

Study on Effect of Microbial Consortium on Aerobic Composting of Sugar Press Mud

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Abstract

Generally we all know that huge quantity of waste is generated from sugar industries, managing of which has become a very serious issue. It is a well-established fact that due to the mono-cropping year after year in the same field, the physical, chemical and biological fertility and productivity of the soil is deteriorating. At present, the majority of the farmers are used to inorganic fertilizers to meet the total nutrient requirements in crop production. Continuous uses of inorganic fertilizers and lack of organic matter have resulted in increase of environmental pollution, alkalinity and salinity of the soils, which result in reducing the crop productivity. Present study was conducted to prepare the compost from the raw press mud and five set of batches were prepared which consist of raw press mud, culture of microorganisms, water and composted cowdung as the nutritional source.

Keywords: Compost Mixture, Degradation, Microorganisms, Nutrient Mixture, Sugar Press Mud

I. INTRODUCTION

Sugar industry has taken the second largest place in agricultural based industry and plays a very important role in social and economical development of the country. After Brazil sugar industry plays a leading role as the second largest producer in the global market and estimated that it produces nearly 15 percent of sugar and 25 percent of sugarcane respectively. In India the sugar industries have become the source of living for about 50 million farmers and their families and direct employment is provided by the sugar industries for both skilled and semi-skilled laborers in industries and sugar mills all over the country.

Sugarcane is named as the most important commercial crop and generally occupies an area of 5 million hectares of the Indian nation. The two different raw material extracted from the sugar are sugarcane and beet, both produce identical refined sugar. There were totally 703 sugar factories India had as on January 31, 2015. These sugar factories concentrated more on rural areas of the nation.

II. MATERIALS AND METHODOLOGY

The study pertaining to degradation of press mud was undertaken with the objectives of evolving suitable methods for its degradation. Hence, in order to provide the organic enhancement to the field, sugar press mud from the sugar mills is transported to the field because of which there is decrease in demand of inorganic fertilizer and sugarcane yield has been increased.

The present study has been carried out in Angadi Institute of Technology and Management, Belagavi. Sugar press mud was brought for the study from Doodhaganga Krishna Sahakari Sakkare Karkhana Niyamat, Chikodi, which is located at 84 km from Angadi Institute of Technology and Management, Belagavi. The collected samples were stored in a cool place along with the precautions for preventing insect nuisance.

The microorganism for composting of press mud were collected from University of Agricultural Science, Dhawad. Microorganism include *Phaenocarpa*, *Trichoderma Virdea*, *Aspergillus Niger*, *Pleurotus*, which are favourable for decomposing the highly organic waste, Decomposed cowdung was collected from Military Farm house Belagavi, which act as the nutrient for microorganism during initial acclimatization process.



Fig. 1: Press mud



Fig. 2: Composted Cowdung

- Trichoderma is a Fungus and Bio Fungicide, this plays the very important role to decompose the cellulosic matter into glucose. Some of the Trichoderma organisms are isolated from different media in nature like T. Koningii and T. Viride.
- Aspergillus Niger belong to Fungi Kingdom and it is one of the most common organism of genus Aspergillus, it is present in soil and plants and commonly used as a food preservative and used for chemical and biological product generation.
- Pleurotus is the commonly cultivated microorganism of Oyster Mushroom generally found in dead plants. It is white to greyish brown to brown in color and shaped like a cap
- Phaenerochaete is a saprophytic fungus or white root fungus because it decomposes the polymer lignin and harmful chemicals. It can sustain in the moderate temperature of about 40 degree centigrade.

III. COMPOSTING PROCESS

Composting is one of the most widely used treatment method for organic solid waste, press mud is highly organic waste which has the high potential of converting itself into the organic manure, through proper composting technique. For the present study composting of press mud was carried out by inoculating press mud with various microorganism, along with the cowdung as the nutrient in the initial stages.

Compost act as an excellent soil conditioner, it improves the manure handling and land application, it generally lowers the risk of pollution and nuisance complaints and helps to destroy the pathogens it also helps to increase the soil fertility and crop productivity, and helps to reduce the cost of production of the crop. The major factors that affect the process of composting are Moisture, Aeration, Temperature, pH, C:N ratio, Microorganism, Electrical conductivity, Odour and color of compost, Physical and Chemical nature of substrate.

The present study concentrate on effectiveness of various microorganism on composting of press mud, by adopting four different microorganism and a fifth variation, which is a combination of all the four microorganism. The entire study can be divided into five stages/ sets, which were conducted parallelly and the details of the same are given below.

A. Compost Mixture

As per literature study, microorganisms are important aspect for composting of press mud. Collected press mud was oven dried to remove all the moisture content, then 7kg of press mud was weighed accurately. 3kg of decomposed cowdung was mixed with the water along with four microorganisms and was added to the press mud for acclimatization process. The dosage of microorganism mixture (17.5 gram phaenerochaete, 17.5 gram Trichoderma Virdea, 17.5 gram Aspergillus Niger and 17.5 gram Pleurotus) that is 0.25 percent of weight of press mud was taken. Moisture content was also maintained between 40 to 60% to aid in acclimatization of microorganisms. The entire content were added in a plastic container of size top diameter 0.4225m, bottom diameter 0.1875m, and depth of 0.2375m and heaps were prepared to provide proper aeration and to maintain optimum temperature. As per the evaporation addition of water was carried out at an interval of every three days along with the mixing of entire contents to provide proper aeration. Temperature of the composting heap was measured on the daily basis to monitor the composting process.

IV. RESULTS

Press mud (filter cake), a waste byproduct is produced from the cane sugar mills. This press mud is not properly recycled but inefficiently utilized due to various reasons. The existing methods of waste disposal are inefficient and yet remain a major problem for utilization of these wastes profitably in order to realize their full potential and avoid pollution.

Table - 1
Analysis of Press Mud during composting

| SL.NO | PARAMETER | Raw Press mud | After 15 days | After 25 days | After 50 days | units |
|-------|-------------------------|---------------|---------------|---------------|---------------|-------|
| 1 | pH | 6.25 | 7.09 | 7.38 | 7.62 | |
| 2 | Electrical Conductivity | 6.554 | 2.18 | 1.92 | 3.67 | mS/cm |
| 3 | Moisture Content | 72.50 | 74.49 | 75.03 | 73.95 | % |
| 4 | Total Organic Carbon | 12.53 | 20.01 | 20.20 | 17.64 | % |
| 5 | Total Kjeldhal Nitrogen | 0.48 | 1.52 | 0.58 | 2.24 | % |
| 6 | Total Phosphorous | 0.40 | 3.36 | 4.40 | 4.91 | % |
| 7 | Total Potassium | 1.09 | 1.01 | 2.71 | 1.11 | % |
| 8 | C/N Ratio | 25.95 | 13.16 | 34.83 | 7.86 | % |
| 9 | Iron | 0.15 | 79.33 | 74.27 | 72.20 | mg/Kg |

From the above table we can notice that pH of press mud was 6.25 and Electrical conductivity was 6.55 ms/cm which shows the nearly neutral and relatively high soluble salts of the press mud. The Total organic carbon is 12.53 percent, and the total major nutrient contents were 0.48, 0.40 and 1.09 percent of Total kjeldhal Nitrogen, Phosphorous and potassium. C/N ratio was found to be 25.95 percent and iron content is 0.15 mg/Kg.

V. CONCLUSION

Present study was conducted in Angadi Institute of Technology and Management Belagavi, and sugar press mud was collected from Doodhganga Krishna Sahakari Sakkare Karkhane Niyamat, Chikodi, and the study concentrates on preparing the compost from the raw press mud by using various microorganism, totally five batches were prepared which consists of raw press mud, composted cowdung and microorganisms.

The composting process was carried out for the period of fifty days that is from 23/03/2018 to 11/05/2018, the samples from all the five plastic containers were tested for the various parameters such as pH, Moisture content, Electrical Conductivity, Nitrogen, Total Carbon and C/N ratio and from the results and graphs which are plotted above, it is concluded that the fifth stage of compost which is the mixture of all microorganism (Phaenerochaete, Trichoderma viride, Aspergillus Niger and pleurotus) has the highest rate of degradation.

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