

turning. Depending upon the temperature and kind of residues, turning is done two to three times at an interval of about three weeks. If the heap is prepared using residues having different C:N ratios with proper aeration and moisture, only one turning after 3-4 weeks would be sufficient.

Maturation of compost: The time required for the heap to mature and become good compost, depends on the local climatic conditions and the materials used. If the weather is warm, the heap is moist, well aerated and good combination of materials is used for building the heap, the compost is ready in three months time. In colder or dryer conditions and dominance of materials with high C:N ratio, heap usually takes six months to ripe. When the compost is mature or ripe, except for some small twigs, none of the original components are recognizable. The material is converted from dark brown to gray colour, gives an earthy smell and is coarse. The volume of the mature heap is reduced to half of the original. The matured compost should have moisture content of 15-20%, C:N ratio 15-25:1, light in weight (has <1g/cc bulk density) and odourless.

Application of compost: In coffee, application of compost at least once in 2-3 years at the rate of 5kg and 10 kg is recommended per plant for Arabica and Robusta respectively for obtaining the benefits of integrated nutrition.



Coffee pulp



Compost enrichers



Cow dung slurry



Layer of raw materials



Compost heap



Closing with mud

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Published by Dr. M. Senthilkumar, Director of Research
Printed at M/s. Omkar Offset Printers, Bengaluru

COMPOSTING OF COFFEE WASTES



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In Coffee plantations, various bio-degradable farm wastes are available in the form of shade tree leaf litter, prunings, weed biomass and coffee processing wastes like coffee pulp and cherry husk. It is estimated that shade trees alone contribute about 4 tonnes of bio-mass per acre every year. Besides this, for every tonne of clean coffee processed, one tonne of fruit skin or cherry husk are produced. But in nature all the available biomass is not effectively recycled and there will be slow decomposition and loss of nutrients. Composting is an effective means of recycling the available farm wastes for obtaining high value organic compost in coffee plantations. Composting is a process wherein larger organic matter is broken down by the action of soil micro and macro fauna. The end product, which is friable, is called compost. The compost produced on the farm would be useful in minimizing the dosage of chemical fertilizers used in coffee. Besides, the application of compost has several advantages such as improvement in soil texture; minimizing soil erosion by binding soil particles; increasing water holding capacity of soils; providing ideal environment for growth of beneficial microorganisms in the soil and increasing the use efficiency of applied nutrients.

Methods of composting: Different methods of composting like aerobic (heap method), anaerobic (pit method) and vermicomposting can be followed. The aerobic method (heap method) is simple and efficient for composting of organic material available at farm level.

Material required for composting: Any biodegradable farm wastes could be composted. However, for effective composting and also for obtaining good quality compost different raw materials are required as indicated below.

- **Farm wastes:** Any farm wastes like cherry husk, coffee pulp and other crop residues like straw etc. would form the basic raw material for compost preparation.
- **Animal wastes:** Cattle shed wastes containing dung and urine, goat droppings, piggery and poultry wastes.
- **Green material:** Any green plant material (preferably of legumes) like leaves, shade tree loppings, weed biomass etc.

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- **Compost enrichers:** Nutrients like phosphorus (super phosphate and rock phosphate) could be used for enriching the composts.
- **Enrichment with biological agents:** Ten days before field application of bio-fertilizers like N fixers, P & Zn solubilizers, K mobilizers, plant growth promoters, disease suppressors – *Trichoderma* sp. be introduced @ 10 kg of consortia to enhance microbial activity and nutrient cycling.

Selection of site: It is better to take up composting under shelter of trees to prevent drying of heaps and to preserve moisture. There should be enough space so that turning could be done conveniently.

Size of compost heap: The compost heaps should essentially have one-and half to two meters width and about one meter height. They can of any convenient length depending upon the availability of raw materials.

Preparation of the material: Although many materials can be used directly, some may need pre-treatment before composting, as given below.

- Material containing high moisture content (eg. Coffee pulp) should be allowed to wither a little
- Rough and coarse materials such as stalks of maize, cotton, millets, etc. should be broken or chopped before use. The best way to break these materials is to spread them over cattle shed. It will also help in collecting the urine and dung properly
- Dry woody material like cherry/ parchment husk, sugarcane trash, tree bark and sawdust should be made moist before being added to the heap, preferably soak them in water for several days.

Construction of heap: All materials may be gathered at a time or may stored until sufficient materials are available to make one or several heaps. The compost heap or pit needs to be made up layer by layer by spreading different raw material as described below.

Before starting to build a heap, it is always advisable to lay a lattice of old branches or fibrous material like coconut shells etc. at the bottom for providing aeration and preventing water logging. Over the base layer, spread the farm wastes (like cherry husk, coffee pulp, crop residues etc.), green matter (like leaves of shade trees; green manure crops like Diancha,

sesbania; any crop residues and weed slashings etc.) and animal wastes (cattle shed wastes) layer by layer alternatively till the suggested height. The thickness of each layer should be around 10-15 cm. Sprinkle cow dung slurry or biogas slurry between each layer to hasten the composting. Sprinkling of supernatant liquid from well fermented curds is also found to be highly effective, especially for composting coffee wastes like cherry husk and coffee pulp.

Addition of small quantities of super phosphate or rock phosphate would be advantageous as they not only help in hastening of composting but also enrich the compost. However, in case of organic farming, only rock phosphate should be used, as urea and super phosphate, being inorganic fertilizers are not permitted in organic farming.

When the heap is 150 cm high, ventilation holes should be made in the heap by pushing pointed wooden poles vertically into the heap about 1 meter apart. When the heap is finished, it can be covered with a layer of soil and straw. The poles or stalks can be removed on the next day. Temperature will begin to rise slowly. After 4-5 days, the holes should be plastered to avoid the loss of heat and moisture.

Turning of the heap: The heap is turned so that the material from edges, where temperature is lower, is moved to the center where it is warm, while center of heap does not suffer from over heating. All materials in the heap should be exposed to heat in order to kill germs, weed seeds, insects and speed up decomposition. Turning also improves aeration of the heap. Excess carbon dioxide concentrated inside the heap is allowed to escape.

Turning gives a chance to check the moisture content of the material and if the material is too dry, it should be watered. Some un-decomposed patches can also be evenly mixed along with the material and good quality compost is ensured.

The first turning should be done after 2-3 weeks of heaping, when the temperature has started to drop after reaching a peak. Materials are properly mixed, starting from one side of the heap ending towards another side. Sprinkle water, if necessary. The heap can be turned again three weeks after the first

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