International Journal of Zoology and Applied Biosciences **ISSN: 2455-9571**
Volume 2, Issue 4, pp: 166-169, 2017
https://doi.org/10.5281/zenodo.1311963
http://www.ijzab.com
Research Article

EVALUATION OF HOSTEL KITCHEN WASTES VERMICOMPOSTED USING *EISENIA FOETIDA* FOR GROWTH STUDY OF LADIES FINGER (*ABLEMOSCHUS ESCULENTUS*)

P. Sivakumar* and P. Meena

Department of Biology, Gandhigram Rural Institute - Deemed University,
Gandhigram-624 302, Dindigul Dist, Tamil Nadu, India.

Article History: Received 11th April 2017; Accepted 16th June 2017; Published 25th August 2017

ABSTRACT

Present study deals with the evaluation of hostel kitchen wastes vermicomposted using *Eisenia foetida* for growth study of Ladies finger (*Ablemoschus esculentus*) preparation of Hostel Kitchen waste vermicompost and its physico-chemical parameters were analyzed, enumeration of microorganisms bacteria, fungi and actinomyces from vermicompost, preparation of vermiwash and vermicompost extract and its physico-chemical parameters were analyzed, growth parameters and biochemical characteristics also studied of Ladies finger. The Hostel Kitchen waste vermicompost was studied the physico-chemical parameters like pH, temperature, electrical conductivity, organic carbon, total nitrogen, total phosphorous, total potassium and C:N (ratio) were studied. The number of colony forming unit of the vermicompost of Bacteria, Fungi and Actinomyces. After preparation of vermicompost, vermiwash and vermicompost extract was prepared using after 45 days worked healthy earthworm. The physico-chemical parameters of vermiwash and vermicompost extract also studied. The growth parameters like, seed germination, shoot length, root length, total fresh weight, total dry weight, leaf area index and vigour index were studied and biochemical characteristics such as chlorophyll a & b, total chlorophyll, carotenoide and anthocyanin were estimated. Based on the results growth parameters and biochemical characteristics were higher in ladies finger treatments 5 and 6 using various concentration of vermicompost, vermiwash and vermicompost extract.

Keywords: Vermicompost, Vermi wash, Vermicompost extract, Physico-chemical parameters, Biochemical parameters.

INTRODUCTION

Every home kitchen generates food scraps for disposal. Throwing these scraps in the garbage can create odor problems and adds to the volume of waste going to the landfill. Disposing of kitchen waste in a garbage disposal is convenient. But it is also the border of the waste treatment system and through away a potentially reliable resource. Furthermore garbage disposal not recommended to homes that rely on a septic system for waste disposal (Shekdar 1999). Vermicomposting technology is one of the best options available for the treatment of organics rich solid wastes by the conversion of bio gradable garbage into high quality yield. Agriculture waste, city garbage and kitchen waste has been recycled with vermicomposting along with bioconversion of organic waste wastes materials into nutrition rich vermicompost by earthworm activity, vermicomposting is an important aspect as it converts waste to wealth by using cheap eco-friendly option with activity of earth worms (Hartenstein and Biseri (1988).

The present study deals with the effect of vermicompost from vegetable market waste on growth and yield of okra plant (*Ablemoschus esculentus)*. The influence of vegetable market waste with low dung substrate of feeding material on the growth (biomass) in composting earthworm's species *Eudrilus eugeniae* has been noticed. The demand for organic vegetable is increasing day by day in domestic and market. Carrot is highly nutritious and preferred sale vegetable is common household (Puspanjali Sonowal *et al.,* 2014). As market for organic carrot is flourishing very fast, farmers are gradually adopting organic carrot cultivation using vermicompost as organic source of nutrients. Vermicompost is the cast obtained from the ingested biome by earthworm after undergoing physical chemical, microbial transformations. vermicompost contains higher percentage of available nutrient Applied use of earthworms in the breakdown of a wide range of organic residues, kitchen waste and industrial refuse to produce vermicompost has been recommended Van Gestel

*Corresponding Author: P. Sivakumar, Department of Biology, Gandhigram Rural Institute, Deemed University, Gandhigram-624 302, Tamil Nadu, India. Email: sivak2067@gmail.com.

et al., (1992). The work related to the preparation of predecompost with vermicompost, preparation of vermiwash and vermicompost extract, physical parameters of predecompost and physic chemical parameters of vermicompost, enumeration of microorganisms (bacteria, fungi and actinomyces) growth parameters and biochemical characteristics of Ladies finger (*Ablemoschus esculentus*) is totally wanting. Hence the present study was carried out.

MATERIALS AND METHODS

Hostel kitchen wastes are collected and cut into small pieces and dried under shade condition. To this hostel kitchen wastes add cow dung in the ratio of 1:3 (1 kg of hostel kitchen wastes and 3 kg of cow dung). This set up was kept for predecomposition in tank (40 cm height × 55 cm diameter size) for 30 days. Water was regularly sprinkled and the substrate was regularly turned for 30 days, for preparing the vermicompost, the predecomposition was directly mixed with cow dung in 1:2 (1 kg of predecompost and 2 kg of cow dung) ratio on dry weight basis in same tank. The substrates were hold 60-80 percentage of moisture content and kept for 24 hrs stabilization. Seventy number of healthy, clitellate Earth worm *Eisenia foetida* were introduced in the same tank. After 45th day, the trial tank compost were sieved and collected for weed plants waste vermicompost. The vermicompost extracts were analyzed for various physico-chemical parameters such as pH, electric conductivity, total nitrogen, total phosphorous and total potassium using standard procedures (Nirmala Natarajan and Gajendran 2014).

The enumeration of microorganisms such as bacteria, fungi and actinomycetes were used standard plate count method (Chitrapriya *et al.,* 2013). The vermiwash and vermicompost extract were prepared using standard procedures (Gurav and Pathade, 2011). The vermiwash and vermicompost extract were analyzed for various physico-chemical parameter such as pH, electrical conductivity, total nitrogen, total phosphorous and total potassium using standard procedures Avinish and Joshi (2010). Pot culture study was carried out for growth parameters were observed and biochemical characteristics were analyzed for 30 days and 60days intervals of pot culture study of Ladies finger (*Ablemoschus esculentus*).

RESULTS AND DISCUSSION

The physico-chemical parameters of hostel kitchen wastes vermicompost was given in the table 1. The physico-chemical parameters of hostel kitchen waste vermicompost, such as pH (7), Temperature (36^{0}C), Electrical conductivity (420), Organic carbon (58.47), Nitrogen (2.68), Potassium (2.3), Phosphorus (2.6), C:N ratio (4:1). Avinish and Joshi (2010) also reported the vermicompost vegetable waste using cowdung using *Eisenia foetida, Eudrilus eugeniae* were the physico-chemical parameters such as pH (8.2), Organic carbon (3.90), Nitrogen (2.50), Phosphorous (27.5), Potassium (0.30), C:N ratio (28.32). Azizi Abu Baka *et al.,* (2011) also reported the vermicompost market waste using *Eisenia foetida* were the physico-chemical parameters such as carbon (60.25), nitrogen (4.45), C:N ratio (13.54). Ramar and Vasanthy (2014) studied that the vermicompost kitchen waste using *Eisenia foetida* were the physico-chemical parameters such as pH (7), Electrical conductivity (1.52,) Carbon (2.59), Nitrogen (1.06), Potassium (1.94).

The physico-chemical parameters of vermiwash such as pH was (6.8), temperature (29^{0}C) electrical conductivity (1.1 x 10^{2}), carbon (36.34), nitrogen (2.61), total phosphorus (2.10), and potassium (2.05), C:N ratio (17.48). The physico-chemical parameters of vermicompost extract (Table 3) such as pH was (6.7) Temperature (30^{0}c), Electrical conductivity (1.0x10^{2}), Carbon (56.89), Nitrogen (2.31), Phosphorus (1.81), Potassium (2.10), C:N ratio (21.72). Musaida Mercy Manyuchi and Anthonyraj (2013) studied the physico-chemical parameters of vermicompost using vermiwash moisture content (40%) were analyzed. Jayanthi and Jayanthi (2013) reported that the physico-chemical parameters of using species *Eudrilus eugeniae* vermiwash were Nitrogen (1.94), Phosphorous (3.40), and Potassium (0.96).

The vermicompost (*Eisenia foetida*) the enumeration of micro organisms (bacteria, fungi and actinomyces) from 45 days worked vermicompost (Table 2). The microorganisms bacteria was (60 x 10^{6}), fungi (19 x 10^{3}) and Actinomyces was (151 x 10^{4}). Jadia and Fulekar (2008) reported the physico-chemical parameters of market waste using *Eisenia foetida* were enumeration of micro organisms such as bacteria (34) and fungi (67). Seetha Devi *et al.,* (2012) also reported physico-chemical parameters of fruit waste vermicompost using *Eisenia foetida, Eudrilus eugeniae*. The enumeration of micro organisms Bacteria and fungi were analyzed for fruit wastes vermicompost. Viji and Narayanan (2013) also reported the physico-chemical parameters of vegetable waste vermicompost using *Eudrilus eugeniae*. After 45 days vermicompost was enumerated the microorganisms like bacteria (170), fungi (295) and actinomyces (11).

The growth parameters of ladies finger germination efficiency (Table 4) was higher in T_6 (100%) and lower in T_0 (73%). The growth parameters were root length (6.1±0.57), shoot length (5.5±1.00), fresh leaf (2.5±1.4), fresh weight (7.5±3.5) and dry weight (1.5±2.1). Ranjit Chatterjee *et al.* (2014) also reported the growth parameters of carrot plant root length (19.76), shoot length (18.76), plant height (30.33±1.15) using various concentration of vermicomposting compared to inorganic fertilizer. Kanimozhi and Jayakumar (2015) also reported the growth parameters like height (117.33 ± 2.08), number of leaves (12 ±2), flowering (38.33 ± 1.15) of Bendi using vermicompost. Jaya Nair *et al.* (2006) also reported the growth parameters such as root length, number of leaves, plant height using various concentrations of vermicompost, vermiwash, and vermiextract.

The biochemical parameters of ladies finger (Table 5) was chlorophyll a (2.66± 4.2), in T4 plant treatment was higher. Lower in T6 (0.601 ± 0.009) plant treatment.

Chlorophyll b and total chlorophyll was higher in T_2 plant treatment lower in T_1 plant. Carotenoids was higher in T_2 plant lower in T_0 plant treatment. Anthocyanin was higher in T_2 plant (0.142) lower in T_6 plant. Kamal Lochan Barmer *et al.* (2013) reported the biochemical characteristics of chlorophyll a (1.2± 0.4), chlorophyll b (1.9±0.71), carotenoids (11± 0.3) and anthocyanin (2.7± 0.3). Mohamad Oma Albasha *et al.*, (2015) also reported the biochemical characteristics such as chlorophyll a and chlorophyll b and total chlorophyll of brinjal plant using *Eisenia foetida* worked vermicompost.

Table 1. Physico-chemical parameters of weed plants waste vermicompost.

S. No.	Parameters	At 45 Days
1	pH	7.2
2	Temperature (^{0}C)	28^{0}C
3	Electrical conductivity (ds/m)	37x10^2
4	Organic Carbon (%)	45.04
5	Total Nitrogen (%)	2.15
6	Total Phosphorous (%)	2.45
7	Total Potassium (%)	1.24
8	C: N (%)	22.5

Table 2. Enumeration of microbial populations of weed plants waste vermicompost.

S. No.	Microorganisms	No of Colony forming units (CFU) of Commercial vermicompost	No of Colony forming units (CFU) of Weed plants waste vermicompost
1	Bacteria	60x10^6	185x10^6
2	Fungi	9x10^3	15x10^3
3	Actinomyces	103x10^4	207x10^4

Table 3. Physico-chemical parameters of *Eudrilus eugeniae kingberg* vermiwash and vermicompost extract.

S. No.	Parameters	Vermiwash	Vermicompost extract
1	pH	7.2	7.4
2	Temperature (^{0}C)	30^0 C	29^0 C
3	Electrical conductivity (ds/m)	12x10^2	10x10^2
4	Organic Carbon (%)	48.99	48.20
5	Total Nitrogen (%)	2.65	2.38
6	Total Phosphorous (%)	2.15	1.95
7	Total Potassium (%)	2.05	2.12
8	C: N (%)	18.48	22.73

Table 4. The growth parameters of ladies finger germination efficiency.

Growth parameters	T0	T1	T2	T3	T4	T5	T6
Germination efficiency	57	73	77	79	98	97	100
Shoot length	4.9±0.2	4.9±0.2	6.3±0.3	6.2±0.3	6.7±0.4	7.9±0.4	7.2±0.4
Root length	5.3±0.2	6.9±0.4	6.8±0.3	7.0±0.6	7.1±0.7	7.7±0.2	9.2±0.8
Total fresh weight	5.4±0.2	4.3±0.2	5.6±0.2	6. 1±0.3	6.4±0.2	6.6±0.4	6.5±0.2
Total dry weight	1.3±0.2	1.6±0.1	1.7±0.1	1.9±0.1	2.1±0.1	2.2±0.1	2.3±0.1
Vigour index	580	862	990	1036	1106	1160	1172

Table 5. The biochemical parameters of ladies finger.

Biochemical characteristics	T0	T1	T2	T3	T4	T5	T6
Chlorophyll (a)	0.8±0.1	0.6±0.2	0.5±0.1	0.6±0.1	1.1±0.3	1.7±0.5	2.9±0.1
Chlorophyll (b)	0.6±0.1	0.5±0.2	0.6±0.5	1.2±0.3	1.8±0.2	5.5±0.1	2.8±0.1
Total Chlorophyll	1.4±0.3	1.1±0.4	1.1±1.4	1.8±0.2	2.9±0.5	7.2±0.5	5.7±0.1
Carotenoide	4.8±0.7	3.1±0.2	2.9±0.2	3.8±0.6	4.6±1.8	11.4±0.4	14.7±0.3
Anthocyanin	0.05	0.08	0.09	0.10	0.11	0.23	0.24

CONCLUSIONS

The present study was concluded that the earthworm *Eisenia foetida* is more efficient in bioconversion of hostel kitchen wastes vermicompost, vermiwash and vermicompost extract were using various concentration of pot culture study of Bendi (40 days) was higher in growth parameters and it is acts as an excellent base for the establishment and multiplication of beneficial and symbiotic microbes. It is a natural way of soil fertility management strategy for sustainable agriculture.

ACKNOWLEDGMENT

The authors express sincere thanks to the HOD Department of Biology, Gandhigram Rural Institute, Deemed University for the facilities provided to carry out this research work.

REFERENCES

Avinish, C. and Joshi, P.C., 2010. Composting of some dangerous and toxic weeds using *Eisenia foetida*. *J. Am. Sci.*, 6(3), 1-6.

Chitrapriya, K., Asokan, S and Nagarajan, R., 2013. Estimating the level of phosphate solubilising bacteria and azotobactor in the vermicompost of *Eudrilus eugeniae* and *Perionyx excavatus* with various combinations of cow-dung and saw-dust. International *J. Sci. Res.Pub.,* 4(10), 1-6.

Gurav, M.V. and Pathade, G.R., 2011. Production of vermicompost from temple waste (Nirmalya). *Uni. J. Environ. Res. Technol.,* 1(2), 182-192.

Jadia, C.D. and Fulekar, M.H. 2008. Vermicomposting of vegetable wastes: A bio-physico-chemical process based on hydro operating bioreactor. *Afr. J. Biotechnol.,* 7(20), 3723-3730.

Jaya Nair, Vanja Sekiozoic and Martin Anda, 2006. Effect of pre-composting on vermicomposting of kitchen waste. *Bioresour. Technol.,* 97, 2091-2095.

Jayanthi and Jayanthi, 2014. Bioconversion of ficusreliglosa in to eco-friendly manure by using epigic earthworm *Eisenia foetida*. *Indian Streams Res. J.,* 4(10), 2-3.

Kanimozhi, A. and Jayakumar, K., 2015. Recycling of vegetable market waste into vermicompost and its effect on the growth and yield of okra plant. *Int . J. Cur. Microbiol. Appl. Sci.,* 4(6), 501-506.

Mohamad Oma Albasa, Gupta, P. and Ramteke, P.W., 2015. Management of kitchen waste by vermicomposting using earthworm, *Eudrilus eugeniae*. *Int. Conf. Adv. Agr. Biol. Environ. Sci.*, pp. 81-84.

Musaida Mercy Manychi and Anthonyraj, 2013. Effective separation of vermicasts from earthworms using a cylindrical rotary trommel separators. *Int. J. Innovat. Res. Sci*., 2(8), 4069-4072.

Nirmala Natarajan, and Gajendran, M., 2014. Vermiconversion of paper mill sludge for recycling the nutrients using earthworm *Eudrilus eugeniae*. IOSR J. *Environ.Sci. Toxicol. Food Techn.,* 8(9), 06-11.

Puspanjali Sonowal, Dhamo Dharan, K., Meena Khwairkpam Kalamdhad and A.S., 2000. Feasibility of vermicomposting dewatered sludge from paper mills using *Perionyx excavates*. *European J. Environ. Sci.,* 3(1), 17-26.

Rama, L. and Vasanthy, M., 2014. Market waste management using compost technology. *Int. J. Plant Ani. Environ. Sci.*, 4(4), 57-59.

Ranjitchatterjee, S., Bandyopadhyaj and Jana, J.C., 2014. Evaluation of vegetable waste recycled for vrmicomposting and its response on yield and quality of carrot (*Daucus carota* H). *Int. J. Recyc. Orig. Waste Agri.,* 3(3), 561 - 568.

Seetha Devi, G., Karthika, A., Susila, S. and Vasanthi Muthunarayanan, 2012. Bioconversion of fruit waste into vermicompost by employing *Eudrilus eugenia* and *Eisenia foetida*. *Int. J. Plant Ani. Environ. Sci*., 2(4), 245-252.

Shekdar, A.V., 1999. Municpal solid waste management. The Indian perspective. Indian Assoc. Environ. Manag.,27, 100-108.

Van Gestel, C.A.M., E.M. Ven-van Breeman, and Baerselman, R. 1992. Influence of environmental conditions on the growth and reproduction of the earthworm *Eisenia Andrei*. Arti. *Soil Subst. Pedobiol*., 36, 109-120.

Viji, J. and Neelanarayanan, P., 2013. Production of vermicompost by utilizing paddy (*Oryza satirastraw*) pre-digested with tricho dumavilide) and *Eudrilus eugeniae, Perionyx excavatcus* and *Lampito marutii*. *Int. J. Pharm. Biosci.,* 4(4), 986-995.