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PROCESSING OF FOOD WASTE FROM HEALTH SERVICES

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Abstract: Considering that approximately 85% of waste from health services, corresponding to group D (common) are equivalent to solid urban waste, their recovery and recycling potential is quite significant, and can reduce the amount of waste sent to landfills. The existing organic fraction in this group is commonly sent to landfills along with the non-recyclable fraction of group D, however, there are destination alternatives such as the processing of organic waste that reduces the volume of waste and transforms organic matter into organic "compost". This work was carried out with the objective of evaluating the technical feasibility of using processing equipment for the organic fraction of group D waste from a hospital of great complexity in Morumbi, São Paulo, based on comparative planting using dilutions of the "compost" in seeds of caserta stem zucchini (Cucurbita pepo). The results of the analyzes show that the "compost" is not matured and has an acidic pH, therefore, it does not fit the specifications of the Ministry of Agriculture and, due to this, it cannot be used or marketed as an Organic Fertilizer. From comparative planting, it was proven in practice that the use of "compost" as an organic fertilizer inhibits germination and impairs seedling growth.
Keywords: Health Services Waste; Organic waste; Food waste processing; Organic Fertilizer.

INTRODUCTION

In Brazil, care with waste began mainly due to waste generated in health care - such as materials containing organic matter, anatomical parts, syringes, among many others that are likely to contain viruses and bacteria, and the risks they offered to health public due to the spread of disease. Over time, it was realized that the simple action of covering the waste to avoid contact with vectors was not enough, as it entailed environmental impacts such as soil and water contamination, which highlighted the need to create laws and implement them. policies to discipline the situation.

Health Services Waste - RSS, according to ANVISA's RDC No. 222/2018, are those generated during human or animal health care, including home care services and field work; acupuncture and tattooing services, among other similar ones, and these residues are classified into five groups, according to their dangerousness. Groups A, B, C and E (infectious, chemical, radioactive and sharp) are considered Hazardous Waste by NBR 10.004:2004. Group D (common) waste, according to ANVISA's RDC nº 222/2018, is subclassified as recyclable and non-recyclable and does not present a biological, chemical or radiological risk to health or the environment, and can be equated to household waste.

Despite the legislation in force, the situation of Health Waste in Brazil is still worrying. Studies show that many health services still dispose of their waste incorrectly, others do not even separate the various types of waste generated, mixing them indiscriminately. Due to the different ways of disposing of healthcare waste in the Brazilian states and their lack of control, the total volume of generation in Brazil is still unknown, as well as the real destination, which makes it difficult to publish an overview. that faithfully reflects the current situation.

The health service under study, a large hospital located in Morumbi - São Paulo - SP, generates approximately 700 ton/year of organic waste, which is equivalent to the organic fraction existing in group D waste generated by the health service. When analyzing the volume of organic waste generated and the expenses with its disposal in the landfill, the hospital's Environment sector opted to buy equipment to reduce the volume of this waste, with the intention of reducing costs with final disposal and in the future using the " compost" generated as an organic substrate in its green areas.

The equipment has been shown to be efficient, achieving up to 90% reduction in weight, but until now, the "compost" and the generated effluent have not been subjected to laboratory analysis to verify the composition and possible alternatives for use, and have not been carried out. If there is no analysis of the financial viability of using this processor, that is, it is not known whether the cost generated with the use of electricity exceeds the costs of destination to landfills or composting. It is not known whether the generated "compost" can be used as an organic fertilizer, or whether the effluent generated and discarded in the sewage collection network can be potentially polluting, due to the presence of substances above the maximum value allowed in legislation regarding the release of effluents.

This work contributes so that the impacts on the useful life of Brazilian landfills, which are currently being reduced at an accelerated pace, are not aggravated, since alternatives are presented for the destination of organic waste, such as processing that reduces the volume of this waste that will come to be sent to landfills. Small and large generators of organic waste will be able to review their current forms of final disposal and start to consider processing as feasible in the hospital in question, composting or forwarding to other companies that carry out these activities.

METHODOLOGY

The processing of organic waste consists of using equipment to reduce the volume of organic waste produced in a given location, dehydrating them by heating. The product is a "compound" in powder form that represents approximately only 25% of the initial amount, the other 75% referring to the water removed from the residue, discarded as liquid effluent. Due to this reduction, the volume of waste sent to landfills is reduced, representing an environmental gain.

In order to evaluate the applicability of the "compound", it was necessary to carry out physicochemical laboratory analyzes on the collected samples. It was defined that the determination of metals, carbon, sulfur and nitrogen would be carried out in the laboratory of the Institute of Energy and Nuclear Research, IPEN-USP, as it had the appropriate equipment for solid samples, and the analyzes of humidity, pH, organic matter, carbon/nitrogen ratio and colloidal suspension would be carried out in the laboratory of Centro Universitário SENAC – SP.

Laboratory analyzes were carried out in order to characterize it in terms of the amount of nutrients present after processing and in order to use it as an organic substrate in the landscaping areas of the hospital in question, comparing it with the standards required by the Ministry of Agriculture and Livestock - MAP for organic fertilizers. For this, parameters such as moisture content (65 °C) and pH (determination in water) were evaluated; for measurement of organic matter content and colloidal suspension, the methodology adopted by Martins (2009) was followed; carbon, sulfur and nitrogen contents were determined by gas chromatography; metals present were quantified by X-ray fluorescence; C/N ratio according to the methodology described by BRASIL (2007).

From these results, and from the discussions held about compliance with the parameters established in the legislation, it was pondered which use could be given to this "compound" and whether adjustments would be necessary for this. It was decided to carry out comparative planting, to verify whether when watering seeds with different concentrations of the "compound", they would germinate faster or slower than if they were watered only with distilled water.

RESULTS AND DISCUSION

When evaluating the results of the analyzes carried out on the "compost" and comparing them with the MAPA specifications for fertilizers, it was concluded that, according to the parameters obtained, it is not possible to market it as an organic fertilizer, as it does not fit the standards required physicochemicals. Parameters such as humidity, MOT, carbon, nitrogen, metals and C/N ratio comply with the legislation, but low pH is a parameter that prevents its use as an organic fertilizer.

With that in mind, it was decided to use Sodium Hydroxide to reduce the acidity and raise the pH of the "compound", as an alternative to adapt to the standards established in Normative Instruction SDA 25 of 2009. Thus, with the pH corrected and the Guaranteed compliance with legislation, the "compost" could be marketed as an organic fertilizer, however, the colloidal suspension analysis showed that the "compost" was not yet matured, and therefore, when placed in the soil, it could interfere with plant growth and cause until their death.

Aiming to test the "compost" to find out if it could be used as an organic fertilizer, a comparative planting was carried out (Figure 1). The objective was to test the efficiency of the "compost" from the germination of caserta zucchini seeds (Cucurbita pepo). According to MAPA (2009), "seed germination is the emergence and development of the essential structures of the embryo, demonstrating its ability to produce a normal plant under favorable field conditions". For this, 5 dilutions of the compound were used: 20%, 40%, 40% acid (without pH correction), 60% and 80%, in addition to distilled water to serve as a standard for comparison, or the blank test.

The monitoring of the comparative planting was carried out during 6 days in October, in which the percentage of seeds that had germinated in each of the six "greenhouses" was observed, if the seedlings developed stronger or weaker than the others and the structures developed, as primary root, secondary root, hypocotyl and primary leaves (see Figure 2). According to MAPA (2009), "the percentage of seed germination corresponds to the proportion of the number of seeds that produced seedlings classified as something normal".

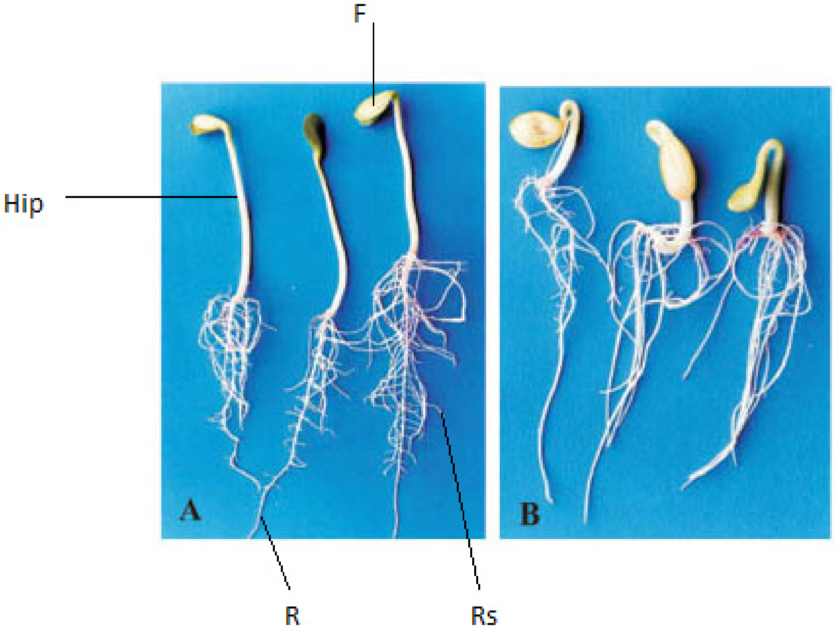
According to the definition by Barros et al (2005), perfect seedlings, intact and well developed in the germination test were considered strong (Figure 2A). The weak seedlings had small defects and did not grow well (Figure 2B).

Initially, the intention was to extend the experiment up to 8 days from the beginning, due to the seed germination period which was 4 to 8 days, however, on the 6th day there was already a lot of mold in the samples, especially in the most concentrated ones. Due to this, the experiment was terminated, as the "greenhouses" were no longer a favorable environment for seed germination.

On the 3rd day of the experiment, the seeds of all dilutions began to germinate, showing the primary root, with those in the white test being the ones that germinated in greater quantity and the most developed. The amount of germinated seeds on the third day is shown in Table 1.

From the 4th to the 6th day, the experiments began to develop differently, decreasing according to the increase in the

Figure 1 - comparative planting.



Caption: Hip – hypocotyl; R – primary root; Rs – secondary root; F – primary leaf.

Figure 2 - zucchini seedlings.

Source: BARROS et al, 2005.

	3º day	4º to 6º	Germination (%)
white	29	29	97%
20%	24	25	83%
40%	12	12	40%
40% acid	19	19	63%
60%	12	12	40%
80%	10	12	40%

Table 1 - Amount of germinated seeds.

percentage of “compost” in the dilution, some more quickly and presenting more developed and stronger seedlings; others quickly, but with less developed and weaker seedlings; and others, after germination of the seeds, stopped developing, presenting weak and poorly developed seedlings.

The white test (see Figure 3) was the one that developed the most compared to the others, showing 97% germination of normal and strong seeds and seedlings, measuring up to 16 cm. Mold was present, but in small quantities, formed by the “greenhouse” stifling, which did not influence the development of seedlings.

The 20% experiment (see figure 4) also performed very well, with normal, strong seedling growth and well-developed roots. Despite having been watered with distilled water containing diluted “compound”, it showed a lower germination rate compared to the blank, reaching 83% of the total number of seeds. The roots developed a lot, but a smaller number of seeds developed the hypocotyl and primary leaves in relation to the white test, with seedlings reaching up to 10 cm. There was also little mold present.

The 40% experiment (see figure 5) developed much less compared to the previous ones, using this percentage of “compost” only 12 seeds germinated, totaling 40%. The seedlings that reached up to 7 cm, also less than the other experiments, were weaker than those of the previous experiments.

The roots developed, but became shorter and only three developed primary leaves, and even then, they did not detach from the seed coat. There was mold all over the filter, covering the seeds and seedlings.

The 40% experiment with acidic pH (see figure 6), different from what was expected, developed more than the 40% experiment with corrected pH, reaching 63% germination with 19 germinated seeds. The roots developed a lot, however the seedlings were weak and only reached 6 cm. There was mold all over the filter, but less than the 40% one.

Few seeds germinated in the 60% “compost” experiment, only 12 of the total. Of the 40% that germinated, none developed primary leaves or hypocotyl, being considered weak seedlings. Mold was present all over the filter and in large quantities. The results can be seen in figure 7.

The experiment in which there was less seedling development was the 80% experiment (see figure 8). Despite presenting 12 germinated seeds, totaling 40% of the total number of seeds, like the 60% experiment, the seedlings developed little, presenting only primary roots or radicles.

Of the 6 experiments carried out, this was the one that developed the least and the one that most showed mold covering the seeds, perhaps due to the dilution being quite concentrated, as there was little water.

It can be concluded that the presence of the “compost” inhibited seed germination, because when comparing the white test with the different percentages of dilution of the “compost”, this was the one that developed the highest number of seedlings, more developed and stronger. As the dilution of the “compost” in water was reduced, fewer seeds germinated and those that germinated, lesser amount developed secondary roots, hypocotyl and primary leaves.

It was also possible to conclude that, as the colloidal suspension test had shown, the “compound” is not matured, and when in contact with water, bacterial activities, as well as decomposition reactions of organic matter restarted. It was possible to verify that, as previously mentioned, when applying the compost that is in this phase as an organic fertilizer, there is interference in the growth of the plants (KIEHL, 1985).

Figure 3 - 6th day of the White Test.

Figure 4 - 6th day of the Test 20%

Figure 5 - 6th day of the 40% Test.

Figure 6 - Day 6 of the 40% Acid Test.

Figure 7 - 6th day of the 60% Test.

Figure 8 - 6th day of the 80% Test.

FINAL CONSIDERATIONS

Because it is simply dehydrated and not yet matured organic matter, it was proven in the comparative planting experiment that when it comes into contact with water, biological reactions of decomposition of the organic matter occur again, causing the inhibition of growth and germination of the plant or even death. of the same. In order to comply with the legislation, it would only be necessary to correct the pH, making it basic, however, as evidenced in the comparative planting experiment, even using a "compost" with a basic pH, there is no development of the seedlings, in addition to the use causing the outcrop of fungi.

In this case, as no viable alternative for correcting the compost has been proven so that its use is beneficial to the plants, it is believed that the best alternative for the disposal of this "compost" would be sending it to compost, together with the amount of unprocessed organic waste generated by the health care facility.

Regardless of whether processing is carried out or not, the best alternative to be adopted for the destination of organic waste produced by the hospital is composting, as it prevents approximately 700 tons of organic waste from being sent per year for final disposal in landfills. Even so, the best alternative would be to reduce the generation of organic waste, carrying out an efficient campaign against food waste in the kitchen, which would reduce the volume of organic waste discarded and, consequently, the expenses with final disposal.

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