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Coconut Leaf Vermicompost and Vermiwash



a grass-root level
eco-technology



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Introduction

Among the low external input resources, vermicompost is one of the major components of organic farming for sustaining soil health, fertility and crop productivity. Many crop residues are now a days being converted to vermicompost. Coconut palm grown in 1.91



Coconut leaf refuse

million ha area in India is estimated to produce around 6000 to 8000 kg of leaf biomass refuse from 1 ha of coconut garden each year. The coconut leaves contain approximately 31% lignin, which offers high resistant to natural decomposition.

However, certain group of earthworm that survives on organic matter can enhance the decomposition process of such materials. Research work carried out at CPCRI, Kasaragod has resulted in locating an indigenous strain of earthworm related to African Night crawler (*Eudrilus* sp.), which is very efficient in composting coconut leaves. This worm is large sized, dark violet in colour, vigorous and the cocoon case produced is spindle shaped, thick and dark. As much as 4000kg of vermicompost can be generated from 1 ha of healthy coconut garden every year by this worm that can meet a considerable percentage of nutrient need of the coconut palm. The coconut leaf vermicompost can also be used for improving the productivity of other



Eudrilus sp. & its cocoons

annuals, vegetables, fruits, flowers as well as cash crops.

A low cost grass-root level technology for production of large-scale coconut leaf vermicompost has been developed at CPCRI. It has two major steps in the process –

Step 1. Mass-multiplication of earthworm

Fallen and weathered coconut leaves are chopped into 15 cm pieces with a knife using a chaff cutter, and mixed with cowdung slurry in 1:1 ratio. This substrate is

pre-decomposed for 15-20 days with constant moisture. The pre-decomposed material is then filled into plastic basins, cement pots or made into 10 cm bed on floor. The nucleus culture of *Eudrilus* sp. is then introduced into the above mixture (50 worms per 10 kg of the substrate) and properly mulched with dry grass, straw or wet gunny bag. The units are protected from direct sunlight, and watered regularly. Once in a week fresh cow



Chopped coconut leaves + cowdung (1:1 ratio)



Worm multiplication in plastic basins, cement pots & beds

dung slurry can be added to the material. Within 1-2 months, the earthworms multiply to 300 times, which is used for large-scale vermicompost production.

Step 2. Coconut leaf vermicompost production

Coconut leaf vermicompost can be produced in pits, thatched sheds, and open ground and cement tanks. The length and breadth of the production unit can be made as per convenience; however, the depth should not be more than 1 metre. Weathered coconut leaves are cut into two pieces and stacked with bottom side up to 1 feet height. Above this, a layer of cow dung slurry is spread. Three such layers can be accommodated in 1 metre deep cement tank. The ratio of coconut leaves to cow dung slurry must be 10:1 (e.g. 1000 kg leaves: 100 kg cow dung slurry). Sufficient moisture must be ensured by sprinkling water

regularly, and the whole substrate is allowed to pre-decompose for 2-3 weeks. At the end of this period, 1000 worms per 1000 kg of substrate are introduced, which start feeding on the leaves. Mulching with available organic wastes, dry grass, straw or coconut leaves



Tank filled with coconut leaves + cowdung (10:1 ratio)

help to conserve moisture. Watering must be done once in a week during monsoon and twice in a week in summers. The composting area should be provided with sufficient shade to protect from direct sunlight and



Earthworms feeding on leaves

rainwater. Covering the tanks/heaps/pits with nylon mesh prevents entry of predatory birds, rats and rhinoceros beetle. The rhinoceros beetle can also be managed by application of an entomopathogenic fungi *Metarhizium*

anisopliae in the substrate. Providing water channels around the tanks will prevent access to ants.

Depending upon the extent of pre-decomposition, a maximum of 70% of the substrate will be converted to vermicompost within a period of 60-75 days, indicated by the fall in the level of substrate by more than ½ metre in the tank. At this stage, watering should be stopped to facilitate separation of worms from the vermicompost by heaping the compost into a mound. After another 2 weeks, the vermicompost free of earthworms can be collected from the top layer of the heap, sieved, shade dried and packed. Earthworms accumulated at the bottom of the heap can be sorted and picked by hand.



Level of substrate after composting

Properties of coconut leaf vermicompost

The coconut leaf vermicompost is dark brown coloured granular organic material. It has a C:N ratio of 9.95, organic carbon content of 17.8% and 10-13% humic acid, besides 1.8% nitrogen, 0.21% phosphorus and 0.16% potash. It is rich in plant growth promoting hormones viz.



Coconut leaf vermicompost

indole acetic acid, gibberellic acid and phenolics, and harbours high counts of nitrogen fixing, phosphate solubilizing, cellulose degrading and plant growth promoting bacteria.

The coconut leaf substrate can also be mixed with pineapple waste, banana pseudo stem or gliricidia leaves in 3:1 ratio for production of vermicompost. Though the vermicompost production from coconut leaves can be carried out through out the year, the efficient compost turnover and multiplication of worms takes place when the temperature is in the range of 28-32°C and relative humidity is above 90%, which normally coincides during June to Oct months in the coastal tract of Kerala.

Vermiwash Production

Vermiwash is a liquid organic fertilizer obtained from the vermicomposting process produced by washing the actively composting substrate with water. The wash collected is termed as vermiwash. The vermiwash production can be carried out in 200 lit plastic drum containing a mixture of pre-decomposed coconut leaves+cowdung, mature compost and earthworms, with a mud pot hung on top, from which water drops fall into the drum containing the substrate.



Vermiwash production unit

Properties of vermiwash

The product is clear brown colour liquid containing 2.8 ppm inorganic nitrogen, 10.28 ppm of phosphorus, 205ppm of potash and 100 -142 ppm humic acid. On soil application, vermiwash has shown to improve the yield of cowpea, bhendi and maize by 10-30%. It also significantly increases plant beneficial microbial population and enzyme activities in soil besides suppressing nematode population. The dosage of application of vermiwash from coconut leaf vermicompost is 1:5 for crops like maize and bhendi and 1:10 for production of leafy vegetables like amaranthus.

Technology dissemination

For popularizing the vermicomposting technology, CPCRI has supplied approximately 10 lakh *Eudrilus* worms as nucleus culture and 5 tonnes of



Nucleus culture of *Eudrilus*



Vermicompost for sale

vermicompost in last 6 years to target groups, in addition to conducting regular training classes. Currently the *Eudrilus* sp. is available at CPCRI priced at 80 paise per worm and vermicompost at Rs. 5.00 per kg.

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CPCRI Extension Folder No.	: 178
Folder Title	: Coconut leaf vermicompost & vermiwash
Published	: February 2007
Publisher	: Dr. George V. Thomas Director, CPCRI, Kasaragod
Text input	: Murali Gopal, Alka Gupta and George V. Thomas
Photo credit	: K. Shyama Prasad
Front page design	: C.H. Amarnath