt powder as fertilization reported fewer pest attacks on their crops, because the plants absorb more nutrients, ie, being healthier and with a higher concentration of nutrients, has its improved development enabling greater protection against pest attacks.

Theodoro (2000) points out that another positive point for the use of basalt powder is its cost, which can be up to 20 times lower than the chemical fertilization (NPK), important for family farming, given the unavailability of financial resources. Prolonged effect allows a decrease in fertilization frequency, and does not contribute to environmental contamination. Its major disadvantage is insolubility in water, with little leaching and therefore considered as "agroecological fertilizer".

There is a lack of data on the agronomic conditions adequate to the cultivation of the vegetable bush, although some studies aimed at commercialization, feeding and analysis of seed maturation have already been carried out (Cruz et al., 1997; Bal et al., 2004; Lee y Yoo, 2006; Carvalho, 2007; Siqueira et al., 2009; Marouelli et al., 2013).

Thus, this research has great importance, because no studies are describing the biological cycle of the vegetable bush in southern Brazil or have alternative and organic fertilizer proposals (such as basalt powder), in the species culture, besides ecological information referring to the insect-plant dynamics.

Based on this information, this research aimed to not only analyze the morphological development patterns and the life cycle of *L. cylindrical*, as test them in two different types of fertilizers (natural/basalt powder, chemical/NPK, as well the control), besides identifying the visitor entomofauna and its ecological relations with the species.

MATERIAL AND METHODS

The study was conducted in an experimental field, in Rio d'Areia do Meio, a rural area of the municipality of Canoinhas, State of Santa Catarina, southern Brazil. This region is located in the Rio Canoinhas valley and geographically inserted in the coordinates 26º10'38 "S and 50º23'24" W, altitude of 765 meters. The city has a land area of 1140.39 sq km and population of 54,319 inhabitants, with a population density of 46.27 ind. x km² (Instituto Brasileiro de Geografia e Estatística [IBGE], 2018).

The experimental area of the study comprised a total of 450 m², divided into nine flowerbeds with 2 m x 3 m size and 4 m between them spacing (Carvalho, 2007), in a completely randomized design (CRD) and four plants per replicate. The whole experiment was carried out respecting the development cycle of *L. cylindrica* (October to May) in the region. After defining spaces and general layout of beds, all areas were cleaned and the experiment, set up. A lottery was made to organize and distribute the beds and their respective treatments, in which three received the refined basalt powder; three, NPK and three were the control test.

One month before sowing (September), two pits, 20 cm x 20 cm x 20 cm (Carvalho, 2007), were prepared, in a total of 18 pits, in the nine nurseries. In the beds with basalt powder, 500g x pit (1 kg x bed) was added. In the group with NPK, 100 g x pit (200g x nursery) and the control test, there was no pit preparation.

At the beginning of October sowing was carried out, with seeds selected and provided by an agricultural technique. Planting techniques followed proposals of Carvalho (2007), who suggested the distribution of four seeds per pit. Given the growth characteristics of the species, the construction of shipyards in beds was necessary. These were made with wood and smooth wire No. 12, 2 m x 2 m (Carvalho, 2007). The shipyards contribute to better yields and fruit quality, since any constriction results in deformed fruits (Bal et al., 2004). The experiment was constantly monitored, including cleaning and beds organization, and manual irrigation (twice a week), according to the reference values (Carvalho, 2007).

Variables such as seed quantity, plant height (cm), leaf, flowers and fruits length (cm), amount of flowers and fruits (total and damaged) were evaluated biometrically, with digital caliper and measure tape. Regarding the floral biology, there was evaluation of visitor entomofauna at the beginning of flowering, due to the large number of insects during the period. One square meter entomological ramps, with triangular wooden ribs intersecting the edges, made of white cloth, were used by researchers to facilitate the collection of small insects on small plants (beetles, bugs, etc.) (Almeida, Ribeiro-Costa y Marinoni, 1998).

Collection procedures were carried out twice a week, during morning period, in all beds. Three agitations were carried out at each pit, in order to knock down the visiting insects, captured with tweezers and stored in identified plastic microtubes (with collection date, time and pit) in 70% alcohol solution for conservation. The screening was done by specialized researchers of Laboratory of Entomology of the State University of Paraná (UNESPAR), campus of União da Vitória (PR), through identification guides. Specimens were identified primarily as to order or family, reaching genera and species when possible.

Data analysis was performed by analysis of variance (ANOVA). The data homogeneity was tested according to Bartlett, and their effect by F-test before ANOVA. When there was significant difference between treatments means, comparisons test were followed by Tukey analysis (1 to 5% probability, when applicable).

RESULTS AND DISCUSSION

Biometry of *Luffa cylindrica*

Seed emergence occurred, on average, at 60 days after sowing (DAS), regardless of fertilization. The apex of plant development occurred in its 225 days after sowing, reaching 2.41 m height, with life cycle ended at 240 DAS (Table 1).

The leaves reached 2.56 cm wide and 4.06 cm to 105 DAS. The apex of the development of these characteristics occurred at 225 DAS, with 16.72 cm and 18.67 cm, respectively. The apex of leaf production occurred at 225 DAS, with results within the expected, according to Matos (1997), 13 to 30 cm in length and a mean of 17 cm.

For flowers, counting and diameter measurement started at 150 DAS, with six flowers and 3.94 cm, respectively. At 180 DAS, the flowering apex was reached, when 10 flowers and 6.67 cm in diameter were observed. The flowering started in the middle of summer, in early February, until the next three months until the beginning of May. There are no reports in the published literature on the number and diameter of flowers for the studied species.

Fruit counts and measurements were started at 180 DAS, with seven fruits and 5.17 cm long. The apex of fruit production was at 210 DAS, with 11 fruits and 24.50 cm in length. The onset of fruiting occurred in March, during the late summer, extended by two months (April and May). The first damaged fruits were also observed at 180 DAS, with two fruits on average.

There are published reports in the literature regarding the number of fruits per individual, except Newton (2006), which describes the length of the fruit, from 35 to 40 cm greater than the observed 30 days after fruit set.

Table 1. Mean values () and standard deviation (s) of *Luffa cylindrica* M. Roemer general development, 75 days after sowing, in an experiment carried out in Canoinhas – SC.

Variables	**Spring**			
	75 days	**90 days**	**105 days**	**120 days**
	±s	**±s**	**±s**	
Height (m)	0.03±0.02	0.13±0.04	0.33±0.12	0.55±0.23
Leaf length (cm)	---	---	4.06±1.00	6.67±1.36
Leaf width (cm)	---	---	2.66±0.58	5.33±1.09
Variables	**Summer**			
	135 days	**150 days**	**165 days**	**180 days**
	±s	**±s**		
Height (m)	0.78±0.32	1.27±0.53	1.57±0.67	1.92±0.94
Leaf length (cm)	8.72±2.93	12.67±3.09	13.67±3.09	15.61±2.74
Leaf width (cm)	7.67±3.17	10.55±2.67	12.00±2.52	13.61±2.93
Number of flowers	---	4±2	5±1	7±2
Diameter of flowers (cm)	---	6.33±5.86	6.00±6.93	9.67±6.11
Number of fruits	---	---	---	5±2
Fruit length (cm)	---	---	---	6.67±1.53
Variables	**Autumn**			
	195 days	**210 days**	**225 days**	**240 days**
	±s	**±s**	**±s**	**±s**
Height (m)	2.21±0.97	2.30±0.94	2.40±0.98	2.23±0.89
Leaf length (cm)	17.11±2.01	17.67±3.00	18.67±2.4	17.67±2.03
Leaf width (cm)	15.17±2.13	16.16±2.93	17.33±1.53	15.78±1.65
Number of flowers	6±2	4±2	5±1	3±2
Diameter of flowers (cm)	5.67±1.53	2.33±1.15	4.67±1.53	1.00±1.00
Number of fruits	11±5	19±5	25±5	24±5
Fruit length (cm)	6.67±3.21	9.67±4.16	10.67±4.16	9.33±3.79
Damaged fruits	0±1	2±1	3±2	2±2

Analysis of nutritional treatments

There was no significant difference in nutrient efficiency for seedling emergence, leaves width and length, and number of fruits (Table 2).

For emergency, beds with basalt powder took 15-60 days while NPK, 45 to 75 days, and finally, the control test took between 15 and 75 days after sowing. Regarding the quantity and diameter of flowers and amount of damaged fruits, fertilization with NPK was shown to be higher than others, at 1% error (Table 3). There are few studies in the literature about using basalt powder as fertilizer, in both *L. cylindrical,* as in other crop species of economic importance, except in Pinheiro y Barreto (2000), in Italian grape, rice and beans. In these cultures, the production efficiency using basalt powder, reached the orders of 33.20 and 58%, respectively, concerning control test.

Table 4 shows the general treatment means from biometric variables evaluated and the effectiveness of each treatment.

Accessions from different origins may present morphological and biometric variations (Bisognin, 2002; Joshi et al., 2010). Knapik (2005) evaluated the use of these treatments on seedlings of *Prunus sellowii* (peach-brave), found increased efficiency of NPK, other than treated in this study. However, it is important to note that different species have different nutritional requirements, since, during the conventional process of food production, only macronutrients (N, P and K) are supplied, unbalancing the soil (Knapik et al., 2007), whereas the healthy development of plants generally occurs with the use of at least 45 nutrients, present in basalt powder constitution.

In a study on the growth and evaluation of the progression of mass and nutrient accumulation in the organs, fruit production and nutrient export by fruits of *L. cylindrica*, Siqueira et al. (2009) found that the maximum total dry mass production occurred at 231 days, 9.69 kg x plant. In the leaves, accumulated nutrients were N, Ca, Fe and Mn; while the flowers and fruits, P, K, Mg, S, Cu and Zn; with K and Fe the nutrients most absorbed by the plants of this species.

Table 2. Analysis of variance of the emergency period, leaves width and length, and number of fruits from *Luffa cylindrica* in two nutritional systems (Chemical fertilizer (NPK) and basalt powder), in an experiment conducted in Canoinhas – SC.

Variation Source	DF	Emergency	Leaf width	Leaf length	Number of fruits
		MS	MS	MS	MS
Treatments	2	0.3889^{ns}	24.3889^{ns}	34.6667^{ns}	15.1667^{ns}
Residuals	15	0.9889	25.2556	30.0444	21.8778
Total	17	---	---	---	---
Means		2.41	16.72 cm	18.67 cm	11
VC (%)		38.14	30.05	29.36	44.55

DF – degrees of freedom; MS – middle square; ns not significant (p < 0.05); VC – variation coefficient.

Table 3. Analysis of variance of the growth, number and diameter of flowers, fruit length and number of damaged fruits from *Luffa cylindrica* in two nutritional systems (chemical fertilizer (NPK) and basalt powder), in an experiment conducted in Canoinhas – SC.

Variation Source	DF	Growth	Number of flowers	Diameter of flowers	Fruit length	Damaged fruits
		MS	MS	MS	MS	MS
Treatments	2	5.7439**	219.5556**	32.6667*	145.1667*	12.0556**
Residuals	15	0.8418	27.0667	6.5778	41.6111	1.7000
Total	17		---	---	---	---
Means		2.41 cm	10	6.67 cm	24.50 cm	3
VC (%)		38.14	53.21	38.47	26.33	47.90

DF – degrees of freedom; MS – middle square; *significant at 5% probability level (p > 0.05); ** significant at 1% probability level (p < 0.01); VC – variation coefficient.

Table 4. Average overall efficiency of treatments with regard to growth, number and diameter of flowers, fruit length and number of damaged fruits of *Luffa cylindrica* in an experiment conducted in Canoinhas - SC.

Treatment	Growth (cm)	Number of flowers	Diameter of flowers (cm)	Fruit length (cm)	Damaged fruits
Basalt powder	3.33a	11ab	7.67ab	29.33a	1.67b
Chemical fertilizer (NPK)	2.5ab	15a	8.33a	24.67ab	4.33a
Control test	1.38b	3b	4.00b	19.5b	2.17b

Means followed by the same letter are not statistically different from each other.

For the quantity of damaged fruits, the most plausible justification is related to the high relative air humidity, providing a perfect environment for pathogens attack, affecting their quality and development (Silva, 1982). In addition, curcubitaceous borers (*Diaphania hyalinatae* and *D. nitidalis*) occurence, the main crop pests, causes high yield and fiber quality losses. The lack of nutrients in the soil also leads to plant low development, producing unsuitable fruits for commercialization (Knapik et al., 2007).

The results showed that the use of basalt powder is a sustainable and viable alternative to conventional fertilization, producing larger and fewer damaged fruits in addition to the low cost.

Ecological relationships established between *Luffa cylindrica* and visiting insects in both nutritional systems

There was predominance of insect pests in beds with a conventional fertilization (97% pests and 3% of natural enemies). In those with basalt powder, the proportion was lower (75% versus 25%). In the control, the ratio was reversed (25 versus 75%).

They were captured insects 273 in total, distributed in the order Hymenoptera (82.8%), Diptera (7.7%), Coleoptera (7%), Hemiptera (1.8%) and Lepidoptera (0.4%). From the total of 33.3%, 36.6% and 30% were collected from sites with basalt powder, NPK and control test, respectively (Table 5). Family formicidae correspond to 226, collected mostly in basalt powder beds (38.5%).

Four genera of ants (*Brachymyrmex* spp. subtypes 1, 2 and 3; *Dorymyrmex* sp., *Solenopsis saevissima* and *Nylanderia fulva*) were found and determined. The representativity scale of the samples can be classified as *Brachymyrmex* sp. subtype 1, followed by *Brachymyrmex* sp. subtype 3, *S. saevissima*, *Brachymyrmex* sp. subtype 2, *Dorymyrmex* sp and *N. fulva*. *Brachymyrmex* sp. subtype 1 was collected in all treatments, with fewer individuals in the control group, in contrast to *Brachymyrmex* sp. subtype 2, in greater quantity than all the others in the same treatment; finally, *Brachymyrmex* sp. subtype 3 in greater quantity in basalt powder. Golias (2008) showed the genus *Brachymyrmex* is composed of 38 species, with 35 located in Neotropical regions, with positive associations to plants, when preying on phytophagous insects, consuming their eggs and nymphs. In addition, species of the same genus have great adaptation to anthropic environments, becoming responsible for the damages in the fruits, as in the case of the beds treated with basalt powder.

Dorymyrmex sp., Although has aggressive behavior, it did not occur in conventional fertilization, since it tends to alienate other species in order to protect its nest. In the long term, aggression may result in the occurrence of other insects, especially phytophagous and consequent removal of their predators (Golias, 2008).

S. saevissima had higher occurrence in conventional fertilization. Martins (2010) found that the species is omnivorous and opportunistic, predating vertebrates, invertebrates and plants and supplementing its diet by protecting sap-sucking organisms. Their nests are built on the ground, in open and sunny areas, in the form of a mound, whose interior maintains the colony with several foraging tunnels. Areas with upturned soil tend to favor the presence of the species.

N. fulva appeared only in the control beds. It was not considered a pest, but is part of the insect-pest association. It's kind of mutualistic ant along with pearl mealybug land cysts (*Eurhizococcus brasiliensis*), which provides sugar excretions in exchange for plague spread, when transporting mobile nymphs to different locations, while also providing their defense against natural enemies (Haji et al., 2004). So, ant control becomes important to management strategies of *L. cylindrica*.

With the exception of *N. fulva*, other ants are natural enemies of other phytophagous, favoring the occurrence of the plant, in association with the basalt powder as fertilizer. However, the aggressiveness of the genus *Dorymyrmex* is able to ward off both pests and other natural enemies (Haji et al., 2004).

Table 5. Ant species amount found in *Luffa cylindrica*, in an experiment conducted in Canoinhas - SC.

Class	Order	Suborder	Family	Species	N. of Individuals	% individuals	Treatment: Basalt powder	Treatment: Chemical fertilizer	Treatment: Control test
Insecta	Coleoptera	----------	Carabidae	----------	1	0.4	-	1	-
		Polyphaga	Crysomielidae	----------	6	2.2	1	4	1
			Nitidulidae	----------	12	4.4	-	12	-
	Diptera	----------	----------	----------	2	0.7	-	2	-
		Brachycera	Deolichopodidae	----------	10	3.7	1	-	9
		Cyclorihapla	Tephritidae	----------	1	0.4	1	-	-
		----------	----------	----------	8	2.9	-	8	-
	Hemiptera	Homoptera	Cicadellidae	----------	2	0.7	-	-	2
			Aphididae	----------	3	1.1	1	2	-
	Lepdoptera	----------	----------	----------	1	0.4	-	1	-
	Hymenoptera	Apocrita	----------	----------	1	0.4	-	1	-
			Formicidae	*Brachymyrmex sp1*	127	46.5	53	46	28
				Brachymyrmex sp2	17	6.2	2	1	14
				Brachymyrmex sp3	35	12.8	16	11	8
				Dorymyrmex sp1	13	4.8	9	0	4
				Solenopsis saevissima	24	8.8	7	11	6
				Nylanderia fulva	10	3.7	0	0	10
Total (n)					**273**		**91**	**100**	**82**
Total (%)						**100.0**	**33.3**	**36.6**	**30.0**

The occurrence of other insects was only verified at order level: Coleoptera (19:

Nitidulidae, 12; Crysomelidae, six; Carabidae, one). The first two are phytophagous and the third, phytophagous predator, with nocturnal or crepuscular habits (Gullan y Cranston, 2007; Costa Lima, 1953). Diptera (21: Deolichopodidae, nine, unidentified, nine, Thephridae, one). Deolichopodidae are predators of pest insects and Thephridae are pests (Gullan y Cranston, 2007; Paranhos, 2007).

Two insects, one Hymenoptera and one Lepidoptera, were not identified at the family level. The presence of these orders may have occurred due to feeding with nectar, parasitoid or hyperparasitoid larvae, or parasites of other insects (Gallo et al., 2002). In the order Hemiptera, insects were identified from the Cicadellidae and Aphididae family, considered pest insects (Gullan & Cranston, 2007).

Despite initial inability to identify the pest of a species in the family level, the advantages obtained are: time of occurrence, losses, economic importance, aspects of the life cycle, behavior, distribution, most appropriate control methods, involving the plague with previously known and related species (Fujihara, 2008).

CONCLUSION

L. cylindrica emerges from the soil at 60 days, reaches 2.41 m in height, 18.67 cm in length and 16.72 cm in width of the leaf.It has at least 10 flowers per individual, measuring 6.67 cm; 11 fruits measuring 24.50 cm in length and the amount of damaged fruit does not exceed three fruits per foot.

The seedling emergence, fruit quantity, leaf width and leaf length are not influenced by treatments.The amount and diameter of flowers and fruits are higher in chemical fertilization (NPK), and for total height and fruit length, basalt powder is more efficient. The use of basalt powder, besides presenting good results in the cultivation of *L. cylindrica*, is sustainable alternative fertilization, avoiding the use of conventional products.

As for the visitor entomofauna, the Formicidae family is more representative, mainly regarding the use of basalt powder in the fertilization, most of them natural enemies of pests. Other insects were found in the conventional fertilization, mainly characterized as insect pests.

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