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Effect of Cowdung Vermicompost, Vermiwash and Organic Waste Vermicompost on Growth and Yield of *Abelmoschus esculentus (L)*

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Abstract: *An experiment was conducted to determine the effect of vermicompost and other fertilizers on growth, yield and fruit quality of Abelmoschus esculentus(L) in the field condition. Vermicomposting technology is a fast growing one with its pollution free, cost effective and efficient nature. Vegetable waste from market and homes are source of environmental pollution, global climatic changes and human health hazards. Methods of their disposal and management are not satisfactory. This study has been done for reducing the pollution due to Vegetable waste by converting it into compost by using earth worm very successfully, economically, and usefully. Vermicomposting is the process by which worms are used to convert organic materials (usually wastes) into a humus-like material known as vermicompost. The goal is to process the material as quickly and efficiently as possible.*

Keywords: Vermicompost, Agriculture, Cowdung, Vegetable waste

I. INTRODUCTION

Vermicomposting is a method of preparing enriched compost with the use of earthworms. It is one of the easiest methods to recycle agricultural wastes and to produce quality compost. Earthworms consume biomass and excrete it in digested form called worm casts. Worm casts are popularly called as Black gold. The casts are rich in nutrients, growth promoting substances, beneficial soil micro flora and having properties of inhibiting pathogenic microbes.

Vermicompost is stable, fine granular organic manure, which enriches soil quality by improving its physicochemical and biological properties. It is highly useful in raising seedlings and crop production. Vermi is the Latin Word for worm. Vermicomposting is simply composting with worms. Vermicomposting refers to the method of converting organic waste in to worm castings. It is one of the most cost efficient and environmentally friendly methods of waste disposal. Vermicomposting is the best biotechnology to reduce the load on the treatment and disposal of biodegradable agro waste.

Vermicompost is nutrient rich organic compost with active microorganisms resulting from the interaction between earthworm and microorganisms on the breakdown of organic matter. Earthworms convert the waste material in to small particles by breaking in the gut of earth worm obtaining nutrients from the microbes that harbor on them. These processes increase the rate of degradation of the organic waste matter, modify the Physico-chemical properties of the waste materials and forms humus in which unstable waste matter is completely oxidized. Vermicompost involves aerobic decomposition of organic waste by using microorganism. In particular temperature, moisture, waste character, earthworm densities are the factor. The density of earthworm in any Vermicomposting system is related to rate of waste processing. Vermicompost contain plant hormones like auxin and gibber lines and enzymes which believed to stimulate plant growth and discourage plant pathogens. It improves the fertility and water holding capacity of the soil. It also enriches the soil with useful microorganism which add different enzymes like phosphatase and cellulose to soil.

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promoting substances, beneficial soil micro flora and having properties of inhibiting pathogenic microbes. Vermicompost is stable, fine granular organic manure, which enriches soil quality by improving its physicochemical and biological properties. It is highly useful in raising seedlings and crop production.

Vermiwash is a liquid substance of Vermicompost, extracted in the presence of earthworms and contains several enzymes, plant growth hormones, vitamins along with micro and macronutrients which increases the crop resistance power against various diseases and enhances the growth and productivity of crops. Vermiwash is an eco-friendly natural fertilizer prepared from biodegradable organic wastes and is free from chemical inputs. It helps to develop resistance against various diseases and pests in plants. Vermiwash acts not only as a liquid organic fertilizer but also as a mild biocide, which can be used as an effective input in organic agriculture for both soil health and disease management for sustainable crop production with low cost.

II. MATERIALS AND METHODS

Vermicompost Preparation

The Vermicompost was Prepared by Two different Organic Waste.

1. The first method of Vermicompost was Prepared by Cowdung. The Cowdung was Collected from Biominin Laboratory, S.T.E.T Women's College, Sundarakkottai, Mannargudi.

2. The Second method of Vermicompost was Prepared by mixture of food waste, vegetable clippings, fruit wastes and other Organic waste residues collected from the

S.T.E.T Women's College Hostel, Sundarakkottai, Mannargudi.

The Collected waste substrate was chopped finally and thoroughly mixed the earthworm Eisenia foetida was introduced two week later. Vermicompost incubation period was 50 Days. A maturation of the Vermicompost Chemical properties were analysed using standard procedure.

The two types of Vermicompost Preparation was done in Plastic Container, because it will keep the worms cooler in the summer and warmer in the winter season. The Plastic Container was washed thoroughly and rinsed before the worms and bedding are added. Store the worm bin where the Temperature remains between 14°C and 25°C.

pH and Temperature

The pH, temperature, and moisture content was maintained between 40% and 50% during the study by periodically sprinkling of an adequate quantity of water. All the pots were covered on the top by jute cloth cover and wire mesh to prevent and protect the earthworm from the predators-centipedes, moles, and shrews; small holes were drilled at the bottom of each pot which was filled with small stones up to a height 5cm for air circulation and good drainage. The processes of Vermicomposting and composting were carried out for a period of 48 days. pH, temperature and moisture content were monitored and maintained by sprinkling adequate quantity of water at frequent intervals.

Collection of Vermiwash

In the above Vermicompost Preparation Setup the water outlet tap was fixed at the bottom in order to collect the Vermiwash after 50 Days of Composting.

Pot Culture Experiment

The effect of Organic waste Vermicompost, Cowdung Vermicompost and Vermiwash was studied using growth of Abelmoschus esculentus (L).

Collection, Selection and Treatment of Seeds

The seeds of Abelmoschus esculentus(L). were collected from agro clinic, Biominin Laboratory, STET Women's College, Sundarakkottai, Mannargudi. The collected seeds were washed with deionised water and surface sterile with 0.1% mercuric chloride solution to keep off from spores of fungi and sown in Pots.

Experimental Design

T1 - Control (5kg soil+ Abelmoschus esculentus seeds)

T2- Organic waste Vermicompost (5kg soil+Abelmoschusesculentus Seeds+2kg of Organic waste Vermicompost)

T3 – Vermiwash (5kg soil+Abelmoschusesculentusseeds+Vermiwash(spray at regular interval(i.e)once in every week for six weeks)

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T4 - Cowdung Vermicompost (5kg soil+Abelmoschusesculentus seed+2kg Of Cowdung Vermicompost)
Analysis of Exo Morphological Characters of Abelmoschus esculentus (L)
The morphological characters such as Shoot length, Length of the internode, Diameter of the internode, number of Leaves and Leaf surface area were recorded for all the four treatment. And the results were Compared with that of control.

Statistical Analysis (Gupta.2004)
All the experiments were repeated as triplicates. The result obtained in the present study were subjected to statistical analysis like mean $\bar{X}$ and standard deviation (SD).

III. RESULTS AND DISCUSSION

In the Present Study to Produce the two types of Vermicompost using Cowdung and Organic waste by Standard Procedure at Biominin Labaratory, STET Women's College, Mannargudi (Plate-1). After 50 days of Compost Preparation the growth of Abelmoschus esculentus (L). was analysed by using the two types of Vermicompost and Vermiwash compared with Control. After that Physicochemical Properties of Vermicompost was Analysed. The microbial population was also analysed by Standard Procedure. The growth of the plant was determined by height of Plant, Leaf Length, number of leaves and Surface area of Leaves.

Analysis of Exomorphological Characters
Shoot Length
The Shoot length was found to be increased in Cowdung Vermicompost treated Abelmoschus esculentus (L).Plant than Organic Waste Vermicompost and Vermiwash treated Plant when compared to Control. (Table-7) (Figure-1). The Shoot Length was observed in every week interval Applications of casts showed significant increase in the Length and Weight of the Shoot and Root Systems of the Sorghum plant(Reddy et al., 1994). In the IV-Week of the growth the Shoot Length was increased to 56.24 cm.

Length of the Internodes
The Internode Length of the Abelmoschus esculentus(L). in each treatment is listed in Table-8, Figure-2. The Internodal Length was higher in Cowdung Vermicompost treated Soil Plant (T4) than the Control (T1), Vermiwash (T3), Organic waste Vermicompost (T2) Sample on every week interval.(Plate-6)
On the Sixth week the Internode Length of the Plant treated with Cowdung Vermicompost was 9.45 cm. Reddy et al.,(1994) found that the Plant height and biomass of Sorghum were Significantly higher when applied with earthworm casts and Soil mixture than Soil alone.

Diameter of Internode
The diameter of Internode was found to be increased in Cowdung Vermicopost as well as Vermiwash and Organic Waste Vermicompost treated groups than the control.(Table
-9) (Figure-3).The diameter of internode was increased to 6.77 mm after six weeks.

Number of Leaves
Number of leaves was found to be increased in Cowdung Vermicompost as well as Vermiwash and Organic Vermicompost treated groups than the control plants. (Table-10) (Figure-4). After six week the Cowdung Vermicompost treatment Abelmoschus esculentus (L). Plant Contain 20.91 Leaves than other Treatments. (Plate-7)

Leaf Surface Area
The Leaf Surface area of Abelmoschus esculentus (L). in Pot with different treatment is given in Table-11 and Figure-5. The Leaf being major site of Photosynthesis the increased Surface area of Leaves and its Longivity might be attributed to the enhancement of Plant growth and development during its ontogeny by endogenous growth hormonal system

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(Parvathamet al.,1990) The Leaf Surface area of Abelmoschus esculentus(L).Plant treated with Cowdung Vermicompost was 18.58 square.cm than other Treatment.

Table:1 Chemical Properties of Cowdung Vermicompost, Vermiwash, Organic Waste Vermicompost

S. No	Chemical Properties	Cowdung Vermicompost	Vermiwash	Organic Waste Vermicompost
1	Ph	8.5	8.1	7.8
2	Carbon I	32.6%	31.8%	31.2%
3	Nitrogen (N)	1.45%	1.39%	1.30%
4	Phosphorus(P)	1.40%	1.32%	1.26%
5	Potassium(K)	0.72%	0.65%	0.58%
6	Calcium(Ca)	0.65%	0.58%	0.51%
7	Magnesium(Mg)	0.30%	0.25%	0.19%
8	Sodium(Na)	0.14%	0.10%	0.07%
9	Carbon/Nitrogen (C/N)	23.4%	21.9%	18.7%
10	Zinc(Zn)	31.5ppm	30.2 ppm	29.5ppm
11	Lead(Pb)	4.25ppm	4.14 ppm	4.07ppm
12	Iron(Fe)	20.6ppm	19.5 ppm	18.08ppm
13	Copper(Cu)	14.9ppm	13.9 ppm	13.1ppm

Table:2 Effect of Cowdung Vermicompost, Vermiwash and Organic waste Vermicompost on the Shoot length(cm) of Abelmoschus esculentus (L.)

TREATMENTS	I-WEEK	II-WEEK	III-WEEK	IV-WEEK	V-WEEK	VI-WEEK
T1	5.40±0.16	9.76±0.14	18.20±0.13	28.34±0.12	37.34±0.18	47.76±0.17
T2	6.50±0.17	10.42±0.14	21.72±0.22	32.64±0.21	41.15±0.22	51.25±0.18
T3	7.35±0.16	13.11±0.21	26.19±0.10	35.64±0.17	43.91±0.14	53.72±0.16
T4	8.35±0.17	15.25±0.15	30.19±0.12	42.35±0.17	51.65±0.26	56.24±0.12

Note: Value were expressed as, mean ± standard deviation(T1 – Control;T2 – Organic waste Vermicompost;T3 – Vermiwash;T4 – Cowdung Vermicompost

Table :3 Effect of Cowdung Vermicompost, Vermiwash and Organic waste Vermicompost on the Length of internode (cm) of Abelmoschus esculentus(L.)

TREATMENTS	I-WEEK	II-WEEK	III-WEEK	IV-WEEK	V-WEEK	VI-WEEK
T1	1.00±0.15	2.05±0.14	2.61±0.16	3.39±0.17	4.32±0.18	5.25±0.15
T2	1.97±0.16	2.71±0.23	3.58±0.18	4.60±0.27	5.54±0.22	7.10±0.20
T3	2.82±0.14	3.93±0.18	4.91±0.16	5.85±0.19	6.79±0.17	7.55±0.15
T4	3.19±0.14	4.94±0.16	5.99±0.26	7.45±0.16	8.49±0.15	9.45±0.18

Note: Value were expressed as, mean ± standard deviation(T1 – Control;T2 – Organic waste Vermicompost;T3 – Vermiwash;T4 – Cowdung Vermicompost)

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Table:4 Effect of Cowdung Vermicompost, Vermiwash and Organic waste Vermicompost on the Diameter of internode (mm) of Abelmoschus esculentus(L.)

TREATMENTS	I-WEEK	II-WEEK	III-WEEK	IV-WEEK	V-WEEK	VI-WEEK
T1	1.14±0.13	1.94±0.09	2.52±0.12	3.45±0.20	4.11±0.14	4.66±0.21
T2	2.06±0.14	2.85±0.19	3.55±0.20	4.50±0.25	5.42±0.21	6.13±0.18
T3	2.08±0.11	3.30±0.15	3.80±0.11	4.76±0.17	5.81±0.11	6.51±0.12
T4	2.33±0.14	3.45±0.13	3.99±0.20	4.85±0.32	5.88±0.32	6.77±0.34

Note: Value were expressed as, mean ± standard deviation (T1 – Control;T2 – Organic waste Vermicompost;T3 – Vermiwash;T4 – Cowdung Vermicompost)

Table:5 Effect of Cowdung Vermicompost, Vermiwash and Organic waste Vermicompost on the Leaves of Abelmoschus esculentus(L.)

TREATMENTS	I-WEEK	II-WEEK	III-WEEK	IV-WEEK	V-WEEK	VI-WEEK
T1	2.77±0.43	4.37±0.49	5.55±0.50	9.10±0.90	13.08±0.93	15.76±0.95
T2	4.46±0.52	6.41±0.50	8.42±0.51	12.45±0.70	15.41±0.51	18.36±0.49
T3	5.51±0.50	8.84±0.63	11.25±0.70	13.52±0.76	16.75±0.47	19.56±0.17
T4	6.47±0.51	9.49±0.51	12.20±0.37	14.70±0.65	17.55±0.50	20.91±1.02

Note: Value were expressed as, mean ± standard deviation(T1 – Control;T2 – Organic waste Vermicompost;T3 – Vermiwash;T4 – Cowdung Vermicompost)

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Table: 6 Effect of Cowdung Vermicompost, Vermiwash and Organic waste Vermicompost on the Leaf Surface area (cm)² of Abelmoschus esculentus(L.)

TREATMENTS	I-WEEK	II-WEEK	III-WEEK	IV-WEEK	V-WEEK	VI-WEEK
T1	5.45±0.18	7.44±0.21	9.33±0.24	11.32±0.25	13.45±0.38	15.47±0.33
T2	6.39±0.23	8.37±0.24	11.38±0.25	13.57±0.25	15.64±0.26	17.39±0.28
T3	8.61±0.21	10.69±0.45	12.64±0.25	15.64±0.33	16.59±0.23	17.59±0.39
T4	9.65±0.24	11.64±0.25	14.65±0.26	16.60±0.24	17.58±0.23	18.58±0.24

Note: Value were expressed as, mean ± standard deviation(T1 – Control;T2 – Organic waste Vermicompost;T3 – Vermiwash;T4 – Cowdung Vermicompost)

IV.CONCLUSION

In this present study Vermicompost and Vermiwash are environmentally friendly and low cost. The Physicochemical Parameters such as pH, Carbon, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sodium, Carbon/Nitrogen, Zinc, Lead, Iron were tested. The seedling of Abelmoschus esculentus (L.) were transplanted in four pots of equal size, which were noted as (T1,T2,T3,T4). The seedling of pot were treated with Cowdung Vermicompost, Vermiwash and Organic Waste Vermicompost. The uninoculated Pots was denoted as control.

Thus, it can be said that for obtaining maximum grain yield as well as profit from Cowdung Vermicompost than soil should be inoculated with Vermicompost and Vermiwash. The Cowdung Vermicompost inoculated plant have effective Shoot length, Root length, Length of Internode, Diameter of Internode, Leaf Surface area. In addition, Cowdung Vermicompost increases the rate of organic matter mineralization which results in an increase in plant available nutrients. Composting is an alternative technology for a sustainable solid waste management. Vermicompost can be used to promote soil fertility and soil quality, enhances crops yield and quality accelerates the production of quality fertilizer by promoting decomposition of waste and inorganic matter used in agriculture and lowers the hazards of continued cropping in open and green house environment.

REFERENCES

[1]. Ansari AA, Sukhraj Kumar Effect of Vermiwash and Vermicompost on soil parameters and productivity of Okra. Current Advances in Agricultural Sciences 2010; 2(1):1-4

[2]. Anand, J. A., Wilson, M. D. P. and Kale, R. D. Effect of Vermiwash on seed germination and seedling growth. Journal of Soil Biology and Ecology.1995; 15: 90-95.

[3]. Bhat, M. R. and Limaye, S.R. Nutrient status and plant growth promoting potential of prepared Vermicompost. International Journal of Environmental Sciences. 2012; 3(1): 312-321.

[4]. Barley, K.P., The Influence of Earthworm on Soil Fertility II: Consumption of Soil and Organic Matter by the Earthworms. Journal of Agricultural Research, 1959; 10: 179-185.

[5]. Choudhary AK. Geneticbehaviour of yield and its components in hybrid okra

[6]. [Abelmoschus esculentus (L.)Moench]. M.Sc. (Ag.) Thesis, J.N.K.V.V., Jabalpur, 2006;

IJARSCT
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[7]. Dutta S, Kalita N, Maibangsa S. Effect of organic source of nutrients in growth and yield parameters of Okra (Abelmoschus esculentus L.) in KarbiAnglong district of Assam. International Journal of Chemical Studies. 2020; 8(5):1910-1913.

[8]. Edwards, C.A. and Bater, J.E. The Use of Earthworms in environmental management. Soil biology and Biochemistry. 1992 ; 24:1683-1689.

[9]. Elumalai, D., Kaleena, P.K., Fathima, M. And Hemavathi, M. Influence of Vermiwash and Plant growth regulators on the Exomorphological characters of Abelmoschus esculentus (Linn.) Moench. African journal of basic and Applied Sciences. 2013; 5(2):82-90.

[10]. Fathima, M. and Sekar, M. Studies on growth on promoting effect of Vermiwash on the germination of Vegetable Crop. International Journal of Current Microbiology and Applied Sciences. 2014; 3(6): 564-570.

[11]. Gajalakshmi, S.,Ramasamy, E.V. and Abbasi, S.A. Potential of two epigeic and two anecic earthworm species in Vermicomposting of water hyacinth. Bioresource Technology: 2001; 76:177-181.

[12]. Hemalatha. B. Vermicomposting of fruit waste and industrial sludge. 2012; Issue 0976 P:6063

[13]. Ismail, S.A. Vermicology: The Biology of Earthworms. Orient longman Press, Hyderabad :92. 1992.

[14]. Joshi, N.V. and B.V. Kelkar, 1952. The role of earthworms in soil fertility. Indian Journal of Agricultural Science, 1952; 22:189-96.

[15]. Kumar C A, State of the art report on Vermiculture in India (Council for Advancement of People's Action and Rural Technology, New Delhi) 1994; 1-60.

[16]. Lee, K.E., Earthworms, their Ecology and Relationships with Soil and Land Use. Academic Press, Sydney, 1985; pp: 411.

[17]. Mahapatra, P. B. Mal, S. Mohanty and H. N. Mishra Growth and yield parameters of okra (Abelmoschus esculentus) influenced by Diazotrophs and chemical fertilizers Journal of Crop and Weed, 2013; 9(2):109-11

[18]. Maithy TK, Tripathy P. Impact of integrated nutrient management on growth yield, quality, nutrient content and soil fertility in okra [Abelmoschus esculentus (L.) Moench]. Hybrids. Proceedings of International conference on Horticulture held at Bangalore. 2009; 677-679.

[19]. Paramasivan M, Jawahar D, Krishnamoorthi VV. Effect of organic manures and inorganic fertilizers on yield and economics of okra [Abelmoschus esculentus (L.) Moench] In an Alfisol of Tambiraparani Tract. South Indian Hort., 2006; 53(1-6):312- 315.

[20]. Parvatham, P . Studies on phyto hormonal effect on Azospirillum brasilense on Brailense on Bhendhi (Abelmoschus esculentus L.Moench). M.Sc Thesis. Tamil Nadu Agricultural University coimbatore 1990; 42-48.

[21]. Prabhu, T.; Narwadekar, P.R.; Sannindranath, A.K. and Rofi, Mohd. Effect of integrated nutrient management on growth and yield of okra (Abelmoschus esculentus L.) Orissa J. Hort., 2003; 31: 17-21.

[22]. Parle, J.N., 1963. A microbiological study of earthworm casts. Journal of General Microbiology, 1963; 31: 13-23.

[23]. Rammohan, R.V., and Shivarudrappa, B. Vermicomposting for Efficient Crop Residue Recycling, Soil Health Improvement and Imparting Climate Resilience : Experiences from Rainfed Tribal Regions. CRIDA, Hyderabad. Andhra Pradesh. 2013 ; 40 p.

[24]. Rajendran S, Exploiting earthworms for fertilizers, Down to Earth, 2 (21) (1994) 22-23.

[25]. Singh, K. V., Anuj, K., Kumar, M., Soni, S., Kumar, A. and Singh, M. K. Response of different organic and inorganic fertilizers on growth and yield of okra (Abelmoschus esculentus L.) Ann. Hort. 2015; 8 (1): 107-109.

[26]. Shanthi, N; Vijayakumari, B. Effect of NPK with different organic manures on biometric parameters of bhendi (Abelmoschus esculentus L) Journal of Phytological Research 2002; 15: 209-12.

[27]. Tiamiyu RA, Ahmed HG, Muhammad AS. Effect of sources of organic manure on growth and yield of A. esculentus (Abelmoschus esculentus (L.)Moench) in Sokoto, Nigeria. Nigerian Journal Basic Applied Sciences., 2012; 20(3): 213-16.

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ISSN: 2581-9429
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Impact Factor: 7.67

[28]. Vennila, C. and Jayanthi, C. Response of okra to integrated nutrient management. Journal of Soils and Crop 2008; 18 (1)36-40.

[29]. Webster,K.A. Vermicompost increases yield of cherries for three years after single application. EcoResearch, South Australia.2005

[30]. Yadav, G. L., Singh, S. P., Jitarwal, O. P., Yadav, V. K. and Choudhary, R. Effect of nitrogen and bio-organics on growth and yield of okra [Abelmoschus esculentus (L.) Moench]. Chemical Science Review and Letters. 2017; 6 (23): 1515-1519.

[31]. Zajonc I and Sidor V. Use of some wastes for Vermicompost preparation and their influence on growth and reproduction of the earthworm Eisenia foetida. Pol'nohospodars- tvo (CSFR) 1990 ; 36(8):742–752.