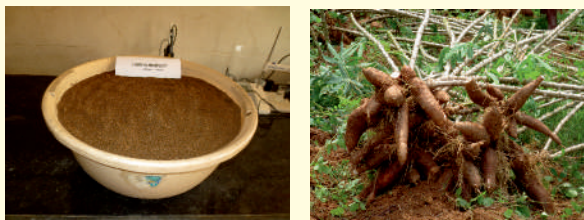


- *Thippi* compost is a substitute to chemical fertilizers up to 50% of the recommended dose of NPK as per PoP (PoP:100:50:100 kg ha⁻¹)
- *Thippi* compost is a substitute to application of ZnSO₄ and MgSO₄@2.5 kg ha⁻¹
- *Thippi* compost application can reduce the bitterness and increase the starch content of cassava tubers

The technology could solve the environmental problem due to the cassava starch factory solid residue, facilitated its safe disposal and could result in the preparation of a nutritious organic manure from the cassava starch factory solid residue, *thippi*.

Economics of *thippi* compost preparation and its use in cassava

- The quantity of dry *thippi* from one hectare of cassava cultivation having an yield of 35 t ha⁻¹ is 770 kg.
- The recovery of *thippi* to *thippi* compost being estimated as 95%, the cost of production of *thippi* compost is ₹ 10/kg.
- B:C ratio of using *thippi* compost as a substitute to different organic manures, NPK fertilizers, secondary and micronutrients ranged from 1.7-2.55.



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Wealth from Waste: A nutrient rich organic manure from cassava starch factory solid residue (*Thippi*)



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In India, cassava cultivation is confined mostly in southern states viz., Kerala, Tamil Nadu and Andhra Pradesh. In states except Kerala, tubers are used as raw material for starch and sago industries. Among these states, Tamil Nadu utilizes the tubers to the full extent for industrial purposes having about 8-10 large scale starch factories and 150-200 small scale starch and sago production units. These factories are generating nearly 40-60 tonnes of solid residue (*thippi*) per annum creating serious environmental pollution especially during rainy season causing lot of health issues to the people residing near the factory premises. Considering the severity of the problem near the cassava starch factory premises affecting the normal life through the foul smell and the leachate from the *thippi* heap polluting the nearby water bodies, a research project was formulated for composting the residue to convert it into a nutrient rich organic manure aiming the safe disposal of the waste thereby managing the environmental hazard. The physico-chemical and biological analysis undertaken with *thippi* revealed it as very poor in nutrient content with a C:N ratio of 82:1.



Thippi from cassava starch factory

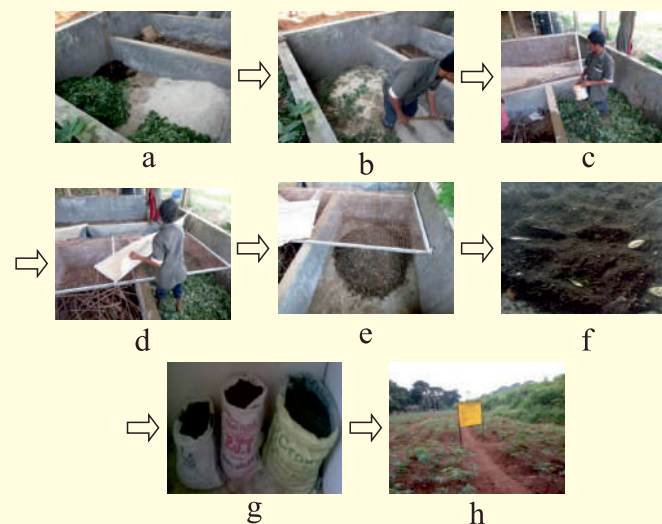
Among the nine combinations adopted for composting, vermi composting of *thippi* enriched with *Glyricidia* and cassava leaves, cowdung, Mussooriphos and rock powder for 2 months resulted in the best organic manure having the highest nutrient content and lowest C:N ratio (8:1).

Composting Materials

Materials	Quantity
Thippi	: 1 ton
Cowdung	: 200 kg
Rajphos/Mussooriphos	: 20 kg
Rock powder	: 20 kg
<i>Azolla/ Glyricidia/Cassava leaves</i>	: 100kg
Earthworms	: 20 kg

Infrastructure required:

1. Cement tanks of 2m³ volume
2. Metallic wire mesh lids (to ensure both aeration as well as protection from pests)



Protocol of *thippi* compost preparation

- a: Thippi
 b: Composting process
 c: Composting d: Covering with lid
 e: Lid covered
 f: Composted thippi
 g: Thippi compost
 h: Use of thippi compost in cassava

Thippi compost preparation

- Mix the contents well in the tank with adequate moisture content (should be slightly wet)
- Composting for a period of 45-60 days
- Proper mixing and moistening of the mixture at periodic intervals to maintain moisture content at 20-25% for enabling better decomposition.
- After 2 months, dry the decomposed mixture in shade for one week
- Sieve the well dried compost through 2 mm sieve
- Keep in dry condition
- Mean N, P, K, Ca, Mg, Fe, Mn, Cu and Zn content in *thippi* compost was 1.32, 3.82, 0.40, 2.18, 0.96, 1.11, 0.08%, 11.23 and 89.93 ppm respectively which is 3.5, 49.7, 32.5, 8, 185, 100, 2.5 and 12 times than *thippi*.
- *Thippi* compost had low bulk density, starch, carbohydrate and cellulose with no fibre and cyanide but high protein suggesting this protocol as a possible alternative for composting *thippi* to *thippi* compost.
- Studies on the nutrient release pattern of *thippi* compost done for one year showed that, maximum release of all nutrients upon application to the soil was during 5-9th month of its application in soil.

Response of cassava to *thippi* compost

Field experiments conducted for two seasons indicated

- *Thippi* compost is a good substitute to organic manures like farm yard manure (FYM), green manuring *in situ* with cowpea, crop residue, vermicompost and coir pith compost