Knowledge about compost in students of the Health Sciences Area

Conocimiento sobre la composta en estudiantes del Área de Ciencias de la Salud

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Key Handbooks

This research is very important in science and technology, since it contributes to the knowledge about the perception that students in the Health Sciences Area have about compost; This is of interest to us because in recent years the pollution problem is serious for the planet. Based on the above, it should be noted that there are key aspects to apply to the generation of universal knowledge, such as: open access to research journals, the link between communities of universal access to knowledge, common objectives, epistemic solidity, linkage with local and regional communities, exchange of knowledge and resources, generation of synergies in networks, addressing strategic issues. This work concludes that students in the area of health sciences do know what compost is, but only 50% of those surveyed separate organic waste, so some strategy must be considered so that the student population becomes aware. about environmental pollution

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Abstract

Pollution is an emerging problem that affects human life, for this reason, solutions are sought to reduce the pollution problem. As a sustainability action, composting is a good alternative to reduce environmental problems. Making use of organic waste for soil fertilization is very important for the environment. The objective of this research was to know how much health sciences students know about organic waste and composting. Based on the above, a questionnaire was applied in order toobtain said information. The results showed that although the majority know that it is organic waste, only about 50% separate it. Likewise, a large number of respondents know that it is compost and the majority would also like to make it as a sustainability action.

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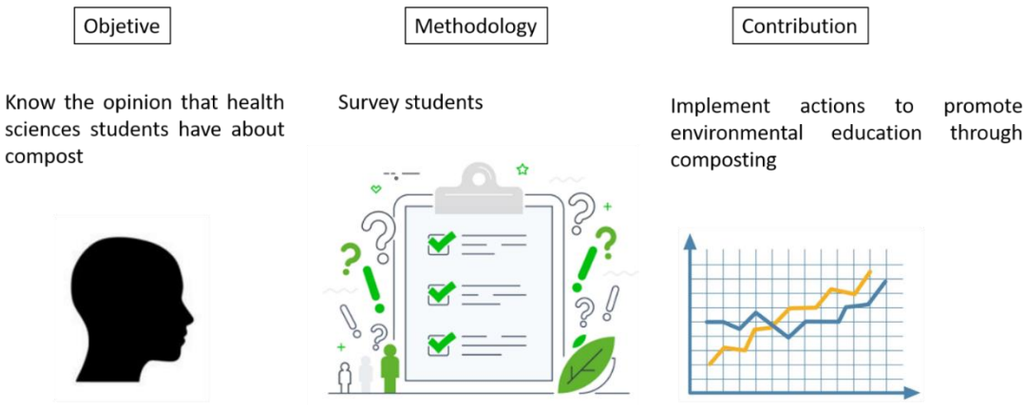

Compost, Organic waste, Sustainability

Resumen

La contaminación es un problema emergente que afecta la vida del ser humano, por tal motivo, se buscan soluciones para reducir el problema de contaminación. Como una acción de sustentabilidad, la elaboración de composta es una buena alternativa para reducir los problemas ambientales. Hacer uso delos residuos orgánicos para la fertilización del suelo es muy importante para el medio ambiente. El objetivo de esta investigación fue saber que tanto conocen los estudiantes de ciencias de la salud sobre los residuos orgánicos y la elaboración de composta. En base a los anterior, se aplicó uncuestionario con la finalidad de obtener dicha información. Los resultados mostraron que aunque la mayoría sabe que es un residuo orgánico, solo cerca del 50% los separa, así también, gran número de los encuestados sabe que es una composta y a la mayoría también le gustaría elaborarla como una acción de sustentabilidad.

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Composta, Residuo orgánico, Sustentabilidad

Introduction

1. Compost as a sustainability action

Due to the high environmental pollution that prevails in our world today, the need has arisen to propose solutions and/or strategies to fully manage biodegradable solid waste. One of these treatment methods is compost, which consists of transforming organic solid waste by biological means and under controlled conditions (commonly called composting) to obtain organic fertilizer at the end of the process (Montes, 2021).

Organic fertilizers, also known as biomass fertilizers, represent a great economic and sustainable alternative to improve plant nutrition and improve crop soil conditions. These fertilizers, mainlyderived from materials such as manure and plant residues, offer a series of significant benefits compared to chemical fertilizers. Firstly, these fertilizers significantly improve the structure of the soil by increasing its porosity and capacity to retain water, promoting the growth of plant roots and beneficial microbial activity. In addition, compost releases a large amount of nutrients over a long period of time, ensuring plant nutrition (Alarcón, 2024). Recently, it has been shown that climate change has mainly affected cropland located in forest or grassland areas (Smith, 2021).

2. Composting phases

Composting is a biological process, which occurs under aerobic conditions (presence of oxygen). With adequate humidity and temperature, a hygienic transformation of organic remains into a homogeneous material that can be assimilated by plants is ensured.

It is possible to interpret composting as the sum of complex metabolic processes carried out by different microorganisms, which in the presence of oxygen, take advantage of the nitrogen (N) and carbon (C) present to produce their own biomass. In this process, additionally, the microorganisms generate heat and a solid substrate, with less C and N, but more stable, which is called compost (Azim et. al, 2018).

By decomposing C, N and all initial organic matter, microorganisms release measurable heat through temperature variations over time. Depending on the temperature generated during the process, three main stages are recognized in composting, in addition to a maturation stage of variable duration. The different phases of composting are divided according to temperature into:

2.1. Mesophilic phase. The starting material begins the composting process at room temperature and in a few days (and even hours), the temperature increases to 45 °C. This increase in temperature is due to microbial activity, since in this phase the microorganisms use simple sources of C and N, generating heat. The decomposition of soluble compounds, such as sugars, produces organic acids and therefore the pH can drop (to about 4.0 or 4.5). This phase lasts a few days, between two and eight days (Sánchez et. al, 2019).

2.2. Thermophilic or Sanitization Phase. When the material reaches temperatures higher than 45°C, the microorganisms that develop at medium temperatures (mesophilic microorganisms) are replaced by those that grow at higher temperatures, mostly bacteria (thermophilic bacteria), which act by facilitating the degradation of sources. more complex C, such as cellulose and lignin. These microorganisms act by transforming nitrogen into ammonia, which raises the pH of the medium. In particular, from 60 ºC onwards, bacteria appear that produce spores and actinobacteria, which are responsible for decomposing waxes, hemicellulose and other complex C compounds. This phase can last from a few days to months, depending on the starting material, weather and site conditions, and other factors. This phase is also called the sanitization phase since the heat generated destroys bacteria and contaminants of fecal origin such as Eschericha coli and Salmonella spp. This phase is important because temperatures above 55°C eliminate cysts and helminth eggs. , spores of phytopathogenic fungi and weed seeds that can befound in the starting material, resulting in a sanitized product. (Sanchez et. al, 2021)

2.3. Cooling or Mesophilic Phase II. Once the carbon sources and, especially, the nitrogen in the

composting material are exhausted, the temperature drops again to 40-45°C. During this phase, the degradation of polymers such as cellulose continues, and some fungi visible to the naked eye appear. When lowering below 40 ºC, the mesophilic organisms restart their activity and the pH of the medium decreases slightly, although in general the pH remains slightly alkaline. This cooling phase requires several weeks and can be confused with the maturation phase.

2.4. Maturation Phase. It is a period that takes months at room temperature, during which secondary reactions of condensation and polymerization of carbon compounds occur to form humic and fulvic acids. (Agreda and Deza, 2018).

3. Physicochemical parameters in composting

The composting process will depend largely on the environmental conditions, the method used, the raw materials used, and other elements, so it must be under constant surveillance of some parameters called physicochemical and can always be within an optimal range, not However, depending on the composting process some parameters may vary. Considering that composting is a biological process carried out by microorganisms, some physicochemical parameters that affect their growth and reproduction must be taken into account. These factors include oxygen or aeration,carbon dioxide, color, substrate humidity, temperature, pH, and C-N ratio. (Cerda et. al, 2019). The parameters and their optimal ranges are indicated below.

3.1.Oxygen

Composting is an aerobic process and adequate aeration must be maintained to allow microorganisms to breathe, in turn releasing carbon dioxide (CO2) into the atmosphere. Likewise, aeration prevents the material from compacting or becoming waterlogged. Oxygen needs vary during the process, reaching the highest consumption rate in the thermophilic phase. (Montoya et. al, 2019)

3.2.Carbon Dioxide (CO2)

In any aerobic or aerobic process, whether in composting or even in human respiration, oxygen serves to transform (oxidize) the Carbon present in raw materials (substrate or food) into fuel. Through the oxidation process, Carbon is transformed into biomass (more microorganisms) and carbon dioxide (CO2) which is a source of carbon for plants and other organisms that carry out photosynthesis. However, CO2 is also a greenhouse gas, that is, it contributes to climate change. (Uribe, 2020)

3.3.Color

Mature compost has a dark brown or blackish color, a forest or earthy aroma, the final product; It improves the physical, chemical and biological properties of the soil, and also allows the reduction of traditional fertilization without significantly affecting the yield of agricultural crops. (Crespo et al., 2018)

3.4.Humidity

The optimal humidity for compost is around 55%, although it varies depending on the physical state and size of the particles, as well as the system used to carry out composting. If the humidity drops below 45%, microbial activity decreases, without giving time for all the degradation phases to complete, causing the product obtained to be biologically unstable. If the humidity is too high (>60%) the water will saturate the pores and interfere with the oxygenation of the material. A simple way to monitor the humidity of the compost is to apply the “fist technique” (Ansorena et. al, 2024).

3.5.Temperature

Composting begins at room temperature and can rise to 65°C without the need for any anthropic activity (external heating), to reach room temperature again during the maturation phase. It is desirable that the temperature does not drop too quickly, since the higher the temperature and time, the greater the rate of decomposition and greater sanitation. (Campitelli et. al, 2020)

3.6.Ph

The pH of composting depends on the source materials and varies in each phase of the process (from 4.5 to 8.5). In the early stages of the process, the pH is acidified by the formation of organic acids. In the thermophilic phase, due to the conversion of ammonium into ammonia, the pH rises and the medium becomes alkaline, finally stabilizing at values close to neutral. When the pH is below 4.5 it is due to excess organic acids, however, if the pH is above 8.5 there is an excess of nitrogen. (Rodríguez-Torres et. al, 2020)

3.7.Carbon-Nitrogen (C-N) Ratio

The C-N relationship varies depending on the starting material and the numerical relationship is obtained by dividing the C content (% total C) by the total N content (% total N) of the materials to be composted. This ratio also varies throughout the process, being a continuous reduction, from 35:1 to 15:1, if the ratio is greater than 35:1 there is an excess of carbon, however, if it is less than 15:1, has an excess of nitrogen. (Castro et. al, 2019)

Methodology

The methodology that was carried out was a longitudinal, transversal and participatory research. The study sample was chosen at random with a total of 171 students from the health sciences area of the Autonomous University of Zacatecas. The time period of the study was between January-July 2024. The sample was taken at the UAZ Siglo XX campus of said University. A dichotomous questionnaire was carried out to obtain numerical data on knowledge of organic waste, waste separation, identification of compost, knowledge of how to make compost and finally the pleasure of making compost.

Results

As can be seen in the following figures, of the total number of students surveyed, 159 know what organic waste is and only a total of 12 do not; Regarding the separation of organic waste from inorganic waste, only 80 of the total separate waste, while 87 of them do not; 150 of them identify what compost is; 114 have knowledge of how to make compost and 122 students would like to make compost, the rest do not.

The questions asked were the following:

1. Do you know what organic waste is?
2. Do you separate organic waste from inorganic waste?
3. Do you identify what compost is?
4. Do you know how to make compost?
5. Would you like to know how to make compost?

Box 1

Figure 1

Knowledge about organic waste

Own elaboration

Box 2

Figure 2

Separation of organic and inorganic waste

Own elaboration

Box 3

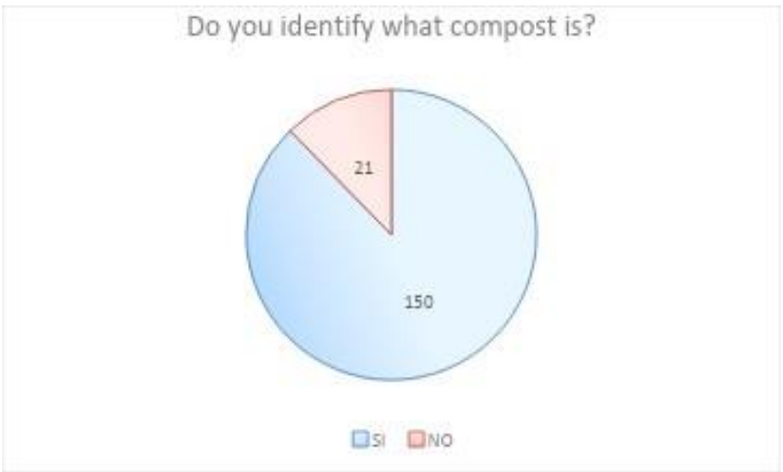

Figure 3

Compost Identification

Own elaboration

Box 4

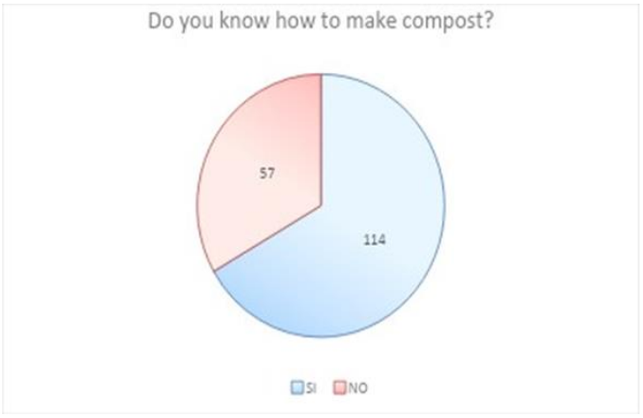

Figure 4

Knowledge of how to make compost

Own elaboration

Box 5

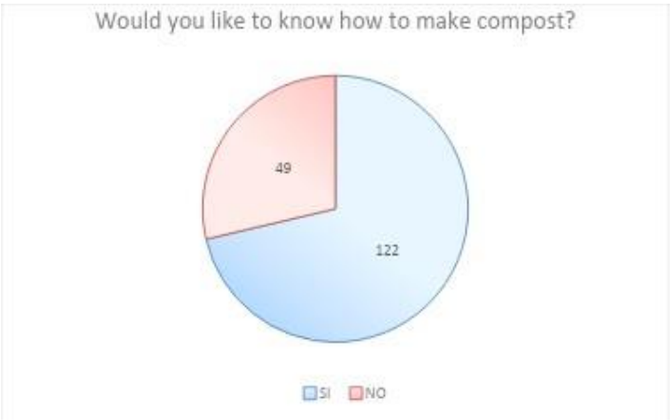

Figure 5

Like to make compost

Own elaboration

Conclusions

It is important to mention that a sustainability action today is the production of compost through the useof organic waste. The health sciences students at the Autonomous University of Zacatecas have knowledge about what organic waste is and whether they would like to make compost, since a large number of those surveyed know what compost is. It would be very interesting to carry out this type of actions in the different academic units that have to do with health, this with the aim of being sustainable and having a better planet, since it can be environmentally educated.

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