

Original Research Article

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Growth, Yield and Quality of Snake Gourd (*Trichosanthes anguina* L.) as Influenced by Organic Nutrient Management Practices

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ABSTRACT

The experiment was conducted at Kethanur village, Palladam taluk, Tirupur District, Tamil Nadu to assess the effect of various organic sources on productivity and quality of snake gourd. The experiment was conducted in randomized block design using eleven treatments and replicated thrice. The treatments used were; Enriched farmyard manure, vermicompost, groundnut cake, neem cake are applied alone or combined with foliar application of panchagavya (3%) and 3G extract (3 per cent), farmer practices of organic cultivation and control (no manure/foliar spray). The results revealed that significantly enhance the growth, yield (20.15 t/ha) and quality parameters of snake gourd performance by vermicompost + panchagavya spray (3 per cent) followed by application of vermicompost + 3G extract (3 per cent) and EFYM + 3G extract spray @ 3 per cent than control. Based on the results, these studies suggest that it is advantageous to application of vermicompost along with foliar spray of panchagavya or 3G extract (1 per cent) as an effective on growth and yield in order to improving the quality parameters of snake gourd under organic cultivation system.

Keywords

Vermicompost, Panchagavya, 3G extract, Yield, Quality.

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Introduction

India has made significant progress on the vegetable map of the world and accounts for about 12 per cent share in the world total vegetable production (Nayak *et al.*, 2016). Among the several factors related to vegetable production, nutrient management is one of the key factor for achieving higher yield and better quality of the crop. With changing scenario of vegetable production, efficient nutrient management system needs emphasis for reduced cost of production and increased productivity (Kumar *et al.*, 2012). However, in the modern days, when agriculture is motivated not only for

production, but also accounts for the sustainability of all the resources including soil for the generations to come (Stockdale *et al.*, 2001). During the last four decades, indiscriminate use of inorganic fertilizers, pesticides and fungicides without any organic manure caused environmental pollution, especially in soil thereby affecting its fertility on long term basis (Das *et al.*, 2015). An unabated upraise in 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 (Sheeba and Janova, 2015). Organic manures supply important plant elements, both macro and micro. Apart from supplying plant nutrients, they favor aggregation of fine soil particles, thereby promoting good soil structure and it is also essential for healthy development of soil micro-organisms which further carry out biochemical transformations, play active role in decomposing organic matter and help in releasing the essential plant nutrients (Sureshkumar and Karuppaiah, 2008).

Snake gourd (*Trichosanthes anguina* L.) is an important vegetable crop in India and it has captured a prominent position among the vegetables due to its year round cultivation, export potential and nutritive value. Plant nutrition is one of the most important factors that increase production and balanced nutrition with macro and micro nutrients is regarded as an essential requirement for optimal plant growth and high quality products (Zeka *et al.*, 2014). The growth, yield and quality of snake gourd are largely influenced by the application of manures.

The cultivation of snake gourd requires an ample supply of plant nutrients. Use of organic manures is essential for its proper growth and development. Recently, organic farming is appreciated by vegetable consumers as it enhances quality of the produce (Rekha and Gopalakrishnan, 2001).

As the demand for organically grown vegetables are increasing in the global market and the information on the effect of organic manure on the production of vegetables, particularly in cucurbits is as much expected one in the present investigation was carried out to develop package of practices for organic snake gourd cultivation.

Materials and Methods

Field experiment was conducted at Kethanur village, Palladam taluk, Tirupur District, Tamil Nadu. The soil at the site was a sandy clam loam (*Typic Ustropept*). The soil was neutral in reaction (pH 7.6), low in organic carbon (0.36) and low available nitrogen (208 kg/ha) and medium in phosphorus (18 kg/ha) and high in potassium (415 kg/ha). A field trial was conducted as a randomized block design with three replications. The treatments comprised comprising of different organic manures at 100 per cent recommended dose of nitrogen (RDN) on equivalent nutrient basis (Enriched farmyard manure, vermicompost, groundnut cake and neem cake) and organic sources of nutrients with and without foliar spray of each @ 3 percent of panchagavya or 3G (ginger, garlic and green chillies) extract. These treatments were compared with farmer practices of organic snake gourd cultivation and no manure or no spray (control).

The quantity of organic manures was incorporated into soil before sowing, based on the equal recommended dose of N (nitrogen) for snake gourd. Two sprays of panchagavya at 3 per cent were given once before and after flowering. The 3G extracts were sprayed at 20 days interval. The treatments were imposed on the test cultivar of snake gourd 'Kethanur vari podalai'. Plumpy seeds selected for planting were treated with *Bacillus subtilis* at 10 g/kg of seeds and dibbled with a spacing of 2.0 m between the plants for depth of 2-3 cm in soil surface. A field is laid out by drip irrigation system and irrigation was given immediately after sowing and uniformly life irrigation was given on the third day. The growth, yield attributes and yields were recorded from five selected plants in each plot. The treatment differences were worked out at five per cent probability level.

Results and Discussion

Growth characters

Snake gourd productivity is governed by a complex set of interacting factors that involve genetics, physiology, nutritional, field management and weather. Most of the plant growth and development process are regulated by management practices. Nutrient management is one of the important factors, which directly influence the plant by changing the capacity of the plant to respond to the natural available nutrients and others (Rajbir Singh *et al.*, 2010).

An understanding of plant growth and its parameters in quantitative terms is essential to interpret crop yield in snake gourd. An uninterrupted growth in terms of vine length and stem girth is an important parameter, which helps to judge the plant vigour (Table 1). In the present study plant growth characters showed a progressive increase with the applied manures.

In the initial stages, (up to 30 DAS) the lengthier vines (1.57 m) and thicker stem (1.92 cm) was found in the treatments receiving 100 per cent N through groundnut cake + neem cake @ 5:1 ratio + 3G extract spray @ 3 per cent. The vine and stem girth of the plant increased as the age of the crop progressed from 30 DAS to harvesting stage. The higher vine length and stem girth at 60 DAS and at harvesting stage (5.68 m and 8.69 m; 3.74 cm and 4.89 cm respectively), were observed in the treatment receiving 100 per cent N through vermicompost + panchagavya spray @ 3 per cent. It is interesting to observe that at initial stages 100 per cent N through vermicompost + 3G extract spray @ 3 per cent performed superior than the rest, which might be due to the fast release of nutrients especially N, due to the lower C: N ratio of groundnut cake coupled with the higher P, S

and other micronutrient present in the neem cake. Even though the neem cake slows down N mineralization, it might have synchronized with crop nutrient requirement of the crop at the earlier stages for its better establishment (Marimuthu and Rabindran, 1991) in betel vine.

At later stages with the advancement of the crop phenology, 100 per cent N through vermicompost + panchagavya spray @ 3 per cent has taken upper hand than 100 per cent N through vermicompost + 3G extract spray. This is might to be vermicompost accelerates the rate of decomposition of the organic matter, alters the physical and chemical properties of the material, and lowers the C: N ratio, leading to a rapid humification process in which the unstable organic matter is fully oxidized, whereas the nutrient availability from groundnut cake plus neem cake had showing declining trend with nutrient availability after 40 DAS. Also the foliar spraying of panchagavya has shown a positive effect on growth. The results are similar to the findings of Yadav and Lourduraj, (2006).

Dry matter production (DMP)

Plant growth is dependent on the rate of accumulation of dry matter. The dry matter accumulation influences the economic yield on one hand, while production of dry matter is dependent upon adequate supply of plant nutrients (Dawam *et al.*, 2015). The amount of nutrients present in soil and their availability in turn with the pattern of crop growth is essential to decide the plant growth and yield. In the present study, during the initial stage of plant growth (Table 1), 100 per cent N through Groundnut cake + Neem cake @ 5:1 ratio + Panchagavya spray @ 3 per cent registered significantly higher dry matter production (747 kg/ha). The probable reason might be attributed to fast release of nutrients from the oil cakes due to lower C: N ratio

than any other organic sources which were used in the experiment. At later stages, 100% N through Vermicompost + Panchagavya spray @ 3 per cent produced significantly higher dry matter (6814 and 8964 kg/ha).

It suggests that incorporation enhanced earlier mineralization and release of nutrients from the organic manure, hence their availability for absorption for plant growth attributed to continuous slow release of nutrients which might have enabled the leaf area duration to extend, thereby providing an opportunity for plants to increase the photosynthetic rate which could have led to higher accumulation of dry matter Kumar *et al.*, (2010). It also showed that organic manure application method determines tomato growth and fruit yield by influencing nutrient availability and release for plant uptake and growth (Adekiya and Agbede, 2009).

Number of fruits and fruit weight

Among the various sources of organic nutrients, more number of fruits/plant (15.2 fruits/plant) and fruit weight (662.80 g/fruit) was recorded with application of 100 per cent N through vermicompost + panchagavya spray @ 3 per cent and it was comparable with 100 per cent N through vermicompost + 3G extract spray @ 3 per cent (Table 2). This might to be relatively higher amount of carbohydrates could have promoted the growth rate and in turn increased the number of fruits and fruit weight.

The increase in fruit weight might be due to better mineral utilization of plants accompanied with enhancement of photosynthesis, other metabolic activity and greater diversion of food material to fruits. This was in accordance with the result of Narayanamma *et al.*, (2009) and Mulani *et al.*, (2007) in bitter gourd.

Yield

A perusal of the yield revealed that the yield differences among the various organic nutrient treatments attained the level of significance (Table 2).

Significantly higher fruit yield (20.15 t/ha) was obtained by application of 100 per cent N through vermicompost + panchagavya spray @ 3 per cent followed by treatment that received 100 per cent N through vermicompost + 3G extract spray @ 3 per cent. Drastically lower fruit yield of 2.51 t/ha achieved from control plot (no manure/no spray). The higher fruit yield in the above treatment may be due to the growth promoting substances present in vermicompost coupled with the growth substances rich panchagavya spray, which has enhanced the female flower production, reduced ovary abortion, reduced flower and fruit drop, Hence it could able to set more number of fruits. The results are analogous to those reported by Gayathri *et al.*, (2013) and Patil *et al.*, (2013).

Quality parameters

In vegetable crop like snake gourd, quality standards have become the most important factors influencing consumption. In the present study the quality parameters observed are ascorbic acid content, total soluble solids, moisture content, acidity and shelf life (Table 2).

Ascorbic acid

The highest value of ascorbic acid (4.80 mg/100 g of sample) was observed with application of 100% N through vermicompost + panchagavya spray @ 3 per cent and followed by 100 per cent N through vermicompost + 3G extract spray @ 3 per cent.

Table.1 Effect of organic manures on growth characters of snake gourd

T. No.	Treatment	Vine length (m)			Stem girth (cm)			DMP (kg/ha)		
		30 DAS	60 DAS	Har	30 DAS	60 DAS	Har	30 DAS	60 DAS	Har
T ₁	100% N as EFYM	1.23	3.82	5.88	1.51	2.58	3.69	537	4506	6656
T ₂	100% N as Vermicompost	1.43	3.90	6.08	1.77	2.63	3.92	635	4926	7076
T ₃	100% N as Groundnut cake + Neem cake @ 5:1	1.30	3.73	5.38	1.59	2.53	3.59	617	4326	6476
T ₄	100% N as EFYM + Panchagavya @ 3 %	1.19	5.01	7.06	1.45	3.46	4.62	562	6231	8381
T ₅	100% N as Vermicompost + Panchagavya @ 3 %	1.50	5.68	8.69	1.87	3.74	4.89	680	6814	8964
T ₆	100% N as Groundnut cake + Neem cake @ 5:1 + Panchagavya spray @ 3 %	1.64	4.78	6.57	1.99	3.36	4.15	747	5104	7254
T ₇	100% N as EFYM + 3G extract spray @ 3 %	1.14	4.20	6.79	1.34	3.42	4.45	498	5591	7741
T ₈	100% N as Vermicompost + 3G extract @ 3 %	1.38	5.24	7.99	1.66	3.53	4.51	580	6338	8488
T ₉	100% N through Groundnut cake + Neem cake @ 5:1 + 3G extract spray @ 3 %	1.57	4.89	6.66	1.92	3.05	4.02	721	5087	7237
T ₁₀	Farmer practices of organic snake gourd cultivation	1.06	3.65	5.30	1.30	2.43	3.21	490	4214	6123
T ₁₁	Control (No manure/ No spray)	0.89	3.10	4.45	1.10	2.27	2.70	419	3601	5269
SEd		0.08	0.25	0.37	0.09	0.17	0.23	34	295	409
CD (P=0.05)		0.16	0.53	0.77	0.19	0.35	0.47	71	614	854

EFYM: Enriched Farmyard manure, 3G extract: Ginger, Garlic and Green chillies extract, DMP: Dry matter production, Har: Harvest

Table.2 Effect of organic manures on yield and quality of snake gourd

T. No.	No of fruits/plant	Fruit weight (g)	Fruit yield (t/ha)	Ascorbic acid (mg/100 g)	Total soluble solids (⁰ B)	Shelf life (days)
T ₁	8.20	320.6	5.26	3.91	2.26	9.80
T ₂	9.40	432.8	8.14	4.06	2.30	10.40
T ₃	9.10	373.6	6.32	3.72	2.21	8.70
T ₄	11.20	507.3	11.36	4.62	2.74	13.60
T ₅	15.20	662.8	20.15	4.80	2.92	14.50
T ₆	9.70	439.9	8.54	4.57	2.57	12.80
T ₇	10.50	460.8	9.68	4.59	2.61	11.40
T ₈	15.00	609.7	18.29	5.10	2.83	12.50
T ₉	9.60	437.2	8.39	4.10	2.48	10.80
T ₁₀	6.80	286.4	3.90	3.53	2.20	8.00
T ₁₁	6.20	202.6	2.51	3.49	2.14	6.50
SEd		0.59	25.56	0.60	0.14	0.63
CD (P=0.05)		1.23	53.33	1.26	0.29	1.31

Increased ascorbic acid content in the pointed gourd fruits with the application of vermicompost as an organic source might be due to slow but continuous supply of all major and micronutrients which might have helped in the assimilation of carbohydrates and in turn synthesis of ascorbic acid. Further the result is in agreement with the findings of Anuja and Archana (2012) in bitter gourd and Kameswari *et al.*, (2011) in ridge gourd.

Total soluble solids

Total soluble solids have significant influence with organic manures and highest value of total soluble solids (2.92 °B) was observed with application of 100 per cent N through vermicompost + panchagavya spray @ 3 per cent. This might be due to increased translocation of sugars and growth modifying substances. Kameswari *et al.*, (2011) stated that application of poultry manure along with recommended dose of nitrogenous fertilizers and vermicompost improved the quality characters like TSS and ascorbic acid content in ridge gourd. This is in consistent with the findings of Beulah, (2001) in moringa, and Combrink *et al.*, (1995) in muskmelon.

Shelf life

The maximum shelf life of fruits (14.5 days) was recorded in the treatment that received 100 per cent N through vermicompost + panchagavya spray @ 3 per cent and flowed by 100 per cent N through vermicompost + 3G extract spray @ 3 per cent. This treatment was significantly superior over control (6.5 days), the reason being thickening of cell wall due to the application of vermicompost as basal coupled with the foliar spray of panchagavya. Kamel (2002) investigated and reported that the storage life of organically grown spinach was longer due to difference in free amino acid content. However, Naby and Sanbaty (2005) found that organically grown

banana really had greater mineral and vitamin content than that produced conventionally.

In this experiment brings to light the positive response the yield and quality of snake gourd has to organic nutrition. This is especially important in the present decade during which organic cultivation is being given utmost importance in crop production. It can be concluded that application of vermicompost and foliar spray of panchagavya or 3G extract played a greater role in maintaining soil fertility, improve growth and yield, enhance the quality and found to be profitable than farmer practices of organic snake gourd cultivation

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