

The use of Coffee Residues in the Cultivation of vegetables

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Abstract— Since its discovery, coffee has had a large increase in its consumption, nowadays those who do not usually drink a cup of it, whether at home, at work, coffee is present at the table of many. By the time coffee was born, we know that real wild coffee was born in the interior of Ethiopia. This work was developed from February to October 2019 in the city of Manaus-AM. For the elaboration of the vegetable garden an area was delimited in the urban area in the north of the city, and parallel to this measuring 1x1,20 m was composted using the coffee residues. Instead of disposing of it through the sewage system, which harms both residential plumbing and the sewerage, because the accumulation of sludge in the pipes generates fungi and damages the PVC pipes. Coffee grounds are a product with great potential for use in vegetable cultivation, it is a great outlet for mainly domestic reuse offering an outlet for reuse and avoiding inappropriate disposal.

Keyword— Coffee waste, Blurs, Compost.

I. INTRODUCTION

Due to the high cost of chemical fertilizers, several alternative sources of organic waste have been used, such as animal waste, compound of urban waste, sewage sludge, coffee grounds and etc. In addition to these residues, there is the option of using organic soil conditioners in the production of vegetables, and can be marketed in liquid or solid form according to (DANTAS, 2011).

Composting, a biological process of transformation of organic waste in humic substances, in other words, from the mixture of food scraps, fruits, leaves, manure, straws, among others, a fertilizer is obtained at the end of the process homogeneous organic, dark color, stable, loose, ready to be used in any crop, without causing damage and providing numerous improvements to the soil (SOUZA, 2009).

In Brazil, coffee is one of the favorite drinks, which is part of the daily life of the Brazilian, which makes the second largest consumer of this drink in the world, as given (EMBRAPA, 2017). It is believed that coffee is one of the organic classes that most favors the Brazilian economy, being also considered one of the seeds that gave the most profitability to the country (DAMASCENA, 2015).

Also Souza (2016) showed that advances in technology combined with rampant population growth often result in an explosion of unsustainable practices of natural resources. Associated with these processes, the lack of control in the final destination of waste from food production is also highlighted. However, what was

previously produced on a small scale, with the population increase took large proportions. In fact, the production of global food has increased considerably over the centuries.

Since its discovery, coffee has had a big increase in its consumption, nowadays it is difficult to imagine, who throughout their day, does not usually drink at least one cup of this drink, whether at home, at work, coffee is present at the table of many around the world.

But what can we do with the waste generated during their preparation? An alternative to the use of these waste is their reuse through the composting process. This process is carried out through the reuse of these residues, or through their constituents the qais presents some economic value. Composting is one of the most attractive ways to solve these wastes, both economically and from an environmental point of view, providing a sustainable alternative to disposal (SZNTE, 2010).

Research shows that the use of organic waste provides improvements in the physical, chemical, and biological properties of the soil, favoring an environment conducive to microbial establishment (GULLO, 2010).

In soil organic matter, microbial biomass is the living and most active part, consisting of bacteria, fungi, actinomycetes, protozoa, and etc. Microbial biomass has several functions, such as controlling the decomposition and accumulation of organic matter, and regulating nutrient cycling in the soil (GRUGIKI, 2017).

It is noteworthy that inadequate disposal of coffee residue can generate various damage to the pipes of the

residences and over time, the waste begins to solidify on the walls of the pipes, which makes it difficult to clear the internal channeling of the Residence. However, coffee preparation residue can be used for various purposes, highlighting its use as fertilizer in plantations, being added to the single or dry soil. The organic composition and mineral composition of coffee grounds can affect its efficiency as fertilizer, however, one advantage we can cite is the high percentage of organic matter and the high amount of potassium (SZNTE, 2010).

Thinking about this problem, this work will show an experience of the sustainable use of waste generated in

the preparation of coffee, as a source of organic fertilizer, and thus show it as a source of reverse and sustainable logistics.

II. MATERIALS AND METHODS

This work was developed during the period from February to October 2019 in the city of Manaus-AM. For the preparation of the vegetable garden, an area was delimited in the urban region in the northern part of the city measuring approximately 1 x 1.20 m, where the composting process was developed using coffee reins.



Fig.1: a) area used where the composteira mounted; b) amount of coffee waste collected daily.

At first, the residue was collected, and these were identified to control the collection period, and the amount that was collected, in order to obtain an average consumption in the residence. Subsequently, some by-products such as dried leaves were added to the coffee residues, and eggshell.

After adding the elements to the residues of coffee preparation that were collected, a measurement of 250 ml was used as a parameter for the mixture.

Thus, we have a fertilizer prepared with 4 measures of 250 ml of coffee residue (lees), along with 1 and a half measure of crushed egg shells (totaling 375 ml), and then this compound will be added to the soil, for the composting process. So that it is dry, because we will not work with the same damp.



Fig.2 - Collection of eggshells.

For the use of this type of residue it is important to take some basic care during the handling of waste, do not keep the smudge collected in a closed place in a very long period, as the proliferation of fungi may occur, a fact that is not advisable in the Process. It is noteworthy that in many cases, when preparing the compound, the coffee spray should not be added to the mixture, which in its preparation was added sugar.

III. RESULTS AND DISCUSSION

Following the measurement of the mentioned compound, for the composting process, the time period of at least 15 to 30 days should be obeyed for the maturation process of the compound. During the composting process there is a sequence of microorganisms that decompose organic matter until the final product appears. For a good use in this process, it is recommended to make a good choice of the area in which there will be the composting process, this site must have a good drainage, receive sufficient solar radiation, but also airy. If the composteira is too exposed to the sun, organic waste may dry excessively, besides being able to harm microorganisms operating in the composting process (fungi, bacteria and actinomycetes), most of which do not survive under temperatures above 70 °C as (WANGEM, 2010).

As mentioned above, the coffee compound cannot be added before the fourth week in composting, because it is overhumid, and before this period there is a greater possibility of the emergence of fungi, these are not beneficial, and which in turn will assault the plants and vegetables, for which the compound was used. In addition to oxygen, microorganisms also require moisture to develop and decompose organic matter, however, too harmful moisture is harmful, because excess water occupies the existing spaces between organic particles, making it difficult to Circulation (EMARP, 2019).

The vegetables that the compound was tested were watered daily at 7:00 a.m. in an airy place, and their behavior and growth were analyzed for 45 days. Thus composting could be divided into three phases with respect to temperature. The first phase is mesophilic, that is when temperature increases due to the growth of microorganisms. In the second phase, thermophilic, the temperature exceeds 40°C and that is when the most intense biochemical reactions occur. And the last, is the humification or maturation of organic matter, which corresponds to the degree of stabilization of organic materials, and at the end of this phase, the organic compound will be ready. (OLIVEIRA, 2014).

During the first two weeks, it was noticed that the samples presented an excellent development, which is the initial objective of our work.



Fig.3 - Chives after 2 weeks

However, at times in the experiment, some samples of spring onions presented alterations, such as yellowish tips, this may be due to some factors, such as: lack of irrigation, nutritional deficiency, high sun exposure or fungi. As shown (SILVA, 2019), sunlight is one of the factors that directly influences the chives, as well as one of

the factors that can cause yellowing of the chives leaves is the lack of water in the correct measure, because it is a plant that does not requires many gas and does not like water very much we can not fail to take into account that chives needs a watering, once or again, during the day, always taking into account the moisture factor as a reference, if the place has good humidity , it is advisable to water once a day.

To prevent fungi from attacking the spring onions, the recommended is to decrease the gas in periods of low humidity and line the floor with dead cover, as in Manaus we went through some periods where the rain is intense, during some moments the gas were controlled. Fertilization is the way to replenish in the soil the nutrients that plants take from it for their development, so in plant cultivation this process is fundamental for the development of them.

Furthermore, it was found that vegetables should be exposed to the sun at most, within up to 4 hours a day, in the primieras hours of the day, between 07:00 and 11:00, because sunlight can directly influence the taste, aroma of our seasonings and development of them , the vast majority of seasonings need to receive at least 4 hours of direct sunlight to develop well and maintain their aromas and flavors, as (SILVA, 2019).

Even though all these measurements were taken, it was noticed that after three weeks they had no sign of improvement, the yellowish tips continued to appear, using the hypothesis that the soil, in which the samples were presenting a nutritional deficiency picture, the baixa P concentration drastically affected the root growth of the plant, these presented typical visual symptoms of P deficiency, with small plant growth and yellowing of leaves, which coincides with the symptoms described by ARAUJO (2016), this measure was taken with corrective effect.

For this correction, a simple and common alternative was used, chicken manure was added to the mixture in the soil, and with the passage of a few days, it was noted that they showed an improvement, the main benefits of the use of avian manure, the highlight is for the potential to provide chemical elements such as nitrogen, calcium, phosphorus, magnesium among others, also the organic matter supplied to the soil favors better soil structuring, causing it to retain more water, plants will suffer less with short periods of lack of water, in addition to favoring the proliferation of beneficial microorganisms as described Araújo (2011). Although chives are a vegetable that does not require a large amount of water, one cannot fail to irrigate them daily during the process, whenever necessary to highlight.



Fig.4 - Composting process.

After exactly fifty days, we were able to realize that the soil and fertilizer managed to enter a balance, the spring onions grew, and hears an accelerated reproduction of them, the yellow tips were no longer present, and even the coloration of the spring onions became more visually trimmed.

For this process, coffee residues with sugar should not be used, because sugar in addition to attracting insects



Fig.5 - Final result.

According to the figure above, we observed the final result of this work, the chives went through several processes until it reached the point, as we see in the image. If we observe figures 3 and 5 we can see how the development process was, it is perceptible how reproduction occurs high, and they can reach a pleasant size, in a natural way and maintaining a great coloring.

IV. CONCLUSION

This work showed the great potential of coffee residues in the cultivation of vegetables, it can be an outlet for domestic reuse, avoiding inadequate disposal that most often occurs in homes.

With the use of coffee compound, together with composting we can emphasize the opportunity to generate less organic household waste, because we can add in the process some residues such as fruit peels, dried leaves, but not left over food that they were cooked when prepared, thus

compromises the development of plants, it is of paramount importance that some details are obeyed, especially the measure in the preparation of inputs that will compose on the ground. The wrong use of the mixture affects the development of plants such as water and nutrient absorption, and in this case the spring onions end up being compromised, a high amount of coffee smudge on plants generates a layer that ends up solidifying, compromising the absorption of water and other nutrients according to (FERREIRA, 2011) the composting of coffee grounds can be an important and essential practice so that this residue can be used safely as organic fertilizer. There is evidence that, in the process of composting coffee grounds, nitrogen intervenes in the mineralization of organic matter, thus the coffee blur when applied directly to the soil may reduce the availability of this chemical element for plants. Instead of adducting, the coffee grounds remove this element that was already present in the soil. Therefore, the process of composting coffee grounds is important, before the cultivation is carried out, so that it is dry and does not compromise the plants.

reducing disposal in landfills, which is the final destination in many cases. Coffee residues offer various nutrients to the soil, in addition to protecting (eliminates bacteria and other soil-damaging microorganisms) and makes plants more productive, always when used respecting the amounts needed for soil.

During our experiment we had some problems, and with our learning we left some recommendations, whenever we use coffee waste to prepare the fertilizer, obey the composting period, because it is fundamental to obtain good results in plant development. For the higher nutritional efficiency of the soil prepare the site always checking the type of soil in which planting will be done, prefer the use of green fertilization, using leaves, wood remains, animal manure and etc.

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