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RESEARCH ARTICLE

EFFECT OF VERMIWASH ON GROWTH AND YIELD OF BRINJAL, *SOLANUM MELONGENA* (EGGPLANT OR AUBERGINE)

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ABSTRACT

The present study was conducted to evaluate the effect of vermiwash on growth and productivity of brinjal plants. Physico-chemical properties of the soil in both control and experimental plots were studied and interrupted with results. The results revealed that vermiwash spray enhanced the growth parameters (plant height and number of leaves) and yield parameters (number of flowers and fruits per plant). Flowering and fruiting ratio was significantly increased in experimental plots. From the results it could be seen that extracts from earthworms offer a valuable resource which could be effectively exploited for increasing the production of brinjal. The foliar spray of vermiwash can be economically and environmentally suitable for the soil environment. Therefore, it may be concluded that significant increase in the growth of vermiwash treated plants and their yield is due to high level of macro and micronutrients available in the vermiwash.

INTRODUCTION

Increased use of chemical fertilizers over a long period of time has led to contamination of food materials. This has placed emphasis on organic farming to improve food quality and the health of consumers. Organic farming is a system of natural farming which fulfills the food and nutrition needs of society without depleting the essential natural resources of agriculture. Of late biofertilizers have shown a good promise and has emerged as an important component of Integrated Plant Nutrition System (IPNS). Biofertilizers improve the soil physical properties, organic carbon, soil tilth and soil health in general and enhance nutrient utilization, efficiency and grain quality. They are cheaper and pollution free and their production are based on the renewable energy sources as pointed out by Tewatia, *et al* (2007). The role of earthworm in soil formation and soil fertility is well documented and recognized. An approach towards good soil management, with an emphasis on the role of soil inhabitants like earthworms, in soil fertility, is very important in maintaining ecosystem. Application of vermicompost, favourably affects soil pH, microbial population and soil enzyme activities (Maheswarappa *et al*., 1999). Vermiwash plays an important role in the plant growth and development; contribute to initiation of rooting, root growth, plant development, promotion growth rate and improvement in crop production increasing the soil organic matter and increase in nutrient content which are readily available for the plants, resulting in good crop yield. Vermiwash has excellent growth promoting effects besides serving as biopesticide. In recent days the vermiwash is used as liquid manure. Even though much work has been done on vermicomposting, very few reports are available related to vermiwash and its impact on the plant growth (Hatti *et al*., 2010; Elumalai *et al*., 2013). The main objective of the present investigation was carried out the influence of vermiwash on growth and yield parameters of brinjal plants.

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MATERIALS AND METHODS

Experiments were conducted at the wet laboratory, PG and Research Department of Zoology, Arignar Anna Government Arts College, Musiri, Tamil Nadu, India.

Preparation of vermiwash (VW)

Vermiwash was prepared by the method standardized by Ismail (1997). A plastic tub of dimensions 100 x 100 x 100 cm was fitted with a plastic gate-valve to facilitate drainage of eluates. The tub was filled 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). Above the soil, a layer of shade dried and powdered cow dung was added. This was gently moistened with distilled water and the excess water was drained off. The unit was moistened every day (80% moisture). To this, 250 earthworm adults belonging to the species *Eudrillus euginiae* were released. After sixteen days,

eluates 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 eluates collected were stored at 4°C and used for assessing the biological productivity.

Experimental Design

The soil of selected experimental control plots were analyzed for available nutrients before and after cultivation. Size of the control and experimental plots were 5m length X 5m breadth. Control plot was prepared by mixing of 12kg of farmyard manure. Experimental plot was prepared by 1 liter of vermiwash. In this experiment the selected vegetable crop namely, Brinjal (*Solanum melongena*) was planted in 50 number both in the control and experimental plots I (25%:75%), experimental plots II (50%:50%). During the whole growing season period, growth parameters at every 30 days interval (stem length) was measured and recorded. Leaves of the plants were counted and recorded. Yield parameters (flowering and fruiting) both in the experimental and control plots were observed, quantified and recorded. Analysis of available nutrients of soil before after harvesting the crop in both experimental and control plots were tested at Research laboratory, Department of Zoology, Nehru Memorial College, Puthanampatti, Tamil Nadu, India.

Statistical Analysis

The experimental data was expressed as mean ± S.E., One way analysis of variance (ANOVA) and Least Significant Difference (LSD) was carried out MS Excel to determine difference from control and between the treatments ($P \leq 0.05$).

RESULT AND DISCUSSION

This experiment was conducted to assess the effect of vermiwash spray on the growth and yield of brinjal (*Solanum melongena)* to study the productivity levels through organic inputs to be offered to the farmers. Analysis of available nutrients in the soil before and after harvest were recorded and presented in Table 1. Nutrients such as, electrical conductivity, pH, nitrogen, phosphorus, potassium, magnesium, zinc, copper, ferrous and organic carbon were increased in experimental plot I and II after harvesting compared with control plot. Present study, the parameter included height of the plant, number of leaves, number of flowers and fruits were observed in the experimental and control plants. The effect of different concentrations of vermiwash spray on height of the plant, number of leaves, number of flowers and fruits were presented in Table 2. Significant plant height was observed in experimental plot II (50.8 cm) on 90 days and followed by experimental plot I (50.1 cm) when compared with control (49.84) on 90 days. Highest number of leaves were counted on experimental plot II (65.7) and followed by the experimental plot I (64.1) compared to control on 90 days. More number of flowers and fruits were recorded the experimental plot II (37.4; 31.6) and followed by experimental plot I (36.6; 27.2) on 90 days.

Flowering and fruiting ratio was significantly increased in experimental plot II. Vermiwash is a liquid bio-fertilizer and is mostly comprised of water. This therefore resulted in decreased soil copper content as the quantity of vermiwash applied increased. This was possibly because the copper ions were leached away from the sample as the volume of the vermiwash applied increased. However, increase in the vermiwash quantity applied did not alter the soil zinc, manganese and copper content possibly because the soil was a bit compacted hence could not allow leaching away of nutrients. In the present study analysis of soil nutrients after harvesting was high in the experimental plots which indicate that the presence of micro nutrients in vermiwash. Increased application time of the vermiwash quantity resulted in increased soil copper and iron content due to increased organic matter which resulted in improved soil aeration and microbial activity. Furthermore, the loam-clay soils have a potential to retain the nutrients despite the vermiwash quantity added over

Table 1. Analysis available nutrients in the soil before and after harvesting

Parameters	Control		Experimental I Vermiwash – Water (25 % : 75 %)		Experimental II Vermiwash – Water (50 % : 50 %)	
	Harvesting		Harvesting		Harvesting	
	Before	After	Before	After	Before	After
EC(dSm^{-1})	0.05	0.09	0.13	0.20	0.10	1.02
pH	8.97	9.27	8.81	9.32	8.67	8.99
+N(kg ha^{-1})	53.8	60.3	56.5	58.7	43.5	50.6
P(kg ha^{-1})	7.96	8.86	9.78	9.94	6.17	7.13
K(kg ha^{-1})	44	51	124	144	22	33
Mg	0.7224	0.7125	0.8531	0.7913	0.7113	0.7255
Zn	0.2755	0.3134	0.2710	0.2985	1.1369	0.1471
Cu	1.0791	1.0791	1.5619	1.5337	0.9996	0.9986
Fe	0.7630	0.7691	1.304	1.0462	0.7399	0.7376
Organic carbon	0.33	0.41	0.20	0.21	0.40	0.63

Table 2. Effect of vermiwash on growth and yield parameters of brinjal

Plant	Control Plot			Experimental I			Experimental II		
	30days	60days	90days	30days	60days	90days	30days	60days	90days
Height (cm)	30.98±0.87	45.1±0.25	49.84±0.55	31.2±0.91	46.4±0.26	50.1±0.61	31.8±0.95	47.3±0.34	50.8±0.67
Leaves (n)	35.88±0.58	54.2±0.45	63.58±0.54	36.4±0.64	55.3±0.58	64.1±0.64	36.7±0.65	56.78±0.71	65.7±0.84
Flowers (n)	23±1.58	27±1.22	33.6±1.14	24.2±1.92	28.2±1.30	36.6±1.14	24.8±1.79	28.8±1.48	37.4±1.14
Fruits (n)	16.2±1.48	18.2±0.84	26.4±0.89	16.6±1.52	20.4±0.84	27.2±1.10	18.8±1.10	22.4±1.34	31.6±0.89

Values Mean of six replication. Experimental I (Vermiwash 25%: water 75%); Experimental II (Vermiwash 50%: water 50%)

time. The soil manganese and zinc content decreased with increased application time possibly because highly organic soils have lower manganese content. The organic material in the soil continuously increased with increased vermiwash quantities applied over time. In addition, increased soil iron content has tendencies to lower the manganese content (Manyuchi *et al* 2013). In the present investigation, the yield of brinjal in response to vermiwash was highly significant in experimental plots which may be due to increased availability of more exchangeable nutrients in the soil by the application of vermiwash. 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*. The effect of vermiwash treated soil in which Spinach and Onion were grown, was found to be significantly higher when compared to control group. No significant effect was observed on the plants of potato (Ansari, 2008). The effect of vermiwash was observed on okro by Ansari and Kumar (2010).

Conclusion

In the present study, the effect of vermiwash was observed on the plants of brinjal showed significant growth and yield. However it can be conclude from the study that the vermiwash proves to be an effective fertilizer which contributes the growth of plants when sprayed directly. It was also observed that the plants treated with vermiwash were disease resistant and no any worms like leaf eaters were seen on the leaves and other parts of plants. Thus vermiwash can be used as a substitute of commercial fertilizers available in market however other the effect on other parameters has yet to be analyzed.

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