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Preparation of Enriched Compost from Farm Wastes/ By-Products through Microbial Decomposition for Agriculture Sustainability

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SUMMARY

Farm wastes and byproducts are abundant in India and can be used as organic inputs. These inputs can be transformed into nutrient-rich materials i.e. enriched compost through use of microorganisms or microbial consortium. The preparation of such enriched compost from various farm wastes is presented step by step by use of any effective microbial culture capable of decomposing it through the use of effective microorganisms consortium. Enriched compost prepared by such method can fruitfully be used in agriculture for sustenance of crop productivity and environmental stability as well.

INTRODUCTION

Composting of organic wastes can be most effectively accomplished by biological process, employing the activities of microorganism such as bacteria, algae, fungi or by some microbial consortium meant for decomposition of organic substrates. India has an abundance of farm wastes and byproducts available for use as organic inputs. These inputs can be transformed into nutrient-rich materials i.e. enriched compost through use of microorganisms or microbial consortium. The preparation of such enriched compost from various farm wastes of any effective microbial culture capable of decomposing it through the use of effective microorganisms consortium. It is estimated that total availability of different trappable organic sources (cattle manure, crop residues, forest litter, rural compost, city refuge, sewage sludge and press mud) in the country is 875 million 2 tonnes. The novel process of composting on one hand, transform of huge organic waste materials into nutrient-rich worth materials. Microorganisms are important biological organisms responsible for maintaining nutrient flows from system to system and in the process reduce the environmental degradation. As the availability of FYM is limited and prices of inorganic fertilizers are increasing day by day, there is an immense need to prepare enrich -organic manure or compost from farm wastes/byproducts through scientific process or by using microorganisms or microbial consortium for the use of compost in agriculture for sustenance of crop productivity and environmental stability as well.

Benefits of Composting

1. Compost when added in heavy soils or in clay soils, water holding capacity of soil improves.
2. It loosens heavy soils by reducing their compactness and providing more passage for air, and thus prevents soil water-logging too.
3. Compost associated with microorganisms also acts as growth promoter of plants and at the same time plays a role as a source of plant nutrients.
4. Repeated addition of composts in soil improves its physical, chemical and biological properties which in turn enhances the growth and yield of plants.
5. Compost being an organic source, gradually and slowly releases plant nutrients (nitrogen, phosphorus, sulphur etc.) within soil system which ultimately become available to the plant root system resulting in good growth and higher crop yield.
6. The growth and yield of crop are influenced by compost due to its many-fold benefits in soil.
7. Composting process of farm waste materials and its proper use in crop production minimize the chances of pollution hazards and sustain the environmental stability.

Raw Materials for Composting

- Farmers can make a small pit-cum-heap (3 m length × 2 m width × 2 m depth) on soil in a suitable place.
- 7 to 10 days old cattle dung, farm wastes of wheat, pigeon pea, Indian bean, mustard etc. are used as main raw materials.

- Leaves and twigs of subabul /glyricidia /sun hemp etc.
- Castor cake and animal urine may be added along with main raw material to enrich the compost in nitrogen.
- Further, rock phosphate may also be blended with the raw material to enhance the phosphorus content of compost.
- Small quantity of FYM and soil are also additionally mixed with raw materials for preparation of enriched organic compost to take advantage of microorganisms present in these substrates during composting process apart from decomposing micro-organisms culture or microbial consortium.
- Decomposing micro-organisms culture or microbial consortium like lactic acid bacteria (*Lactobacillus spp*.), photosynthetic bacteria (*Rhodopseudomonas spp)*, yeast (*Saccharomyces spp*) available in the market for making eco friendly organic compost.

Preparation of Compost

Step 1: Heavy soils (pH between 6 and 8) should be selected preferably for making pit-cum-heap so as to minimize termite and rodent attacks in light soil.

Step 2: For preparation of enriched compost, main and other raw materials as described above are to be collected. Large sized raw materials first to be chopped to about 2-3 cm size.

Step 3: For making enriched compost leaves and twigs of subabul /glyricidia /sun hemp etc. (5 to 10 % of total weight of raw materials), castor cake (5 % of total weight of raw materials), rock phosphate (5% of total weight of raw materials), FYM (3 to 5 % of total weight of raw materials) and soil (2 to 3 % of total weight of raw materials) are to be mixed thoroughly with main raw materials (farm wastes of Wheat, Pigeon pea, Indian bean, Mustard etc. . up to about 25 to 30%to total weight of raw materials).

Step 4: For making the first layer (about 15 cm thick) at the bottom of the pit, first cattle dung having 50% weight of the layer is to be spread and then above a layer of mixed materials as under step 3is to be spread so as to maintain the total height of first layer of about 15 cm.

Step 5: The complete layer is to be moistened throughout with water to allow the entire material to soak as much as water. Then animal urine (10% V/V of this layer) is to be sprayed over it.

Step 6: Spraying solutions of decomposing microbial culture or microbial consortium is to be spread thoroughly on whole material.

Step 7 : The same procedure is to be followed for making the second layer of raw materials having height of 15 cm. Then again it is to be soaked with as much as water followed by Spraying of decomposing Solution.

Step 8: The same procedure is to be followed for making 3rd, 4th, 5th layer. The layers to be made till the upper height of the layer heap reach to 0.5 m above ground.

Step 9: The upper surface of heap (materials) is to be covered with a thin layer of cattle dung slurry (3 – 4 cm) and then is to be covered with gunny bags to avoid any direct sunlight on the heap and loses of nutrients.

Step 10: The whole materials are then to be allowed for composting for about 55 days maintainingmoisture level to about 55 to 60 %. Throughout the period of composting the moisture level is to be maintained around 55 to 60 % by watering the materials at regular interval.

Harvesting of Enriched Compost

When the color of the material would becomes dark brown to black (at about 55 days), the compost would be ready for harvesting. Thus watering to the material should be stopped 6 to 7 days prior to harvesting of brownish black enriched compost material. Harvested compost material should be stored in plastic bags under shades.

Recommendation Level

Crops:

1. Vegetables: 5-10 tons/ha (2-4 tons/acre)
2. Fruits: 10-20 tons/ha (4-8 tons/acre)
3. Cereals: 2-5 tons/ha (0.8-2 tons/acre)
4. Pulses: 3-6 tons/ha (1.2-2.4 tons/acre)
5. Oil seeds: 4-8 tons/ha (1.6-3.2 tons/acre)
6. Tomato: 5-7 tons/ha (2-2.8 tons/acre) at planting, 2-3 tons/ha (0.8-2 tons/acre) 30 days after planting
8. Rice: 2-3 tons/ha (0.8-1.2 tons/acre) at transplanting
9. Wheat: 1-2 tons/ha (0.4-0.8 tons/acre) at sowing

CONCLUSION

As the availability of FYM is limited and prices of inorganic fertilizers are increasing day by day, there is an immense need to prepare enrichorganic manure or compost from farm wastes/byproducts through scientific process or by using microorganisms or microbial consortium for the use of compost in agriculture for sustenance of crop productivity and environmental stability as well. By adding this compost instead of regular compost, it increases the organic C and is observed to have more accessible N, P, and K components. After crop harvest, exchangeable, non-exchangeable, and total K in the soil were improved by enriched compost. With this, 50% N could be substituted for wheat, greengram, potato, soybean and other crops.

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