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Effect of Organic Inputs on Growth Parameters of Bottle Gourd [*Lagenaria siceraria* (Mol.) Standl.]

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A B S T R A C T

The experiment was conducted by using different organic inputs viz., farmyard manure (FYM), vermicompost, poultry manure, seaweed extract, effective microorganisms (EM) and panchagavya along with recommended dose of fertilizes (RDF). It was laid out in Randomized Block Design with 10 treatments each having three replications. The results of the present investigation revealed that the application of FYM @ 10 kg pit^{-1} plus PM @ 0.52 kg pit^{-1} (equivalent to N in RDF) plus EM 1: 100 dilution plus seaweed extract @ 7 ml/ lit of water has recorded the maximum positive response for growth characters like vine length, number of nodes plant^{-1}, number of primary branches vine^{-1}, number of secondary branches vine^{-1}, leaf area and dry matter production.

***Key words*:** Bottle gourd, FYM, Vermicompost, Poultry manure, Seaweed extract, Panchagavya

Bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] is one of the most important cucurbitaceous crops in India. Its fruits are available in the market throughout the year. The use of chemical fertilizers can inflict irreparable damage to land and environment. To avert this situation, immeasurable decrease in fertilizer consumption without compromising on yield and quality can be achieved if the nutrient supply is given through organic manures [1]. Many researchers have revealed that the cost incurred on the inorganic fertilizers can be reduced to a great extent by the application of plant nutrients through organic sources. This would increase the nutrient use efficiency, soil fertility, besides enhancing the crop productivity as well as quality.

The growth of bottle gourd can be augmented through effective nutrient management using organic inputs. The important aim of organic inputs is to increase the organic nutrient level for the crop production and protection in the small holder sector and to help farmers reduce inputs of synthetic mineral fertilizers so as to increase enterprise profitability. The United States Department of Agriculture have stated that organic production is a system that integrates "cultural, biological and mechanical practices that foster cycling of resources, promote ecological balance and conserve biodiversity". Organic inputs are derived from the processing of plant and animal products. Organic manures improve the organic matter in the soil, soil fertility, soil structure and moisture holding capacity. They provide organic acids that help to dissolve soil nutrients and make them available for the plants. The organic inputs such as farm yard manure (FYM), vermicompost, poultry manures, panchagavya, seaweed extract and effective microorganisms (EM) are widely used by the farmers. In view of the above facts in mind a study has been formulated to find out the effect of organic inputs on growth parameters of bottle gourd.

MATERIALS AND METHODS

An investigation entitled "Effect of organic inputs on growth parameters of bottle gourd [*Lagenaria siceraria* (Mol.) Standl.]" was carried out in Surakudy village, Karaikal district, Pudhucherry, during the year 2019 – 2020. The experiment was conducted by using different organic inputs viz., farmyard manure (FYM), vermicompost, poultry manure, seaweed extract, effective microorganisms (EM) and panchagavya along with recommended dose of fertilizes (RDF). It was laid out in Randomized Block Design with 10 treatments each having three replications. The experimental field was ploughed with a tractor driven disc plough followed by harrowing and planking to bring the field to a good tilth. Pits of size 30 cm^3 were made at a spacing of 2.5m × 2m. Farmyard manure, poultry manure and vermicompost were applied @ 10, 0.52 and 1.6 kg per pit respectively along with top soil according to the treatment schedule. Recommended dose of fertilizers were applied @ 32:24:24 kg of NPK ha^{-1}. Soil application of effective microorganisms was done @ 1:100 dilution.

Four seeds were sown pit^{-1} at a depth of 2 cm by dibbling method. The seeds germinated in 4-5 days. After germination two healthy seedling per pit were maintained and extra seedlings were removed. Seaweed extract and panchagavya

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were given @ 7 ml/lit of water and 3 per cent respectively as three foliar sprays during the pre-flowering (25th DAS), flowering stage (50th DAS) and fruit development stage (75th DAS). Bottle gourd was trailed on pandal system. For this, pandal of 2 m height were erected using bamboo poles. When plants start vining, coir ropes were tied in a crisscross manner so that horizontal coir ropes run across on the top forming a net. Vines were supported by bamboo stakes, which help vines freely climb and reach the top. Irrigation was given immediately after sowing with care. Life irrigation was given on third day after sowing. Subsequent irrigations were given at 7-10 days interval and as when the crop requires. Required organic plant protection measures were done as and when necessary. The fruits were harvested 12 days after anthesis when they have attained edible maturity and full growth.

Five plants were randomly selected from each plot and tagged for recording observations on various growth parameters viz., vine length, number of nodes plant^{-1}, number of primary branches vine^{-1}, number of secondary branches vine^{-1}, leaf area and dry matter production. The experimental data were statistically analyzed by analysis of variance for Randomized Block Design for significant test as described by Panse and Sukhatme [2].

RESULTS AND DISCUSSION

The results obtained from the experiments are presented in (Table 1-2). The present investigation showed that the growth parameters viz., vine length, number of nodes, number of primary branches, number of secondary branches, leaf area and dry matter production were significantly influenced by the application of different organic manures. The maximum values for the above said growth attributes were recorded in the plots which received the application of FYM @ 10 kg pit^{-1} plus PM @ 0.52 kg pit^{-1} (equivalent to N in RDF) plus EM 1: 100 dilution plus seaweed extract @ 7 ml/ lit of water. It was followed by the treatment combination with FYM @ 10 kg pit^{-1} plus VC @ 1.6 kg pit^{-1} (equivalent to N in RDF) plus EM 1: 100 dilution plus seaweed extract @ 7 ml/ lit of water. The favourable positive response on plant growth obtained could be attributed to the action of FYM, facilitating better aeration and better drainage by improving the soil physical and biological conditions leading to deeper penetration of roots and higher nutrient extraction. These findings are in conformity with the reports by Spirescu [3] in watermelon. Application of FYM would have helped in the metabolic activity through the supply of such important micronutrients in the early vigorous growth [4]. The present finding is in harmony with the report of John *et al.* [5] who indicated that poultry manure released essential elements which promoted high photosynthetic activities that enhanced growth and yield of watermelon. Dauda *et al.* [6] reported an increase in growth parameters with an increase in poultry manure rates. Ewulo *et al.* [7] reported that poultry manure is not only cheap and effective source of N for sustainable crop production, but improves soil physical properties by reducing temperature, bulk density and increasing total porosity, if higher rates are applied. Stephen and Cartor [8] report that as plant reaches vegetative stage, its demand for N increase and the plots that are treated with poultry manure produced highest number of leaves and leaf area in cucumber.

Table 1. Effect of organic inputs on growth parameters in bottle gourd (*Lagenaria siceraria* (Mol.) Standl.)

Treatments		Plant height			No. of nodes	No. of primary branches	No. of secondary branches primary branch^{-1}
		At 30 DAS (cm)	At 60 DAS (cm)	At 90 DAS (cm)			
T_1	Absolute control	31.73	117.40	321.33	18.40	3.93	3.00
T_2	FYM + RDF	47.27	163.93	449.93	27.20	6.00	4.20
T_3	FYM + VC (equivalent to N in RDF)	38.67	138.67	352.67	21.67	4.67	3.46
T_4	FYM + PM (equivalent to N in RDF)	39.07	140.07	363.80	22.07	4.87	3.53
T_5	FYM + VC (equivalent to N in RDF) with EM	42.93	148.13	395.07	24.00	5.27	3.80
T_6	FYM + PM (equivalent to N in RDF) with EM	43.67	150.40	406.00	24.27	5.40	3.86
T_7	FYM + VC (equivalent to N in RDF) with EM + panchagavya	46.00	158.93	437.53	26.53	5.87	4.07
T_8	FYM + PM (equivalent to N in RDF) with EM + panchagavya	46.87	159.87	439.80	26.80	5.93	4.13
T_9	FYM + VC (equivalent to N in RDF) with EM + seaweed extract	49.87	172.67	473.27	28.53	6.33	4.46
T_{10}	FYM + PM (equivalent to N in RDF) with EM+ seaweed extract	52.27	179.40	492.33	29.93	6.60	4.73
	S.Ed.	0.82	2.69	7.41	0.45	0.10	0.07
	C.D. (P=0.05)	1.65	5.38	14.82	0.90	0.20	0.14

The increase in vine length might be due to more organic matter in the soil, because it has more water holding capacity and releases the nutrients in the soil. In such situation, the rate of plant metabolic processes are improved and in response, the growth also is also increased. These results resemble with the findings of Adekiya *et al.* [9] which confirmed that the poultry manure was not only a rich source of nutrients, but it also helped to make available those nutrients to the plants which were already present in the soil.

The stem diameter of cucumber, pumpkin and squash transplants was significantly larger in the application of EM. The larger the stem diameter is the better the plant can obtain the nutrients from soil, especially Ca, which flows through the plants with water flow of transpiration. Similar results have been obtained with tomato transplants. In addition EM helps to solubilize minerals, including Ca, and the Ca content can increase in vegetables. This is desirable because a higher Ca content reduces the incidence of insect pests and diseases and improves fruit transport and storage qualities. EM improved the quality of fruits, higher yields and larger stem [10]. The liquid extracts obtained from seaweeds have gained importance as foliar sprays for several crops because the extract contains growth promoting hormones (IAA and IBA), cytokinins, trace elements (Fe, Cu, Zn, Co, Mo, Mn, Ni), vitamins and amino acids. The results of this study confirmed these findings where all growth parameters were enhanced by seaweed extract application. The enhanced plant growth effects in seaweed extract-treated plants may be affected by auxins, gibberellins,

cytokinins, precursors of ethylene and betaine and cytokinins which are present and potentially involved in enhancing plant growth responses. Enhancement of foliage plant growth could be the result of the hormonal activity of the seaweed extract [11]. The positive response in the present study was also due to the application of FYM and vermicompost mixture portably stimulates the root growth through efficient translocation of growth promoting substances synthesized in plant followed by enhanced nutrients absorption. Rate of various physiological and biochemical processes enhanced due to development of large photosynthetic areas comprising of wider leaf area and higher weight of branch was observed. The phenomena of increase in growth parameter might be due to better photosynthetic activities in wide photosynthetic area [12-13].

Table 2 Effect of organic inputs on leaf area and dry matter production in bottle gourd (*Lagenaria siceraria* (Mol.) Standl.)

	Treatments	Leaf area (cm^2)	Dry matter production (g $plant^{-1}$)
T_1	Absolute control	680.87	456.07
T_2	FYM + RDF	933.40	621.20
T_3	FYM + VC (equivalent to N in RDF)	780.27	511.67
T_4	FYM + PM (equivalent to N in RDF)	808.20	523.33
T_5	FYM + VC (equivalent to N in RDF) with EM	850.93	564.13
T_6	FYM + PM (equivalent to N in RDF) with EM	861.13	578.00
T_7	FYM + VC (equivalent to N in RDF) with EM + panchagavya	907.40	608.27
T_8	FYM + PM (equivalent to N in RDF) with EM + panchagavya	918.33	614.07
T_9	FYM + VC (equivalent to N in RDF) with EM + seaweed extract	986.73	649.13
T_{10}	FYM + PM (equivalent to N in RDF) with EM+ seaweed extract	1030.00	677.27
	S.Ed.	10.27	16.35
	C.D. (P=0.05)	21.54	32.70

Application of seaweed extract was found to improve the growth of tomato plants and their roots significantly. The enhanced vegetative growth by seaweed extract was reflected on fruit growth where fruit weight and diameter were enhanced as well. These may be brought about by more assimilates going to the fruits and or more enhancement in sink strength of the fruits to attract more water and assimilates due to higher concentrations of promoting substance. Aqueous extract of seaweed (*Sargassum wightii*) when applied as a foliar spray on *Zizyphus mauritiana* showed an increased yield and quality of fruits. It could be concluded that applying seaweed extract can be a powerful and environmentally friendly approach to improve plant growth and production [14].

CONCLUSION

Based on the findings of the present investigation, it can be concluded that the application of FYM @ 10 kg pit^{-1} plus PM @ 0.52 kg pit^{-1} (equivalent to N in RDF) plus EM 1: 100 dilution plus seaweed extract @ 7 ml/ lit of water can be considered as best organic manure combination to obtain the maximum growth parameters of bottle gourd.

LITERATURE CITED

1. Sheeba RI, Janova V. 2015. Influence of nutrient sources on the seed yield and quality in snake gourd (*Trichosanthes anguina* L.). *Int. Jr. Agri. Sci. and Res*. 5(2): 99-104.
2. Panse VG, Sukhatme PV. 1985. *Statistical Methods for Agricultural Workers*. Indian Council of Agriculture Research, New Delhi.
3. Spirescu C. 1986. Chemical fertilization of watermelon cultivated on sand in southern Romanica. *Bulethinal Informative al Academiei de stiinate Agricle Si ssivice* 16: 115-126.
4. Anburani A, Manivannan K. 2002. Effect of integrated nutrient management on growth and yield in brinjal. *South Indian Hort*. 50(4): 377-386.
5. John LW, Jamer DB, Samuel LT, Warner LW. 2004. Soil fertility and fertilizers: An Introduction to Nutrient Management, Pearson Education, India. pp 53-106.
6. Dauda SN, Aliyu L, Chiezey UF. 2005. Effect of seedling age at transplant and poultry manure on fruit yield and nutrients of garden egg (*S. gilo* L) varieties. *Jr. Trop. Sci*. 5: 38-41.
7. Ewulo BS, Ojeniyi SO, Akanni DA. 2008. Effect of poultry manure on selected soil physical and chemical properties, growth, yield and nutrient status of tomato. *African Jr. Agri. Res*. 3(9): 9-14.
8. Stephen RC, Cartor LR. 1983. *Crop Production Principles and Machines*. W.H. Freehand and company. pp 559.
9. Adekiya AO, Ogunboye OL, Ewulo BS, Olayanju A. 2020. Effects of different rates of poultry manure and split applications of urea fertilizer on soil chemical properties, growth, and yield of maize. *Sci. World Journal*. pp 1-8.
10. Olle M, Williams I. 2015. The influence of effective microorganisms on the growth and nitrate content of vegetable transplant. *Jr. Adv. Agric. Tech*. 2(1): 25-28.
11. Chatterjee R, Thirumdasu RK. 2014. Nutrient management in organic vegetable production. *Int. Jr. of Food, Agri. and Veterinary Science* 4: 156-170.
12. Sarhan TZ, Mohammed GH, Teli JA. 2011. Effect of bio and organic fertilizers on growth, yield and fruit quality of summer squash. *Sarhad Jr. of Agri*. 27(3): 23-84.
13. Baghel SS, Bose US, Singh SS. 2017. Impact of different organic and inorganic fertilizers on sustainable production of bottle gourd (*Lagenaria siceraria* L.). *Int. Jr. Pure App. Bioscience* 5(2): 1089-1094.
14. Valencia RT, Acosta LS, Hernández MF, Rangel PP, Robles MAG, Cruz RCA, Vázquez CV. 2018. Effect of seaweed aqueous extracts and compost on vegetative growth, yield, and nutraceutical quality of cucumber (*Cucumis sativus* L.) fruit. *Multidisciplinary Digital Publishing Institute* (MDPI). pp 1-13.