1. INTRODUCTION

The environmental friendly ‘vermicomposting technology’ can very well be adopted for converting wastes into wealth. ‘Vermicomposting’ is a process of composting, featuring the addition of certain species of earthworms to enhance the process of waste conversion and to produce a better end product. Since the material passes through the earthworm gut, it undergoes a significant but not yet fully understood transformation. Hence, the resulting earthworm castings are abundant in microbial activity, plant growth regulators and fortified with microbial enzymes as well. Earthworms can hasten the composting process to a significant extent, with production of a better quality of composts as compared with those prepared through traditional methods. A study has been carried out to assess the nutritional content of vermicomposts. In case of nitrogen, except coffee pulp compost, all other composts recorded more nitrogen over their respective raw materials. Among composts and vermicomposts, vermicompost recorded more nitrogen. In case of total phosphorus, the content enhanced due to composting and vermicomposting. The increase was more pronounced with earthworm activity. Even though vermicompost recorded more phosphorus, the content varied with waste materials used. The differences in the result could be attributed to the differences in the chemical nature of the materials. The raw materials were subjected to physico-chemical analysis like pH, electrical conductivity, organic carbon, total nitrogen, phosphorus and potassium.

2. MATERIALS AND METHODS

The raw materials were subjected to physico-chemical analysis like pH, electrical conductivity, organic carbon, total nitrogen, phosphorus and potassium.

2.1. Soil reaction (pH) and electrical conductivity (EC)

The pH of the soil solution was determined by potentiometry method of Piper (1966). The electrical conductivity (EC) of the compost solution was determined by conductometry method of Piper (1966). The values were expressed as dSm⁻¹.

2.2. Organic carbon

The organic carbon content of compost and soil samples were analysed by following the method suggested by Walkley and Black (1934).

2.3. Total nitrogen

The total nitrogen content of compost and soil samples were analysed by following the method suggested by Jackson (1973).

2.4. Total phosphorus (Vanadomolybdate yellow colour method)

Total phosphorus content of compost and soil samples were analysed by following the method of Vanadomolybdate yellow colour method.
2.5. Total potassium (by flame photometry)
Total potassium content of compost and soil samples were analysed by following the method of Flamephotometry.

3. RESULTS
3.1. Physico-chemical properties of the compost
The results of physico-chemical properties of the composts are given in Table 1.

3.1.1. pH and Electrical conductivity
Among the substrates, pungam shell evidenced mild increase in pH from partially to fully during both conventional (6.7 to 9.2) and vermicomposting (7.5 to 8.2) processes (Table 1). On comparison of both the conventional and vermicompost, teak litter of conventional compost recorded higher value for electrical conductivity (5.9) and vermicomposted teak litter registered lower value in both partially (0.96) and fully (1.32) degraded compost.

3.1.2. Organic carbon and Carbon: Nitrogen ratio
In case of organic carbon, fully decomposed albizia litter exhibited higher values for both conventional (25.2%) and vermicompost (19.5%). In case of carbon: nitrogen ratio, conventional composting of albizia litter registered higher value (3.4:1). In vermicomposting process, simaruba shell recorded higher value (3.2:1) (Table 2).

3.1.3. Nutrient status of the conventional compost and vermicompost
The results on total nitrogen, phosphorus and potassium content of the substrates are given in Table 3. The nutritional analysis revealed that total nitrogen, phosphorus and potassium content of both conventional and vermicomposts enhanced during composting except potassium. The potassium content reduced during conventional process.

3.1.4. Total nitrogen
In case of conventional composting, coffee pulp recorded higher value (8.1%) and pungam shell recorded lower value (6.8%). Results of vermicomposting process revealed that teak litter registered more value (8.7%) and simaruba shell recorded lower value (7.0%).

3.1.5. Total phosphorus
The highest value for total phosphorus was recorded by pungam shell of conventional composting and lower value was recorded by albizia litter (0.9%). In vermicomposting process also, pungam shell registered higher value (3.83%) and teak litter registered lower value (1.05%).

3.1.6. Total potassium
The potassium content of vermicompost was greater than that of fully degraded composts. But reverse the case with vermicomposting. Conventional compost of simaruba shell exhibited higher value (0.54%) and teak litter recorded lower value (0.11%). In vermicomposting process, pungam shell revealed higher value (2.68%) and albizia registered lower value (1.52%).

4. DISCUSSION
The data on nutrient analysis showed that total nitrogen, phosphorus and potassium content of various substrates enhanced while composting with and without earthworms. In case of nitrogen, except coffee pulp compost, all other composts recorded more nitrogen over their respective raw materials. The final nitrogen content of the compost would be dependent on the initial nitrogen present in the substrate and the extent of decomposition (Crawford, 1983). According to Viel et al. (1987), losses in organic carbon might be responsible for nitrogen addition. Among composts and vermicomposts, vermicompost recorded more nitrogen. Since earthworms also have a great impact on nitrogen transformation in manure by enhancing nitrogen mineralization (Aitieh et al., 2000). Addition of nitrogen in the form of mucus, nitrogenous excretory substances, growth stimulating hormones and enzymes from earthworms has also been reported (Tripathi and Bhardwaj, 2003). According to them, these nitrogen rich substances were not
originaly present in the substrates and hence might have contributed to the additional nitrogen content.

In case of total phosphorus, the content enhanced due to composting and vermicomposting. The increase was more pronounced with earthworm activity. Such effects of earthworms in mineralizing wide ranges of organic materials with help of various bacteria and enzymes in the intestine has been described in detail by Edward and Lofty (1977). Mansell et al. (1981) showed that plant litter contained more available phosphorus after ingestion by earthworms and they attributed this increase to physical breakdown of the plant material by the worms. Satchell and Martin (1984) found 25.0 per cent increase in total phosphorus of paper waste sludge after worm activity. They attributed this increase in total phosphorus to direct action of worm gut enzymes and indirectly by stimulation of the microflora. Similarly, in the present study also, total number of microbes, phosphate solubilizing microbes (except coffee pulp) and soil dehydrogenase activity (except abelz JOHN litter and pungum shell) were higher for vermicompost over conventional composts. So our results strongly support the reports of earlier results. Even though vermicompost recorded more phosphorus, the content varied with waste materials used. The differences in the result could be attributed to the differences in the chemical nature of the initial raw material. The results on total potassium content of various composts showed that the content decreased drastically during conventional composting. However, the potassium content of various composts enhanced due to earthworm activity. There are contradictory reports regarding the potassium content of compost. Similar to the present study, Delgado et al. (1995) have reported higher content of potassium in the sewage sludge vermicompost; whereas Orozco et al. (1996) reported decrease in total potassium after ingestion of coffee pulp waste by earthworms.

5. CONCLUSION

Environmentally friendly vermicomposting technology has transformed the different wastes with fortification of nutrients. Hence this technology has a definite edge over conventional composting process.

SUMMARY OF RESEARCH

1. Among the substrates used for composting except cabbage and tea processing wastes, all other wastes degraded fully by conventional and vermicomposting technologies.
2. The degradation or decomposition process was faster due to introduction of earthworms. Teak litter degraded quicker than other substrates.
3. The fertility status of conventional and vermicomposts revealed that total nitrogen and phosphorus enhanced during both kinds of composting processes. But total potassium content reduced due to conventional process. While vermicomposting enhanced potassium content tremendously. Among the substrates, teak litter and coffee pulp registered more value for total nitrogen. Total potassium and phosphorus were greater on pungam shell compost.

FUTURE ISSUES

With the nutritional status of the vermicompost of different substrates assessed. Quantifications of microbial enzymes will definitely throw new vistas.

REFERENCES