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RESEARCH PAPER

Effect of organic nutrients on yield and quality of bittergourd

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Abstract **:** An investigation was carried out to find the effect of soil and foliar application of organic nutrients on yield and quality of bittergourd *(Momordica charantia)* cv. LONG GREEN. From the experimental results, it was found that application of organic nutrients like FYM@ 25 t ha^{-1} and vermicompost @ 5 t ha^{-1} along with panchagavya 3 per cent foliarspray increased the yield of bittergourd. The same treatment was found to register the maximum TSS content and increased the ascorbic acid (vitamin C) content of bittergourd cv. LONG GREEN. Among the two season studied, season-II recorded high yield and good quality fruits compared to season-I.

Key Words **:** Bittergourd, Yield, TSS, Ascorbic acid

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INTRODUCTION

Bitter gourd or balsam pear (*Momordica charantia* L.) is one of the commercially important cucurbitaceous vegetable crops extensively grown throughout the country for its nutritive value and medicinal properties. It is very rich source of calcium, phosphorus, iron, protein, vitamin A and vitamin C. Its juice consumption is also very useful for diabetic patient due to its potent oxygen free radical scavenging activity of the fruit juice (Sreejayan and Rao, 1991). The bitter principle in bitter gourd is cucurbitacin (tetracycline triterpenes) a bitter glucoside which prevents the spoilage of cooked vegetable and keeps fit for consumption even for two to three days (Aykrod *et al.*, 1951).The leaf extract of bitter gourd has also very good mosquitocidal effect (Yadav, 2008). The fruits are prepared for consumption in many ways and are quite commonly used as fried, boiled and stuffed form. Organic farming helps to improve the physical, chemical and biological properties of the soil and maintains the ecological balance as well as productivity of life supporting systems for the future generations. With this background in view, the present investigation was carried out to find the effect of organic nutrients on yield and quality of bittergourd.

MATERIALS AND METHODS

An investigation was carried out in the vegetable field unit, Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar, during two seasons *viz.*, Season-I (January-April 2008) and Season-II (July-October 2008) to study the effect of organic nutrients on yield and quality of bitter gourd (*Momordica charantia*) cv. LONG GREEN under irrigated conditions. The experimental field was located at 11" 24° North latitude and 79" 41° East longitude at an altitude of ±5.79 m above mean sea level. The maximum mean temperature ranges from 28°C to 43°C, while the minimum mean temperature ranges from 18.5°C to 27.5°C. The mean annual rainfall is 1655.6 mm with a distribution of 1255.0 mm during north east monsoon (October-December), 358.6mm received during SW monsoon (June-September) and 100 mm summer showers (March-May) and spread over 60 rainy days. The mean relative humidity was 72 per cent. The soil type was clay loam, pH of the soil was 7.5, Electrical conductivity 0.67 dSm^{-1} and available N 210.5 kg ha^{-1} (low), P 10.3 kg ha^{-1}

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(low) and K 249.4 kg ha^{-1}(medium).The field was laid out in randomised block design with three replications. The treatment combinations were T_1: Absolute control,T_2: FYM @ 25 t ha^{-1}, T_3: Vermi compost @ 5 t ha^{-1},T_4: Neem cake @ 5 t ha^{-1},T5: FYM @ 25 t ha^{-1} + Panchagavya @ 3 per cent, T_6: Vermicompost @ 5t ha^{-1} + Panchagavya @ 3 per cent, T_7: Neem cake @ 5 t ha^{-1} + Panchagavya @ 3 per cent,T_8: FYM @ 25 t ha^{-1} + Sea weed extract @ 3 per cent, T_9: Vermicompost @ 5t ha^{-1} + Sea weed extract @ 3 per cent, T_{10}: Neem cake @ 5 t ha^{-1} + Sea weed extract @ 3 per cent, T_{11}: FYM @ 25 t ha^{-1} + Vermicompost @ 5 t ha^{-1} + Panchagavya @ 3 per cent, T_{12}: FYM @ 25 t ha^{-1} + Neem cake @ 5 t ha^{-1} + Panchagavya @ 3 per cent,T_{13}: FYM @ 25 t ha^{-1} + Vermicompost @ 5 t ha^{-1} + Sea weed extract @ 3 per cent, T_{14}: FYM @ 25 t ha^{-1} + Neem cake @ 5 t ha^{-1} + Sea weed extract @ 3 per cent, T_{15}: Recommended dose of NPK @ 70:25:25 kg ha^{-1}. Data on yield and quality attributes like fruit yield per vine, TSS and ascorbic acid content were recorded. Fruit yield per vine was calculated by adding the weight of edible fruits that were harvested from the plant during fruiting period and was expressed in gram. The determinations of the TSS were made using 'Carlzeiss' hand refractrometer at room temperature and expressed as °Brix. Ascorbic acid content was estimated by A.O.A.C method (1975) and was expressed as mg per 100g of sample.

RESULTS AND DISCUSSION

From the data presented in Table 1, it was observed that the fruit yield/vine was found to vary significantly among the various treatments in both the seasons. In season-I, the maximum yield of fruits per vine (1488.61 g) was registered in T_{11}, followed by T_{15} (1343.78 g) and T_{12} (1151.19 g). The minimum yield of fruits (222.21 g) was observed in the control (T_1). In season-II also, a similar trend was observed with T_{11} recording the highest yield of fruits (1616.31 g), while the treatments T_{15} (1507.55 g) and T_{12} (1263.48 g) proved to be the next best treatments. T_1 (absolute control) recorded minimum yield of fruits (245.14g). When both the seasons were compared, season-II was found to be the best in producing the maximum yield of fruits than season-I, irrespective of the treatments.

Statistically significant difference was observed among the treatments in both the seasons for TSS trait (Table 2). All the treatments proved to be superior to the control in increasing the total soluble solids in both the seasons. In season-I, T_{11} registered the maximum total soluble solids (4.22° Brix) followed by T_{15} (3.98 °Brix) and T_{12} (3.84° Brix). In season-II also, the same treatments T_{11}, T_{15} and T_{12} registered the maximum total soluble solids (4.48, 4.20 and 4.00° Brix, respectively). The control (T_1) registered the lowest TSS (2.23 and 2.29° Brix) in both the seasons, respectively. While comparing the two seasons, fruits produced in season-II was found to record the maximum total soluble solids than season-I.

The results of the effect of organic nutrients on the ascorbic acid content of fruits are presented in Table 3. Various treatments showed statistically significant differences for this character. In season-I, T_{11} recorded the maximum ascorbic acid content (120.33 mg 100 g^{-1}), followed by T_{15} (119.28 mg 100 g^{-1}) and T_{12} (116.34 mg 100 g^{-1}). A similar trend was observed in season-II also, with the treatment T_{11} recorded the highest

Table 1 : Effect of soil and foliar application of organic nutrients on fruit yield per vine (g) of bitter gourd cv. LONG GREEN

Tr. No.	Treatment details	Fruit yield per vine (g)	
		Season I	Season II
T_1	Absolute control	222.21	245.14
T_2	FYM @ 25 t ha^{-1}	748.45	768.16
T_3	Vermicompost @ 5 t ha^{-1}	462.16	509.54
T_4	Neem cake @ 5 t ha^{-1}	279.19	288.78
T_5	FYM @ 25 t ha^{-1} + Panchagavya @ 3 %	1009.75	1113.09
T_6	Vermicompost @ 5 t ha^{-1} + Panchagavya @ 3 %	897.63	994.79
T_7	Neem cake @ 5 t ha^{-1} + Panchagavya @ 3 %	346.52	351.81
T_8	FYM @ 25 t ha^{-1} + Sea weed extract @ 3 %	543.18	564.23
T_9	Vermicompost @ 5 t ha^{-1} + Sea weed extract @ 3 %	372.69	382.08
T_{10}	Neem cake @ 5 t ha^{-1}+ Sea weed extract @ 3 %	455.88	471.03
T_{11}	FYM @ 25 t ha^{-1} + Vermicompost @ 5 t ha^{-1} + Panchagavya @ 3 %	1488.61	1616.31
T_{12}	FYM @ 25 t ha^{-1} + Neem cake @ 5 t ha^{-1}+ Panchakavya @ 3 %	1151.19	1263.48
T_{13}	FYM @ 25 t ha^{-1} + Vermicompost @ 5 t ha^{-1} + Sea weed extract @ 3 %	611.59	608.68
T_{14}	FYM @ 25 t ha^{-1} + Neem cake @ 5 t ha^{-1} + Sea weed extract @ 3 %	766.70	781.44
T_{15}	Recommended dose of NPK @ 70:25:25 kg ha^{-1}	1343.78	1507.55
S.E. ±		14.12	14.21
C.D. (P=0.05)		28.24	28.43

ascorbic acid content of 121.00 mg 100 g^{-1}, which was followed by T_{15} (119.88 mg 100 g^{-1}) and T_{12} (117.81 mg 100 g^{-1}). T_1 (control) registered the lowest ascorbic acid content of 92.99 and 93.51 mg 100 g^{-1} in season-I and season-II, respectively. Irrespective of the treatments, the fruits produced in season-II recorded the highest ascorbic acid content than season-I.

In the present study, higher yields due to application of vermicompost may be attributed to the high level of nutrients along with growth stimulating substances excreted by earthworms into their casts. Tomati and Galli (1988) emphasized the influence of microbial, hormone like substances on the plant metabolism, growth and development by vermicompost.

Table 2 : Effect of soil and foliar application of organic nutrients on total soluble solids (°Brix) of bitter gourd cv. LONG GREEN

Tr. No.	Treatment details	Total soluble solids (°Brix)	
		Season I	Season II
T_1	Absolute control	2.23	2.29
T_2	FYM @ 25 t ha^{-1}	2.54	2.60
T_3	Vermicompost @ 5 t ha^{-1}	1.87	1.99
T_4	Neem cake @ 5 t ha^{-1}	2.87	2.97
T_5	FYM @ 25 t ha^{-1} + Panchagavya @ 3 %	3.56	3.98
T_6	Vermicompost @ 5 t ha^{-1} + Panchagavya @ 3 %	3.42	3.87
T_7	Neem cake @ 5 t ha^{-1} + Panchagavya @ 3 %	1.90	2.81
T_8	FYM @ 25 t ha^{-1} + Sea weed extract @ 3 %	3.56	3.81
T_9	Vermicompost @ 5 t ha^{-1} + Sea weed extract @ 3 %	2.80	2.95
T_{10}	Neem cake @ 5 t ha^{-1}+ Sea weed extract @ 3 %	2.82	2.82
T_{11}	FYM @ 25 t ha^{-1} + Vermicompost @ 5 t ha^{-1} + Panchagavya @ 3 %	4.22	4.48
T_{12}	FYM @ 25 t ha^{-1} + Neem cake @ 5 t ha^{-1}+ Panchagavya @ 3 %	3.84	4.00
T_{13}	FYM @ 25 t ha^{-1} + Vermicompost @ 5 t ha^{-1} + Sea weed extract @ 3 %	2.92	3.44
T_{14}	FYM @ 25 t ha^{-1} + Neem cake @ 5 t ha^{-1} + Sea weed extract @ 3 %	2.80	3.11
T_{15}	Recommended dose of NPK @ 70:25:25 kg ha^{-1}	3.98	4.20
S.E. $\pm$		0.06	0.07
CD (P=0.05)		0.12	0.14

Table 3 : Effect of soil and foliar application of organic nutrients on ascorbic acid content (mg 100g^{-1}) of bitter gourd cv. LONG GREEN

Tr. No.	Treatments details	Ascorbic acid content (mg 100g^{-1})	
		Season I	Season II
T_1	Absolute control	92.99	93.51
T_2	FYM @ 25 t ha^{-1}	93.78	97.47
T_3	Vermicompost @ 5 t ha^{-1}	88.77	92.48
T_4	Neem cake @ 5 t ha^{-1}	86.88	89.78
T_5	FYM @ 25 t ha^{-1} + Panchakavya @ 3 %	99.11	100.47
T_6	Vermicompost @ 5 t ha^{-1} + Panchagavya @ 3 %	87.48	88.55
T_7	Neem cake @ 5 t ha^{-1} + Panchagavya @ 3 %	91.87	95.98
T_8	FYM @ 25 t ha^{-1} + Sea weed extract @ 3 %	102.33	105.45
T_9	Vermicompost @ 5 t ha^{-1} + Sea weed extract @ 3 %	98.44	100.85
T_{10}	Neem cake @ 5 t ha^{-1}+ Sea weed extract @ 3 %	90.80	90.82
T_{11}	FYM @ 25 t ha^{-1} + Vermicompost @ 5 t ha^{-1} + Panchagavya @ 3 %	120.33	121.00
T_{12}	FYM @ 25 t ha^{-1} + Neem cake @ 5 t ha^{-1}+ Panchagavya @ 3 %	116.34	117.81
T_{13}	FYM @ 25 t ha^{-1} + Vermicompost @ 5 t ha^{-1} + Sea weed extract @ 3 %	99.22	101.47
T_{14}	FYM @ 25 t ha^{-1} + Neem cake @ 5 t ha^{-1} + Sea weed extract @ 3 %	112.11	115.78
T_{15}	Recommended dose of NPK @ 70:25:25 kg ha^{-1}	119.28	119.88
S.E.$\pm$		0.91	0.96
C.D. (P=0.05)		1.82	1.93

The favourable effect of panchagavya on fruit yield may be due to the fact that panchagavya acts as a growth-promoter and immunity booster. Panchagavya stock solution creates a depression, which facilitates a cosmic ray link. The basic elements for the growth are harmonized by this energy which refresh the growth process (Sundarraman *et al*.,2001). In any vegetables, the quality of the produce is very important, as it determines the market price. In the present study the quality parameters like ascorbic acid and total soluble solids were significantly influenced by the application of organic manures along with panchagavya.

The highest values for the quality characters were recorded in the treatments in which FYM @ 25 t ha^{-1} and vermicompost @ 5 t ha^{-1} were applied along with foliar spray of panchagavya 3 per cent.

This may be due to the known fact that organic manures are capable of supplying adequate macro and micro plant nutrients which play major role in quality improvement through desirable enzymatic changes taking place during growth and organic manures in combination further enhanced the effect on quality (Kalalbandi *et al*., 2007). Application of organic forms of manure showed a definite advantage in improving the quality of fruits over the inorganic fertilizers. Fruits obtained from FYM treated plots showed maximum content of ascorbic acid and total soluble solids compared to other organic manures like vermicompost (or) poultry manures (Kansal *et al*., 1981). The results of the present study which envisaged increased quality attributes due to organic manures are in agreement with the findings of Kalalbandi *et al*. (2007) in cabbage, Duraiswamy *et al*. (1999), Sendurkumaran *et al*. (1998), Prabakaran and James Pitchai (2003) and Kannan (2004) in tomato.

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