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Research Article

INFLUENCE OF VARIOUS ORGANIC INPUTS ON GROWTH AND YIELD OF SNAKE GOURD (*Trichosanthes anguina* L.)

MOHAN KUMAR K.[1*], SOMASUNDARAM E.[2] AND MARIMUTHU S.[3]

[1,3]Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore, 641003, India
[2]Department of Sustainable Organic Agriculture, Tamil Nadu Agricultural University, Coimbatore, 641003, India
*Corresponding Author: Email-mohanagronomy@gmail.com

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Abstract- A field experiment was conducted in the farmer field at Kethanur village, Palladam taluk, Tirupur District, Tamil Nadu during *kharif* season of 2015-2016 to assess the effect of organic inputs on growth and yield of snake gourd. The results showed that application vermicompost along with panchagavya spray increased 17.4 % yield of snake gourd compared to other organic inputs. Appreciable improvement in growth characters like vine length (8.69 m), stem girth (4.89 cm), dry matter production (8964 kg/ha), and yield attributes *viz.,* fruits per plant (15.20), fruit weight (662.80 g/fruit), and yield (10.07 kg/plant, 20.15 t/ha) of snake gourd were observed with application of vermicompost + panchagavya spray (3%) which was comparable with vermicompost + 3G extract @ 3%. Finally, it can be concluded that use of vermicompost with panchavgaya spray which is economically viable as well as ecologically safe is almost important to improve the productivity of snake gourd

Keywords- Vermicompost, Panchavgavya, 3G extract, Yield, Snake gourd.

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Introduction

Vegetables play a vital role in the health and nutrition of people throughout the world. The food experts and nutritionists have realized and appreciated the food value of the low calorific value, high protein content, vitamins and minerals. Recently our country was striving hard to achieve nutritional security because of the scare supply of vegetables [2]. Among the c*ucurbitaccae* vegetables, snake gourd (*Trichosanthes anguina* L.) is more nutrition rich (protein (0.5 per cent), fat (0.3 per cent), minerals (0.05 per cent), fibre (0.5 per cent) and 3.3 per cent of carbohydrate) vegetable and it can also full grown in any type of soil having good drainage system. Ripe fruits are rich in vitamin A due to high keeping quality and it has also export potentiality [9]. A few decades ago, the tremendous food production was achieved mainly due to increased use of inorganic fertilizers, pesticides and more area under irrigation. Because of this, soil fertility started declining due to indiscriminate use of inorganic fertilizers and pesticides and led to serious undesirable side effects such as soil salinity, decreased soil productivity, reduction in the quantum of natural enemies, poisoning of non-target organisms and contamination of food, water and environmental pollution and endangerment to human health [14]. This has basically prompted the demand of organically cultivated, eco-friendly or 'green' vegetable (snake gourd) cultivation. Organic inputs play an important role as a substitute for mineral nutrients, it is not only improves soil properties including higher plant available water holding capacity and cation exchange capacity (CEC) and lower BD, but also, faster beneficial microorganisms [13] In recent times, organic agriculture is esteemed by vegetable consumers and it is improving the quality of the produce. Organic resources namely enriched farm yard manure, vermicompost, concentrated organic inputs of edible and non-edible cakes are substituted for inorganic fertilizers to maintain productivity and environmental quality [11].

The low level soil nutrition, particularly nitrogen is essential factor for low productivity of snake gourd but the use of large quantity and imbalance use of chemical fertilizers has led to think about the use of organic inputs in intensively growing areas for sustainable production. In the light of the above facts, the present investigation was undertaken to study the effect of different organic inputs on growth and yield of snake gourd.

Materials and Methods

The present study was carried out during the *kharif* seasons of 2015-2016 at Kethanur village, Palladam taluk, Tirupur District, Tamil Nadu to evaluate the performance of organic inputs on growth and yield of snake gourd. The soil of the experimental area was sandy clay loam in texture with low available nitrogen (208 kg/ha) and medium in phosphorus (18 kg/ha) and high in potassium (415 kg/ha) contents and was neutral in reaction (pH 7.6). The randomized block design (RBD) was used in the present experiment and replicated three times. The experiment consisted of eleven treatments 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 were incorporated into soil before sowing, based on the equal recommended dose of N (nitrogen) for snake gourd. The applied manures also satisfied the P (phosphorus) and K (potassium) requirements of 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. Subsequent irrigation was given as and when as required for better crop establishment. The various data on the growth characters and yield of snake gourd studied under different treatments were statistically as suggested by [5]. Wherever the treatmental differences were found significant (`F` test), critical difference was worked out at 0.05 probability level.

Results and Discussion

The results of the present investigation showed that there were significant differences on the vine length, total dry matter production and stem girth due to the application of various organic inputs. The source-sink relationship mainly depends on these important above mentioned parameters.

Growth characters

Growth of snake gourd was greatly influenced by the organic manurial treatments. Growth characters like vine length, stem girth and dry matter production (DMP) were recorded at different growth stages (30, 60 DAS and at harvest) of snake gourd and the results are presented here under.

Irrespective of the treatments, vine length and stem girth increased gradually from 30 DAS till harvest [Table-1]. The tallest vine (1.64 m) and stem girth (1.99 cm) was recorded with 100 per cent N through groundnut cake + neem cake @ 5:1 ratio at 30 DAS along with foliar spray of panchavgavya (3 per cent) and 100 per cent N through vermicompost + panchagavya spray @ 3 per cent has recorded higher vine length (5.68 and 8.69 m) and stem girth (3.74 and 4.89 cm) at 60 DAS and harvest respectively and it was comparable with 100 per cent N through groundnut cake + neem cake @ 5:1 ratio + 3G extract spray @ 3 per cent. It is interesting to observe that at initial stages, application of groundnut cake + neem cake @ 5:1 ratio along with foliar spray of panchavgavya 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, so it synchronizes crop nutrient requirement at the earlier stages for its better establishment. It might be due to a 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 @ 3 per cent, it is due to the higher nutrient releasing from the vermicompost had synchronized with crop nutrient requirement. The results are similar to the findings of [3] in moringa, [7] in cassava and [6] in ashwagandha.

Table-1 *Effect of various organic inputs on growth characters of snake gourd*

T. No.	Treatment	Vine length (m)			Stem girth (cm)		
		30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest
T_1	100% N through EFYM	1.23	3.82	5.88	1.51	2.58	3.69
T_2	100% N through Vermicompost	1.43	3.90	6.08	1.77	2.63	3.92
T_3	100% N through Groundnut cake + Neem cake @ 5:1 ratio	1.30	3.73	5.38	1.59	2.53	3.59
T_4	100% N through EFYM + Panchagavya @ 3 %	1.19	5.01	7.06	1.45	3.46	4.62
T_5	100% N through Vermicompost + Panchagavya @ 3 %	1.50	5.68	8.69	1.87	3.74	4.89
T_6	100% N through Groundnut cake + Neem cake @ 5:1 ratio + 3 % Panchagavya spray	1.64	4.78	6.57	1.99	3.36	4.15
T_7	100% N through EFYM + 3G extract spray @ 3 %	1.14	4.20	6.79	1.34	3.42	4.45
T_8	100% N through Vermicompost + 3G extract @ 3 %	1.38	5.24	7.99	1.66	3.53	4.51
T_9	100% N through Groundnut cake + Neem cake @ 5:1 ratio + 3G extract spray @ 3 %	1.57	4.89	6.66	1.92	3.05	4.02
T_{10}	Farmer practices of organic snake gourd cultivation	1.06	3.65	5.30	1.30	2.43	3.21
T_{11}	Control (No manure/ No spray)	0.89	3.10	4.45	1.10	2.27	2.70
	SEd	**0.08**	**0.25**	**0.37**	**0.09**	**0.17**	**0.23**
	CD (P=0.05)	**0.16**	**0.53**	**0.77**	**0.19**	**0.35**	**0.47**

(EFYM: Enriched Farmyard manure, 3G extract: Ginger, Garlic and Green chillies extract)

Dry matter production (DMP)

The DMP increased steadily with the advancement of age, attaining its peak at harvest in all the treatments [Table-2]. DMP was distinctly higher (747 kg/ha) in 100 per cent N through groundnut cake + neem cake @ 5:1 ratio + panchagavya spray @ 3 per cent at 30 DAS. Later growth stage of snake gourd at 60 and harvest, the application of 100 per cent N through vermicompost + panchagavya spray @ 3 per cent recorded maximum dry matter production of 6814 and 8964 kg/ha respectively, which was comparable with 100 per cent N through vermicompost + 3G extract spray @ 3 per cent. The crop at 60 DAS showed a phenomenal increase in dry matter production. Continuous slow release of nutrient by vermicopost is matched with the nutrient requirement of the snake gourd and also the foliar sprayed panchagavya which enabled the leaf area duration to extend and provided an opportunity for the plants to increase the photosynthetic rate leading to higher accumulation of dry matter. Similar findings were reported by [16].

Table-2 *Effect of various organic inputs on dry matter production of snake gourd*

T. No.		Treatment	Dry matter production (kg/ha)		
			30 DAS	60 DAS	At harvest
T_1	:	100% N through EFYM	537	4506	6656
T_2	:	100% N through Vermicompost	635	4926	7076
T_3	:	100% N through Groundnut cake + Neem cake @ 5:1 ratio	617	4326	6476
T_4	:	100% N through EFYM + Panchagavya @ 3 %	562	6231	8381
T_5	:	100% N through Vermicompost + Panchagavya spray @ 3 %	680	6814	8964
T_6	:	100% N through Groundnut cake + Neem cake @ 5:1 ratio + Panchagavya spray @ 3 %	747	5104	7254
T_7	:	100% N through EFYM + 3G extract spray @ 3 %	498	5591	7741
T_8	:	100% N through Vermicompost + 3G extract spray @ 3 %	580	6338	8488
T_9	:	100% N through Groundnut cake + Neem cake @ 5:1 ratio + 3G extract spray @ 3 %	721	5087	7237
T_{10}	:	Farmer practices of organic snake gourd cultivation	490	4214	6123
T_{11}	:	Control (No manure/ No spray)	419	3601	5269
SEd			**34**	**295**	**409**
CD (P=0.05)			**71**	**614**	**854**

(EFYM: Enriched Farmyard manure, 3G extract: Ginger, Garlic and Green chillies extract)

Yield attributes

Results illustrated in [Table-3] represented the effect of various organic inputs on yield and its components. Significant increase fruits per plant, fruit length, fruit girth and fruit weight were observed with mulch application of 100 per cent N through vermicompost + panchagavya spray @ 3 per cent (24.62 per cent, 15.20 fruits/plant, 38.67 cm, 18.62 cm and 662.8 g respectively) which was on par with 100 per cent N through vermicompost + 3G extract spray @ 3 per cent. The yield and yield attributing characters were mainly dependent on growth characters of the plant. As in any other plant, leaves are chief functional photosynthetic units. For normal production, a snake gourd crop needs sufficient number of leaves at vegetative phase. Greater accumulation of dry matter conferred greater ability to give high yield. This was obviously due to vigorous plant growth characters. The results of the present study indicated increased number of leaves, increased the photosynthetic activity resulting in higher accumulation of carbohydrates. Comparatively more amount of starches could produce the growth rate and it leads to increase the number of fruits and fruit weight [8]. The plants has been utilized mineral nutrients which is turn to improving the photosynthesis, other metabolic action and better diversion of photosynthates to fruits. This was in accordance with the result of [17] in chillies and [15] in French bean and [12] in 'chandler' strawberry.

Table-3 *Effect of various organic inputs on yield parameters of snake gourd*

T. No.	Treatment	No of fruits/plant	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)
T_1	100% N through EFYM	8.20	21.90	10.80	320.6
T_2	100% N through Vermicompost	9.40	24.30	11.60	432.8
T_3	100% N through Groundnut cake + Neem cake @ 5:1 ratio	9.10	23.20	10.19	373.6
T_4	100% N through EFYM + 3 % Panchagavya spray	11.20	33.10	15.61	507.3
T_5	100% N through Vermicompost + panchagavya @ 3 %	15.20	38.67	18.62	662.8
T_6	100% N through Groundnut cake + Neem cake @ 5:1 ratio + 3 % Panchagavya spray	9.70	36.07	17.32	439.9
T_7	100% N through EFYM + 3 % 3G extract spray	10.50	30.20	15.32	460.8
T_8	100% N through Vermicompost + 3 % 3G extract spray	15.00	35.80	18.21	609.7
T_9	100% N through Groundnut cake + Neem cake @ 5:1 ratio + 3% 3G extract spray	9.60	35.58	16.76	437.2
T_{10}	Farmer practices of organic snake gourd cultivation	6.80	20.70	9.86	286.4
T_{11}	Control (No manure/ No spray)	6.20	19.60	8.13	202.6
	SEd	**0.59**	**1.72**	**0.83**	**25.56**
	CD (P=0.05)	**1.23**	**3.59**	**1.73**	**53.33**

(EFYM: Enriched Farmyard manure, 3G extract: Ginger, Garlic and Green chillies extract)

Yield

The effect of various organic manure treatments on the fruit yield of snake gourd per hectare has shown a significant difference [Table-4]. Among the different organic treatments, higher fruit yield/plant (10.07 kg/plant) and yield (20.15 t/ha) was recorded with the application of 100 per cent N through vermicompost + panchagavya spray @ 3 per cent and it was closely followed by 100 per cent N through vermicompost + 3G extract spray @ 3 per cent. This might be due to improved growth characters as a result of soil application of vermicompost and foliar application of panchagavya which would have enhanced photosynthesis and other metabolic activities resulting into the increased production and accumulation of carbohydrates and retention of flowers and fruits, which might have increased number and weight of fruits. Increased yield in response to organics have been reported by Nirmalatha *et al*. (2010) in turmeric, [4] in cucumber; [2] and [10] in bitter gourd. (EFYM: Enriched Farmyard manure, 3G extract: Ginger, Garlic and Green chillies extract)

The lower growth characters *viz*., vine length, stem girth and dry matter production (30, 60 DAS and harvest stages respectively) and yield attributes and it components (fruit/plant, fruit length, fruit weight and fruit girth) were registered in the control plots, which was comparable with farmer practices of organic snake gourd cultivation. This might be probably due to the low availability and low uptake of nutrients resulting in production of less number of leaves ultimately less photosynthates, which reflects the low yield. The availability of lower nutrient levels reduced the leaf count, delayed flowering, number of fruits per plant and fruit size was also reported by [1].

Conclusion

It can be concluded that resource available to has adopting the organic manures and foliar spray of panchagavya or 3G extract played a greater role in maintaining soil fertility and found to be profitable than farmer practices of organic snake gourd cultivation. The future research has been identification of compounds responsible for the pest repellent action in panchagavya and 3G extract and standardization of time of application of panchagavya.

Table-4 *Effect of various organic inputs on yield of snake gourd*

T. No.	Treatment	Fruit yield (kg/ plant)	Fruit yield (t/ha)
T_1	100% N through EFYM	2.63	5.26
T_2	100% N through Vermicompost	4.07	8.14
T_3	100% N through Groundnut cake + Neem cake @ 5:1 ratio	3.16	6.32
T_4	100% N through EFYM + 3 % Panchagavya spray	5.68	11.36
T_5	100% N through Vermicompost + panchagavya @ 3 %	10.07	20.15
T_6	100% N through Groundnut cake + Neem cake @ 5:1 ratio + 3 % Panchagavya	4.27	8.54
T_7	100% N through EFYM + 3 % 3G extract spray	4.84	9.68
T_8	100% N through Vermicompost + 3 % 3G extract spray	9.15	18.29
T_9	100% N through Groundnut cake + Neem cake @ 5:1 ratio + 3% 3G extract spray	4.20	8.39
T_{10}	Farmer practices of organic snake gourd cultivation	1.95	3.90
T_{11}	Control (No manure/ No spray)	1.26	2.51
	SEd	**0.30**	**0.60**
	CD (P=0.05)	**0.63**	**1.26**

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Author Contributions

K. Mohan Kumar

The author has completed M.Sc., in Agronomy at Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore. He has secured national level ICAR JRF rank and secured fellowship from ICAR. His research interest includes the organic farming and water management.

E. Somasundaram
The author currently working as Professor and Head, Department of sustainable organic agriculture, TNAU, Coimbatore. He has guided many M. Sc. and P.h.D. scholars for their research programme. He has experience in teaching/ research/ extension for 27 years and published more than 150 research papers both as national and international journals. His research interest includes the organic farming and Integrated Farming Systems (IFS).

S. Marimuthu
The author pursuing Ph.D in Agronomy at Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore. His research interest includes the organic farming and weed management.

Abbreviations
The following abbreviations are used in the article
N: Nitrogen, P: Phosphorus, K: Potassium, @: at the rate, RBD: Randomized block design, RDN: Recommended dose of Nitrogen, DMP: Dry matter production, EFYM: Enriched farmyard manure, 3G extract: Ginger, Garlic and Green chillies extract, C: N ratio: Carbon and Nitrogen ratio

Conflict of Interest: None declared

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