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BIOSOLIDS COMPOSTED BY THE STATIC PILE MATURATION METHOD FOR ITS APPLICATION IN AGRICULTURE

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ABSTRACT

The objective of this work was to know the quality of the compost obtained, of the biosolids generated in municipal wastewater treatment plants and a mixture of different organic materials that were obtained from public gardens and to analyze their effect on the yields in some crops. In this way, the quality of soils that have been degraded by agricultural activity and other anthropogenic actions near the capital of Puebla will be improved. Piles of: 2 m wide, 1 m high and 3.5 m long were built, placing 9 m³ of biosolids, it was mixed in a 2:1 ratio. With exposure to the wind and plastic cover or shading, the piles were periodically manipulated by shoveling or turning to aerate them, this phase is the aerobic part that lasted 3 months. The anaerobic phase consists of increasing the temperature and mixing with other organic residual materials, and they were covered for a period of 2 months, this stage is the static part and without movement until maturing or stable.

KEYWORDS: Composting, organic recycling material, static maturation pile, gardening waste and sewage lily.

INTRODUCTIÓN

Biosolids are residues that result from wastewater treatment, these can be liquid, semi-solid or solid, they have a great nutritional value and a great field of application especially in agriculture, where they promote the growth of crops and plants, since they have a high content of macronutrients and micronutrients. The methods for treating biosolids as stabilizing media are the most effective in eliminating the development of biological reduction of volatile matter content, chemical oxidation of volatile matter, the addition of chemical agents to make the sludge unsuitable for microorganisms do not survive and that of applying heat in order to sterilize and disinfect the sludge.[1-3] Composting is the process in which a biosolid is subjected to a process where the organic material will undergo degradation in order to reduce the content of pathogenic microorganisms.[4-9] Composting biosolids is a very good alternative to control pathogenic organisms since bacteria of enteric origin are sensitive to temperatures that are higher than 42 ° C. This method of composting is carried out in two temperature ranges, the Mesophilic ranging from 10 ° C to 40 ° C and thermophilic ranging from 40 ° C to 71 ° C, the critical temperature to eliminate human pathogens is 55 ° C. It should be taken into account that the design and management of a composting plan will depend both on the measurement of the volume of materials available for composting, as well as the weight and volume of the finished product.[10-13]

MATERIALS AND METHODS

Table number 1 describes the 2: 1 ratio in the mixture of the m³ of crude biosolids over m³ of pruning residual material mixed in this proportion to obtain a proportional compost that is more efficient in its maturation.

Table 1. 2:1 ratio of crude biosolids on pruning of residual materials used for the composting process.

Residual Materials	Amount
1st. Mix: (raw biosolids) / (pruning of botanical garden chip material)	$\frac{2.5\ m^3}{1\ m^3}$
2nd. Mix: (crude biosolids) / (pruning of green areas of botanical garden)	$\frac{2.5\ m^3}{1\ m^3}$
3rd. Mixture: (raw biosolids) / (pruning of crushed water lily material)	$\frac{2.5\ m^3}{1\ m^3}$
4th. Mix: (raw biosolids) / (corn bagasse material pruning)	$\frac{2.5\ m^3}{1\ m^3}$
Total: (crude biosolids) / (pruning of organic waste materials)	$\frac{10\ m^3}{5\ m^3}$

The research within the laboratory was following the methodology presented in the manual of methodology of physicochemical analysis of compost of the Department of Research in Agricultural Sciences belonging to the Benemérita Universidad Autónoma de Puebla, as well as on a par with official Mexican standards in the matter bisolides and composting of biosolids. (NOM-004-SEMARNAT-2002)-(NADF-020-AMBT-2011). In the composting process, those responsible or agents of transformation are living beings, all those factors that may limit their life and development will also limit the process itself, the factors involved are: Temperature, in each phase of the process a series of microorganisms intervene, each of them with a different temperature range.[14-16] Humidity is essential for microorganisms, since water is the environment in which they live, move and feed, in the practice of composting, high humidity must always be avoided because it would displace oxygen and, consequently, the The process would stop being anaerobic, on the other hand, if the amount of humidity in the static mixing and maturing pile or mound is low, the activity of the microorganisms decreases and consequently the process is delayed or slow.[17-18] In the aeration phase, oxygen is essential for microorganisms to be able to effectively decompose organic matter, therefore, the supply of air at all times must be ideal to maintain microbial activity, without the appearance of anaerobic conditions, which, in addition to hinder the process, lead to the appearance of odors and a product of inferior quality. In order for the anaerobic process not to start, a minimum of 10% aeration must be exceeded.[19] For this reason, it is important to mix and control the appropriate organic materials in the static pile or mound, since many of the organic residues, especially the grass, tend to become caked and generate a slow decomposition generating bad odors, in image 1 y 2, the method is illustrated static mixing and maturing pile.

Image 1: Static ripening stacks.

Image 2: Static maturing stacks with coating.

RESULTS

The organic material that is obtained as a product of the controlled microbial action on organic waste and industrial waste of organic origin with these waste separately or well mixed, piles or mounds are formed, as indicated in figures 1and 2, that by action of microorganisms give rise to a material (organic matter),

very useful for agricultural soils since it improves their structure and fertility.

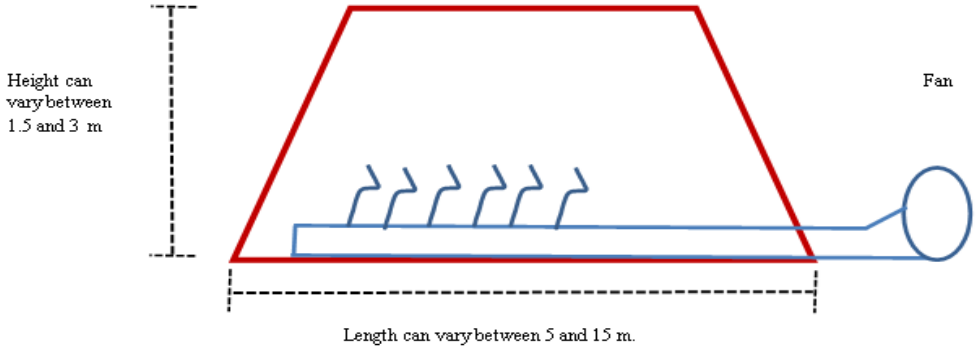

Figure 1: Stack or monticule static for maturation.

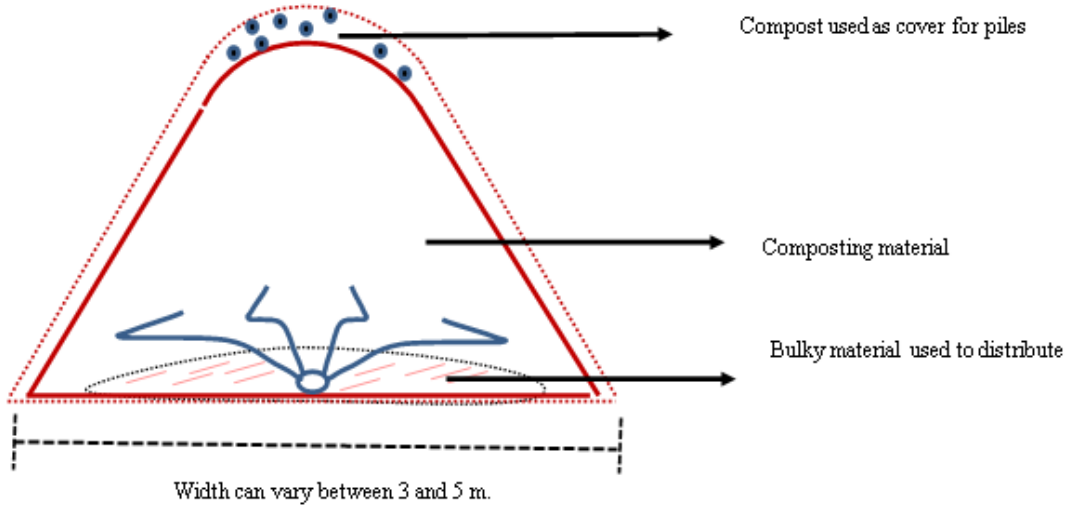

Figure 2: Pile or heap of maturation aerobic phase composting process.

DISCUSSION

Feasibility studies in analysis of the quality of the compost for each support and amendment material, Studies of the characterization conditioning of the tests of the phytotoxicity of the finished product, Economic analysis of production costs and uses of composting with economic income, Agronomic and maturity characteristics of the compost obtained, Diagnosis of the phytotoxicity of the compost obtained, We can conclude that the composted biosolid can be applied in different types of crops due to the applied method and by mixing with other residuals, the maturation process called composted biosolid achieves as a final product a high content of % Moisture, % Organic Matter and excellent pH, allowing to have excellent characteristics of a natural organic fertilizer, enriched composting, improving the quality when used in any type of soil highly eroded by different anthropogenic activities and allows it to be used for various uses in the agriculture industry and avoiding the use of agrochemicals as fertilizers, thus avoiding soil contamination.[20-23]

CONCLUTION

Once the biosolid was composted, analyzes were made to determine the macro and micro minerals (N, K, P, Cu, Zn, Fe, Ca, Mn) by means of atomic mass absorption, where the potassium was made by dilution, the standard method that is a mixture of acetylene gas with lamp for each element detected, analysis and characterization to see the amount of nutrients.[24-26]

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