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Utilization of mushroom spawn and spent mushroom substrate of *P. florida and C. India* for effective coir pith compost preparation

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ABSTRACT

The present study focused on the utilization of Spent Mushroom Substrate (SMS) of edible mushrooms such as *P. florida* and *C. indica* after cultivation as a co-composting material in the coir pith compost. The physico-chemical properties such as organic carbon (%), pH, EC, potassium (%), calcium (%), manganese (ppm), and copper (ppm) was analyzed for before and after inoculation of SMS. The pH, moisture content, nitrogen, phosphorus, magnesium, sodium (%) and zinc (ppm) were increased. The organic carbon (%), EC, potassium, calcium (%), iron, manganese, and copper (ppm) content was recorded to be decreased. The pilot scale experiments revealed that SMS could use as co-composting material and increased the quality compost within 45 days.

KEYWORDS

Spent mushroom substrates;
Coir pith compost;
Physico- chemical properties.

INTRODUCTION

In India, an estimated 7.5 million tons of coir pith are produced per annum. The coir pith waste has traditionally been disposed of by burning. Burning of waste has resulted in various environmental problems like carbon deposits as well as the warming of the atmosphere. The tannins and phenols of the coir pith are leached out into the soil and irrigation canals which will make agricultural lands become unproductive and harmful to the aquatic and soil biological life. Therefore, alternate ways to dispose of coir pith, such as composting, is of critical importance[3]. The coir pith thus produced decomposes very slowly in the soil as its pentosan-lignin ratio is below 0.5, and because of the chemical and structural complexity of its lignin-cellulose complex[4].

Mushroom industry utilizes organic wastes or lignocellulosic substrates and generates waste referred as spent mushroom substrates (SMS). For every tone of mushroom harvested about 1 - 2 tones of SMS is generated which needs appropriate management[1]. Spent mushroom substrates uses as soil amendment have shown this also nitrogen limiting substrate[5]. Composting is best approached through the concept of ecosystem management starting with the initial ingredients, composting requires the management of various chemical and physical factors that select for a succession of microbial population and substrate changes[5].

In the present study, pilot scale experiments was conducted and successfully converted coir pith wastes into compost within 45 days and spent mush-

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room substrates was utilized as amendment. The harvested compost was estimated for physico- chemical properties.

MATERIALS AND METHODS

Coir pith compost preparation

Coir pith compost was prepared by following methods which includes, raw Coir pith (1000 kg), Spawn bags (3.5 kg), spent mushroom substrates (100 kg), bio gas slurry (200 liters) and soil (100 kg).

In the uniform shaded area (152 × 52 feet), 100 kg of raw coir pith was spread and which was moistened (200 %). The mushroom spawns of *P. florida* and *C. indica* was spreaded uniformly on the surface of the moistened coir pith. Again second layer of 100 kg moistened coir pith was spread over the first layer and sprinkled 40 liter of bio gas slurry uniformly on the second layer. Repeat that sandwiching process of one layer of coir pith with mushroom spawn and 10 kg of SMS followed by another layer of coir pith and bio gas slurry up to one meter height and ten layers was prepared. Water was sprinkled every day, maintained 200 per cent moisture for 45 days.

Analysis of physico- chemical properties of Coir pith compost

The physico- chemical properties such as moisture content (%), organic carbon (%), pH, Electrical Conductivity (EC), nitrogen (%), phosphorus (%), potassium (%), calcium (%), magnesium (%), sodium (%), iron (ppm), manganese (ppm), zinc (ppm) and copper (ppm) of the coir pith and coir pith compost were analyzed in soil testing laboratory, EID Parry (P) Ltd., Pugalur, Karur district, Tamil Nadu, India.

RESULTS AND DISCUSSION

Water was sprinkled every day and maintained 200% of moisture for 45 days and black colour compost was harvested (Plate 1). The physico- chemical properties were analyzed for raw substrate and

Plate 1 : Utilization of mushroom spawn and spent mushroom substrate (*P. florida and C. india*) for coir pith compost preparation; A. Raw coir pith waste, B. Coir pith waste was spread as first layer, C-D. Spreaded mushroom spawn, E. Spraying bio gas slurry, F. Spread the SMS, G. Moisture Maintenance, H. Compost degradation evaluation, I. Compost.

TABLE 1 : Spent mushroom substrate (SMS) amended with coir pith compost and its physico-chemical parameters analysis in before compost and after compost

Parameters	Raw substrate	Compost
Moisture (%)	59.29	68.12
Organic Carbon (%)	27.42	22.36
pH*	5.61	6.33
EC*	1.30	1.19
Nitrogen (%)	1.22	1.36
Phosphorous (%)	0.24	0.32
Potassium (%)	0.62	0.58
Calcium (%)	1.02	0.96
Magnesium (%)	0.44	0.52
Sodium (%)	0.18	0.26
Iron (ppm*)	2316	2112
Manganese (ppm)	196	162
Zinc (ppm)	30	46
Copper (ppm)	21	14

compost sample. The pH was recorded to be increased from 5.61 to 6.33; whereas the EC was recorded to be decreased from 1.30 to 1.19. The moisture content (%) was recorded to increase from 59.29 to 68.12, whereas the organic carbon (%) was recorded to decrease from 27.42 to 22.36. The nitrogen, phosphorus, magnesium, sodium (%) content and zinc (ppm) were recorded to increase from 1.22 to 1.36, 0.24 to 0.32, 0.44 to 0.52, 0.18 to 0.26 and 30 to 46 respectively. However, potassium, calcium (%), iron, manganese, copper (ppm) content were recorded to decrease from 0.62 and 0.58, 1.02 to 0.96, 2316 to 2112, 196 to 162 and 21 to 14 respectively (TABLE 1). Composting is the most suitable technique for transforming organic waste into usable agricultural amendments[8]. Suresh Kumar and Ganesh 2012 reported that the various macro (NPK) and micronutrients (Zn, Cu, Fe) were enriched in coir pith composted by basidiomycete fungus *Pleurotus sajor caju*. *Phanerochaete chrysosporium* and *Pleurotus sajor caju* which are showed highest reduction of lignin, cellulose, hemicelluloses and C: N ratio. Vermicomposting technique proved to be able decomposer of coir pith when amended with 20 % of cow dung. Ghosh *et al.* 2007 similarly reported the composting of pith was complete in 21 days. The present study focused on pilot scale composting experiments was conducted and successfully converted the coir pith wastes into compost within 45 days and spent mushroom substrates were utilized as amendment.

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