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## **Sugar Factory Waste (Vermicomposting with an Epigeic Earthworm, *Eudrilus eugeniae* (Kinberg))**

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### **ABSTRACT**

Vermicomposting is waste management techniques that promote the conversion of organic waste into valuable product. Filter mud has significant fertilizer value but due to prohibitive cost of sludge disposal, it is dumped in open where it adversely affects the ambient environment. The management and nutrient recovery from filtermud has been attempted by vermicomposting after mixing it with organic nutrient in appropriate quantities. The final products were nutrient rich, odour free, more mature and stabilized. Bioconversion of filter mud waste using organic nutrients like Jeevamirtham, Panchagavya, *Azospirillum* and Cow dung lead into nutrients rich manure by using the earthworm *Eudrilus eugeniae*. The results suggest that the filter mud supplementary organic nutrients promote the activity of earthworm and produce highly nutritive vermicomposts. The chemical composition of the compost prepared by different types of composting using filter mud showed that the level of nitrogen, phosphorus, potassium, showed an increasing trend and organic carbon and the C:N ratio decreased during end of the vermicomposting.

**Key words:** *Eudrilus eugeniae*, filter mud, jeevamirtham, panchagavya, *Azospirillum*

### **INTRODUCTION**

Filter cake or filter mud as it is commonly known is one of the important by-products of the sugar industry. Filter mud is a soft, spongy, amorphous and dark brown to brownish white material containing sugar, fibre and coagulated colloids including cane wax, albuminoids, inorganic salts and soil particles. It is readily converted to a repository of macro and micro nutrients besides being a very effective soil ameliorant through vermicomposting. Filter mud mounts as it is accumulated at a stocking point. It undergoes self combustion and adds to pollution to the environment besides causing an eye sore (Lakshmi Bai and Vijayalakshmi, 2000). Patil and Kale (1983) do not advocate the direct application of pressmud to the soil due to its 8-15% wax content and prefer that it be composted before use.

According to Parthasarathi (2006) approximately 12 million tones of press mud is produced in India annually. Due to the prohibitive cost of sludge disposal, it is either dumped in open or along roadsides or railway tracks or stored in the sugar mill premises where it causes adverse impacts on the ambient environment. Apart from this, such practices entail wastage of organic and inorganic nutrients present in the sludge that might be put to good use (Elvira *et al.*, 1985).

The compost so obtained has less nutritive value and more compactness. Therefore, appropriate pressmud management technology is desired which not only protect and conserve the environment and land resources but also to recover the nutrients present in it. However, industrial sludge cannot be used without dilutions for earthworm feed because it contains several hazardous chemicals which directly harm inoculated earthworms in vermibed. A suitable amendment substance is needed for successful vermicomposting operation. Suthar (2006) used the saw dust and cowdung as bulky agents for vermicomposting trials of guar gum industrial wastes. He suggested that 60:20:20 ratio of industrial waste, cow dung and saw dust are ideal combination to achieve the maximum biopotential of earthworms. Garg *et al.* (2006) suggested that substrate containing 40% textile mill sludge+60% biogas plant slurry as a suitable combination for better mineralization and earthworm production during process.

The present study deals with the analysis of nutrient load and minerals in *E. eugeniae* filter mud, vermibed after supplementary with organic nutrient Jeevamirtham, Panchagavya, *Azospirillum* and Cow dung.

## MATERIALS AND METHODS

**Jeevamirtham preparation:** Two hundred liters of water was taken as a stock solution. To which, the following ingredients were mixed:

- Ten kg desi Cow dung (Cow dung of the native Indian breed Cow, collected fresh)
- Ten liters of desi Cow's urine (Urine can be collected and stored for any number of days, does not lose quality)
- Two kg of Palmyra jaggery and 2-4 liters of sugar cane juice
- Flour of black gram hand ground (not as effective if ground in a power grinder the particle size varies)
- Handful of chemical free soil

**Panchagavya:** It was prepared using Cow's urine (10 L), fruits (2 kg), yoghurt (0.5 kg), sugarcane juice (2 L), coconut juice (1 L) and a bit of toddy and left to ferment for 30 days.

**Biofertilizers:** *Azospirillum* was collected from Government Agriculture Department, Tenkasi, Tirunelveli, Tamilnadu, India.

**Cowdung:** Fresh Cow dung was collected from an intensively live stocked farm situated at Tenkasi, Tirunelveli, India.

**Earthworm's cultures:** *E. eugeniae* was obtained from a vermicomposting unit of Kalapavirusam (NGO) unit in Tenkasi, Tamilnadu, India. The stock culture of the earthworm was maintained in plastic containers using partially decomposed bio-waste and Cow dung as growth medium in laboratory condition. This was further used in the vermicomposting experiment.

**Filtermud:** The filter mud was collected from the Dharani Sugar Factory near Vasudevanallur, Tirunelveli, Tamilnadu. Fresh filter mud was mixed with goat dung in 1:1 ratio and kept in shade

for 2-3 weeks before using for the vermicomposting process. The partially degraded goat dung mixed Filter Mud (FM) was then blended with nutrient supplement Jeevamirtham (J), Panchagavya (P), *Azospirillum* (A) and Cow dung (C) in different proportion. Using filter mud eight different compositions ( $T_1$ - $T_8$ ) were prepared, (V/V) viz. FM:J-1:1 ( $T_1$ ); FM:J-1:3( $T_2$ ); FM:P-1:1( $T_3$ ); FM:P-1:3( $T_4$ ); FM:A-1:1( $T_5$ ); FM:A-1:3( $T_6$ ); FM:C-1:1( $T_7$ ) and FM:C-1:3( $T_8$ ).

**Experimental design:** The vermibed were prepared using filter mud in plastic containers and watering was done regularly to moist the medium. Eight treatments were taken for vermicomposting of FM materials; For filter mud the feed ratios introduced into the vermibed (in triplicates) are 100% Cow dung (C) control; Filter mud: Jeevamirtham FM+J(1:1); FM+J(3:1); Filtermud: Panchagavya; FM+P(1:1); FM+P(3:1); Filter mud: *Azospirillum*; FM+A(1:1); FM+A (3:1); Filtermud: Cow dung; FM+C(1:1); FM+C(3:1).

Experimental beddings were kept in triplicate for each treatment in perforated cylindrical plastic containers of capacity 6 L. Control consisted of 100% Cowdung (C) All waste mixtures were turned over manually for 15 days in order to pre-compost it so that it becomes palatable to earthworms. After 15 days of pre-composting 20 adult epigeic earthworms *E. eugeniae* species having individual live weight (350-400 mg) were inoculated in each vermicompost. All the vermicompost were operated in dark at a laboratory temperature of ( $26\pm 1^\circ\text{C}$ ). The moisture content was maintained at  $65\pm 5\%$  by periodic sprinkling of distilled water. During the experimental period no extra waste mixture was added at any stage in any vermicompost. All the vermicomposters were maintained in triplicate with earthworm density of twenty in each container. Control and treatments were triplicate. At the end of experiment, worms, cocoons and hatchlings were removed and so produced vermicompost was air dried at room temperature and packed in airtight plastic bottles for further physico-chemical and nutrient content analysis.

The vermicompost was harvested after appearance of black granular structure on the surface of the composting medium. Watering of the composting medium was discontinued four days before the harvesting. Vermicompost output from each treatment was calculated on dry weight basis.

**Compost analysis:** About 110 g of homogenized wet samples (free from earthworms, hatchlings and cocoons) were taken out at 60th day of composting period. Triplicate samples were collected and stored at  $4^\circ\text{C}$  for stability parameters, The pH and EC were determined using a double distilled water suspension of each waste in the ratio of 1:10 (w/v) that had been agitated mechanically for 30 min and filtered through Whatman No.1 filter paper. Total organic carbon (TOC) was measured using the method of Nelson and Sommers (1982). Total Nitrogen (TN) was determined after digesting the sample with concentrated  $\text{H}_2\text{SO}_4$  and concentrated  $\text{HClO}_4$  (9:1, v/v) according to Bremner and Mulvaney (1982) procedure. Total available phosphorus (TAP) was analyzed using the colorimetric method with molybdenum in sulphuric acid. Total potassium (TK) was determined after digesting the sample in diacid mixture (concentrated  $\text{HNO}_3$ : concentrated  $\text{HClO}_4$ , 4:1, v/v), by flame photometer (Bansal and Kapoor, 2000). Heavy metals' content in the vermicomposts was determined by using diacid digest of the sample. Analysis was done using Atomic Absorption Spectrophotometer (AAS). Standard solutions were prepared by using the nitrate salts of the estimated heavy metals.

## RESULTS AND DISCUSSION

**Physico-chemical changes in filter mud waste mixture during vermicomposting:** The earthworm processed waste mixture was more stabilized, odor-free, dark brown and nutrient rich material. During the process physio-chemical properties of waste mixtures is changed drastically and end material is rich in soil nutrients. Hence it is essential to specify various physico-chemical characteristics, such as pH, electrical conductivity, total organic carbon, total nitrogen, total available phosphorus, total potassium, metal content etc., to quantify the dynamics of vermicomposting process. Physico-chemical characteristics of the initial feed mixtures and vermicomposts are given in Table 1.

**Electrical conductivity (EC):** Electrical conductivity in the reactors  $T_1$ - $T_8$  varied in relation to vermicomposting period and supplement addition (Table 1). The prolongation of vermicomposting from 15 day to 60 days elevated the EC rate significantly in all the reactors. The increment was high in control and in other reaction. It was significant ( $p < 0.05$ ). The increase in EC was due to the loss of weight of organic matter and release of different mineral salts in available forms (such as phosphate, potassium and Ammonia) as reported by earlier workers (Garg *et al.*, 2006; Kaviraj and Sharma, 2003; Khwairakpam and Bhargava, 2009; Hait and Tare, 2011).

**Total pH content (pH):** pH is an important parameter in the vermicompost for promoting plant growth (Goh and Haynes, 1977). In the present study (Table 1), pH in the filter mud and filtermud supplemented with Jeevamirtham, Panchagavya, *Azospirillum* and Cow dung showed an alkaline trend above neutral (pH-7) at 15th days of vermicompost. After 60th days a shift from the initial alkaline status to neutral condition was observed. In all the reactors ( $T_1$ - $T_8$ ) the pH was in the range, 7.13-8.46. In Jeevamirtham treated filter mud the pH was 7.13 in  $T_1$  and 7.14 in  $T_2$ . In Panchagavya treatment the pH level was above 7.64 (Table 1). The change in pH after vermicomposting must be due to mineralization of nitrogen and phosphorus into nitrites/nitrates and orthophosphates and bioconversion of the organic material into intermediate species of organic acids (Ndegwa *et al.*, 2000; Khwairakpam and Bhargava, 2009). Ndegwa and Thompsan (2001) had reported that pH shift is dynamic and substrate dependent. The pH for all the reactors varied significantly ( $p < 0.05$ ) on 60th sampling days.

**Total nitrogen (TN):** The total nitrogen content after 15th days and 60th days of *E. eugeniae* action in the different vermibed was estimated. The results were compared with total nitrogen content in precomposted filter mud. In the filter mud the nitrogen content was  $1.63 \pm 0.0$  on 15th day and  $1.80 \pm 0.05$  on the 60th day in control. After supplementing the filter mud with Jeevamirtham, Panchagavya, *Azospirillum* and Cow dung, the total nitrogen content increased in all the treatments on 15th day except Panchagavya and Cow dung treatment. But on the 60th day in all the treatments ( $T_0$ - $T_8$ ) the total nitrogen level increased significantly. More than 2 fold increase in nitrogen content was observed in all treatments. Of the different substrates, tested  $T_5$  and  $T_6$  (*Azospirillum*) showed a good response. The increase in nitrogen contents during vermicomposting corroborates with the findings of other workers (Kaushik and Garg, 2004; Suthar and Singh, 2008; Khwairakpam and Bhargava, 2009; Hait and Tare, 2011). The reduction in dry weight i.e., organic carbon in terms of  $CO_2$  due to substrate utilization by earthworm and

Table 1: Variation in physico-chemical constituents during vermicomposting of filter mud with organic nutrient supplement

Treatments	Days	pH	EC	TN	TP	TK	TOC	Calcium (%)	Magnesium (%)	Sulphur (%)	Copper (%)	Zinc (%)	C/N ratio
T <sub>0</sub>	15th day	8.40±0.05	1.02±0.00	1.63±0.03	0.76±0.03	0.53±0.03	52.46±0.08	1.54±0.01	0.53±0.03	0.53±0.00	1.16±0.03	0.13±0.03	34.73±0.34
	60th day	8.06±0.03	2.36±0.03	1.80±0.05	0.83±0.03	0.60±0.25	48.33±0.33	2.74±0.0	0.87±0.00	0.53±0.03	0.70±0.05	1.10±0.11	28.63±0.03
T <sub>1</sub>	15th day	7.86±0.03	1.03±0.01	2.02±0.008	1.03±0.0	0.76±0.03	57.66±0.33	2.13±0.003	1.02±0.00	0.84±0.00	1.56±0.03	1.97±0.00	32.73±0.33
	60th day	7.13±0.00	2.04±0.00	4.07±0.00	2.66±0.04*	0.99±0.00*	47.7±0.01*	5.13±0.0*	2.23±0.01*	1.34±0.0*	2.10±0.005*	3.2±0.011*	14.04±0.01*
T <sub>2</sub>	15th day	8.33±0.03	1.43±0.14	1.97±0.003	0.97±0.003	0.56±0.03	59.33±0.3	1.97±0.003	0.99±0.00	0.78±0.00	0.80±0.05	1.72±0.00	33.80±0.35
	60th day	7.14±0.01	1.97±0.00	1.80±0.01	2.35±0.00	0.88±0.00*	43.01±0.47*	4.93±0.00*	1.82±0.00*	1.06±0.04*	1.83±0.06*	2.82±0.03*	12.42±0.01*
T <sub>3</sub>	15th day	8.46±0.03	1.22±0.00	0.86±0.03	0.56±0.003	0.36±0.00	63.38±0.35	1.31±0.00*	0.83±0.00	0.61±0.00	0.43±0.03	0.60±0.05	38.56±0.17
	60th day	7.64±0.00	1.35±0.07	1.80±0.01	0.40±0.2*	0.40±0.03*	43.38±0.35*	3.11±0.0	1.03±0.00*	0.81±0.03*	0.87±0.03*	0.87±0.08*	17.42±0.04*
T <sub>4</sub>	15th day	8.10±0.05	1.28±0.00	0.93±0.03	0.59±0.02	0.33±0.01	65.61±0.02	1.21±0.0	0.74±0.02	0.64±0.00	0.36±0.03	0.73±0.03	38.86±0.03
	60th day	7.65±0.01	1.69±0.02	2.44±0.01	0.63 ±0.01	1.40±0.03	45.61±0.02	2.21±0.0	0.90±0.00	0.84±0.08	0.53±0.03	0.90±0.05	16.6±0.01
T <sub>5</sub>	15th day	8.46±0.03	1.22±0.00	1.84±0.005	0.73±0.03	0.53±0.03	60.54±0.62	1.58±0.0	0.81±0.01	0.73±0.02	0.73±0.03	1.35±0.005	37.53±0.18
	60th day	7.53±0.00	1.90±0.00	4.06±0.00	2.47±0.01	1.10±0.01	51.88±0.62	3.11±0.0	0.88±0.00	1.21±0.00	1.23±0.03	1.70±0.05	14.50±0.11
T <sub>6</sub>	15th day	7.86±0.03	1.13±0.00	1.63±0.006	0.68±0.04	0.46±0.03	58.71±0.21	1.62±0.0	0.75±0.01	0.68±0.00	0.63±0.03	1.20±0.02	37.86±0.03
	60th day	7.42±0.00	1.82±0.01	3.45±0.02	1.69±0.02	1.40±0.00	48.71±0.21	2.97±0.00	0.77±0.00	1.03±0.02	0.93±0.03	1.17±0.03	14.06±0.01
T <sub>7</sub>	15th day	7.83±0.03	1.07±0.00	1.56±0.012	0.66±0.08	0.43±0.033	57.68±0.88	1.58±0.0	0.69±0.00	0.62±0.00	0.56±0.03	1.08±0.00	38.00±0.05
	60th day	7.47±0.00	1.68±0.04	3.69±0.02	2.32±0.04	1.43±0.00	54.71±0.15	3.01±0.01	1.21±0.00	1.18±0.00	1.03±0.08	1.30±0.011	14.27±0.17
T <sub>8</sub>	15th day	8.06±0.03	1.08±0.00	1.43±0.02	0.53±0.03	0.40±0.05	58.96±0.24	1.33±0.0	0.62±0.00	0.58±0.01	0.43±0.03	1.01±0.00	39.00±0.05
	60th day	7.65±0.00	1.83±0.03	3.42±0.01	2.12±0.01	0.82±0.01	59.34±0.27	2.95±0.01	1.27±0.00	1.04±0.00	0.70±0.05	1.37±0.08	14.97±0.00

p<0.05: Significant \*-non: Significant

microorganisms and then metabolic activities as well as addition of earthworm Nitrogen excrements and evaporative moisture loss due to prevailing environmental condition might have lead to increase in total nitrogen content (Viel *et al.*, 1987; Suthar and Singh, 2008).

**Total phosphorus (TP):** Total phosphorus in vermicompost contributes the presence of phosphate, an important macronutrient. Phosphate content in the vermicompost must be in an optimal level to promote the vermicompost as a plant nutrient. In the present study total phosphorus was in the range 0.53-1.03 in all the reactors at 15th day. At 15th day the reactor T<sub>1</sub> and T<sub>2</sub> had the high level of total phosphorus content (1.03±0.00 and 0.97±0.00) respectively. But in the 60th day vermibeds the amount of TP increased (Table 1). The increase in TP content during vermicomposting at 60th day was in the range of 1.69- 2.66 in the reactors T<sub>1</sub>, T<sub>2</sub>, T<sub>5</sub>, T<sub>6</sub>, T<sub>7</sub> and T<sub>8</sub>. In the treatment T<sub>3</sub> and T<sub>4</sub> the total phosphorus content at 60th day was less (0.40-0.63). In panchagavya treated filter mud the total phosphorus content was less on 15th and 60th day when compared with other treatments. The increase in TP content for control was in the range of (0.76±0.03). The increasing trend in TP content during vermicomposting had been reported by earlier workers (Delgado *et al.*, 1995; Tripathi and Bhardwaj, 2004; Suthar and Singh, 2008). Hait and Tare (2011) had postulated that the increase in TP content during vermicomposting was through mineralization, release and mobilization of available phosphorus content from organic waste performed partly by earthworm gut phosphates and further release of phosphorus might be due to phosphate solubilizing microorganisms present in worm cast (Le Bayon and Binet, 2006). According to Vig *et al.* (2011) the increase in phosphorus during vermicomposting was of the direct action of worm gut enzymes (Gut phosphates) and indirectly by stimulation of microflora.

**Total potassium (TK):** Potassium is one of the major nutrients essential for plant growth. The optimum presence of TK in a vermicompost elevates its nutritional value for application to crops. The total potassium content in all the vermireactors tested in the present study was in the range 0.33-0.99 at 15th day. But on the 60th day of vermicomposting the total potassium content level increased and it was in the range 0.82-1.43 in T<sub>1</sub>, T<sub>2</sub>, T<sub>5</sub>, T<sub>6</sub>, T<sub>7</sub> and T<sub>8</sub> vermibeds. But in the T<sub>3</sub> and T<sub>4</sub> vermibed the TK content was not significantly elevated. Probably Panchagavya supplementation might have affected the conversion process of TK in the vermireactors either by inhibiting the enzymes, mineralization process and microbial action. The TK content was observed to be increasing in Jeevamirtham supplemented vermibeds (T<sub>1</sub>-0.76±0.03) (T<sub>2</sub>-0.56±0.03) *Azospirillum* supplemented vermibeds (T<sub>5</sub>-0.53±0.03) (T<sub>6</sub>-0.46±0.03) and Cow dung supplemented vermibeds (T<sub>7</sub>-0.43±0.03) (T<sub>8</sub>-0.40±0.05) in 15th day of vermicomposting. The high concentration of TK in the above mentioned vermibeds (T<sub>1</sub>, T<sub>2</sub>, T<sub>5</sub>, T<sub>6</sub>, T<sub>7</sub> and T<sub>8</sub>) must be due to higher mineralization rate as a result of enhanced microbial and enzyme activities in the guts of the earthworms as reported earlier (Parthasarathi, 2006).

In the present study vermicomposted material showed more potassium mineralization rate than control material. The decomposition of organic wastes in the presence of worms drastically influences the availability to plant metabolites (Suthar, 2008). According to Barois and Lavelle (1986), the earthworm primes its symbiotic gut microflora with secreted mucus and water to increase their degradation of ingested organic matter and the release of metabolites (Suthar, 2008).

**Total organic carbon (TOC):** Total organic Carbon in 15th days and 60th days vermicompost was estimated in filter mud as well as filter mud and organic nutrient supplemented vermibeds.

Total organic content in 60th day vermicompost was reduced when compared to 15th days old vermicompost. The TOC content in 60th day old vermicompost was in the range 43.01-59.34 where as it was in the range 52.42-65.61 in 15th days old vermibeds. In all the treatment except Jeevamirtham the TOC decreased. The combined action of earthworms and microorganisms were responsible for TOC loss from initial feed (Prakash and Karmegam, 2010; Yadav and Garg, 2011). Elvira *et al.* (1998) had reported that 20-43% fraction of organic matter present in the initial feed substrates is lost as CO<sub>2</sub> during vermicomposting. Earthworms modify substrate conditions which consequently promotes the carbon losses from the substrates through microbial respiration in the form of CO<sub>2</sub> and even through mineralization of organic matter (Yadav and Garg, 2011).

**Calcium (Ca):** Calcium content in the vermicompost was higher than initial feed substrates. The increase in Ca level was higher in 60th day treatment than in 15th day treatment. In the 60th days vermicompost the highest Ca level was 5.13% observed in Jeevamirtham supplemented filtermud. The lowest level of Ca was noticed in filter mud vermibeds in which Panchagavya was supplemented (1.12%). When compared to control filter mud, the hike in Ca level in (T<sub>1</sub>) Jeevamirtham mixed filter mud was 87.23% on 60th day.

Suthar (2010b) reported that Ca metabolism in earthworm is primarily associated with gut secreted enzymes. He had also reported that in few endogeic and anecic worms the calcium gland is considered to play an important role in calcium secretion. The release of organically bound Ca in waste feed stocks is converted into free or plant available forms which makes vermicomposting techniques superiors than traditional composting method. Yadav and Garg (2011) had reported that earthworms drive the mineralization process and convert a proportion of calcium from binding form to free forms, resulting in enrichment in worm casts.

**Metals (Mg, S, Cu, Zn):** Vermicomposting caused significant changes in the metal content. In the present study the Mg, S, Cu and Zn contents in the substrate was less in 15th days treated vermireactors than the control. In 60th days old vermibeds the Cu, Mg, S and Zn contents level increased. (Table 1) Yadav and Garg (2009) also reported similar increase in vermicompost. Suthar (2010a) reported that there is no direct contribution of earthworm in Mg metabolism. However, it is hypothesized that the fungal and micro-algal hyphae which easily colonize on freshly deposited worm casts contributes to trace level of Mg, S and Zn are important micronutrients and play an important role in plant physiology. Mineralization of partially digested worm faecal by detritus communities (bacteria and fungi) and their action in the foregut resulted in high level of extractable or available trace elements in vermicompost (Suthar, 2010b). Kizilkaya (2004) stated that earthworm directly influences the availability of Zn in worm casts due to mineralization during passing of substrate through worms gut.

**Carbon and nitrogen ratio (C/N):** The C/N ratio in all the experimental set up including control (T<sub>0</sub>-T<sub>8</sub>) was in the range 32.73 to 39.00 after 15th day of vermicomposting. But prolongation of *E. eugeniae* activity on vermibeds had reduced the C/N ratio significantly (Table 1). The C/N ratio was in the range 12.42-17.42 after 60th of day vermicomposting. The decrease in C/N ratio was high in filter mud with Jeevamirtham (T<sub>2</sub>), whereas in other treatments, filter mud supplemented with Jeevamirtham, Panchagavya, *Azospirillum* and Cow dung (T<sub>1</sub>-T<sub>8</sub>), the C/N ratio on 60th day was not much reduced when compared to T<sub>0</sub>. The C/N ratio is a factor related to the decomposition



of the waste material and, even if it is recognized as a factor related negatively with the growth of earthworms and reproduction activities (Suthar, 2007). The C/N ratio, which is an indicator of maturity. A C/N ratio below 20 is indicative of acceptable maturity (Golueke, 1981) and a ratio 15 or less is preferable. In the present study, the observed decreasing trend in C/N ratio during vermicomposting is in good agreement with other authors (Suthar and Singh, 2008; Hait and Tare, 2011). In the present study in all the reactors the C/N ratio was less than 15 which is indicative of agronomic potential of vermicompost as reported (Hait and Tare, 2011). The C/N ratio was relatively less on 60th day in T<sub>1</sub>, T<sub>2</sub>, T<sub>5</sub>, T<sub>6</sub>, T<sub>7</sub> and T<sub>8</sub>. It was because of the higher amount of nitrogen content in the vermicompost.

## CONCLUSION

The present investigation clearly suggests that the incorporation of Jeevamirtham *Azospirillum* and Cow dung with filter mud convert this huge waste into highly valuable vermicompost. Due to excellent level of nutrient release into the filter mud by the action of *E. eugeniae*, the vermicompost becomes a good plant growth promoter. The results suggest that the filter mud supplementation with organic nutrient promotes the activity of the earthworm and produce highly nutritive vermicompost.

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