

Coir Pith Compost:

An alternate source of organic manure in coconut farms

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Introduction

Coconut (*Cocos nucifera* L.) is one of the oldest crops in India and presently covers 2.28 million hectares in this country with a total production of more than 20,535 million nuts. Coconut plays an important role in the agrarian economy of India. The crop contributes to nutritional security, food security, poverty alleviation, employment security and social security in the major coconut growing countries. The coconut is used for domestic dietary needs, mostly as coconut oil and coconut milk/cream, in daily household food preparations. The by-product of coconut husk is coir pith and it is difficult to decompose due to its high lignin and cellulose



The coir pith compost is used as the soil medium for better yield in agriculture sector. The coir pith compost is an alternate source of soil medium for growth of plants. The coir pith compost is preferred as a rooting medium and is considered as a better alternate for soil medium.



Raw coir pith



Composted coir pith

content. The porosity of coir pith is high and moisture holds up to 500% that makes it a unique input as soil amendment.

With the introduction of the farm machinery and commercial fertilizers, the reliance of the animal power as cultural tool has substantially reduced in the recent past and has thus reduced the availability of farm yard manure in the farm. Environmental degradation is a major threat and the rampant use of chemical fertilizers contribute largely to the deterioration of the environment through depletion of fossil fuels. Coir pith compost is a good source of organic manure for dry land agriculture as it can absorb water five times its weight and thereby when applied to soil increase the water holding capacity of soil. Coir industry in Tamil Nadu generates nearly 4.5 lakh tonnes of organic waste (coir pith) every day which needs safe disposal. Coir pith contains constituents like lignin (30%) and cellulose (26%), which do not degrade quickly but can be decomposed by employing the fungus *Pleurotus sojar-caju* with urea supplementation. At the end of the composting period, the coir pith is changed in to a well-decomposed black mass. The C:N ratio is reduced to nearly 24:1 with the N content enhanced from 0.26 to 1.06%.

Table 1. Chemical Composition of Coir Fibre

S.No.	Particulars	Percentage
1.	Water soluble compounds	5.25
2.	Pectin & Related compounds	3.00
3.	Hemi-cellulose	0.25
4.	Lignin	45.84
5.	Cellulose	43.44
6.	Ash	2.22

Coir Pith Compost

It is obtained from the raw material of the coconut. In the drought season it can act as mulching material for young plantations and conserves the soil moisture. The coir pith retain high moisture capacity of about 500-600% and high cation exchange capacity (CEC), and it enable large amounts of nitrogen and high content of exchangeable K, Na, Ca and Mg. The coir pith compost is used as the soil medium for better yield in agriculture sector. The coir pith compost is an alternate source of soil medium for growth of plants. Therefore the coir pith compost is preferred as a rooting medium and is considered as a better alternate for soil medium and hence the water is absorbed up to eight time of its weight.

Preparation of coir pith compost

One tonne of coir pith, 5 kg of urea and 5 bottles of *Pleurotus* spawn is required to prepare one ton of coir pith compost. First 100 kg of coir pith waste should be spread over a shady place. Then one bottle of *Pleurotus* spawn should be applied over this layer uniformly. Now 100 kg of coir pith waste should be applied over this first layer and one kg of urea spread over the second layer of coir pith. This procedure of alternate application of *Pleurotus* and urea should be done for the whole one tonne of coir pith waste. Sufficient moisture should be ensured for speedy decomposition in this composting process. It takes nearly one month for complete decomposition of coir pith indicated when its colour changes to black.

Turning of material

The compost heap should be turned once in 10 days to allow the stale air trapped inside the

compost material to go out and fresh air will get in. The composting process is an aerobic one, the organism performing the composting require oxygen for its metabolic activity. This turning of material indirectly aerates the substrate. The other way of giving aeration is inserting perforated unused PVC or iron pipe in the composting material both vertically and horizontally.

Moisture maintenance

Maintaining optimum moisture is the prerequisite for uniform composting or waste material. Sixty percent moisture is to be maintained, the compost material should be always wet. But excess water should be drained. From the waste material take a handful of composting material and squeeze it. If no water is coming out of the material, then the moisture status is ideal for composting.

Compost harvest

The composted material which is obtained from sieving is ready for use. If the composition is not used immediately, it should be stored in an open, cool place, to retain the moisture, so that the beneficial micro organism present in the compost will not die. Once in a month, water is sprinkled over the compost material to maintain the moisture.

Nutritive Value of Composted Coir Pith

When compared to other major nutrients, the composted coir pith is used as a source of plant nutrition. Higher quantity of potassium is present in the coir pith. In horticulture, the Coir pith is used as an important growth media for growing plants, because, of wider carbon and nitrogen ratio and lower biodegradability due to high lignin content. Coir pith is composted to increase the manurial value of pith, to reduce the wider C:N ratio, and also to reduce the lignin and cellulose content. Composted coir pith is used to convert plant nutrients to the available form and reduces its bulkiness. The composted coir pith application is used to increase the soil fertility particularly the available K status of the soil.

Soil amendment

Soil amendments are those materials when added to soil, which must modify the soil properties in a positive way so as to make the soil healthy. Coir pith is especially of high demand in dry areas due to its high moisture retaining capacity around 40%. Paramanandham and Ross (2015) studied the microstructure of coir pith compounds and observed

Parameters	Raw coir pith (%)	Composted coir pith (%)
Lignin	30.00	4.80
Cellulose	26.52	10.10
Carbon	26.00	24.00
Nitrogen	0.26	1.24
Phosphorous	0.01	0.06
Potassium	0.78	1.20
Calcium	0.40	0.50
Magnesium	0.36	0.48
Iron(ppm)	0.07	0.09
Manganese(ppm)	12.50	25.00
Zinc(ppm)	7.50	15.80
Copper(ppm)	3.10	6.20
C:N ratio	112.1	24:1

the presence of numerous open cells forming large empty cavities, forming as capillaries for water and nutrient adsorption. In clay soil when the coir pith is added, it modifies the clay soil into stickiness and enhances the drainage properties of the soil. Some other organic sources such as vermicompost, FYM, coir pith compost, and press mud improved the chemical and biological fertility of soil. The optimum C: N ratio of organic amendments is attributed which resulted in faster disintegration and release of nutrients in the soil. When the composted coir pith is applied, it improve the cation exchange capacity of soils. Application of coir pith as soil amendment on long term basis could reduce the bulk density, increase the water holding capacity and improve the organic carbon content of soil.

Composting of coir pith with earthworm or microorganisms itself may degrade the lignin. N-fixing bacteria are excellent and eco-friendly substitute for urea for composting of coir pith with *Pleurotus sajor caju*. Composted coir pith based potting medium for cultivation of medicinal plants suggest that this compost can be used in reclamation of soils for its enhanced production, and also possibly other crops. Raghuvaram and Ravindranath (2010) confirmed that composted coir pith can be used for reclamation of soils for enhanced production.

In agro-industrial waste, the coir pith can be bio converted into compost, and it will obtain

productive yield besides quality of produce. The composted coir pith is one of the important organic sources for the agriculture crops, because of using the inorganic sources such as fertilizer, herbicides etc, which degrade the soil surface and destroy the soil amendments. The coir pith provide sufficient nutrient for the growth of the plants. Even “Coir pith” (coco peat or processed coir pith) is used as the plant growing medium, and hence the coir pith is exported in the form of brick and also is used as soil conditioner for plant growth in indoor gardens and nurseries. It increase the ammonification, nitrification, and nitrogen fixation, due to improved microbiological activity. The coir pith helps to increase the growth of soil micro organism, and maintain the soil healthy, reducing the soil erosion.

Uses of Coir Pith Compost

Among various by-products, the coir pith is conventionally used in land fillings and manuring purposes. The dumping of the coir pith itself in water bodies may increase the concentration of hydrogen sulphide, methane and carbon dioxide that are toxic gases. The all plant nutrient elements is present in composted coir pith and it can also provide a supplemental effect with inorganic fertilizers. The application of coir pith compost is used to increase the soil native micro flora. The coir dust is applied in bulk density and improved the water holding capacity and organic carbon status of the soil. The water holding capacity is enhanced due to the pore space available by the coir pith applied in the soil. The advantages of coir pith compost over other compost materials are that adds micronutrient to the soil, enhances microbial activity and reduces soil erosion. In addition to the higher moisture content, coir pith compost is known to supply micro and secondary nutrients such as magnesium, sulphur, calcium besides nitrogen, phosphorous and potassium.

Application of coir pith compost

- Composted coir pith 5 tons per hectare is recommended
- Composted coir pith should be applied before sowing.
- For nursery development in poly bags, while preparing the potting mixture 20 % of composted coir pith can be mixed with the soil and sand before filing it in the poly bag.
- For applying to the established trees like coconut, mango, banana and other fruit bearing

trees, minimum 5 kg composted coir pith is required.

Limitation in using composted coir pith

- It is not economical to buy composted coir pith and put in the farm for large areas. It is better to prepare compost in one's own farm.
- Before buying composted coir dust, it should be ensured that the material is composted completely and quality analysis certificate is available with the material.
- If immature compost is applied to the soil, even after entering into the soil, it will undergo decomposition inside the soil, by taking nutrients from the soil. Because of this, standing crop will get affected.

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