MATERIALS AND METHODS

3.1 Earthworm species exposed

The earthworm, *Eudrilus eugeniae* was mass cultured in cow dung medium at Sri Parasakthi College for Women, Courtallam. Cocoons from the culture were placed in petridishes containing distilled water to obtain newly hatched worms for further study.

*Eudrilus eugeniae* KINBERG, 1867

*E. eugeniae* also known as the African night crawler is an epigeic exotic worm. Its systematic position is

- **Phylum**: Annelida
- **Subphylum**: Clitellata
- **Class**: Oligochaeta
- **Order**: Haplotaxida
- **Family**: Eudrilidae
- **Genus**: *Eudrilus*
- **Species**: *eugeniae*
E. eugeniae was found to be distributed originally in equatorial West Africa but presently found in most parts of the world. It has been introduced by vermiculturists for various purposes in vermitechnology.

### 3.1.1 Primary differentiating characters

Length 90-185 mm, diameter 5-8 mm, segment number 145-196. Setae closely paired. Clitellum annular between segments xiv-xviii, less strongly developed ventrally. Male and prostatic pores paired, combined, large, immediately in front of furrow 17/18 between setal lines ab; penial setae absent. Female and spermathecal pores paired, combined moderately sized transverse slits centered at or just median to, setal lines cc, presetal on segment xiv. Gizzard in segment v, two midventral sub oesophageal pouches in segments x and xi with paired stalked calciferous glands laterodorsal in segment xii. Testes holandric. Paired ovaries in segment xiii with the ovisacs and external ends of the oviducts modified to form spermathecae. The growth of E. eugeniae is far better than other species and it gains upto 12mg/worm/day. A week after attainment of maturity, the individuals commence laying cocoon, almost one cocoon/day or upto 4 cocoons/day for 46 days, depending upon the environmental conditions. Incubation period for the cocoons ranges from 16-17 days and upto hatchlings emerge from a single cocoon. After two or three years the harvestings of the worms should be done because the reproductive activity gradually decrease, which affects composting activity. In such exhausted state it is advisable to utilize the worms as animal feed or it could be just buried in the field as a nitrogen source (Bhatnagar and Palta, 1996).
3.2 COLLECTION OF WASTES

Five different wastes such as Vitex negundo (Notchi), Ricinus communis (Aamanakku), Calotropis gigantea (Yerkku), Parthenium hysterophorus and spent tea waste were collected and transported to the working unit at Sri Parasakthi College, Courtallam. The waste materials obtained had high water content. To reduce the excess heat and volatile matter, the heaped wastes were well spread and sun dried. (Plate.1)

3.2.1. Vitex negundo

**Scientific Classification**

Kingdom : Plantae

Class : Angiosperms

Order : Lamiales

Family : Lamiaceae

Genus : Vitex

Species : negundo.

*V. negundo* is a large, aromatic shrub with quadrangular, densely whitish, tomentose branchlets. The leaves possess discutient properties and are applied to rheumatic swellings of the joints and in sprains. The plant has anti – inflammatory, antibacterial, antifungal and analgesic activities. The essential oil of *V. negundo* has been used to reduce inflammation and swelling of joints due to rheumatism and injuries.
### 3.2.2. *Ricinus communis*

**Scientific classification**

- **Kingdom**: Plantae
- **Class**: Magnoliopsida
- **Order**: Malpighiales
- **Family**: Euphorbiaceae
- **Genus**: *Ricinus*
- **Species**: *communis*

Then castor oil plant, *R. communis* is a species of flavoring plant in Euphorbiaceae. Castor is indigenous to the Southeastern Mediterranean Basin, Eastern Africa and India and is widespread throughout tropical regions. It is a fast growing, suckering perennial shrub and the leaves are long, colour varies from dark green to reddish tinge. It is used extensively as a decorative plant.
3.2.3. *Calotropis gigantea*

**Scientific classification**

Kingdom : Plantae

Class : Angiosperms

Order : Gentianales

Family : Apocynaceae

Genus : *Calotropis*

Species : *gigantea*

*C. gigantea* is a species of *calotropis*, native of Indonesia, Malaysia, Thailand, India and China. It is a large shrub, 4 meters tall and has clusters of waxy flowers that are white or lavender in colour. The plant has oval, light green leaves and milky stem. In India, the plant is common in the compounds of temples. This plant plays host to a variety of insects and butterflies.
3.2.4. *Parthenium hysterophorus*

**Scientific classification**

Kingdom : Plantae  
Class : Angiosperms  
Order : Asterales  
Family : Asteraceae  
Genus : *Parthenium*  
Species : *hysterophorus*.

The species *P. hysterophorus*, also known as congress weed, has become a common weed in India, Australia, and parts of Africa. In some areas, outbreaks have been of almost epidemic proportions, impacting crop production, giving stock and human health. *Parthenium* leaf extract is utilized to synthesize silver nanoparticles.

3.2.5. *Camellia sinensis*

**Scientific classification**

Kingdom : Plantae  
Class : Angiosperms  
Order : Ericales  
Family : Theaceae
Genus : Camellia
Species : sinensis

*C. sinensis* is the species of plant whose leaves and leaf buds are used to produce tea.
Older names for tea plant include Thea bohea, Thea sinesis and Thea viridis.

### 3.3 Selection of *Eudrilus eugeniae*

The exotic earthworm, *E. eugeniae* has been chosen for the present study based on the following reasons.

1. The prevailing climatic condition in South India is ideal for the activity of *E. eugeniae* (Bano and Kale, 1988). The worms perform well at tropical and subtropical conditions.

2. It is a voracious feeder on organic matter and prefers food richer in nitrogen, cellulose and microorganisms (Hartenstein and Bisesi, 1989) and all kinds of organic wastes having these qualities form the diet to this worm.

3. The biomass turnover is the most important factor in the species selection for vermicomposting. *E. eugeniae* attains higher biomass turnover within shorter period of time with higher fecundity than any other species of earthworm (Hartenstein and Bisesi, 1989, and Kale, *et al.*, 1992).

4. It has a shorter incubation period, higher fecundity and shorter life cycle with longevity more than one year.

5. Easy maintenance of this worm.
3.3.1 Mass culture of earthworm of *Eudrilus eugeniae*

Culturing of exotic earthworm *E. eugeniae* was carried out in the cement tank 69 × 42 × 30 cm dimensions. A bed of leaf litter and spent biogas slurry an ideal field material obtained from biogas plant and was prepared with a height of 0.5m into which 10 adult worms were inoculated into tank and pits. Regular watering is essential for earthworms. The worms being surface feeders gathered near the surface and started feeding vigorously. The feed was replenished after 40–45days of exhaustion. (Plate.2)

3.3.2 Vermicomposting

The collected dried waste materials were mixed with cow dung at 2:1, and one served as control, in which, 4 kg of dried leaf litter mixed with 2 kg of biogas slurry (2:1), and biogas slurry was only used as control. The above mixed waste materials were placed in 125 × 62.5× 25 cm size vermpits. The exotic earthworm *E. eugeniae* was inoculated, in which, 4 earthworms/ kg were inoculated and the whole setup was triplicated.

3.4 STATISTICAL ANALYSIS

The data on various physico chemical, microbial characteristic, enzymatic studies and field data of the samples were fed into the computer and mean values (X) with standard deviation (S.D) were obtained. Statistical significance on the basis of ‘F’ test (Analysis of Variance) was determined by using Microsoft Excel Package.