International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

Vermicomposting of *Eicchornia*, *Ipomea* and *Parthenium* using Different Species of Earthworm

P. Porkodi[1], T. Athistalatha[2], Dr. Arokiam Thaddeus[3]

[1]Research Scholar, Mother Teresa Women's University, Kodaikanal, India

[2]Research Student, Sri Adi Chunchanagiri Women's College, Cumbum, India

[3]Research Guide, Jeyaraj Annapackium College for Women, Periyakulam, India

Abstract: ***This study has been undertaken to compared the nurient levels of vermicompost by used different substrate such as cow dung, Eichhornia crassipes, Ipomoea carnea and Parthenium hysterophorus weeds by the efficacy of the two earthworm species Eisenia fetida and Eudrilus eugeniae were tested. The physical, chemical, biological factors of these obtained vermicompost were determined. Then the effect of these vermicompost in the growth of Vigna radiatae carried out. Among the study Eisenia fetida showed highest nutrient value of vermicompost than Eudrilus eugeniae. The cow dung vermicomposts (A1 and N1) showed highest nutrient value and growth parameters of Vigna radiatae followed by combined source of cowdung and weed vermicompost (A5, N5, A3, N3, A7 and N7) than weed vermicompost without cowdung (A5, N5, A3, N3, A6 and N6).***

Keywords: Eicchornia, Ipomea, Eisenia fetida and Parthenium

1. Introduction

The prevention and management of weeds has been a continuous problem throughout the history of food production and native ecosystem protection in the world. Weeds still reduce productivity and profitability by unacceptable amounts, and upset the balance of our natural ecosystems (Rasool *et al.*, 2008).

Weeds also create health hazards. They are also responsible for the loss of biodiversity. Among the biotic factors weeds cause about 37% of loss of agricultural produce. Food loss due to the weeds is estimated around 20 metric ton and about 100 billion rupees is spent on weed management annually in India (Krishnamurthy *et al.*, 2005).

2. Review of Literature

Vermicomposting trials of noxious weed *Lantana camara* (LL) leaf litter spiked with cow dung (CD) in different ratios (0%, 20%, 40%, 60% and 80%) using *Eisenia fetida* showed decrease in pH, total organic carbon and C:N ratio but increase in ash content, nitrogen (N), phosphorus (P), potassium (K) and calcium (Ca). The germination index (GI) was between 47% and 83% in all vermicomposts were observed in seed bioassay test (Suthar and Sharma, 2013).

Twelve terrestrial weeds such as *Triumfetta rhomboiclea, Clzenopoditim album, Leucas lavandular folia* and nine perennials such as *Ipomoea sepiaria, Cynoden dectylon, Eupatorium oderatum, mikania cordata, clerodendrum infortunatum, Sacchanium spontaneum, Cyperus rotundeis, Parthenium hysterophorus* and *Imperata cylindrical* were perfectly converted to vermicompost (Sannigrahi, 2008).

Effect of use of *Trianthema* vermicompost on quality aspects of spinach reported that the incorporated *Trianthema* organic manures had significant influence on leaf chlorophyll contents and *Trianthema* organic manures had important persuade on ascorbic acid and β carotene content of spinach (Iyagba, 2010).

To determine an influence of seaweed extracts *(Ecklonia maxima* and *Saragassum spp)* a humic (12%) and fulvic (6%) acids mixture on the germination. Experiments involved seed germination, chlorophyll content and fresh weight of shoots and roots. Seaweed extracts stronger induced seed germination than humic substances. Joint seed and foliar application and double foliar application promote shoot and root growth (Matysiak *et al*., 2011).

Parthenium hysterophorus, Cassia serecia, and *Chromolaena odorata* weed composts were prepared at preflowering and post flowering stage while *Portulaca oleracea* at preflowering stage. Composts prepared from weed species before flowering stage had more beneficial effects than the composts prepared at later stages because of higher nutrient content (Channappagoudar *et al.*, 2007).

Macrophyte (Fresh water weeds) based vermicompost on germination, growth and yield of *Solanum melongena* under field conditions. Macrophyte-based vermicompost is an efficient quality yielder and economy enhancer for sustainable agriculture especially for the communities had vegetable gardens around lakes will benefit by using macrophyte vermicompost, a balanced and low-cost organic fertilizer (Najar and Khan, 2015).

3. Material and Methodology

Collection of Materials

Plant parts of *Eichhornia crassipes, Ipomoea carnea* and *Parthenium hysterophorus* were used for the study was obtained from vaigai dam, lake in Thapukundu and kamatchipuram garden (Theni District, Thamil nadu, India). They were cut into small pieces and were subjected for partial decomposition. Cow dung was collected from nearby dairy form.

The two earthworm species such as *Eisenia fetida* and *Eudrilus eugeniae* were collected from vemicomposting unit in Thapukundu. The experiments were carried out for the period of 90 days in cendect KVK institute, Kamatchipuram, Theni.

Preparation of feeding materials
The plant materials were separately covered by clay for maintaining moisture and anaerobic condition and converted the plant material to palatable feed to earthworm.

Preparation of the compost:
The experiments were conducted in cement tanks; a total 14 cement tanks were used and kept in 2 sets, 7 tanks for *Eisenia fetida* was named as **N1, N2, N3, N4, N5, N6, N7** and 7 for *Eudrilus eugeniae* was named as **A1, A2, A3, A4, A5, A6, A7.** Totally 3 Kg feed material were introduced separately on each set.

Water was sprinkled to the feed material to maintain 80% moisture which was maintained throughout the study. 100 earthworms were inoculated into the feed material. The materials with earthworm was rotated gently and periodically, to prevent agglomeration of feed materials and to facilitate better porosity and aeration. The initial substrate and final vermicompost samples were drawn from tank and key parameters (Moisture content, pH, carbon content, nitrogen, phosphorus, potassium and C: N ratio) were analyzed at Cendect KVK laboratory.

The dried compost was sieved through 2mm sieve and well prepared sample was kept for analysis.

Physio-Chemical Analysis
Before introducing the earthworms into the tanks that was at initial and at the final day the sample of vermicompost were analyzed.

Determination of Ph
The pH of the given sample was determined with the help of a pH meter. Before determination, the pH meter was standardized using buffer solution.

Determination of Electrical Conductivity (EC) (Boopathi *et al*, 2005)
The Electrical conductivity of the given sample was determined with the help of a EC meter.

Estimation of organic carbon (Walky and black, 1934) (Trivedi and Goel, 1986), Estimation of nitrogen (Microkjeldhal method), Estimation of phosphorus, Estimation of potassium (Flame photometric method) Growth parameters, Germination assay (Anantha krishnasamy *et al*, 2013)

The green gram seeds were arranged equi spacially on the periphery of sterilized china dishes lined with filter paper. Each china dishes was filled with different vermicompost and soil was taken in one china dishes as control. 15 seeds were used. Each treatment including control was replicated five times.

All the china dishes were kept under diffused light at room temperature. The number of seeds germinated in each treatment was calculated. The emergence of radical was taken as a criterion for germination.

The percentage of germination was calculated as per the following formula.

$$\text{Percentage of Germination} = \frac{\text{Number of seed germinated}}{\text{Total number of seeds sown}} \times 100$$

Pot Experiment
Fifteen seeds were sown in each pot. In one pot soil only was used and treated as control. The remaining 14 pots were filled with soil and prepared different vermicompost and the experiment were carried out for 30 days. The readings were taken as triplicates of measurement.

Observation of Shoot Length, Root Length of *Vigna radiata*
The shoot and root length of randomly selected shoot and root was measured for both the control and experimental plants with the help of meter scale. The measurement was taken within the time interval of 15, 30 and 45 days.

Vigour Index (Maisuria and Patel, 2009)
Seedlings vigour index in different vermicompost samples and control was calculated under

Vigour index = Root length + shoot length x percentage of seed germination

Dimension of Leaves
The length, width of leaves was measured using meter scale. The measurement was taken within the time interval of 15, 30 and 45 days.

Chlorophyll Estimation (Arnon, 1949)
One gram of finely cut and well mixed sample of leaf was taken. It was ground to fine pulp with mortar and pestle by adding of magnesium carbonate and 1ml of acetone. The mixture was washed with 9 ml of acetone and it was then centrifuged at 500 rpm for 5 minutes, supernatant was collected and absorbance was measured at 645 and 663nm.
Total chlorophyll = $20.2\ A_{645} + 8.02A_{663.}$

Phytochemical Studies (Harborne 1998, Sazada *et al., 2009*)

Extraction procedure
The leaves of *Vigna radiata* were taken and washed well under the running water. 10gm leaves were taken in separate mortar and pestle homogenized with 100ml of methanol. The crude preparation was left overnight in the airtight container. Then it was filtered by Whatmann No. 1 filter paper. The crude extracts of all samples were collected in separate sealed glass tubes, to avoid evaporation.

Qualitative analysis of Alkaloids by Mayer,s test, Terpenoids by Salkowski test, Flavonoids by Sodium hydroxide test, Sulphuric acid test.

A fraction of the extract was treated with Conc.sulphuric acid and observed for the formation of orange colour indicates the presence of flavonoids.

Test for tannins
The substance mixed with basic lead acetate solution. Formation of white precipiatate indicates the presence of tannins.

Test for saponins

Foaming test
A fracton of the aqueous alcoholic plant extract was taken in a test tube and shaken well. Persistent foam formed above the liquid surface indicates the presence of saponins.

Test for phenolic compounds
2 ml of extract was diluted with 5 ml of distilled water. To this a few drops of neutral 5% ferric chloride solution was added. A dark green color indicates the presence of phenolic compounds.

Qualitative test for Protein

Biuret reagent
- Sodium hydroxide : 10% solution in water
- Copper sulphate : 0.5% solution in water

Take 2ml of the sample in a test tube. Add 2ml of sodium hydroxide. Mixed well and add copper sulphate solution drop wise, mixing after each addition. Two or three drops of copper sulphate solution are sufficient to obtain good results.

A purple-violet or pinkish-violet color indicates the presence of protein.

Qualitative test for Sugars
The substance was mixed with equal volume of Fehling's A and B solutions, heated in water bath. Formation of red color is the indication of the presence of sugar.

4. Result and Discussion

Physio-Chemical analysis of Vermicomposts
In that study different substrate such as cow dung, *Eichhornia crassipes*, *Ipomoea carnea* and *Parthenium hysterophorus* weeds were converted in to vermicompost and the efficacy of the two earthworm species *Eisenia fetida* and *Eudrilus eugeniae* were tested. The physical, chemical, biological factors of these obtained vermicompost were determined. Then the effect of these vermicompost in the growth of *Vigna radiatae* carried out.

It was found that the nutrient content significantly varied among the treatments. The amount of major nutrients such as nitrogen, phosphorus and potassium gradually increased in the process of vermicomposting whereas organic carbon content and carbon:nitrogen ratio decreased gradually.

The results of present study coincide with Singh and Abuja, (2014) report, determined that the different chemical parameter of *Water hyacinth* vermicompost mixed with cow dung and saw dust using *Eisenia fetida* showed increase in total nitrogen, phosphorus, sodium and potassium respectively.

Determination of pH
The pH value of vermicompost in all the treatment was lower (5.8-7.3) than the pH value of intial substrate (7.6-8.3). Bisen *et al* (2011)., reported that the pH of final produce declined in all the treatments to neutral and ranged from (4.81-7.13) than initial substrate.

Determination of Electrical Conductivity (ec)
The electrical conductivity of vermicompost in all the treatment was lower (0.53-0.89) than the electrical conductivity of initial substrate (0.97-2.31).

The present findings decreased EC was supported by Nadi *et al*., (2011) showed an eventually decrease in electrical conductivity of vermicompost compared to substrate.

Estmation of Organic Carbon
The organic carbon (OC) decreased (11.54-15.11) in all the treatments compared to initial substrate (15.21-17.42).

Anbalagan *et al*., (2012), reported that the organic carbon content decreased as compared to initial feed material which is *Parthenium and cowdung* due to the combined action of earthworms and microorganisms and also the formation of Co_2.

Estimation of available Nitrogen
The nitrogen content of vermicompost of the two earthworm species in all the fourteen vermicompost was higher (0.64-1.02) than the initial level (0.51-0.86).

Savalgi *et al.*, (2001) stated that mineralization of organic matter containing proteins increases N content in vermicompost.

Estimation of available Phosphorus
The phosphorous content was higher in all vermicompost harvested at the end of the experiment compared to the initial substrate.

The present study was similar to Gandhi and sundari, (2012) reports that highest number of phosphorus was found in cow dung vermicompost compared to *Eichhornia* vermicompost.

Estimation of available Potassium in Soil
The potassium level increased in all treatments compared to initial substrate.

The present findings were supported by Anbalagan *et al.*, (2012)

C: N ratio
The C:N ratio of different substrates degraded by earthworm had been reduced significantly to lower level in cow dung vermicompost (A1 and N1) followed by vermicompost of mixed source with weeds and cow dung (A3,A5, A7, N3, N5 and N7) than vermicompost of 100% weed vermicompost. .

Hence the present study has established the fact that the used plant materials along with the cow dung and leaf wastes could be very well subjected for the process of vermicomposting. And it has resulted in a compost material with a favorable C: N ratio.

The result of the present study are in accordance with previous report which showed that have recorded the reduction in C: N ratio during composting process and inferred that the reduction in carbon and lowering of C: N ratio in the Vermicomposting process could be achieved either by the respiratory activity of earthworms and microorganisms or by increase in nitrogen by microbial mineralization of organic matter in combination with the addition of the worm's nitrogenous waste through their excretion (Muthunarayanan *et al.,* (2011).

Preparation of different types of feed stock

Effect of vermicompost on growth parameters

Germination studies

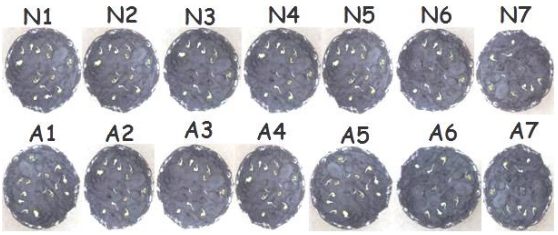
The maximum germination was observed in A1 (cow dung+ *E.fetida*) (100%). The minimum germination was observed in N6 (*Parthenium* vermicompost). All treatment showed high germination percentage than control (table 2).

The lower germination was supported by Girijesh *et al.,*(2005) increase in the concentration of *Parthenium* leaf extract, enhanced the deleterious effect on seed germination and growth parameters of ground nut, sorghum and green gram among the crop species, sorghum and ground nut were more sensitive and showed reduction of germinations. Inhibitory effect of *Parthenium* on the seeds may be due to allelochemicals such as sesquiterpene mainly parthenin, traces of phenolics and organic acids.

Effect of Vermicompost on Seed Germination

Effect of Vermicompost on Seed Germination

Treatment	Number of seeds sown	Number of seed germinated	Percentage of germination (%)
Control	15	9	60
N1	15	14	93
N2	15	12	80
N3	15	12	80
N4	15	13	87
N5	15	13	87
N6	15	10	67
N7	15	11	73
A1	15	15	100
A2	15	13	87
A3	15	13	87
A4	15	14	93
A5	15	15	100
A6	15	11	73
A7	15	11	73



Pot Experiment

Observation of Shoot Length, Root Length of *vigna radiatae*

According to the experiment maximum growth of Vigna *radiatae* was recorded in A1 (cow dung + *E. fetida*) compared to other treatments followed by A5, A3, N5, N3, A7 and N7 which are partially mixed with cowdung. 100% weed source vermicompost showed significantly lower growth than partially mixed with cow dung (table 3 & 4).

Theunissen *et al.,* (2010) experiments reported vermicompost derived from water hyacinth (*Eichhornia crassipes* L.) on the growth and flowering of *Crossandra undulaefolia*, showed that the achieved significantly better height, larger number of leaves, more favorable root to shoot ratio and greater biomass per unit time than the control plants.

Vigour Index

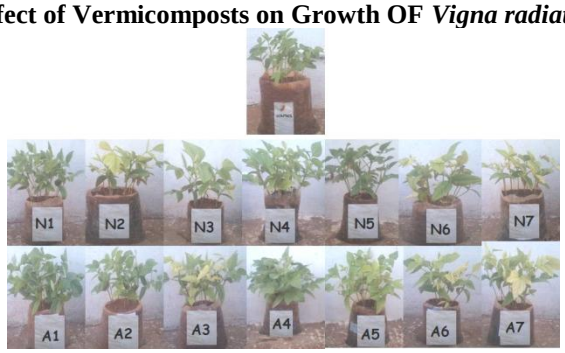
The Influence of various vermicompost in seed germination, shoot length and root length can be seen from the vigour index. The vigour index was increased in all treatments compared to non vermicompost treated plants. The highest vigour index was observed in A1 followed by A5 and next to A3. The lowest vigour index was observed in N6 (*Parthenium* mediated vermicompost) (table 5).

Supported that the positive effect of vermicompost by Joshi and Vig.,(2010).

Effect of Vermicompost on Vigour Index

Treatment	Vigour index Number of days		
	15	30	45
Control	318	432	540
N1	1450	1664.7	1869.3
N2	688	800	1016
N3	720	864	1080
N4	861.3	1052.7	1218
N5	1044	1235.4	1383.3
N6	603	716.9	763.8
N7	700.8	824.9	897.9
A1	1720	1990	2280
A2	913.5	1087.5	1252.8
A3	939.6	1131	1409.4
A4	1181.1	1395	1543.8
A5	1420	1670	1920
A6	627.8	788.4	890.6
A7	730	824.9	963.6

Effect of Vermicomposts on Growth OF *Vigna radiatae*



Dimention of leaves

The length width of leaves showed greater modification in all vermicompost samples in 45days when compared to control (table 6).

Classen *et al.,* (2007) reported similar with the present study was positive results with vermicompost obtained from a series of experiments on field grown turnips

Chlorophyll Estimation

The chlorophyll content of leaves showed greater modification in all vermicompost samples in 45 days when compared to control. Cow dung vermicompost showed highest value than the other treatments (table 7).

The present study results were similar with Ghadge and Jadhav., (2013) reported vermicompost of cow dung showed increased chlorophyll content compared to vermicompost of *Ipomoea* and *Lantana weeds.*

Effect of Vermicompost on Chlorophyll Content

Treatments	Chlorophyll (mg/g Fresh weight)
Control	2.15
N1	3.85
N2	3.21
N3	3.28
N4	3.31
N5	3.66
N6	2.29
N7	2.54
A1	3.97
A2	3.35
A3	3.49
A4	3.57
A5	3.79
A6	2.42
A7	2.61

Phytochemical Studies

Qualitative Analysis test for Alkaloids, Terpenoids, Flavonoids, Tannins, Saponins, Phenolic Compounds, Protein and Sugars. The phytochemical contents of plants increased in plants treated with vermicompost than the control (table 8). Phytochemicals from part of the natural plant defense system against infection and microbial invasions.

Data Analysis

Data sets were subjected to multivariate statistical techniques: mean standard deviation and one way-analysis of variance (ANOVA). The tests were achieved with a significant level (P-0.0000696) for shoot length and (P-0.027) for root length which is less than 0.05 and F values are 8.87 for shoot length and 3.96 for root length.

5. Summary and Conclusion

"Vermiculture Movement" is going on in India with multiple objectives of community waste management, highly economical way of crop production, which replaces the costly chemical fertilizers, and poverty eradication programs in villages.

Among the study *Eisenia fetida showed* highest nutrient value of vermicompost than *Eudrilus eugeniae.* The cow dung vermicomposts (A1 and N1) showed highest nutrient value and growth parameters of *Vigna radiatae* followed by combined source of cowdung and weed vermicompost (A5, N5, A3, N3, A7 and N7) than weed vermicompost without cowdung (A5, N5, A3, N3, A6 and N6). *Parthenium* vermicompost showed significantly lowest nutrient level and germination and growth parameters of *Vigna radiatae* due to its allelopathic less inhibitory effect in vercomposed *Parthenium* plant due to the presence of sesquiterpene mainly parthenin, traces of phenolics and organic acids . But it is less toxic than the non vermicomposted plant and *Parthenium* vermicompost which lack seeds.

Study revealed that the Vermicompost produced from the weeds is not only having beneficial effects on soil health, growth, quality and yield of crop but also playing vital role in eradication of pollution hazards. A huge quantity of domestic, agricultural and rural industrial organic wastes includes weed population from the agricultural fields and surrounding areas can be recycled by the effective and fast decomposition through vermicomposting.

References

[1] Abbasi, T., Anuradha, J., Abbasi, S.A., 2014. Utilization of the Terrestrial Weed Guduchi (*Tinospora cordifolia*) in Clean-Green Synthesis of Gold Nanoparticles. Nanosci Technol. 1, 1-7.

[2] Ali, M., Griffiths, A.J., Williams, K.P., Jones, D.L., 2007. Evaluating the growth characteristics of lettuce in vermicompost and green waste compost. European journal of soil biology. 43, 16-19.
[3] Ali, M.D.N., 2012. Comparative analysis of different feeding stock for the production of vermicompost by *Eisenia fetida.* Journal of crop and weed. 8, 171-172.
[4] Ananthakrishnasamy, S., Gunasekaran, G., Manimegala, G., Sundaramoorthy, P., Murugeshwari, S., 2013. Effect of ordinary compost, compost by effective microorganisms and vermicompost from municipal solid waste on the growth and yield of *Vigna mungo (L)*. Indian streams research journal. 3, 45-57.
[5] Apurva, P., Sinha, S.K., Thakur, P.C., 2010, Composting an obnoxious Weed, *Parthenium hysterophorus L.*,With the Help of a *Millipede, Harpaphe haydeniana.* Asian J. Exp. Biol. Sci. 1, 337 – 343.
[6] Arnon, D.I., 1949. Copper enzymes in isolated chloroplast, polyphenol oxidase in *Beta vulgaris.* Plant physiol. 24, 1-15.
[7] Babu, V.S.M., Adinarayana, G., Subbaiah, R.K., Balaguravaiah, D., Reddy, Y.T., 2008. Vermicompost with different farm wastes and problematic weeds. Indian J Agric Res. 42, 52-56.
[8] Banerjee, A., Matai, S., 2010. Composition of Indian aquatic plants in relation to utilization as animal forage. J.Aquat. Plant manage. 28, 69-73.
[9] Baskar, U.G., Kshirsagar, G.S., Saoji, A.A., 2013. Comparative study of vermicompost using *Parthenium* biodung and usual green biodung. International journal of bioassays. 2, 819-824.
[10] Blessy, K., Prabha, M.L., 2014. Application of *water hyacinth* vermicompost on the growth of *Capsicum annum.* International journal of pharma sciences and research. 5,198-203.
[11] Chakraborty, N.R Duary, B., 2014. Utilization of Some Weeds as Medicine by the Local People in Birbhum District of West Bengal. International Journal of Bio-resource and Stress Management. 5, 148-152.
[12] Chauhan, A., Kumar, S., Singh, A.P., Gupta, M., 2010. Vermicomposting of vegetable wastes with cowdung using three earthworm species *Eisenia fetida, eudrilus eugeniae* and *Perionyx excavates.* Nature and science. 8, 33-43.
[13] Chinnusamy, C., Nithya, C., Muthukrishnan, P., 2006. Making *Parthenium*-compost: an approach for *Parthenium* management. Proce, 3rd Int. Confer. On Parthenium management. 4,151-154.
[14] Classen, J.J., Rice, J.M., Sherman, R., 2007. The effects of vermicompost on field turnips and rainfall runoff. Compost Sci. Utilisation. 15(1), 34-39.
[15] Deka, H., Deka, S., Baruah, C.K., 2013. Vermicomposting of *water hyacinth, Eichhornia crassipes* (mart.solms) employing indigenous earthworm species. International conference on chemical, agriculture and medical sciences. 5, 66-69.
[16] Deshmukh, H.V., Bartakke, G.R., 2012. Utilization of common weed *Ipomoea carnea* along with distillery waste for biogas production. Int J Curr Sci. 229-240.
[17] Dhanalakshmi, V., Remia, K.M., Shanmugapriyan, S., Shanthi, K., 2014. Impact of addition of Vermicompost on Vegetable Plant Growth. International Research Journal of Biological Sciences. 3, 56-61.
[18] Dixit, S., Tiwari, S., 2007. Effective utilization of an aquatic weed in an eco-friendly treatment of polluted water bodies. J. Appl. Sci. Environ. Manage. 11, 41–44.
[19] effect of on C and N contents and the availability of nutrients, Bio fertile soils. Journal on new biological reports. 162-166.
[20] Gajalakshmi, S., Abbasi, S.A., 2004. Neem leaves as a source of fertilizer-cum-pesticide vermicompost. Bioresource Technology. 92(3), 291-296.
[21] Gajalakshmi, S., Ramasamy, E.V., Abbasi, S.A 2001. Potential of two epigeic and two anecic earthworms species in vermicomposting *water hyacinth*. Bioresource Technology. 76, 177-18.
[22] Gandhi, A., Sundari, U.S., 2012. Effect of vermicompost prepared from aquatic weeds on growth and yield of eggplant (Solanum Melongena.L). Biofertil Biopestici. 3, 1-4.
[23] Garg, P., Gupta, A., Satya, S., 2008. Vermicomposting of different types of waste using *Eisenia fetida*, A comparative study. Bioresource technology. 97, 391-395.
[24] Girijesh, G.K., Basavaraj naik, T., Krishnamurthy, R., Rajashekarappa, C.K.S., Pushpa, K., 2005. Allelopathic effect of *Parthenium* on germination and root and shoot growth of food crops. Proce. 2nd Int. Confer. On Parthenium management. 235-237.
[25] Gupta, R., Garg, V.K., 2009. Vermicomposting of garbage, a new technology for solid waste management in hindu temples. Int.J.of environment and waste management. 3, 51-64.
[26] Gupta, R., Garg, V.K., 2009. Vermicomposting of garbage, a new technology for solid waste management in hindu temples. Int.J.of environment and waste management. 3, 51-64.
[27] Hosten, P.E., 2007. Factors Controlling Patterns of Canada Thistle (*Cirsium arvense*) and Yellow Starthistle (*Centaurea solstitialis*) Across the Cascade-Siskiyou. National Monument. U.S. Department of the Interior, Bureau of Land Management, Medford District.3, 32-46.
[28] Iyagba, A.g., 2010. A review on root and tuber crop production and their weed management among small scale farmers in Nigeria. ARPN Journal of Agricultural and Biological Science. 5, 67-89.
[29] Jafari, N., 2010. Ecological and socio-economic utilization of water hyacinth (*Eichhornia crassipes*). J. Appl. Sci. Environ. Manage. 14, 43 – 49.
[30] Joshi, R., Vig, A.P Singh, J., 2013. Vermicompost as soil supplement to enhance growth, yield and quality of *Triticum aestivum* L.: a field study. International Journal of Recycling of Organic Waste in Agriculture. 2, 1-16.
[31] Joshi, R., Vig, A.P., 2010. Effect of Vermicompost on Growth, Yield and Quality of Tomato (*Lycopersicum esculentum* L). African Journal of Basic & Applied Sciences. 2, 117-123.
[32] Khan, A., Ishaq, F., 2011. Chemical nutrient analysis of different composts (*Vermicompost* and *Pitcompost*) and their effect on the growth of a vegetative crop *Pisum sativum.* Asian Journal of Plant Science and Research. 1, 116-130.

[33] Kishor, P., Ghosh, A.K., Singh, S., Maurya, B.R., 2010. Potential use of *Parthenium* (*Parthenium hysterophorus* L.) in Agriculture. Asian J Agric Res. 4, 220-225.
[34] Krishnamurthy, R., Gowda, R.C., Murthy, C.A.S., Prasad, R.T.V., 2005. *Parthenium* and *Chromolaena* as compost and green manure in transplanted rice. Proce. 2nd Int. Confer. On Parthenium management. 193-196.
[35] Kumar, R., Verma, D., Singh, B.L., Kumar, U., Shweta., 2010 Composting of sugar-cane waste by-products through treatment with microorganisms and subsequent vermicomposting. Bioresour Technol. 101, 6707-6711.
[36] Kumar, S., Vishwakarma, K., 2005. Nutritive value of Alligator weed and its possible utility as a fodder in India. Indian J Weed Sci. 37, 152.
[37] Madan, S., Yadav, A., 2012. Vermicomposting of distillery sludge with different wastes by using *Eisenia fetida.* Advances in applied research. 3, 3844-3847.
[38] Mamta., Wani, K.A., Rao, R.J., 2012. Effect of vermicompost on growth of brinjal plant (solanum melongena) under field conditions. Journal on new biological reports. 1, 25-28.
[39] Mathivanan, A.L.A., Sundaramoorthy, C.P., Kalaikandhan, R., 2012. Effect of vermicompost on germination and biochemical constituents of ground nut *(Arachis hypogaea.* L.*)* seedlings. International Journal of Research in Biological Sciences. 2, 54-59.
[40] Matysiak, K., Kaczmarek, S., Krawczyk, R., 2011. Influence of seaweed extracts and mixture of humic and fulvic acids on germination and growth of *Zea mays* L. Acta Sci. Pol., Agricultura. 10, 33-45.
[41] Muthukumaravel, K., Amsath, A., Sulumaran, M., 2008. Vermicomposting of vegetable wastes using cowdung. E-journal of chemistry. 5, 810-813.
[42] Nadi, M., Golchin, A., Mozafari, V., Saeidi, T., Sedaghati, E., 2011. The Effects of Different Vermicomposts on the Growth and Chemical Composition of the Pistachio Seedlings. Journal of Research in Agricultural Science. 7, 59-69.
[43] Nailwade, P., Mogle, U., Jadhav, B., 2011. Improving total chlorophyll, ascorbic acid and β carotene in Spinach by applying weed manures. Bio sci Discovery. 2, 251-255.
[44] Najar, I.A., Khan, A.B., 2015. Effect of macrophyte vermicompost on growth and productivity of brinjal (*Solanum melongena*) under field conditions. A Journal of ecology and application. 4, 1-28.
[45] Njoroge, N., Bussmann, G., Rainer, W., Barbara, G., Newton, L.E., Victoria, W.N., 2015. Co-Utilisation of Weed Species As Sources Of Traditional Medicines In Central Kenya. Int J Recycl Org Waste Agricult. 15, 34-42.
[46] Pandurang, M.U., 2014. Efficacy of weed vermicompost and chemical fertilizer on yield, morpho-pysiological and biochemical investigations of maize. Int. Res. J of science and engineering. 2, 19-22.
[47] Patidar, A., Gupta, R., Tiwari, A., 2013. Potential of microbial inoculated *Water hyacinth* amended thermophilic composting and vermicomposting in biodegradation of agro-industrial waste. Journal of bioremediation and biodegradation. 4, 1-7.
[48] Priya, H.R., Veena Pavithra, A.H., Divya Joythi, D., 2014. Prospects and Problems of Utilization of Weed Biomass. Journal of Agriculture and Allied Sciences. 3, 1-11.
[49] Priya, S., Santhi, S., 2014. Effect of vermicomposts on the growth of amaranthus plants and soil fertility. Advances in Applied Science Research. 5, 231-240.
[50] Rajendran, M., Thivyatharsan, R., 2014. Performance of different species of earthworms on vermicomposting. International journal of research in agriculture and food sciences, 3, 1-6.
[51] Rajkhowa, D.J., 2008. Utilization of Weed Biomass for Nitrogen Substitution in Rice (*Oryza sativa*)- Rice System. Indian J Weed Sci. 40, 27-32.
[52] Rajkhowa, D.J., Gogoi, A.K., Yaduraju, T., 2005. Weed utilization for vermicompost. National research centre for weed science. 2-16.
[53] Rakshit, A., Sarkar, N.C., Sen, D., 2008. Influence of organic manures on productivity of two varieties of rice. Journal of Central European Agriculture. 4, 24-44.