



# Coconut leaf vermicompost- production technology & properties



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## Introduction

Vermicomposting is a technology that recycles agro and urban wastes to useful manure, carried out by earthworm and microorganisms. The vermicompost produced contains all the necessary plant nutrients, growth promoting hormones, humic acid and beneficial microorganisms. Application of vermicompost improves soil health and fertility in ecological manner for sustainable agriculture.

Among the several agro-wastes generated in India, coconut palm produces some of the most recalcitrant biomass residues such as coconut leaves, husk and coir-pith. Annually 6-8 tonnes leaves are shed from one hectare of coconut garden which takes more than 12-18 months to decompose naturally as they contain 31% lignin. However, these lignin rich residues can be decomposed effectively and quickly using certain epigeic earthworms.

## Coconut leaf vermicomposting technology

At CPCRI, 11 different species of earthworm, obtained from different parts of India, were screened for vermicompost production from coconut leaves and an indigenous strain related to African night crawler (*Eudrilus* sp.) was found to be the most efficient one with ability to decompose the coconut leaves within 60-75 days period. The ICAR-CPCRI coconut leaf vermicompost production technology has two important sub technologies: Vermiculturing and large-scale vermicompost production.



*Eudrilus* sp. earthworm

## Vermiculturing

Vermiculturing involves production of earthworms in large numbers for vermicomposting. The following is step-by-step process:

- Chop dry coconut leaves into 15 cm bits using a chaff cutter.
- Mix the chopped bits with cow dung slurry in 1:1 ratio (w/w) and allow to pre-decompose for 20-30 days with regular watering.
- Fill the pre-decomposed material in plastic basins or cement pots or make it into 10 cm height bed on cement floor.
- Introduce nucleus culture of *Eudrilus* sp. to the pre-decomposed material @ 50 worms per 10 kg substrate.
- Protect from direct sunlight by mulching with dry grass or wet gunny bag and water regularly.
- Add fresh cow dung slurry periodically.
- The earthworms will multiply several hundred times within 1-2 months, which can be used for large-scale vermicompost production.



## Basic requirements for large-scale vermicomposting

- Well aerated, properly shaded cement tanks of convenient length and width but with maximum of 75 cm height.
- Regular supply of cow dung, water and coconut leaves
- Coconut leaf degrading earthworm culture

## Large-scale coconut leaf vermicomposting by chopping method

- Cut dry coconut leaves into 2 or 3 pieces manually and fill inside the tank up to 1 feet height with their lower side up.
- Spread a layer of cow dung slurry above this.
- Accommodate three such layers in the 75 cm height tank.

- The ratio of coconut leaves to cow dung slurry is 10: 2 (100 kg leaves: 20 kg cow dung slurry)
- Water regularly and allow to pre-decompose for 20-30 days.
- Now add earthworms to tanks @ 100 worms/100 kg substrate.
- Cover the tank with nylon mesh to prevent entry of rats, birds and rhinoceros beetle.
- The rhinoceros beetle can also be managed by application of *Metarhizium anisopliae* as well as crushed leaves of *Clerodendron infortunatum*.
- Water the tanks regularly to maintain at least 30-40% moisture. Avoid over watering as it will kill the earthworms.
- The level of the substrate will fall down to half the depth of the tank by 60-75 days indicating completion of vermicomposting.
- A maximum of 70% inputs is converted to vermicompost.
- Stop watering at this stage and heap the compost in a mound to facilitate separation of the worms from the vermicompost.
- Harvest vermicompost from the top of the mound, free of earthworms, after two weeks, and shade dry and pack for further use.
- Hand-sort earthworms accumulated at the bottom of the heap which can be used for further vermicomposting.
- The woody petioles and midrib remain partially decomposed. These can be added to next round for complete vermicomposting.



Tank filled with coconut leaves+cowdung



Coconut leaf vermicompost

## Large-scale coconut leaf vermicomposting using bioshredder

- Pulverize the coconut leaves along with thick woody petiole using bioshredder machine.
- Fill the pulverized materials into the tank with layers of cow dung as mentioned earlier.
- Add a layer of uncut coconut leaves or coir-pith layer in between the pulverized substrate to prevent compaction.
- The rest of the procedure is similar to vermicompost production by using cut leaves.



## Mixing other agro-wastes for vermicompost production

Agro-wastes such as banana pseudo-stem, pineapple wastes, sugar cane bagasse and coir-pith can be mixed @ 25% with coconut leaves (75 kg coconut leaves: 25 kg other wastes) and converted to good quality vermicompost using the CPCRI *Eudrilus* sp.

## Properties of coconut leaf vermicompost

The coconut leaf vermicompost produced by *Eudrilus* sp is dark brown coloured, granular matter possessing highly desirable C:N ratio (10-17), high organic carbon (18-20%) and humic acid content (10-13%), easily available important plant nutrients (N-1.8-2.1%, P-0.21-0.30%, K-0.16-0.4%). It has pH of 6.0-6.2 and water holding capacity of 160-170%. It is also rich in plant growth promoting hormones viz. indole acetic acid, gibberellic acid and phenolics. Biologically, the vermicompost harbours high counts of nitrogen fixing, phosphate solubilizing, cellulose degrading and plant growth promoting bacteria like fluorescent pseudomonads and *Bacillus* spp.



## Advantages of applying coconut leaf vermicompost

Application of vermicompost improves the soil aggregation, aeration, and water holding capacity; root growth, microbial activity and the overall crop production capacity of the soil. Its high water holding capacity helps in conserving soil moisture in rain-fed cultivation. The vermicompost can be applied for any field and horticultural crop.

## Kalpa Organic Gold



The vermicompost produced from coconut leaves is now available at ICAR-CPCRI by the trade name 'Kalpa Organic Gold'.

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