



## **Effect of Vermicompost and Vermiwash on growth and Yield of bottle gourd, *Lagenaria siceraria***

**K.Sundararasu**

Department of Zoology, Arignar Anna Government Arts College, Musiri-621211.Tamilnadu, India

### *Abstract*

*The work was carried out to evaluate the impact of vermicompost and vermiwash on growth and yield of bottle gourd plants. Available nutrients of the soil both in control and experimental plots were studied and interrupted results. Plant growth, number of leaves per plant, number of flowers and fruits were recorded. Vermicompost and vermiwash treated soil showed increased plant growth, number of leaves, flowers and fruits compared to control soil. Significant yield was recorded on vermicompost and vermiwash added field. The present study suggested that both vermicompost and vermiwash were favorable vigorous yield of bottle gourd.*

**Key words :** *Farmyard manure, vermicompost, vermiwash, bottle gourd, earthworm, yield*

### **I. INTRODUCTION**

Organic matter plays a key role of achieve sustainability in agricultural production because it possesses many desirable properties such as high water holding capacity, cation exchange capacity, beneficial effects on the physical, chemical and biological characteristics of soil. It also adds organic matter to the soil which may improve soil structure, aeration, soil moisture, holding capacity, and water infiltration. The organic degradable refuse of plant and animal origin provides a good source of nutrients to improve soil productivity. Farmyard manure is an excellent fertilizer containing nitrogen, phosphorus, potassium and other nutrients. . To determine how much manure is needed for a specific application, the nutrient content and the rate of nitrogen becomes available for plant uptake needs to be estimated. Nutrient content of manure varies depending on source, moisture content, storage, and handling methods.

Vermicompost is homogenous with desirable aesthetics, plant growth hormones and high levels of soil enzymes, while enhancing microbial populations and tending to hold more nutrients over longer periods without adverse impacts on the environment. It can also be used as a bio remedial measure to reclaim problem soils, especially acid soils, because of the near-neutral to alkaline pH of vermicompost and the suppression of labile aluminium (Mitchell, 1997).

Vermiwash, a foliar spray, is a liquid fertilizer collected after the passage of water through a column of worm activation. It is a collection of excretory and secretory products of earthworms, along with major micronutrients of the soil and soil organic molecules that are useful for plants. Vermiwash seems to possess an inherent property of acting not only as a fertilizer but also as a mild

biocide (Ismail, 1997). In the present study to evaluate the vermicompost and vermiwash on growth and yield parameters of bottle gourd, *Lagenaria siceraria*.

## **II. MATERIALS AND METHODS**

### **Preparation of Farmyard manure (FYM)**

Farmyard manure was prepared basically cow dung, cow urine, waste straw and other dairy wastes.

### **Preparation of Vermicompost (VC)**

Farmyard manure was used as raw material to prepare vermicompost. Vermibeds of size 5 x 5 x 3 feet were with the help of bricks with cement under a shed opened from all sides in the laboratory, Department of Zoology, Arignar Anna Government Arts College, Musiri for the production of vermicompost and earthworms *Eisenia foetida* were inoculated in each bed.

### **Preparation of Vermiwash (VW)**

Vermiwash was prepared by the method standardized by Ismail (1997). A plastic tub of dimensions of 100 x 100 x 100 cm was fitted with a plastic gate-valve to facilitate drainage of elutes. The tub was fitted to a height of 25 cm with gravel 2-4'' size above which was placed a layer of coarse sand 30 cm and garden soil 30 cm. The soil, a layer of shade dried and powdered cow dung was added. This was gently moistened with distilled water was drained off. The unit was moistened every day 80% moisture. To this, 250 earthworm adults belonging to the species *Eudrilus eugeniae* were released. After sixteen days elutes were collected daily by slowly sprinkling five litres of distilled water from the top. The water slowly percolated through the compost and drilospheres, carrying with it nutrients from freshly formed castings, as well as washings from the drilospheres through the filter unit. Then the elutes collected were stored at 4 c and used for assessing the biological productivity.

### **Experimental Design**

Size of the control and experimental plots were 5 m length and 5 m breadth. Control plot was prepared by mixing of 12 kg of farmyard manure. Experimental plots were prepared by 6 kg of vermicompost and 1litre of vermiwash. The soil of selected experimental, control plots were analyzed for available nutrients before and cultivation. In this experiment the selected vegetable crop namely, Bottle gourd, *Lagenaria siceraria* seeds was planted in 20 number both in the control and experimental plots I( 40% VC: 60% VW) , experimental plot II ( 50% VC : 50% VW) . During the whole growing season period growth of stem length was measured and recorded at every 30 days interval. Leaves of the plants were counted and recorded. Yield parameters of flowering and fruiting were observed, quantified and recorded.

### **Statistical Analysis**

The experimental data was observed as mean + S.E., One way analysis of variance (ANOVA) and Least Significant Difference (LSD) was carried out to determine difference from control and between the treatments ( $p > 0.05$ ).

### III. RESULT AND DISCUSSION

The experiment was conducted to assess the effect of vermicompost and vermiwash on growth and yield of bottle gourd *Lagenaria siceraria*. Analysis of available nutrients in the soil before and after cultivation of the bottle gourd were recorded and presented in Table 1.

**Table1. Analysis of available nutrients in the soil before and after harvesting**

param eters	Control		Experimental I (40% VC:60% VW)		Experimental II (50% VC:50% VW)	
	Before harvesting	After harvesting	Before harvesting	After harvesting	Before harvesting	After harvesting
Electrical conductivity	0.03	0.07	0.11	0.23	0.13	0.99
pH	7.78	8.72	7.97	8.98	7.89	8.96
Nitrogen	48.3	55.45	52.2	56.1	44.7	49.8
Phosphorous	6.97	7.68	8.97	9.99	7.61	8.33
Potassium	48	57	93	122	27	39
Magnesium	0.6773	0.6564	0.7413	0.6915	0.6997	0.7311
Zinc	0.2622	0.3141	0.2690	0.2934	0.1425	0.1519
Sulphur	0.021	0.029	0.034	0.037	0.045	0.059
Calcium	0.38	0.45	0.39	0.47	0.46	0.56
Iron	0.7342	0.7395	1.0132	1.0325	0.7213	0.7384
Organic carbon	0.29	0.37	0.19	0.24	0.36	0.61
Copper	1.0214	1.0219	1.0436	1.0613	1.0092	1.0067

The physico-chemical properties such as, electrical conductivity, pH, nitrogen, phosphorus, potassium, magnesium, zinc, iron, calcium, sulphur, copper and organic carbon were increased in both experimental plot I and II after cultivation compared with control plot. In this present work, the parameter included length of the plant, number of leaves, number of flowers and fruits were observed in the control and experimental plots. The growth and yield parameter of bottle gourd were presented in Table 2. Significant plant length was observed in experimental plot II (242.5 cm) on 90days and followed by experimental plot I (187.2 cm) when compared with control (156.4 cm) on 90 days. Highest number of leaves were recorded on experiment plot II (105.7) and followed by the experimental plot I (94.7) compared to control on 90 days. More number of flowers and fruits were recorded in the experimental plot II (32.6: 26.2) and followed by experimental plot I (26.5: 20.3) on 90 days.

Vermicompost and vermiwash were found to improve the trace element content of the soil. However the combination of these biofertilizers was found to be more effective in improving soil micronutrients content. Flowering and fruiting ratio was significantly increased in experimental plot II. Organic inputs contribute macronutrients and micronutrients in amount that is required by plants. According to Lalitha *et. al.*, (2000) application of organic fertilizers has a significant effect on plant growth and production.

**Table 2. Effect of vermicompost and vermiwash on growth and yield of bottle gourd**

Plants	Control Plot			Experimental Plot -I			Experimental Plot-II		
	30days	60days	90days	30days	60days	90days	30days	60days	90days
Length (cm)	114.6±2.34	137.1±1.01	156.4±2.22	125±2.60	169.2±2.03	187.2±2.4	138.2±2.5	202.6±1.4	242.5±1.16
Leaves (n)	34.3±1.2	45.2±1.3	64.4±2.1	35.4±1.1	67.2±1.4	94.7±2.4	39.6±2.4	83.4±3.1	105.7±2.6
Flowers (n)	16.4±2.3	21.2±3.4	24.1±3.2	18.3±2.4	22.2±0.9	26.5±2.6	19.2±1.3	26.1±2.4	32.6±1.2
Fruits (n)	11.2±1.7	16.2±2.7	19.6±1.9	12.7±3.1	17.2±2.9	20.3±2.8	13.5±1.8	21.4±3.2	26.2±3.1

In the present study analysis of soil nutrients after cultivation was high in the experimental plots which indicate that the presence of micronutrients in vermicompost and vermiwash. Increase the application of the vermicompost and vermiwash quantity resulted in increased soil copper and iron content due to increased organic inputs which resulted in improved soil aeration and microbial activity. In the present investigation, the yield of bottle gourd in response to vermicompost 50% :vermiwash 50% was highly significant in experimental plot II which may due to increased availability of more exchangeable nutrients in the soil by the application of vermicompost and vermiwash. Several researchers agreed with present investigation of chemical properties of vermicompost soil (Bhaskar *et al.*, 1992; Chattopadhyay., 1992; Deepa Devi, 1992; Orozeo *et al.*, 1996; Das *et al.*, 2002; Slaton *et al.*, 2002; Arancon *et al.*, 2006). Vermicomposting involves bio-oxidation and stabilization of organic material through the interactions between earthworm and microorganisms. Although microorganisms and mainly responsible for the biochemical degradation of organic matter, earthworms play an important role in the process by fragmenting and conditioning the substrate, increasing the surface area for growth of microorganisms, and altering its biological activity (Dominguez 2004; Dominguez and Edwards 2004).

The significant performance of Okra using the combination of vermicompost and vermiwash was studied by earlier workers Lalitha *et al.*, 2000; Ismail, 2005; Ansari, 2008a, b; Ansari and Ismail, 2008. These results agreed with earlier, Hemant *et al.*, 2013 reported that vermiwash sprayed on the tomato plants, it showed a significant growth of plants, such as, shoot length, number of leaves. Similarly, Muscolo *et al.*, 1999 also found an auxin-like effect of earthworm worked humic substances on cell growth and nitrogen metabolism in *Daucus carota*.

#### **IV. Conclusion**

In the present study, the effect of vermicompost and vermiwash was observed on the plants of bottle gourd showed significant growth and yield. However it can be concluded from the study that the vermicompost and vermiwash proves to be the effective fertilizers which contribute the growth of plants when applied 50% vermicompost: 50% vermiwash. It was also observed that the plants treated with vermicompost and vermiwash were disease resistant and no any worms like leaf eaters were seen on the leaves other parts of plants. With the global trend moving towards the production of organic food crops, organic waste material processed by naturally occurring earthworm *Eisenia foetida* should be used to produce vermicompost which will supply micronutrients and other soil stimulants for plant growth and improve the soil fertility.

#### **Acknowledgements**

Author is very grateful to University Grants Commission, New Delhi for the support of financial assistant No. F. MRP -5149/14 UGC-SERO dated Jan' 2015.

#### **BIBLIOGRAPHY**

- [1] Ansari, A. A. 2008a. Effect of Vermicompost and Vermiwash on the Productivity of Spinach (*Spinacia oleracea*), Onion (*Allium cepa*) and Potato (*Solanum tuberosum*). World J. Agric. Sci., 4(5): 554-557.
- [2] Ansari, A. A. 2008b. Effect of Vermicompost on the productivity of Potato (*Solanum tuberosum*), Spinach (*Spinach oleracea*) and Turnip (*Brassica campestris*). World J. Agric. Sci., 4(3): 333-336
- [3] Ansari, A. A. and Ismail, S. A. 2008. Reclamation of sodic soils through Vermitechnology. Pakistan Journal of Agricultural Research, Vol. 21, (1-4): 92-97.
- [4] Arancon, N. Q., Edwards, C. A., Lee, S. and Byrne, R. 2006. Effects of humic acids from vermicomposts on plant growth. European J. Soil Bio., 42(Suppl.1): S65-S69.
- [5] Arancon, N. Q., Edwards, C. A., Lee, S. and Byrne, R. 2006. Effects of humic acids from vermicomposts on plant growth. European J. Soil Bio. 42(Suppl.1): S65-S69.
- [6] Bhaskar, A., Magregor, A.N., Kirkman, J.H. 1992. Influence of soil ingestion by earthworm on the availability of potassium in soil. An incubation experiment. Biol. Fert. Soil, 14; 300- 303.
- [7] Chattopadhyay, N., Gupta, M. D., Gupta, S. K. 1992. Effect of city waste compost and fertilizers on the growth, nutrient uptake and yield of rice. J. Indian Soc. Soil Sci. 40: 464 – 468.
- [8] Das, P. K., Jena, M.K., Sahoo, K.C. 2002. Effect of integrated application of vermicompost and chemical fertilizers on growth and yield of paddy in red soil of south eastern ghat zone of Orissa. Environ. Ecol. 20 : 13 – 15.
- [9] Deepa Devi, A.K. 1992. Studies on bioconversion of organic wastes into nutrient enriched composts and their effects on soil fertility, crop growth and yield of sorghum M.Sc., Agri. Thesis. Tamilnadu Agriculture University, Coimbatore, India.
- [10] Dominguez, J. (2004) State of the art new perspective on vermicomposting research. In; Edwards C.A. (Ed.) Earthworm ecology (2<sup>nd</sup> Edn) CRC Press LLC. Boca Raton. Fl USA, pp401- 424.
- [11] Dominguez J, Edwards CA (2004) Vermicomposting organic waste: a review. In
- [12] Hanna SHS, Mikhail WZA (Eds) Soil Zoology for sustainable development in the 21<sup>st</sup> Century, Cairo. Pp 369 – 395.

- [13] Hemant Samadhiya, Puneeta Dandotiya, Jaya chaturvedi and Agrawal, O. P. 2013. Effect of vermiwash on the growth and development of leaves and Stem of tomato plants. International Journal of Current Research. 5 (10): 3020-3023.
- [14] Ismail, S. A. 1997. Vermicology: The Biology of Earthworm. Calcutta: Orient Longman Press, Hyderabad. 92p.
- [15] Kale, R. D. 1998. Earthworms: nature's gift for utilization of organic wastes. Earthworms ecology. CRC Press, Boca Raton FL, 355- 77.
- [16] Lalitha, R., Fathima, K. and Ismail, S. A. 2000. The impact of biopesticide and microbial fertilizers on productivity and growth of *Abelmoschus esculentus*. Vasundara the Earth. (1-2): 4-9.
- [17] Mitchell, A 1997 Production of *Eisenia fetida* and vermicompost from feed lot cattle manure. Soil Biology and Biochemistry 29, 763 – 766.
- [18] Muscolo, A., Bovalo, F., Gionfridda, F., Nardi, S., 1999. Earthworm humic matter produces auxin like effects on *Daucus carota* cell growth and nitrogen metabolism . Soil Biol. and Biochem. 31, 1303 – 1313.
- [19] Slaton, N.A., Wilson, C. F., Norman, R. J., Nitameyungiro, S.A. Frizze NDI., 2002. Rice response to phosphorus fertilizer application and timing on alkaline soil in Arkansas. Agron. 94; 1393 – 1399.