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SIGNIFICANCE OF VEGETABLE WASTE WITH VERMICOMPOSTING AND ITS RESPONSE ON GROWTH OF BRINJAL *(Solanum melongena L.)*

DIVYA.T & KAVITHA.A.V

PG & RESEARCH DEPARTMENT OF ZOOLOGY

GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS)

KUMBAKONAM-612 001

TAMIL NADU- INDIA

Kavitha041977@gmail.com

ABSTRACT

Vegetable crops generate a large amount of crop residues after harvesting of economic part. These potentially nutritious residues are soft, succulent and easily decomposable and instead of disposing or damping, it can be used as source of organic residues for utilizing the embedded nutrients through compost production. In thepresent study, diverse vegetable wastes were recycled for vermicomposting and their effects were evaluated in tank experiments in organic brinjal production. The main aim of this investigation was focused on the assessment of the potency of selected earthworm species *Eisenia foetida* with respect to their biodegradation of vegetable waste(combination of solannacae, leguminacae, cruciferae, cucurbitacae families) into organic manure known as vermicomposting and the effect of vermicomposting on the growth parameters namely plant height, leaf length, number of leaves, vegetable length and total yield of fruits .During the present study vermicomposting alone and chemical fertilizer alone treatment the growth attributes were drastically decreased when compared that of the treatment of vermicomposting with 4 families. Hence based on the various studies performed it was concluded that the vermicomposting obtained from the degradation of combination of solannacae, leguminacae, cruciferae, cucurbitacae families by *Eisenia foetida* is an effective organic manure which would facilitate increased uptake of the nutrients by the plants *(Solanum melongena L.)* resulting in higher growth and yield.

KEY WORDS

Vegetable waste, Vermicompost, *Eisenia Sfoetida*, Brinjal

INTRODUCTION

Earthworm play an important role in soil. The Greek philosopher Aristotle, named them the 'Intestine of earth'. In India so far 509 species referable to 67 genera and 10 families have been reported vermicomposting is used to plant growth. In India about 320 million tons of agriculture waste are generated annually of which vegetable waste alone in the major proportion. The vermicomposting is a rich source of beneficial microorganisms and nutrients and is used a soil conditioner or fertilizer. Increase in crop yield, soil nutrients status(*ChhotuandFulekar2008)*

The benefits of vermicomposting have high levels of macro and micro nutrients in a form which is easy to assimilate for cultivationand an improvement in the physical, chemical and biological properties of soil, as well as other growing mediums. Vegetable waste with vermicomposting consists of necessary minerals which act as organic fertilizer to enhance plant growth and improve soil process vermicomposting has become an appropriate alternative for the safe hygienic and cost effective disposal of vegetable wastes. Recycling of vegetable wastes using earthworms has become an important component of sustainable agriculture which has a multidirectional impact in terms of safe disposal of vegetable wastes preventing environmental pollution besides yielding nutrient rich material(*Mujeebunisaetal.,(2013).*

These earthworms could adapt relatively well to different types of organic wastes, provided the physical structure, pH and the salt concentration were not above the tolerance level for each earthworm species.The earthworms derive their nourishment from microorganisms that grow upon these materials and at the same time they promote further microbial activity since the faucal material or casts they produce is more fragmental and microbially active than what was consumed initial. During the process of composting the important plant nutrients in the materials (particularly nitrogen, potassium, phosphorus and calcium) are released and converted through microbial action into forms that are more soluble and bio available to plants.It has been found that earthworms necessarily have to feed on microbes, particularly on fungi for their protein /nitrogen requirement(*seethadevi etal.,2012*).The objective of this work was to evaluate the impact of vermicomposting of vegetable waste on brinjal plant height, leaf length, number of leaves and weight of fruits.

MATERIALS AND METHODS

Selection of plant: Brinjal*(Solanum melongena L.)*

CLASSIFICATION

Kingdom	**: plantae**
Class	**: Magnoliopsida**
Subclasss	**: Asteridae**
Order	**: Solanales**
Family	**: Solanaceae**
Genus	**: Solanum**
Species	**: Solanummelongena**

Field investigation were carried out Vannakkudi,Govindapuram (po), Thanjavur (D.t). During December 2014 to February 2015, to study the effect of vegetable waste with vermicomposting(organic manure) and inorganic fertilizer (chemical) on the growth and yield of transplanted Brinjal the materials used and method adopted for the investigation are discuss in this chapter.

SOIL CHARACTER

The soil of study area was loamy and contain low amount of organic matters P^H of the soil was 6.8- 7.8 and its slightly acidic in nature. The soil was rich in organic matter and moderately acidic. The climatic of the season is moderated and winter.

SEASON

The season of my study area was winter from December 2014 to February 2015.

VARIETY AND CHARACTER

Character of SM 164 Brinjal (Cylindrical shape, light purple colour) is fleshy, large plant. It provide good yield, flowers are purple in colour that gives rise to the familiar Brinjal vegetables.

Experimental set up 1

The tank experiment on vermicomposting was conducted during october to December of 2014 at the village of vannakkudi, Govindapuram(po), Thiruvidaimaruthur(tk), Thanjavur(Dt) India. The area is characterized by rainfall, high relative humidity, moderate temperature (maximumof 24–37°C), prolonged winter with high residualsoil moisture. Apart from kitchen and market wastes,vegetable residues from four different crop families and their combinations as well as cow dung were recycled forvermicomposting production. Under the Solanaceae family, tomato (*Lycopersiconesculentum Mill*.), potato (*Solanumtuberosum L*.) and brinjal (*Solanummelongena L*.) cropresidues were collected after harvesting of the crops. For leguminous residues, garden pea *(Pisumsativumvar.hortense Asch. and Graebn*.), French bean (*Phaseolus*vulgaris L.) and dolichos bean (*Lablabpurpureus L*.) wastes were chosen. In the Cruciferae family, unused part of cabbage (*Brassicaoleracea var. capitata L*.), cauliflower(*Brassica oleracea var. botrytis L*.) and knolkhol (*Brassica oleracea var. gongylodes L*.) were taken and for Cucurbitaceae family, leaves and vines of bottle gourd [*Lagenariasiceraria (Mol.)Standl*.], pumpkin (*CucurbitamoschataDuch ex Poir*.) and wax gourd [*Benincasahispida (Thunb*.) *Cogn*.]were collected and recycled for vermicomposting production.

Treatment details

There were 3 treatments laid out in complete randomized design with three replications. The treatments were T1 was wastes from (Solanaceae, Leguminasae, Cruciferae and Cucurbitaceae family), T2—was vermicomposting alone, T3 was from chemical fertilizers alone treatments.

Vermicomposting

To prepare vermicomposting for the treatments(T1) the collected vegetable wastes were finely chopped to 5 cm pieces and were allowed to pre-decompose aerobically for 20 days in cemented tank and mixing with cow dungat 1:1 ratio on weight basis. Then, 300 of adult [*Eisenia foetida*] were introduced individually into 20 kg of pre-decomposed biowastes for the treatments(T1) again 20 kg of cow dung used for the treatment T2. Turning was given at 30 days interval for five times and intermittent sprinkle of water was done to keep the substrate moist enough (60 % moisture level) without stagnation of water at the bottom. After around 80 days, the feed materials were converted to odorless loose granular structure. The total earthworm biomass and vermicomposting recovery from each treatment were recorded during harvesting of vermicomposting. This methods was adopted by(*Ranjit chatterjee etal.*,(*2014*).

BIOMETRIC OBSERVATION

Forrecording biometric observation 6 plants were chosen by random sampling, this plant were use for recording all biometric observation at different stage of the plant growth.

GROWTH ATTRIBUTES

Plant Height (cm)

The plant height was measured from ground level to the tip of most leaf these was observed at every 30 days interval. The mean height was worked out expressed in cm scaling.

Length of Vegetables (cm)

The length of vegetables was measured from the tip of the Brinjal to edge of the Brinjal. The measurement only for cm scaling.

The total number of leaves

The total number of leafs was counted in every 30 days interval.

The total yield of vegetables (gm)

The total yield of vegetables in plant were measured for digital weight parameter

RESULT

The preparation of vegetable waste with vermicomposting on cement tank experiments conducted at vannakkudi, Govindapuram(po), Thiruvidaimaruthur(Tk), Thanjavur(Dt) during winter season of December 2014 to February 2015. . The experiments treated with vegetable waste with vermicompost and chemical fertilizer. Treatment-1 Solanacae family contains tomato (*Lycopersicone sculentum Mill*.), potato (*Solanumtuberosum L*.), and brinjal (*Solanum melongena L*.), Leguminacae family contains garden pea (*Pisumsativumvar. hortense Asch*. and *Graebn*.), French bean (*Phaselusvulgaris L*.) and dolichos bean (*Lablab purpureus L*.). Cruciferae family contains cabbage (*Brassica oleracea var. capitata L*.), cauliflower (*Brassica oleracea var. botrytis L*.) and knolkhol (*Brassica oleracea var. gongylodes L*.) Cucurbitaccae family contains bottle gourd (*Lagenariasiceraria (Mol) Standl*.), pumpkin (*CucurbitamoschataDuchexPoir*.) and wax gourd (*Benincasahispida (Thunb.) Cogn*.)were collected. combines all families , Treatment-2 vermicomposting alone, Treatment-3 chemical fertilizer.

GROWTH ATTRIBUTES

Plant height on 30th day

In combination of all families (T-1) treatment the plant height showed 15.2±1.074 cm. In vermicomposting alone (T-2) treatment the plant height showed 9.76±0.84 cm. In chemical fertilizer alone (T-3) treatment the plant height showed 10.4±0.98 cm. (Table 1)

During the vermicomposting alone and chemical fertilizer alone treatment the plant height drastically decreased when compared that the (T-1)combination of all families.(⁒ COFT +31.5 and ⁒COVT +35.7)(Table 1)

When compared with vermicomposting and chemical fertilizer alone treatment the plant height drastically decreased vermicomposting alone treatment (⁒ COFT -6.55).

Plant height in 60th day

In combination of all families (T-1) treatment the plant height showed 20.9±1.11 cm. In vermicomposting alone (T-2) treatment the plant height showed 15.9±0.99 cm. In chemical fertilizer alone (T-3) treatment the plant height showed 16.2±0.86 cm. (Table 1)

During the vermicomposting alone and chemical fertilizer alone treatment the plant height drastically decreased when compared that the (T-1) combination of all families.(٪COFT+22.4 and٪COVT +23.9) (Table 1)

When compared with vermicomposting and chemical fertilizer alone treatment the plant height drastically decreased vermicomposting alone treatment (٪ COFT -1.88).

Plant height in 90th day

In combination of all families (T-1) treatment the plant height showed 31±1.14 cm. In vermicomposting alone (T-2) treatment the plant height showed 25.9±1.06 cm. In chemical fertilizer alone (T-3) treatment the plant height showed 27.2±0.80 cm. (Table 1)

During the vermicomposting alone and chemical fertilizer alone treatment the plant height drastically decreased when compared that the (T-1) combination of all families.(٪COFT +13.2 and٪COVT +16.4) (Table 1)

When compared with vermicomposting and chemical fertilizer alone treatment the plant height drastically decreased vermicomposting alone treatment (٪ COFT-3.86).

Leaf length in 30th day

In combination of all families (T-1) treatment the leaf length showed 8.61±1.50 cm. In vermicomposting alone (T-2) treatment the leaf length showed 5.38±1.37 cm. In chemical fertilizer alone (T-3) treatment the leaf length showed 5.75±1.32 cm. (Table 2)

During the vermicomposting alone and chemical fertilizer alone treatment the leaf length drastically decreased when compared that the (T-1) combination of all families.(٪COFT+33.2 and٪ COVT +37.5) (Table 2)

When compared with vermicomposting and chemical fertilizer alone treatment the leaf length drastically decreased vermicomposting alone treatment (% COFT -6.87).

Leaf length in 60th day

In combination of all families (T-1) treatment the leaf length showed 10.8±2.41 cm. In vermicomposting alone (T-2) treatment the leaf length showed 6.13±1.11 cm. In chemical fertilizer alone (T-3) treatment the leaf length showed 8.21±1.75 cm. (Table 2)

During the vermicomposting alone and chemical fertilizer alone treatment the leaf length drastically decreased when compared that the (T-1) combination of all families.(%COFT +23.9 and %COVT +43.2) (Table 2)

When compared with vermicomposting and chemical fertilizer alone treatment alone the leaf length drastically decreased vermicomposting alone treatment (% COFT -33.9).

Leaf length in 90th day

In combination of all family (T-1) treatment the leaf length showed 12.9±1.51 cm. In vermicomposting alone (T-2) treatment the leaf length showed 8.9±1.53 cm. In chemical fertilizer alone (T-3) treatment the leaf length showed 9.91±1.74 cm. (Table 2)

During the vermicomposting alone and chemical fertilizer alone treatment the leaf length drastically decreased when compared that the (T-1) combination of all families.(%COFT +23.1 and %COVT +31 (Table 2)

When compared with vermicomposting and chemical fertilizer alone treatment the leaf length drastically decreased vermicomposting alone treatment (% COFT -11.3).

Number of leaves in 30th day

In combination of all families (T-1) treatment the number of leaves showed 4.5±0.95 cm. In vermicomposting alone (T-2) treatment the number of leaves showed 2.16±1.06 cm. In chemical fertilizer alone (T-3) treatment the number of leaves showed 3.16±1.34 cm. (Table 3)

During the vermicomposting alone and chemical fertilizer alone treatment the number of leaves drastically decreased when compared that the (T-1) combination of all families.(%COFT +29.77 and %COVT+ 52) (Table 3)

When compared with vermicomposting and chemical fertilizer alone treatment the number of leaves drastically decreased vermicomposting alone treatment (% COFT -46.2).

Number of leaves in 60th day

In combination of all families (T-1) treatment the number of leaves showed 5.66±1.49 cm. In vermicomposting alone (T-2) treatment the number of leaves showed 3.83±1.46 cm. In chemical fertilizer alone (T-3) treatment the number of leaves showed 4.33±0.94 cm. (Table 3)

During the vermicomposting alone and chemical fertilizer alone treatment the number of leaves drastically decreased when compared that the (T-1) combination of all families.(%COFT +32.33 and %COVT +41.16) (Table 3)

When compared with vermicomposting and chemical fertilizer alone treatment the number of leaves drastically decreased vermicomposting alone treatment (% COFT -15.01).

Number of leaves in 90th day

In combination of all families (T-1) treatment the number of leaves showed 10.5±3.54 cm. In vermicomposting alone (T-2) treatment the number of leaves showed 5.66±1.97 cm. In chemical fertilizer alone (T-3) treatment the number of leaves showed 6.83±2.11 cm. (Table 3).

During the vermicomposting alone and chemical fertilizer alone treatment the number of leaves drastically decreased when compared that the (T-1) combination of all families.(%COFT +39.23 and %COVT +46.09 (Table 3).

When compared with vermicomposting and chemical fertilizer alone treatment the number of leaves drastically decreased vermi alone treatment (% COFT - 12.72).

Fruit length

In combination of all families (T-1) treatment the fruit length showed 6.16±0.46 cm. In vermicomposting alone (T-2) treatment the fruit length showed 3.35±0.40 cm. In chemical fertilizer alone (T-3) treatment the fruit length showed 3.55±0.85 cm. (Table 4)

During the vermicomposting alone and chemical fertilizer alone treatment the fruit length drastically decreased when compared that the (T-1) combination of all families.(٪COFT +42.37 and ٪COVT +45.61)(Table 4)

When compared with vermicomposting and chemical fertilizer alone treatment the fruit length drastically decreased vermicomposting alone treatment (٪COFT -5.97).

Total yield

In combination of all families (T-1) treatment the fruit yield showed 30.8±4.77 kg. In vermicomposting alone (T-2) treatment the fruit yield showed 23.8±2.60 kg. In chemical fertilizer alone (T-3) treatment the fruit yield showed 28.6±3.81 kg. (Table 5).

During the vermicomposting alone and chemical fertilizer alone treatment the fruit yield showed drastically decreased when compared that the (T-1) combination of all families.(٪COFT +7.14 and ٪COVT +22.72) (Table 5).

When compared with vermicomposting and chemical fertilizer alone treatment the fruit yield drastically decreased vermicomposting alone treatment (٪COFT -20.16).

TABLE: 1

SIGNIFICANCE OF VEGETABLE WASTE WITH VERMICOMPOSTING AND CHEMICAL FERTILIZER ON THE PLANT HEIGHT IN BRINJAL

(Solanummelongena L.)

DAYS	TREATMENT(CM)IN PLANT HEIGHT		
	COMBINATION OF ALL FAMILIES(T1)	VERMICOMPOSTING ALONE(T2)	CHEMICAL FERTILIZER ALONE(T3)
30	15.2±1.07	9.76±0.84	10.4±0.98
%COFT	+31.5	-6.55	-
%COVT	+35.7	-	+6.15
60	20.9±1.11	15.9±0.09	16.2±0.86
%COFT	+22.4	-1.88	-
%COVT	+23.9	-	+1.85
90	31±1.14	25.9±1.06	26.9±1.05
%COFT	+13.2	-3.86	-
%COVT	+16.4	-	+3.71

MEAN ±STANDARD DEVIATION (Mean of six individuals observation)

%COFT- PERCENTAGE CHANGE OVER CHEMICAL FERTILIZER TREATMENT

%COVT- PERCENTAGE CHANGE OVER VERMICOMPOST TREATMENT

TABLE:2

SIGNIFICANCE OF VEGETABLE WASTE WITH VERMICOMPOSTING AND CHEMICAL FERTILIZER ON THE LEAF LENGTH IN BRINJAL

(Solanummelongena L.)

DAYS	TREATMENT(CM)IN LEAF LENGTH		
	COMBINATION OF ALL FAMILIES(T1)	VERMICOMPOSTING ALONE(T2)	CHEMICAL FERTILIZER ALONE(T3)
30	8.61±1.50	5.38±1.37	5.75±1.32
%COFT	+33.2	-6.87	-
%COVT	+37.5	-	+6.43
60	10.8±2.41	6.13±1.11	8.21±1.75
%COFT	+23.9	-33.9	-
%COVT	+43.2	-	+25.3
90	12.9±1.51	8.9±1.53	9.91±1.74
%COFT	+23.1	-11.3	-
%COVT	+31	-	+10.19

MEAN ±STANDARD DEVIATION(mean of six individuals observation)

%COFT- PERCENTAGE CHANGE OVER CHEMICAL FERTILIZER TREATME

%COVT- PERCENTAGE CHANGE OVER VERMICOMPOST TREATMENT

TABLE:3

SIGNIFICANCE OF VEGETABLE WASTE WITH VERMICOMPOSTING AND CHEMICAL FERTILIZER ON THE NUMBER OF LEAVES IN BRINJAL

(Solanummelongena L.)

DAYS	TREATMENT(CM)IN NUMBER OF LEAVES		
	COMBINATION OF ALL FAMILIES(T1)	VERMICOMPOSTING ALONE(T2)	CHEMICAL FERTILIZER ALONE (T3)
30	4.5±0.95	2.16±1.06	3.16±1.34
%COFT	+29.77	-46.29	-
%COVT	+52	-	+31.64
60	5.66±1.49	3.33±0.94	3.83±1.46
%COFT	+32.33	-15.01	-
%COVT	+41.16	-	+13.05
90	10.5±3.54	5.66±1.97	6.38±2.11
%COFT	+39.23	-12.72	-
%COVT	+46.09	-	+11.28

MEAN ±STANDARD DEVIATION(mean of six individuals observation)

%COFT- PERCENTAGE CHANGE OVER CHEMICAL FERTILIZER TREATME

%COVT- PERCENTAGE CHANGE OVER VERMICOMPOST TREATMENT

TABLE:4

SIGNIFICANCE OF VEGETABLE WASTE WITH VERMICOMPOSTING AND CHEMICAL FERTILIZER ON THE VEGETABLE LENGTH IN BRINJAL

(*Solanummelongena L.)*

DAYS	TREATMENT(CM)IN VEGETABLE LENGTH		
	COMBINATION OF ALL FAMILIES(T1)	VERMICOMPOSTING ALONE(T2)	CHEMICAL FERTILIZER ALONE(T3)
90	6.16±0.46	3.35±0.40	3.55±0.85
%COFT	+42.37	-5.97	-
%COVT	+45.61	-	+5.63

MEAN ±STANDARD DEVIATION(mean of six individuals observation)

%COFT- PERCENTAGE CHANGE OVER CHEMICAL FERTILIZER TREATME

%COVT- PERCENTAGE CHANGE OVER VERMICOMPOST TREATMENT

TABLE:5

SIGNIFICANCE OF VEGETABLE WASTE WITH VERMICOMPOSTING AND CHEMICAL FERTILIZER ON THE TOTAL YIELD OF FRUITS IN BRINJAL *(Solanummelongena L.)*

DAYS	TREATMENT(CM)IN TOTAL YIELD OF FRUITS		
	COMBINATION OF ALL FAMILIES(T1)	VERMICOMPOSTING ALONE(T2)	CHEMICAL FERTILIZER ALONE(T3)
90	30.8±4.77	23.8±2.60	28.6±3.81
%COFT	+7.14	-20.16	-
%COVT	+22.72	-	+16.78

MEAN ±STANDARD DEVIATION(mean of six individuals observation)

%COFT- PERCENTAGE CHANGE OVER CHEMICAL FERTILIZER TREATMENT

%COVT- PERCENTAGE CHANGE OVER VERMICOMPOST TREATMENT

DISCUSSION

The earthworm *Eiseniafoetida* was analyzed to find the degrading potential of vegetable wastes. The effect of vermicomposting on growth parameters of selected vegetable plant namely brinjal*(Solanummelongena L.)* was studied. During the present study the growth attributes plant height,leaflength,number of leaves,vegetable length and total yield of fruits,were increased during the vegetable waste with vermicomposting treatment compared than vermicomposting alone and chemical fertilizer alone treatment.

*PuneetaDandotiya*and *Agrawal* (2012) reported that analysis of vermicomposting revealed maximum nitrogen(N), Potassium(K) and Phosphorus (P) content when treated with vegetable waste with vermicomposting. Thus it is concluded that vegetable waste can be converted into high quality vermicomposting is an environment friendly manner. *Seethadevi* (2012) reported that fruit waste amended with cow dung and soil into vermicomposting using both *Eiseniafetida and Eudrilluseugenia*. The fruit waste with vermicomposting promote the growth of the plant which would be due to the microbial degradation process.

Mujebunisaetal., (2013) reported that soil organisms are essential for nutrient cycling and organic matter turn over there by functioning as key determinations of soil fertility and nutrient uptake by plants. Rapid urbanization, industrialization, unplanned population growth misuse and abuse of the environment have led to an increased accumulation of soil waste materials. This not only reduces available fertile land, but also pollutants air, water and soil. Due to lack of financial resources more than 90% of solid waste is deposited off on land in an indiscriminate manner posing significant hazards to the environment. The present work aims at studying the growth of worm with the help of various wastes.

Sutharetal.,(2008), *Ghoshetal*., (1999) reported that the enhanced P level in the vermicomposting suggests Phophorous mineralization during the process. The worms during vermicomposting converted the insoluble P into soluble forms with the help of P solubilizing microorganisms through phosphateses present in the gut, making if more available to plants. The increased level of phosphorus would be increased the plant growth.

Finally,the vegetable waste accumulation causing and spreading disease namely, Malaria, Cholera andFever. Human were affected by Malaria, Cholera and Fever that disease by the accumulation of vegetable waste. So, we take vegetable waste and recycled degraded and converting into organic fertilizer with the help of earthworm. It would be helpful for humans and also vegetable waste with vermicomposting gave benefits for increased level of yield in agriculture.

REFERENCES

1. Chhotu D. Jadia and M.H. Fulekar (2008). Vermicomposting of vegetable waste: A bio physiochemical process based on hydro-operating bioreactor. African*Journal of Biotechnology* 7(20), 3723-3730.
2. T.T.Mane , and S. RaskarSmita (2012). Management of Agriculture Waste from Market yard Through Vermicomposting. *Research Journal of Recent Sciences 1, 289- 296.*
3. R. Melgar- Ramirez and M.I. Pascual- Alex (2010). Characterization and use of a vegetable waste vermicompost as an alternative component in substrates for horticulture seedbeds.*Spanjsh Journal of Agrjcultural Research 8 (4), 1174-1182.*
4. M.Mujeebunisa, V.Divya and D.Aruna (2013). Effect of leaf litter, vegetable waste, coffee waste, flower waste and may flower waste added vermicompost on weight gain in *Eudriluseugeniae*. *Asian Journal of Plant Science and Research 3 (6), 1-4.*
5. PuneetaDandotiya, O.P.Agrawal (2014). Stabilization of Vegetable Market Waste through Vermicomposting. *International Journal of Science and Research 3 (6).*
6. G. Seetha Devi, A.Karthiga, S.Susila and VasanthyMuthunarayanan (2012). Bioconservation of fruit waste into vermicompost by employing *Eudriluseugeniae* and *Eiseniafoetida*. *International Journal of Plant, Animal and Environmental Sciences 2 (4), 245-252*.
7. Swati Pattnaik and M.Vikram Reddy (2009). Nutrient status of Vermicompost of Urban Green Waste Processed by Three Earthworm Species- *Eiseniafoetida, Eudriluseugeniae, and Perionyx excavates*. *Applied and Environmental Soil Science 2010 (2010), 1-13.*