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PRODUCTION OF COMPOST PRODUCED FROM SOLID WASTE SPENT MUSHROOM SUBSTRATE AND EVALUATE THE PHOSPORUS

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Abstract

Soil phosphorus (P) is a dynamic but it is usually leached from the soil via rain fall process. Soil phosphorus as a soluble substance can be delivered through agricultural fields by runoff or soil loss. It is one of the most important nutrients that affect the sustainability of crops as well as the energy transfer for living organisms. Therefore, an accurate reproduction of soil phosphorus must be performed. Considering a crucial issue for a sustainable soil and water controlling, an effective soil phosphorus valuation in the current research was conducted with the aim of examining the capability of phosphorus stagnant in soil.

Key words: spent mushroom waste, Compost, Phosphorus.

1 Introduction

Bio compost is a boon to the eco system as it prevents soil erosion, wetland and landfill cover system. Monitoring of the compost is one of such methods in bio composting. This system includes the shredding of plant matter, with enough amount of water for the perfect moisture and then regularly adding the mixture for an enhanced aeration. A mixture of ingredients, that fertilize the soil is called compost. It is prepared using a decomposed plant, food waste and recycling organic materials. Aerobic bacteria and fungi with their chemical process convert the underlying components and generate heat, carbon dioxide, and ammonium. Bio-composting is generally the biodegradation of organic matter through micro-organisms with the help of macro- organisms under a controlled aerobic condition [1]. Composting supports in concentrating nutrients for use by oyster, exhaust nutrients which favour oyster competitors and also help remove the heat generating capacities of the substrate [2]. Composting of organic waste through biostimulation strategy improves microbial density, with the upgradation of the microorganic activity in a contaminated zone with the alteration of the moisture and nutrient supply. biodegradability and bioavailability are some important factors that determine the success of this process [3].

1.1. Importance of Carbon: Nitrogen Ratio in Compost Substrate.

The importance of C: N balance cannot be under estimated. Well-adjusted compost holds an optimum nutritional level of microbial growth. Because organic matter is reduced during composting, the C: N ratio gradually decreases (30:1 at makeup, 20:1 at filling and 17:1 at spawning). Increase of nitrogen should be up to 3% level of the finished compost at the time of spawning while over supplementation with nitrogen results in residual carbon compounds [4]. Readily available carbohydrates which are not consumed by the microbes during composting can become food for the competitors. It is therefore important that these compounds are no longer present when composting is finished.

Oyster mushrooms (Pleurotus spp) are fleshy fungi and are the premier recyclers on the planet [5]. World mushroom production is estimated at 12 million tons annually and it is estimated that there are about 1.5 million different species of mushrooms and only 64,000 species have been described so far. Pleurotus ostreatus known as oyster mushrooms. According to the China Business Research Institute, surveyed the edible mushroom production at a global level reached an annual yield of 38.42 million tonnes in 2019. About 5 kg of SMW are produced for each kilogram of mushroom. Normally, at the end of each production cycle, “spent” (used) mushroom substrates are left abandoned or discarded. One of the major environmental problems in the mushroom producing

Spent mushroom substrate is a good source of carbon, nitrogen and other elements. Nitrogen content varies from 0.4- 13.7%. For poor soils, SMC is cheaper and more effective than artificial fertilizers. SMC can be decomposed to humus material exhibiting good ventilation and water-retaining capacity. It can thus improve soil aeration and prevent soil hardening. SMC is also rich in organic matter and many kinds of mineral nutrients that not only offset any soil deficiency but also enhanced soil fertility and output per unit area.

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2. Materials and Methods:

2.1. Materials

Spent mushroom waste (*Pleurotus ostreatus,* Oyster), animal waste: Cow dung, Cow Urine, Amirdha karaisal, plant Humus cum Soil from Sacred Heart College Campus Grass clippings, Twigs and sticks were used for the production of Compost in organic method.

2.2. Production of Compost

Compost to begin with Twigs sticks in bottom spread first layer, Twigs should cut to small size and spread as thick as pencil. Create a larger that about 5cms thick. Twigs being at bottom facilitates aeration of heat air circulation is crucial because microorganisms facilitate composting, need a constant supply of oxygen to survive. Carbon-di-oxide produced by their activity also needs to remove on top of twigs. Then spent mushroom waste, Coir waste, Dried leaves Humus, Cow dung, these four materials placed in layer one by one and finally Amirtha Karaisal sprinkled over the bed, it's called one bed, the above bed placed repeatedly four times in the same manner [6]. Every single layer must be containing the above material 15cm size. First one week every 48hrs the material mixed well ups and down. From second week onwards every weekly once it was mixed thoroughly and ups and down and sprinkle Amirtha karaisel. Because Amirdha karaisal facilitates microorganism's growth thereby accelerating the composting process. The temperature was checked thoroughly every week by the compost thermometer. Amirdha karaisal should be sprinkled on to maintain level as a final step of heap preparation. A polythene sheet should spread over the heap. Sheet helps to retain heat and moisture inside the heap as decomposes these speeds up the composting process.

Figure "1: Preparation process of Compost with Layer 1"

Figure "2: Preparation process of Compost with Layer 2"

Figure "3: Preparation process of Compost with Layer 3"

Figure "4: Preparation process of Compost with Layer 4"

2.3 Estimation of Phosphorus by Atomic Absorption Spectrometric method

Potassium and phosphorus is determined by atomic absorption spectrometry by direct aspiration of the filtered or digested and filtered sample into an air-acetylene flame [7]. Effluent samples must undergo a preliminary nitric acid digestion followed by a hydrochloric acid solubilisation. Atomic absorption spectrometer equipped with electronic digital readout and automatic zero and concentration controls. **Reagents preparation:** 1g ammonium molybdate in 15ml water dissolve well make up to 20ml of water (solution A), 40mg ammonium meta vandate in 5ml water, 5ml nitric acids make up to 20ml of water (solution B). Mix the solution B to solution A. (phosphorus reagent) STD: 65mg – 100ml make up with water (use potassium dihydrogen phosphorus as standard) SPL: 65mg – 100ml make up with water Wait for 15mins make up with water. Measure the absorbance at 420nm.

3. RESULTS AND DISCUSSION

3.1 production of compost

Figure 5: The final value-added end product Compost

The different sources of solid waste raw material with the spent mushroom waste contain the *Pleurotus ostreatus* fungi in the surface of the paddy of waste mushroom bed which is thrown in landfill after mushroom harvested. This fungus partially decomposes the paddy spent mushroom waste and humus waste of sacred heart college compus. When once Sprinkiling of Amirdha karaisal on compost bed which facilitates microorganism's growth thereby accelerating the composting process increasing the speed of decay process inside the solid waste material to become uniform component as compost (figure - 5) after 3 months. This compost used for varies analysis

before and after field trials of plant cultivation in lab scale and land trials.

3.2 Determination of Phosphorus by Atomic Absorption Spectrometric method

Content	Phosphorus	Phosphorus 1	Average
Soil	0.034%	0.036%	0.035%
Compost	0.23%	0.25%	0.24%

Table: 1 determination of Phosphorus by AAS

The AAS shows the phosphorus content average in soil 0.035% and in compost 0.24%. literally the compost shows 14.6% more (Table - 1) phosphorus than in the soil. Soil phosphorus (P) is a vital but limited element which is usually leached from the soil via the drainage process. Soil phosphorus as a soluble substance can be delivered through agricultural fields by runoff or soil loss. It is one of the most essential nutrients that affect the sustainability of crops as well as the energy transfer for living organisms. Therefore, an accurate simulation of soil phosphorus, which is considered as a point source pollutant in elevated contents, must be performed, although soil phosphorus (P) is an essential nutrient for sustained crop production [8]. In other words, it affects the growth of the crops as well as terrestrial systems in addition to the microorganisms living condition in the soil. Interestingly enough, the drained water from agricultural lands can generally contain significant amounts of this element, which has a high spatial and temporal variation.

To better manage soil phosphorus, gaining precise knowledge of available soil P content and planning an efficient fertilization process are strongly needed [9]. There are also other dynamics to be considered, namely, transport and source factors, which should be considered to conserve water quality [10]. In several soils, applying excess P fertilizer above crop needs is desirable, which is thought to be able to enhance the optimal crop yield.

4. CONCLUSION:

According to the above preparation of compost by appropriate analytical tool for waste management application. It will be highly helpful for the upgrade the nature of soil with the presence of organic compound. So as based on this project we are highly suggesting the compost produced from the spent mushroom waste will helpful the benefit of upgrading phosphorus in soil, and in natural environment and improve plant growth, and we can reduce the disposal of solid waste as landfill in nature, and also reduce to pollute soil and environment, instead we can produce value added end product compost in minimal cost without any sophisticated facilities.

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CONFLICT OF INTEREST: NIL

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