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COMPARATIVE STUDY ON BIOCHEMICAL STATUS OF VERMIWASH DERIVED FROM TWO EARTHWORM SPECIES: *LAMPITO MAURITII* (L) AND EUDRILLUS *EUGENIAE* (L).

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ABSTRACT
The vermiwash would have enzymes, secretion of earthworms which would stimulate the growth and yield of crops and even develop resistance in crops receiving this spray, such preparation would certainly have the soluble plant nutrients apart from some organic acids and mucus of earthworm and microbes. It is mandatory to keep the feed given to earthworm moist which will enable them to eat and procreate. Water is regularly sprinkled over the feed. The water mixes in the feed and oily content of earthworms body and slowly drains out from earthworm beds. The outgoing liquid is a concentrate with nutrients which is very beneficial for plants growth. This liquid is called vermiwash. Vermiwash is a Brown colored liquid fertilizer, which is collected after water passes via a worm culture column. As storehouse of nutrients and microorganisms. The present attempt deals with assessment the physico-chemical, nutritional and biochemical status of the vermiwash obtained using the popular composting earthworm species *Eudrillus eugeniae* (Kinb.) (Eudrilidae: Haplotaxida) and *Lampito mauritii* from three different leaf litters namely, Mango (*Mangifera indica*), Guava (*Psidium guajava*) and Sapota (*Achrus sapota*). The results showed substantial increase in the nutrient quality of the vermiwash produced with time in all of three cases. However, the vermiwash produced from guava leaf litter showed more content of electrical conductivity, magnesium, calcium, nitrite, phosphorus, carbohydrate, protein, lipid and amino acid compared with the vermiwash produced from the other two sapota and mango leaf litter by using the both earthworm species *Eudrillus eugeniae* and *Lampito mauritii* respectively. Comparison of physico-chemical, nutritional and biochemical parameters of the vermiwash produced from the present attempt with a standard commercially produced and marketed practices was also carried out to ascertain the quality of produced vermiwash. In the present attempt, control attained the values of most of the parameters of the standard on 60th day. Whereas, the vermiwash was produced by two composting earthworm species and leaf litters from three different plants in the experimental sets that attained the values of the parameters of the standard at an early days. It revealed that the quality of vermiwash can be achieved as in the standard even within 45 days with the use of these earthworms. Vermiwash serve to orchestrate the developmental and growth progression of the crops.

KEY WORDS: *Mangifera indica* , *Psidium guajava* , *Lampito mauritii* , *Eudrillus eugeniae* , Eudrilidae, Haplotaxida, Vermiwash

INTRODUCTION
"Earthworm" is the common name for the largest members of Oligochaeta (which is either a class or a subclass depending on the author). In classical systems, they were placed in the order Opisthopora, on the basis of the male pores opening posterior to the female pores, though the internal male segments are anterior to the female. Theoretical cladistic studies have placed them, instead, in the suborder Lumbricina of the order Haplotaxida, but this may again soon change. Folk names for the earthworm include "dew-worm", "rainworm", "night crawler", and "angleworm" (due to its use as fishing bait). Earthworm is a tube-shaped, segmented worm found in the phylum Annelida. They are commonly found living in soil, feeding on live and dead organic matter. Its digestive system runs through the length of its body. It conducts respiration through its skin. An earthworm has a double transport system composed of coelomic fluid that moves within the fluid-filled coelom and a simple, closed blood circulatory system. It has a central and a peripheral nervous system. The central nervous system consists of two ganglia above the mouth, one on either side, connected to a nerve cord running back along its length to motor neurons and sensory cells in each segment. Large numbers of chemoreceptors are concentrated near its mouth. Circumferential and longitudinal muscles on the periphery of each segment enable the worm to move. Similar sets of muscles line the gut, and their actions move the digesting food toward the worm's anus. Earthworms are cold blooded animals and live in a place where there is food, moisture, oxygen and favourable temperature are available. Approximately 3600 kinds of earthworms are found in the world and are represented from every soil type of the globe (Verma and Prasad, 2005). It feeds on dead organic matter present in soil that is ingested together and the later, along with the undigested food is finally egested in the form of worm castings that are rich in nitrate, available phosphorus, potassium, calcium and magnesium (Subbarao, 2002). It assimilates nutrients and energy from a wide range of ingested materials with variable efficiency, depending on the species and the nature of the ingested materials (Curry and Olaf, 2007).

Vermiwash as a wonderful gift from the "farmer's friends" to boost up plant growth and yield so safely, economically and eco-friendly. It is the fluid collected by pouring water slowly through vermicompost or by washing the compost with water. It is a very nutritious input to plants since it contains a lot of minerals, micronutrients, hormones, vitamins, antibiotics, etc. in a form which is readily absorbable by plants. It is also a repository of different micro organisms which can fix atmospheric nitrogen and also increase the availability of phosphorus from the soil. It can either be applied as a foliar spray over the plants or drenched in soil. Plants treated with vermiwash are green much more resistant to pests and disease and also more vigorous in growth (Jayashree, 2006). Within the world of taxonomy, the stable 'Classical System' of Michaelsen (1900) and Stephenson (1930) was gradually eroded by the controversy over how to classify earthworms, such that Fender and McKey-Fender (1990) went so far as to say, "The family-level classification of the megascolecid earthworms is in chaos." (Fender & McKey-Fender, 1990). Over the years, many scientists developed their own classification systems for earthworms, which led to confusion, and these systems have been and still continue to be revised and updated. The classification system used here, developed by Blakemore (2000), is a modern reversion to the Classical System that is historically proven and widely accepted (Blakemore, Robert J., 2006). Categorization of a megadrile earthworm into one of its taxonomic families under suborders Lumbricina and Moniligastrida is based on such features as the makeup of the clitellum, the location and disposition of the sex features (pores, prostatic glands, etc.), number of gizzards, and body shape. (Blakemore, Robert J., 2006).Currently, over 6,000 species of terrestrial earthworms are named, as provided in a species name database. ,

The families, with their known distributions or origins (Blakemore, Robert J., 2006):

- Acanthodrilidae – (Gondwanan or Pangaean?)
- Ailoscolecidae – Pyrenees and southeast USA
- Almidae – tropical equatorial (South America, Africa, Indo-Asia)
- Benhamiinae – Ethiopian, Neotropical (a possible subfamily of Octochaetidae)
- Criodrilidae – southwestern Palaearctic: Europe, Middle East, Russia and Siberia to Pacific coast; Japan (Biwadrilus); mainly aquatic
- Diplocardiinae/-idae – Gondwanan or Laurasian? (a subfamily of Acanthodrilidae)
- Enchytraeidae – cosmopolitan but uncommon in tropics (usually classed with Microdriles)
- Eudrilidae – Tropical Africa south of the Sahara
- Exxidae – Neotropical: Central America and Caribbean
- Glossoscolecidae – Neotropical: Central and South America, Caribbean
- Haplotaxidae – cosmopolitan distribution (usually classed with Microdriles)
- Hormogastridae – Mediterranean
- Kynotidae – Malagasian: Madagascar
- Lumbricidae – Holarctic: North America, Europe, Middle East, Central Asia to Japan
- Lutodrilidae – Louisiana southeast USA
- Megascolecidae – (Native representatives in Australia, New Zealand, both Southeast and East Asia, and North America).
- Microchaetidae – Terrestrial in Africa especially South African grasslands
- Moniligastridae – Oriental and Indian subregion
- Ocnerodrilidae – Neotropics, Africa; India
- Octochaetidae–Australasian, Indian, Oriental, Ethiopian, Neotropical
- Octochaetinae – Australasian, Indian, Oriental (subfamily if Benhamiinae is accepted)
- Sparganophilidae – Nearctic, Neotropical: North and Central America
- Tumakidae – Colombia, South America

In the light of information presented above, the present attempt was carried out to analyse the physico-chemical, nutritional and biochemical availability in the vermiwash produced by two different composting earthworms namely *Eudrillus eugeniae* and *Lampito mauritii* when provided with the provision of leaf litter from mango, guava and sapota trees.

MATERIALS & METHODS

Procurement and Maintenance of Experimental Animals:
The exotic, epigeic earthworm species *Eudrillus eugeniae* was selected for the present attempt. The earthworm, *Eudrillus eugeniae* was obtained from Vermiculture Unit, Department of Zoology, Savitribai Phule Pune University, Pune (India) , while the earthworm, *Lampito mauritii* was collected from a field in Dhakale village near Malegaon Baramati (India). The worms were transported safe along with native soil substrate in wet gunny cloth bag and introduced into separate containers having a composting bed prepared using cow dung and garden soil. This was maintained as a stock. The vermibed was kept moist by sprinkling water as and when needed.

FIGURE1: *Eudrillus eugeniae* (L).

FIGURE 2: *Lampito mauritii* (L).

Collection and Storage of Cow-dung

The cow dung was collected from a nearly dairy farm. This was shade dried, sieved and stored for use as the basic bedding material in vermicomposting. Most kinds of animal dung are highly attractive and nutritious food sources of earthworms.

Collection and Storage of Leaf-litter

The leaf litter from three plants, Mango (*Mangifera indica*), Guava (*Psidium guajava*) and Sapota (*Achrus sapota*) locally from A. D. T. Malegaon Sheti Farm, Baramati (India). These were then pounded and stored separately in plastic bags. Required quantities of this leaf litter were weighed out and sprinkled with water for pre-digestion. This pre-digestion leaf litter was used as the organic substrate in the present study.

Fabrication of Vermiwash Collection Unit

The collection of vermiwash for the present study was carried out by the effective Earthen pot method (Sonia *et al*., 2007) developed in our lab. For this, the earthen pot with lid was placed over the tripod stand. A hole was made at the bottom of the pot to accommodate the nozzle of the blood transfusion tube and was fitted firmly using M-seal in order to prevent the leakage of vermiwash from the pot. The nozzle end facing inwards the pot was covered with an empty coconut shell and sponge like material to effect the filtration of vermiwash from the soil particles. The vermibed was prepared using gravel, sand, cow dung and sieved soil layered carefully one over the other. The earthworms were then introduced into the pots separately for the attempt of experimentation.

FIGURE 3: Fabrication of Vermiwash Collection Unit.

FIGURE 4: Design of Experimentation (Experimental Set up).

Design of Experimentation (Experimental Set up)

The grown up/ mature earthworms of equal length and weight from the stock of *Eudrillus eugeniae* and *Lampito mauritii* were selected and introduced separately into their respective experimental pots for its collection of vermiwash as follows. Seven earthen pots were taken separately (A1, A2, A3, B1, B2, B3 and C). The pods A1, A2 and A3 were for *Eudrillus eugeniae* in the number of fifty each. The pots B1, B2 and B3 were for *Lampito mauritii* in the number of fifty each. The pot C was the control without earthworm and leaf litter.

Vermiwash Collection

One hundred milligram of different leaf litter mango, guava and sapota after pre-digestion were added in A1, A2, A3 and B1, B2, B3 respectively and water was sprinkled with regular intervals in all pots to maintain the moisture content of 75-85 % RH and temperature at 25ºC. The water after percolation through the compost and burrows of the earthworms get collected amidst gravel bed. The vermiwash was collected at the base due to gravitational force. The roller in the blood transfusion tube was adjusted and the vermiwash was collected in fifteen day interval. Thus collections were made on the initial day (0 day) and on the 15th, 30th, 45th and 60th days respectively. The vermiwash were collected in the bottle placed at the bottom and analysed for the nutrient composition. The extract of the compost in the pot without earthworms and leaf litter was also collected simultaneously and considered as control. Their collections were made on the same day and were treated as replicates in the present attempt of study. The vermiwash produced and marketed by Vanashree Agriculture Private Limted (Vanashree Agrotech) (Magarpatta, Solapur Road, Hadapsar, Pune, Maharashtra, India) was obtained and used as a standard.

FIGURE 5: Vermiwash Collection.

Physico-chemical Analysis

The physico-chemical analyses of all the collected samples were carried out to get as idea about their nutrient status. For this, the vermiwash samples were diluted ten times and various parameters like as pH, Electrical conductivity, Alkalinity, Total hardness, Chloride and Salinity were studied in the every collected samples for the present study following standard procedures of APHA (American Public Health Association) (1975).

Nutritional Analysis

The following nutritional parameters were studied in the samples of vermiwash collected following standard methodology. Walkey and Black method was used to estimate the Organic carbon described by Jackson (1973). Azoditization colorimetric method was used to estimate the Nitrite nitrogen (No2-N) and Vogels method was used to estimate the Phosphorus described by Ramarao *et al*., 1985.

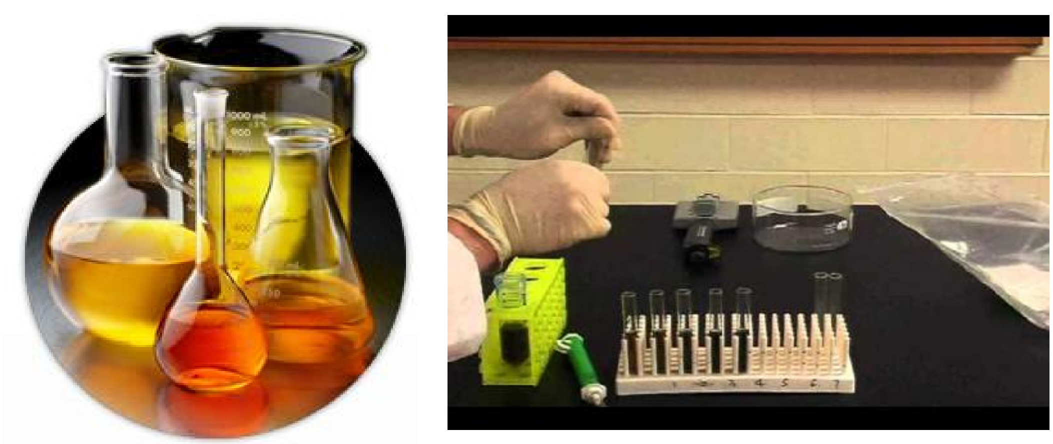

FIGURE 6: Physical, Chemical and Biological Analysis of Vermiwash.

Biochemical Analysis

The following biochemical parameters were studied for the present study. Anthrone method was used to estimate the Carbohydrate of test samples. The total soluble protein was estimated by Lowry's *et al*., 1951. The estimation of Bragdon (1951). The quantitative estimation of Amino acid was measured using the Ninhydrin method followed by Plummer, 1982.

Statistical Analysis

The results obtained in the present study were subjected to statistical analysis to ascertain their credibility. The standard deviation statistical tool was employed for the analysis of the data obtained in the present investigation.

RESULTS & DISCSSION

Vermiwash is a collection of excretory products and excess secretions of earthworms along with micronutrients from soil and digested organic matter or molecules. As the main substrates presented in the waste is of rich source of micro and macronutrients. Resultant complex materials can easily broken by secretary enzymes of earthworms. The physico-chemical, nutritional and biochemical parameters were observed in the present study include pH, EC, TH, magnesium, calcium, chloride, salinity, alkalinity, organic carbon, nitrite nitrogen, phosphorus, carbon : nitrogen, carbohydrate, protein, lipid and aminoacid in the vermiwash produced from three types of leaf litter by using two types of earthworm species during a period of 60 days. In the control the pH value was 7.86 which decreased to 7.29, the EC value was 0.90 which increased to 1.73, values of the total hardness was 2.43 which greatly increased to 10.94, the initial magnesium and calcium content was 1.03 and 1.40 which increased to 4.99 and 5.95, the chloride and salinity content was 5.23 and 7.90 which decreased to 3.39 and 5.17, the alkalinity composition was 7.80 which increased to 9.23, the level of organic carbon was 6.83 which greatly reduced to 4.27, nitrite nitrogen and phosphorus content was 0.16 and 0.30 which increased to 1.42 and 0.57, the C:N ratio was 42.69 which greatly reduced to 3.0, the biochemical content of carbohydrate, protein, lipid and amino acid was 0.25, 0.62, 1.27 and 2.03 which increased to 2.94, 12.97, 10.61 and 12.64 respectively by the action of *Eudrillus eugeniae*.

TABLE 1: Physico-chemical; Nutritional and Biochemical Parameters of Vermiwash Obtained from Mango Leaf Litter (MLL) Through the Use of *Eudrillus eugeniae* (L).

Group (Days) Parameter	Control (00)	Control (15)	Control (30)	Control (45)	Control (60)	MLL (00)	MLL (15)	MLL (30)	MLL (45)	MLL (60)
pH	7.86 (±0.05)	7.83 (±0.05)	7.80 (±0.01)	7.76 (±0.05)	7.71 (±0.01)	7.86 (±0.05)	7.76 (±0.05)	7.66 (±0.05)	7.53 (±0.05)	7.42 (±0.01)
EC mhos/cm^3	0.90 (±0.01)	0.96 (±0.05)	1.06 (±0.05)	1.10 (±0.01)	1.12 (±0.05)	0.90 (±0.01)	1.13 (±0.05)	1.33 (±0.09)	1.60 (±0.01)	1.64 (±0.05)
TH mg/l	2.43 (±0.05)	2.94 (±0.05)	3.33 (±0.05)	3.90 (±0.01)	4.23 (±0.01)	2.40 (±0.01)	2.46 (±0.12)	5.96 (±0.05)	8.70 (±0.01)	10.20 (±0.05)
Magnesium mg/l	1.03 (±0.05)	1.26 (±0.05)	1.30 (±0.08)	1.50 (±0.01)	1.59 (±0.01)	1.10 (±0.01)	1.93 (±0.12)	2.56 (±0.12)	3.90 (±0.01)	4.92 (±0.01)
Calcium mg/l	1.40 (±0.01)	1.66 (±0.05)	2.03 (±0.05)	2.40 (±0.01)	2.64 (±0.05)	1.30 (±0.01)	2.53 (±0.05)	3.40 (±0.08)	4.80 (±0.01)	5.28 (±0.01)
Chloride mg/l	5.23 (±0.05)	4.93 (±0.05)	4.73 (±0.05)	4.50 (±0.01)	4.39 (±0.01)	5.26 (±0.05)	4.83 (±0.05)	4.23 (±0.05)	3.70 (±0.01)	3.47 (±0.01)
Salinity g/l	7.90 (±0.01)	7.53 (±0.05)	7.23 (±0.05)	6.93 (±0.05)	6.64 (±0.05)	7.90 (±0.01)	7.06 (±0.05)	6.23 (±0.05)	5.63 (±0.05)	5.24 (±0.01)
Alkalinity mg/l	7.80 (±0.01)	8.03 (±0.05)	8.13 (±0.05)	8.40 (±0.01)	8.63 (±0.01)	7.80 (±0.01)	8.13 (±0.05)	8.33 (±0.05)	8.83 (±0.05)	8.94 (±0.05)
Organic Carbon %	6.83 (±0.05)	6.56 (±0.05)	6.46 (±0.05)	6.23 (±0.05)	6.18 (±0.01)	6.70 (±0.01)	6.23 (±0.05)	5.43 (±0.05)	4.80 (±0.01)	4.38 (±0.01)
Nitrite %	0.16 (±0.01)	0.19 (±0.01)	0.23 (±0.06)	0.26 (±0.01)	0.29 (±0.06)	0.15 (±0.06)	0.32 (±0.06)	0.61 (±0.01)	0.91 (±0.01)	1.20 (±0.06)
Phosphorus%	0.30 (±0.01)	0.33 (±0.01)	0.35 (±0.01)	0.38 (±0.01)	0.41 (±0.05)	0.30 (±0.01)	0.37 (±0.01)	0.42 (±0.01)	0.46 (±0.01)	0.51 (±0.01)
C:N %	42.97 (±3.29)	34.53 (±3.18)	28.08 (±0.08)	23.96 (±0.18)	21.31 (±0.08)	44.67 (±0.01)	19.47 (±0.05)	8.90 (±0.06)	5.27 (±0.01)	3.65 (±0.01)
Carbohydrate %	0.25 (±0.01)	0.41 (±0.01)	0.64 (±0.05)	0.87 (±0.01)	0.93 (±0.01)	0.20 (±0.06)	0.78 (±0.05)	1.34 (±0.01)	2.50 (±0.01)	2.68 (±0.05)
Protein %	0.62 (±0.01)	1.03 (±0.01)	1.69 (±0.01)	2.50 (±0.01)	2.91 (±0.01)	0.83 (±0.29)	2.31 (±0.01)	4.76 (±0.01)	7.50 (±0.01)	8.99 (±0.05)
Lipid %	1.27 (±0.06)	1.87 (±0.01)	2.29 (±0.01)	2.87 (±0.01)	3.94 (±0.01)	1.36 (±0.01)	3.89 (±0.01)	6.23 (±0.01)	9.58 (±0.01)	10.02 (±0.05)
Amino Acid %	2.03 (±0.01)	2.98 (±0.01)	3.64 (±0.01)	4.21 (±0.05)	4.92 (±0.01)	2.03 (±0.01)	3.91 (±0.05)	7.01 (±0.05)	10.78 (±0.01)	12.03 (±0.05)

Each figure is the mean of the three replications.
Figure with ± sign in the bracket is SD.
Mango Leaf Litter: MLL.

In the control the pH value was 7.86 which decreased to 7.47, the EC value was 0.90 which increased to 1.61, values of the total hardness was 2.43 which increased to 10.42, the initial magnesium and calcium content was 1.03 and 1.40 which increased to 4.75 and 5.67, the chloride and salinity content was 5.23 and 7.90 which decreased to 3.43 and 5.36, the alkalinity composition was 7.80 which increased to 8.99, organic carbon was 6.83 which reduced to 4.49, nitrite nitrogen and phosphorus initial level was 0.16 and 0.30 which increased to 1.13 and 0.52, the C:N ratio was 42.69 which greatly reduced to 4.40, the biochemical composition of carbohydrate, protein, lipid and amino acid was 0.25, 0.62, 1.27 and 2.03 which increased to 2.45, 9.43, 9.94 and 11.90 respectively by the action of *Lampito mauritii* with the three different organic matter. The analysed physico-chemical, nutritional and biochemical, total sixteen parameters of the vermiwash produced from different leaf litters by these two composting earthworms experimented in the present study form and index of the quality of vermiwash produced, enabling the analysis of the nutrient statusat different time intervals. In the present experiment, the level of analysed all parameters were comparatively mere in all the experiment with earthworm species of *E. eugeniae*. Alkalinity, nitrite nitrogen and protein levels were comparatively more in all the experiment with earthworm species of *L. mauritii*.

TABLE 2: Physico-chemical; Nutritional and Biochemical Parameters of Vermiwash Obtained from Guava Leaf Litter (GLL) Through the Use of *Eudrillus eugeniae* (L).

Group (Days) Parameters	Control (00)	Control (15)	Control (30)	Control (45)	Control (60)	GLL (00)	GLL (15)	GLL (30)	GLL (45)	GLL (60)
pH	7.86 (±0.05)	7.83 (±0.05)	7.80 (±0.01)	7.76 (±0.05)	7.71 (±0.01)	7.86 (±0.05)	7.56 (±0.05)	7.46 (±0.05)	7.36 (±0.05)	7.29 (±0.05)
EC mhos/cm^3	0.90 (±0.01)	0.96 (±0.05)	1.06 (±0.05)	1.10 (±0.01)	1.12 (±0.01)	0.90 (±0.01)	1.30 (±0.08)	1.40 (±0.08)	1.70 (±0.01)	1.73 (±0.05)
TH mg/l	2.43 (±0.05)	2.93 (±0.05)	3.33 (±0.05)	3.90 (±0.01)	4.23 (±0.01)	2.40 (±0.01)	4.73 (±0.05)	6.13 (±0.05)	9.20 (±0.01)	10.94 (±0.01)
Magnesium mg/l	1.03 (±0.05)	1.26 (±0.05)	1.30 (±0.08)	1.50 (±0.01)	1.59 (±0.01)	1.10 (±0.01)	2.06 (±0.05)	2.80 (±0.08)	4.30 (±0.01)	4.99 (±0.01)
Calcium mg/l	1.40 (±0.01)	1.66 (±0.05)	2.03 (±0.05)	2.40 (±0.01)	2.64 (±0.05)	1.30 (±0.01)	2.66 (±0.05)	3.33 (±0.12)	4.90 (±0.01)	5.95 (±0.05)
Chloride mg/l	5.23 (±0.05)	4.93 (±0.05)	4.73 (±0.05)	4.50 (±0.01)	4.39 (±0.01)	5.30 (±0.01)	4.73 (±0.05)	4.36 (±0.05)	3.63 (±0.05)	3.39 (±0.01)
Salinity g/l	7.90 (±0.01)	7.53 (±0.05)	7.23 (±0.05)	6.93 (±0.05)	6.64 (±0.05)	7.86 (±0.05)	7.03 (±0.05)	6.06 (±0.05)	5.23 (±0.05)	5.17 (±0.01)
Alkalinity mg/l	7.80 (±0.01)	8.03 (±0.05)	8.13 (±0.05)	8.40 (±0.01)	8.63 (±0.01)	7.80 (±0.01)	8.33 (±0.05)	8.56 (±0.05)	9.00 (±0.05)	9.23 (±0.05)
Organic Carbon %	6.83 (±0.05)	6.56 (±0.05)	6.46 (±0.05)	6.23 (±0.05)	6.18 (±0.01)	6.76 (±0.05)	5.96 (±0.05)	5.23 (±0.05)	4.46 (±0.05)	4.27 (±0.01)
Nitrite %	0.16 (±0.01)	0.19 (±0.01)	0.23 (±0.06)	0.26 (±0.01)	0.29 (±0.06)	0.15 (±0.06)	0.41 (±0.01)	0.84 (±0.01)	1.11 (±0.01)	1.42 (±0.01)
Phosphorus%	0.30 (±0.01)	0.33 (±0.01)	0.35 (±0.01)	0.38 (±0.01)	0.41 (±0.05)	0.30 (±0.01)	0.37 (±0.01)	0.45 (±0.01)	0.50 (±0.01)	0.57 (±0.01)
C:N %	42.69 (±3.29)	34.53 (±3.18)	28.08 (±0.08)	23.96 (±0.18)	21.31 (±0.08)	45.06 (±0.31)	14.54 (±0.05)	6.23 (±0.05)	4.02 (±0.04)	3.00 (±0.01)
Carbohydrate %	0.25 (±0.01)	0.41 (±0.01)	0.64 (±0.05)	0.87 (±0.01)	0.93 (±0.01)	0.20 (±0.06)	0.93 (±0.01)	1.81 (±0.01)	2.87 (±0.01)	2.94 (±0.05)
Protein %	0.62 (±0.01)	1.03 (±0.01)	1.69 (±0.01)	2.50 (±0.01)	2.91 (±0.01)	0.62 (±0.01)	4.30 (±0.05)	7.99 (±0.01)	11.87 (±0.01)	12.97 (±0.05)
Lipid %	1.27 (±0.06)	1.87 (±0.01)	2.29 (±0.01)	2.87 (±0.01)	3.94 (±0.01)	1.36 (±0.01)	4.64 (±0.01)	7.34 (±0.01)	10.13 (±0.01)	10.61 (±0.05)
Amino Acid %	2.03 (±0.01)	2.98 (±0.01)	3.64 (±0.01)	4.21 (±0.05)	4.92 (±0.01)	2.03 (±0.01)	4.32 (±0.01)	8.10 (±0.01)	11.40 (±0.05)	12.66 (±0.05)

Each figure is the mean of the three replications.
Figure with ± sign in the bracket is SD.
Guava Leaf Litter: GLL.

All this can be considered to indicate the perfect blend of the nutrients to be present in the vermiwash produced by the action of *E. eugeniae*. Therefore, it would be comparatively very effective if the production of vermiwash is carried out with *E. eugeniae*. The nutrient increase in the product is due to the fact that *E. eugeniae* has greater potential in the mineralization of waste and even capable of working on every strong pollutants like paper mill sludge (Umamaheshwari and Vijayalakshmi, 2003) and petrochemical sludge (Rajeshbanu *et al*., 2005). The quality of vermiwash produced with the use of leaf litter from three different plants namely mango, guava and sapota clearly show that the vermiwash potential of the earthworm species *E. eugeniae* and *L. mauritii* are largely influenced by the food quality. As a result the role of earthworms in the vermiwash production also depends on the nature of organic input. We judged that the quality of nutritional status of the sixteen parameters of produced and analysed samples, in the present study was an increased with the increase in the number of days of composting. Besides, the quality also changed with reference to the addition of leaf litter from different plants. The neutralization of the pH level of the vermiwash produced in the experiment was great with mango leaf litter followed by sapota and guava respectively. In the present attempt of experiment, the parameters such as electrical conductivity, total hardness, magnesium, calcium, alkalinity, nitrite nitrogen, phosphorus, carbohydrate, protein, lipid and amino acid level were found to be higher in all the experiment with guava leaf litter by sapota and mango respectively. The organic degradable refuse of plant and animal origin have been shown to provide a good source of nutrients to improve productivity (Padmavathiamma *et al*., 2007). The physico-chemical, nutritional and biochemical parameters observed in the present point out that the leaf litters show a marginal difference in their nutrient status initially, but they showed improvement in their quality with duration. Further, the vermiwash produced from the leaf litter of guava appeared to be the best followed by sapota and mango, various researchers have established the viability of vermitechnology for the treatment of different wastes. The earthworms maintain aerobic conditions in organic wastes through proper mixing and enhance the microbial activity to selectively digest the wastes (Kumar and Sekaran, 2004).

TABLE 3: Physico-chemical; Nutritional and Biochemical Parameters of Vermiwash Obtained from Sapota Leaf Litter (SLL) Through the Use of *Eudrillus eugeniae* (L).

Group (Days) Parameters	Control (00)	Control (15)	Control (30)	Control (45)	Control (60)	GLL (00)	GLL (15)	GLL (30)	GLL (45)	GLL (60)
pH	7.86 (±0.05)	7.83 (±0.01)	7.80 (±0.05)	7.76 (±0.01)	7.71 (±0.05)	7.86 (±0.05)	7.66 (±0.05)	7.53 (±0.05)	7.43 (±0.05)	7.37 (±0.05)
EC mhos/cm^3	0.90 (±0.01)	0.96 (±0.05)	1.06 (±0.05)	1.10 (±0.01)	1.12 (±0.01)	0.90 (±0.01)	1.23 (±0.05)	1.36 (±0.05)	1.56 (±0.05)	1.59 (±0.05)
TH mg/l	2.43 (±0.05)	2.93 (±0.05)	3.33 (±0.05)	3.39 (±0.01)	4.23 (±0.01)	2.46 (±0.05)	4.53 (±0.05)	6.06 (±0.05)	9.03 (±0.05)	10.51 (±0.01)
Magnesium mg/l	1.03 (±0.05)	1.26 (±0.05)	1.30 (±0.08)	1.50 (±0.01)	1.59 (±0.01)	1.06 (±0.05)	2.06 (±0.05)	2.83 (±0.05)	4.23 (±0.05)	4.95 (±0.01)
Calcium mg/l	1.40 (±0.01)	1.66 (±0.05)	2.03 (±0.05)	2.40 (±0.01)	2.64 (±0.05)	1.40 (±0.05)	2.46 (±0.05)	3.23 (±0.05)	4.80 (±0.01)	5.56 (±0.05)
Chloride mg/l	5.23 (±0.05)	4.93 (±0.05)	4.73 (±0.05)	4.50 (±0.01)	4.39 (±0.01)	5.30 (±0.01)	4.86 (±0.05)	4.43 (±0.05)	3.66 (±0.05)	3.43 (±0.01)
Salinity g/l	7.90 (±0.01)	7.53 (±0.05)	7.23 (±0.05)	6.93 (±0.05)	6.64 (±0.05)	7.90 (±0.01)	7.06 (±0.05)	6.16 (±0.05)	5.56 (±0.05)	5.21 (±0.01)
Alkalinity mg/l	7.80 (±0.01)	8.03 (±0.05)	8.13 (±0.01)	8.40 (±0.01)	7.63 (±0.05)	8.83 (±0.05)	8.23 (±0.05)	8.43 (±0.05)	8.93 (±0.05)	9.01 (±0.01)
Organic Carbon %	6.83 (±0.05)	6.56 (±0.05)	6.46 (±0.05)	6.23 (±0.05)	6.18 (±0.01)	6.80 (±0.01)	6.06 (±0.05)	5.43 (±0.05)	4.73 (±0.05)	4.31 (±0.01)
Nitrite %	0.16 (±0.01)	0.19 (±0.01)	0.23 (±0.06)	0.26 (±0.01)	0.29 (±0.06)	0.15 (±0.06)	0.39 (±0.06)	0.62 (±0.01)	0.99 (±0.01)	1.31 (±0.01)
Phosphorus%	0.30 (±0.01)	0.33 (±0.01)	0.35 (±0.01)	0.38 (±0.01)	0.41 (±0.05)	0.30 (±0.01)	0.34 (±0.01)	0.40 (±0.01)	0.48 (±0.01)	0.54 (±0.01)
C:N %	42.69 (±3.29)	34.53 (±3.18)	28.08 (±0.08)	23.96 (±0.18)	23.31 (±0.08)	45.33 (±0.01)	15.54 (±0.05)	8.76 (±0.05)	4.78 (±0.11)	3.29 (±0.01)
Carbohydrate %	0.25 (±0.01)	0.41 (±0.01)	0.64 (±0.05)	0.87 (±0.01)	0.93 (±0.01)	0.25 (±0.01)	0.90 (±0.05)	1.67 (±0.01)	2.62 (±0.01)	2.81 (±0.05)
Protein %	0.62 (±0.01)	1.03 (±0.01)	1.69 (±0.01)	2.50 (±0.01)	2.91 (±0.01)	0.62 (±0.01)	2.98 (±0.01)	5.94 (±0.01)	9.37 (±0.01)	10.03 (±0.05)
Lipid %	1.27 (±0.06)	1.87 (±0.01)	2.29 (±0.01)	2.87 (±0.01)	3.94 (±0.01)	1.32 (±0.06)	3.92 (±0.01)	6.61 (±0.01)	9.86 (±0.01)	10.30 (±0.01)
Amino Acid %	2.03 (±0.01)	2.98 (±0.01)	3.64 (±0.01)	4.21 (±0.05)	4.92 (±0.01)	2.03 (±0.01)	4.01 (±0.01)	7.24 (±0.01)	10.93 (±0.01)	12.23 (±0.01)

Each figure is the mean of the three replications.
Figure with ± sign in the bracket is SD.
Sapota Leaf Litter: SLL.

The nutrient level was comparatively higher in the vermiwash produced by *E. eugeniae* than that of the vermiwash produced by *L. mauritii*. The earthworms in the vermifilter bed were agile and healthy and achieved good growth throughout the period of study. They were much developed at the end of the study and even after 60 days several earthworms were seen wringgling down into the sand, gravels and inhabiting in the voids. These observations prove that *E. eugeniae* is comparatively a better soil macro fauna, which helps in the degradation of the organic matter and there by help the bioconversion of waste materials into valuable vermiwash. Earlier attempt of studies on the breakdown of plant residues with contrasting chemical composition in humic tropical conditions by the earthworm, *E. eugeniae* was found to have different effects on soil nutrient supply depending on residue quality (Tian *et al*., 1995 and Vitthalrao B. Khyade, *et al*, 2016). Comparison of physico-chemical, nutritional and biochemical parameters of the vermiwash produced from the present experiment with a standard commercially produced and marketed by A. L. N Farms, Thenkasi was also carried out to ascertain the quality of vermiwash produced. In the present attempt of experiment the control attained the values of most of the parameters of the standard on 60th day and the experimental sets attained the values of the parameters of the standard at an early day. It reveals that the quality of vermiwash can be achieved as in the standard even within 45 days with the use of these earthworms. Moreover, guava leaf litter was dealt better by *E. eugeniae* while *L. mauritii* was effective with sapota and mango leaf litter in the production of vermiwash with in 45 days. Earthworms assimilate nutrients as energy from a wide range of ingested materials with variable efficiency depends on the species and the nature of the ingested materials (Curry and Olaf, 2007).

TABLE 4: Physico-chemical; Nutritional and Biochemical Parameters of Vermiwash Obtained from Mango Leaf Litter (MLL) Through the Use of *Lampito mauritii* (L).

Group (Days) Parameters	Control (00)	Control (15)	Control (30)	Control (45)	Control (60)	GLL (00)	GLL (15)	GLL (30)	GLL (45)	GLL (60)
pH	7.86 (±0.05)	7.83 (±0.05)	7.80 (±0.01)	7.76 (±0.05)	7.71 (±0.01)	7.83 (±0.05)	7.74 (±0.05)	7.63 (±0.05)	7.56 (±0.05)	7.49 (±0.01)
EC mhos/cm^3	0.90 (±0.01)	0.96 (±0.05)	1.06 (±0.05)	1.10 (±0.01)	1.12 (±0.01)	0.90 (±0.01)	1.21 (±0.01)	1.37 (±0.01)	1.50 (±0.01)	1.55 (±0.01)
TH mg/l	2.43 (±0.05)	2.93 (±0.05)	3.33 (±0.05)	3.90 (±0.01)	4.23 (±0.01)	2.50 (±0.01)	4.33 (±0.05)	6.16 (±0.09)	8.40 (±0.01)	10.01 (±0.01)
Magnesium mg/l	1.03 (±0.05)	1.26 (±0.05)	1.30 (±0.08)	1.50 (±0.01)	1.59 (±0.01)	1.10 (±0.01)	1.93 (±0.01)	2.86 (±0.05)	4.00 (±0.01)	4.63 (±0.01)
Calcium mg/l	1.40 (±0.01)	1.66 (±0.05)	2.03 (±0.05)	2.40 (±0.01)	2.64 (±0.05)	1.40 (±0.01)	2.40 (±0.01)	3.30 (±0.08)	4.40 (±0.01)	5.38 (±0.01)
Chloride mg/l	5.23 (±0.05)	4.93 (±0.05)	4.73 (±0.05)	4.50 (±0.01)	4.39 (±0.01)	5.33 (±0.05)	4.86 (±0.05)	4.53 (±0.05)	3.90 (±0.01)	3.61 (±0.01)
Salinity g/l	7.90 (±0.01)	7.53 (±0.05)	7.23 (±0.05)	6.93 (±0.05)	6.64 (±0.05)	7.86 (±0.05)	7.26 (±0.05)	6.76 (±0.05)	6.03 (±0.05)	5.87 (±0.05)
Alkalinity mg/l	7.80 (±0.01)	8.03 (±0.05)	8.13 (±0.05)	8.40 (±0.01)	8.63 (±0.01)	7.80 (±0.01)	8.13 (±0.05)	8.46 (±0.05)	8.83 (±0.05)	8.99 (±0.01)
Organic Carbon %	6.83 (±0.05)	6.56 (±0.05)	6.46 (±0.01)	6.23 (±0.05)	6.18 (±0.01)	6.80 (±0.01)	6.31 (±0.05)	5.47 (±0.01)	4.93 (±0.05)	4.60 (±0.01)
Nitrite %	0.16 (±0.01)	0.19 (±0.01)	0.23 (±0.06)	0.26 (±0.01)	0.29 (±0.06)	0.14 (±0.01)	0.31 (±0.05)	0.58 (±0.01)	0.88 (±0.01)	1.10 (±0.01)
Phosphorus%	0.30 (±0.01)	0.33 (±0.01)	0.35 (±0.01)	0.38 (±0.01)	0.41 (±0.05)	0.20 (±0.01)	0.35 (±0.01)	0.40 (±0.05)	0.44 (±0.01)	0.49 (±0.01)
C:N %	42.59 (±3.29)	34.53 (±3.18)	28.08 (±0.09)	23.96 (±0.17)	21.31 (±0.11)	48.57 (±5.34)	20.35 (±0.23)	9.43 (±0.05)	5.60 (±0.01)	4.82 (±0.01)
Carbohydrate %	0.25 (±0.01)	0.41 (±0.01)	0.64 (±0.05)	0.87 (±0.01)	0.93 (±0.01)	0.29 (±0.05)	0.72 (±0.01)	1.29 (±0.01)	1.87 (±0.01)	2.29 (±0.05)
Protein %	0.62 (±0.01)	1.03 (±0.01)	1.69 (±0.01)	2.50 (±0.01)	2.91 (±0.01)	0.62 (±0.01)	1.82 (±0.05)	3.47 (±0.01)	5.63 (±0.01)	7.04 (±0.01)
Lipid %	1.27 (±0.06)	1.87 (±0.01)	2.29 (±0.01)	2.87 (±0.01)	3.94 (±0.01)	1.40 (±0.06)	3.41 (±0.01)	6.53 (±0.01)	8.76 (±0.01)	9.03 (±0.01)
Amino Acid %	2.03 (±0.01)	2.98 (±0.01)	3.64 (±0.01)	4.21 (±0.05)	4.92 (±0.01)	2.03 (±0.01)	3.10 (±0.01)	7.00 (±0.05)	10.00 (±0.05)	11.16 (±0.05)

Each figure is the mean of the three replications, Figure with ± sign in the bracket is SD, Mango Leaf Litter: MLL.

TABLE 5: Physico-chemical; Nutritional and Biochemical Parameters of Vermiwash Obtained from Guava Leaf Litter (GLL) Through the Use of *Lampito mauritii* (L).

Group (Days) Parameters	Control (00)	Control (15)	Control (30)	Control (45)	Control (60)	GLL (00)	GLL (15)	GLL (30)	GLL (45)	GLL (60)
pH	7.86 (±0.05)	7.83 (±0.05)	7.80 (±0.01)	7.76 (±0.05)	7.71 (±0.01)	7.86 (±0.05)	7.79 (±0.05)	7.68 (±0.05)	7.63 (±0.05)	7.53 (±0.01)
EC mhos/cm^3	0.90 (±0.01)	0.96 (±0.05)	1.06 (±0.01)	1.10 (±0.01)	1.12 (±0.01)	0.90 (±0.01)	1.23 (±0.01)	1.41 (±0.01)	1.56 (±0.05)	1.61 (±0.01)
TH mg/l	2.43 (±0.05)	2.93 (±0.05)	3.33 (±0.05)	3.90 (±0.01)	4.23 (±0.01)	2.43 (±0.05)	4.33 (±0.05)	6.13 (±0.09)	8.50 (±0.01)	10.35 (±0.01)
Magnesium mg/l	1.03 (±0.05)	1.26 (±0.05)	1.30 (±0.08)	1.50 (±0.01)	1.59 (±0.01)	1.03 (±0.01)	1.73 (±0.05)	2.80 (±0.09)	3.90 (±0.01)	4.71 (±0.01)
Calcium mg/l	1.40 (±0.01)	1.66 (±0.05)	2.03 (±0.05)	2.40 (±0.01)	2.64 (±0.05)	1.46 (±0.01)	2.60 (±0.01)	3.33 (±0.05)	4.60 (±0.01)	5.64 (±0.01)
Chloride mg/l	5.23 (±0.05)	4.93 (±0.05)	4.73 (±0.05)	4.50 (±0.01)	4.39 (±0.01)	5.26 (±0.01)	4.76 (±0.05)	4.26 (±0.05)	3.76 (±0.05)	3.43 (±0.01)
Salinity g/l	7.90 (±0.01)	7.53 (±0.05)	7.23 (±0.05)	6.93 (±0.05)	6.64 (±0.05)	7.83 (±0.05)	6.99 (±0.05)	6.23 (±0.05)	5.70 (±0.01)	5.36 (±0.01)
Alkalinity mg/l	7.80 (±0.01)	8.03 (±0.05)	8.13 (±0.05)	8.40 (±0.01)	8.63 (±0.01)	7.80 (±0.01)	8.13 (±0.05)	8.53 (±0.05)	(8.70 ±0.01)	8.90 (±0.01)
Organic Carbon %	6.83 (±0.05)	6.56 (±0.05)	6.46 (±0.05)	6.23 (±0.05)	6.18 (±0.01)	6.73 (±0.01)	6.03 (±0.01)	5.43 (±0.05)	4.76 (±0.05)	4.49 (±0.01)
Nitrite %	0.16 (±0.01)	0.19 (±0.01)	0.23 (±0.06)	0.26 (±0.01)	0.29 (±0.06)	0.15 (±0.06)	0.38 (±0.01)	0.79 (±0.05)	0.92 (±0.01)	1.13 (±0.05)
Phosphorus%	0.30 (±0.01)	0.33 (±0.01)	0.35 (±0.01)	0.38 (±0.01)	0.41 (±0.05)	0.30 (±0.01)	0.36 (±0.05)	0.42 (±0.01)	0.46 (±0.01)	0.52 (±0.01)
C:N %	42.69 (±3.29)	34.53 (±3.18)	28.08 (±0.09)	23.96 (±0.18)	21.31 (±0.09)	44.87 (±1.32)	15.87 (±1.01)	6.88 (±0.11)	5.17 (±0.12)	4.40 (±0.08)
Carbohydrate %	0.25 (±0.01)	0.41 (±0.01)	0.64 (±0.05)	0.87 (±0.01)	0.93 (±0.01)	0.20 (±0.06)	0.83 (±0.01)	1.69 (±0.01)	2.25 (±0.01)	2.45 (±0.05)
Protein %	0.52 (±0.01)	1.03 (±0.01)	1.09 (±0.01)	2.51 (±0.01)	2.92 (±0.01)	0.62 (±0.01)	2.16 (±0.01)	4.35 (±0.05)	6.87 (±0.01)	9.43 (±0.05)
Lipid %	1.27 (±0.06)	1.88 (±0.01)	2.29 (±0.01)	2.87 (±0.01)	3.94 (±0.01)	1.36 (±0.01)	3.91 (±0.01)	6.82 (±0.01)	9.45 (±0.01)	9.94 (±0.05)
Amino Acid %	2.03 (±0.01)	2.98 (±0.01)	3.64 (±0.01)	4.21 (±0.05)	4.92 (±0.01)	2.03 (±0.01)	4.02 (±0.06)	7.82 (±0.01)	10.62 (±0.01)	11.90 (±0.05)

Each figure is the mean of the three replications; Figure with ± sign in the bracket is SD.
Guava Leaf Litter: GLL

TABLE 6: Physico-chemical; Nutritional and Biochemical Parameters of Vermiwash Obtained from Sapota Leaf Litter (SLL) Through the Use of *Lampito mauritii* (L).

Group (Days) Parameters	Control (00)	Control (15)	Control (30)	Control (45)	Control (60)	GLL (00)	GLL (15)	GLL (30)	GLL (45)	GLL (60)
pH	7.86 (±0.05)	7.83 (±0.05)	7.780 (±0.01)	7.76 (±0.05)	7.71 (±0.01)	7.86 (±0.05)	7.78 (±0.05)	7.66 (±0.05)	7.53 (±0.05)	7.47 (±0.01)
EC mhos/cm^3	0.90 (±0.01)	0.96 (±0.05)	1.06 (±0.05)	1.10 (±0.01)	1.12 (±0.01)	0.90 (±0.01)	1.10 (±0.01)	1.32 (±0.01)	1.50 (±0.01)	1.56 (±0.01)
TH mg/l	2.43 (±0.05)	2.93 (±0.05)	3.33 (±0.05)	3.90 (±0.01)	4.23 (±0.01)	2.50 (±0.01)	4.56 (±0.09)	6.43 (±0.05)	8.60 (±0.01)	10.42 (±0.01)
Magnesium mg/l	1.03 (±0.05)	1.26 (±0.05)	1.30 (±0.08)	1.50 (±0.01)	1.59 (±0.01)	1.10 (±0.01)	1.96 (±0.05)	3.03 (±0.05)	4.10 (±0.01)	4.75 (±0.01)
Calcium mg/l	1.40 (±0.01)	1.66 (±0.05)	2.03 (±0.05)	2.40 (±0.01)	2.64 (±0.05)	1.40 (±0.01)	2.60 (±0.14)	3.40 (±0.08)	4.50 (±0.01)	5.67 (±0.01)
Chloride mg/l	5.23 (±0.05)	4.93 (±0.05)	4.73 (±0.05)	4.50 (±0.01)	4.39 (±0.01)	5.30 (±0.01)	4.83 (±0.05)	4.33 (±0.05)	3.80 (±0.01)	3.57 (±0.01)
Salinity g/l	7.90 (±0.01)	7.53 (±0.05)	7.24 (±0.05)	6.93 (±0.05)	6.64 (±0.05)	7.90 (±0.01)	7.03 (±0.05)	6.43 (±0.05)	5.76 (±0.05)	5.52 (±0.01)
Alkalinity mg/l	7.80 (±0.01)	8.03 (±0.05)	8.13 (±0.05)	8.40 (±0.01)	8.63 (±0.01)	7.83 (±0.05)	8.26 (±0.05)	8.63 (±0.05)	8.76 (±0.05)	8.94 (±0.01)
Organic Carbon %	6.83 (±0.05)	6.56 (±0.05)	6.46 (±0.05)	6.23 (±0.05)	6.18 (±0.01)	6.83 (±0.05)	6.07 (±0.05)	5.62 (±0.01)	4.96 (±0.05)	4.63 (±0.05)
Nitrite %	0.16 (±0.01)	0.19 (±0.01)	0.23 (±0.06)	0.26 (±0.01)	0.29 (±0.06)	0.15 (±0.06)	0.36 (±0.01)	0.62 (±0.05)	0.87 (±0.01)	1.06 (±0.01)
Phosphorus%	0.30 (±0.01)	0.33 (±0.01)	0.35 (±0.01)	0.38 (±0.01)	0.41 (±0.05)	0.30 (±0.01)	0.35 (±0.01)	0.41 (±0.01)	0.45 (±0.01)	0.51 (±0.01)
C:N %	42.69 (±3.29)	34.53 (±3.18)	28.08 (±1.07)	23.96 (±1.01)	21.31 (±1.18)	45.53 (±1.31)	16.86 (±1.19)	9.06 (±0.05)	5.70 (±0.13)	4.89 (±0.16)
Carbohydrate %	0.25 (±0.01)	0.41 (±0.01)	0.64 (±0.05)	0.87 (±0.01)	0.93 (±0.01)	0.25 (±0.01)	0.79 (±0.01)	1.46 (±0.06)	2.12 (±0.01)	2.33 (±0.06)
Protein %	0.62 (±0.01)	1.03 (±0.01)	1.69 (±0.01)	2.50 (±0.01)	2.91 (±0.01)	0.62 (±0.01)	2.09 (±0.05)	4.12 (±0.01)	6.25 (±0.01)	8.86 (±0.05)
Lipid %	1.27 (±0.06)	1.88 (±0.01)	2.29 (±0.01)	2.87 (±0.01)	3.94 (±0.01)	1.32 (±0.06)	3.61 (±0.01)	6.72 (±0.05)	9.17 (±0.01)	9.49 (±0.05)
Amino Acid %	2.02 (±0.01)	2.98 (±0.01)	3.64 (±0.01)	4.21 (±0.05)	4.93 (±0.01)	2.03 (±0.01)	3.94 (±0.05)	7.59 (±0.01)	10.31 (±0.01)	11.51 (±0.01)

Each figure is the mean of the three replications.
Figure with ± sign in the bracket is SD.
Sapota Leaf Litter: SLL.

TABLE 7: Comparative chart dealing with vermish from Physico-chemical; Nutritional and Biochemical Parameters of Vermiwash Obtained from *Eudrillus eugeniae* (L) and *Lampito mauritii* (L).

Parameter	Standard	Control	*E.eugeniae* MLL	*E.eugeniae* GLL	*E.eugeniae* SLL	*L. mauritii* MLL	*L. mauritii* GLL	*L. mauritii* SLL
pH	7.61 (±0.05)	60 days	45 days	15 days	30 days	45 days	60 days	45 days
EC mhos/cm^3	1.72 (±0.01)	60 days	60 days	45 days	60 days	60 days	60 days	60 days
TH mg/l	9.24 (±0.05)	60 days	45 days	45 days	45 days	45 days	45 days	45 days
Magnesium mg/l	4.23 (±0.05)	60 days	45 days	45 days	30 days	30 days	45 days	45 days
Calcium mg/l	4.92 (±0.05)	60 days	45 days	45 days	45 days	45 days	45 days	45 days
Chloride mg/l	3.91 (±0.01)	60 days	45 days	45 days	45 days	45 days	45 days	45 days
Salinity g/l	6.09 (±0.05)	60 days	45 days	30 days	45 days	45 days	45 days	45 days
Alkalinity mg/l	8.74 (±0.05)	60 days	30 days	30 days	30 days	30 days	45 days	30 days
Organic Carbon %	4.74 (±0.05)	60 days	60 days	60 days	45 days	60 days	30 days	60 days
Nitrite %	0.97 (±0.01)	60 days	45 days	30 days	30 days	45 days	45 days	45 days
Phosphorus%	0.48 (±0.01)	60 days	45 days	30 days	30 days	45 days	45 days	45 days
C:N %	4.05 (±0.05)	60 days	60 days	45 days	45 days	60 days	60 days	60 days
Carbohydrate %	2.60 (±0.01)	60 days	45 days	30 days	30 days	60 days	60 days	60 days
Protein %	9.35 (±0.01)	60 days	60 days	30 days	30 days	60 days	45 days	60 days
Lipid %	8.79 (±0.01)	60 days	30 days	30 days	30 days	45 days	30 days	30 days
Amino Acid %	11.42 (±0.01)	60 days	45 days	45 days	45 days	60 days	45 days	45 days

Each figure is the mean of the three replications.
Figure with ± sign in the bracket is SD.
Mango Leaf Litter: MLL; Guava Leaf Litter: GLL; Sapota Leaf Litter: SLL .

Sumathi and Isaiarasu (2009) had already reported variability in the quality of vermicompost produced by *L. mauritii* when provided with different leaf litters. In the present study also the quality of vermiwash produced improved with duration of vermicomposting but at the same time the nature of leaf litter influenced the quality of vermiwash produced. The observation in the present attempt of study thus indicate that studies exploring the possibilities of employing earthworms with different substrate could offer more scope for the promotionof organic farming and sustainable agriculture.

CONCLUSION

Vermiwash is a brown coloured fluid fertilizer, which is collected after water passes through the vermibed. As a store house of nutrients and micro-organisms, vermiwash is used as a foliar spray for crop plants. This attempt deals with assessment the physico-chemical, nutritional and biochemical status of the vermiwash obtained using the popular composting earthworm species *Eudrillus eugeniae* (Kinb.) (Eudrilidae: Haplotaxida) and *Lampito mauritii* from three different leaf litters namely, Mango (*Mangifera indica*), Guava (*Psidium guajava*) and Sapota (*Achrus sapota*). The results showed substantial increase in the nutrient quality of the vermiwash produced with time in all of three cases. However, the vermiwash produced from guava leaf litter showed more content of electrical conductivity, magnesium, calcium, nitrite, phosphorus, carbohydrate, protein, lipid and amino acid compared with the vermiwash produced from the other two sapota and mango leaf litter by using the both earthworm species *Eudrillus eugeniae* and *Lampito mauritii* respectively. In the present attempt, control attained the values of most of the parameters of the standard on 60th day. Whereas, the vermiwash was produced by two composting earthworm species and leaf litters from three different plants in the experimental sets that attained the values of the parameters of the standard at an early days. It revealed that the quality of vermiwash can be achieved as in the standard even within 45 days with the use of these earthworms. Vermiwash serve to orchestrate the developmental and growth progression of the crops. The vermiwash can be used as a potent biofertiliser to improve the germination and seedling survival rates in crop plants growing on nutrition depleted soils thus paving the way for sustainable agriculture using organic farming practices.

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