International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2021; 9(4): 280-284

Received: 10-05-2021
Accepted: 12-06-2021

Chandan TK
Department of PSMA, College of Horticulture, Rajendranagar, Hyderabad, Telangana, India

D Lakshminarayana
Associate Professor, Department of Horticulture, College of Horticulture, Rajendranagar, Hyderabad, Telangana, India

N Seenivasan
Professor, Department of Horticulture, Controller of Examination, SKLTSHU, Mulugu, Siddipet, Telangana, India

Veena Joshi
Associate Professor, Department of Fruit Science, College of Horticulture, Mojerla, Telangana, India

S Praneeth Kumar
Scientist (Crop Physiology), Floricultural Research Station, Rajendranagar, Hyderabad, Telangana, India

Corresponding Author:
Chandan TK
Department of PSMA, College of Horticulture, Rajendranagar, Hyderabad, Telangana, India

Growth and yield of Kasuri methi (*Trigonella corniculata* L.) var. Pusa Kasuri as influenced by different organic manures and biofertilizers under Telangana conditions

Chandan TK, D Lakshminarayana, N Seenivasan, Veena Joshi and S Praneeth Kumar

Abstract
A field experiment was conducted during *rabi* 2019-20 at College of Horticulture, Rajendranagar, Hyderabad, Sri Konda Laxman Telangana State Horticultural University, Mulugu, Telangana, to study the efficacy of different organic manures and biofertilizers on kasuri methi (*Trigonella corniculata* L.) var. Pusa Kasuri. The experiment was evaluated in randomized block design with eleven treatment combinations were replicated thrice. Among the treatments, T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (4 t ha^{-1}) + AMC (7.5 lit ha^{-1}) recorded significantly higher plant height (42.07 cm), more number of branches per plant (25.02), significantly maximum plant spread (North-South 29.82 cm and East-West 31.20 cm) at harvesting stage. The same treatment also registered significantly the highest fresh herb yield per plant and per hectare (24.63 g and 8090.53 kg respectively), dry herb yield per plant and per hectare (5.78 g and 1615.69 kg respectively), maximum number of days taken to first and 50 per cent flowering (64.87 days and 95.55 days respectively), significantly more number of pods per plant (634.56), pod length (2.02 cm), maximum number of seeds per pod (6.03), significantly the highest seed yield per plant and per hectare (1.61 g and 482.41 kg respectively) and maximum test weight (1.63 g).

Keywords: growth, yield, Kasuri methi, *Trigonella corniculata* L.) var. Pusa Kasuri, biofertilizers

Introduction
Kasuri methi is an herbaceous, bushy, slow growing annual spice crop, belongs to the family fabaceae and is native to the Mediterranean region. It has diploid number of chromosomes 2n=16. It has many regional names like ‘Champamethi’ and ‘Marwari methi’ (Hindi), Piring (Assami) and in English it is popularly called as sickle fruited fenugreek. Kasuri methi is mainly grown in India, Pakistan, China, Nepal and Bangladesh. In India, it is commercially grown in Rajasthan, Gujarat, Madhya Pradesh, Haryana, West Bengal, Punjab and Maharashtra. Moreover Rajasthan occupies 80 per cent of area and production (Babaleshwar and Shetty, 2017) [2].

In India it is cultivated in an area of 1.49 lakh ha with a production of 2.02 lakh MT (National Horticulture Board, 2017).

Kasuri methi is a semi-arid crop, grows up to 30 cm height and its leaves are pinnate shape with size of leaflets being 1.25-2.0 cm and consists bright orange-yellow coloured flowers. Pods are 1.2-2.2 cm long, sickle shaped with 4-8 seeded number. Kasuri methi is mainly grown for herbage as well as for seed, used as a spice to add aroma and flavor to the food products. Presently Kasuri methi cultivation is confined to North Indian States only. However due to increase in its usage as well as an assured remuneration, there is a need to expand an area under this valuable spice crop. Improper nutrient management is one of the major reason which causes lower yield and poor quality seed in Kasuri methi. So, the integrated nutrient management approach could be a rational way to increase herbage yield and seed quality.

The indiscriminate and continuous application of chemical fertilizers causes soil and environmental degradation and also increases the cost of cultivation of the crop. Hence, a lot of importance is given to organic manures and biofertilizers which involves supplying of nutrient requirements by organic and bio fertilizers helps not only in increasing the yield but also in maintains the soil health and eco-friendly environment.

It is mainly grown as a rabi season crop and the cultivation methods are more or less similar to that of common methi. The nutrient requirement of the crop through organic approach is not studied so far under Telangana conditions. Hence, there is a need to study the optimum dose of nutrients from different organic sources and biofertilizers.

Material and Methods

Present field experiment was conducted during *rabi* 2019-20 at College of Horticulture, Rajendranagar, Hyderabad, Sri Konda Laxman Telangana State Horticultural University, Mulugu, Telangana, India. The experimental site, Rajendranagar is situated at an altitude of 536 m above mean sea level on 78°.40' East longitude and 17°.32' North latitude. The climate of Rajendranagar is semi-arid. The soil of the experimental site was loamy texture with a soil pH of 7.2 and Electrical Conductivity of 0.18 dSm^{-1}. The organic carbon content is very low. The availability of nitrogen, phosphorous and potash per hectare is 205.80, 44.7 and 165.45 kilograms respectively. The experiment was carried out with the variety 'Pusa Kasuri'.

The experiment was carried out with eleven treatments i.e. T_1 - 100% RDN through FYM (16 t ha^{-1}) + AMC (7.5 lit ha^{-1}), T_2 - 100% RDN through Neem cake (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}), T_3 - 100% RDN through Vermicompost (4 t ha^{-1}) + AMC (7.5 lit ha^{-1}), T_4 - 75% RDN through FYM (12 t ha^{-1}) + AMC (7.5 lit ha^{-1}), T_5 - 75% RDN through Neem cake (1.5 t ha^{-1}) + AMC (7.5 lit ha^{-1}), T_6 - 75% RDN through Vermicompost (3 t ha^{-1}) + AMC (7.5 lit ha^{-1}), T_7 - 50% RDN through FYM (8 t ha^{-1}) + AMC (7.5 lit ha^{-1}), T_8 - 50% RDN through Neem cake (1 t ha^{-1}) + AMC (7.5 lit ha^{-1}), T_9- 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}), T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) and T_{11} - Control (without any application) in a Randomized Block Design and replicated thrice. Seeds were sown in the plot of 2 m × 2 m at spacing of 30 cm × 10 cm.

Organic manures *viz*., well decomposed farm yard manure, neem cake and vermicompost were weighed separately for all the plots, according to the treatments and then applied to the respective plots one week prior to sowing and incorporated in to the soil uniformly.

The biofertilizer AMC (Arka Microbial Consortium) was applied as soil application.

Table 1: Effect of organic manures and biofertilizers on growth parameters (plant height and number of branches per plant) of kasuri methi var. Pusa Kasuri

Treatments	Plant height (cm)				No. of branches per plant			
	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest
T_1	4.96	21.62^{b}	37.89^{b}	39.84^{ab}	3.67^{ab}	12.69^{b}	21.47^{ab}	23.58^{ab}
T_2	4.68	20.32^{cd}	37.42^{bc}	39.43^{b}	3.53^{ab}	12.30^{bc}	21.15^{abc}	23.01^{bcd}
T_3	4.86	20.94^{bc}	37.66^{bc}	39.55^{b}	3.60^{ab}	12.44^{b}	21.32^{abc}	23.23^{bc}
T_4	4.49	19.87^{d}	37.23^{bc}	39.31^{b}	3.40^{ab}	12.20^{bcd}	20.87^{bc}	22.51^{bcde}
T_5	4.25	19.55^{de}	36.97^{bc}	38.88^{b}	3.20^{ab}	11.90^{bcd}	20.06^{bc}	22.07^{bcde}
T_6	4.34	19.71^{de}	37.07^{bc}	39.13^{b}	3.33^{ab}	12.03^{bcd}	20.48^{bc}	22.34^{bcde}
T_7	4.17	18.70^{ef}	36.57^{bc}	38.52^{b}	3.07^{ab}	11.60^{bcd}	19.81^{bc}	21.77^{cde}
T_8	4.05	17.97^{f}	36.03^{c}	38.19^{b}	2.80^{b}	11.15^{d}	19.29^{c}	21.05^{e}
T_9	4.09	18.33^{f}	36.32^{bc}	38.36^{b}	2.97^{ab}	11.29^{cd}	19.46^{bc}	21.34^{de}
T_{10}	5.11	23.71^{a}	39.73^{a}	42.07^{a}	3.97^{a}	14.21^{a}	23.15^{a}	25.02^{a}
T_{11}	2.61	15.37^{g}	30.40^{d}	32.17^{c}	1.47^{c}	8.90^{e}	16.89^{d}	18.64^{f}
SEm ±	0.45	0.35	0.6	0.77	0.37	0.38	0.71	0.59
CD at 5%	NS	1.05	1.76	2.27	1.08	1.11	2.09	1.73

DAS, days after sowing.

Table 2: Effect of organic manures and biofertilizers on growth parameters (plant spread) of kasuri methi var. Pusa Kasuri

Treatments	Plant spread (cm)							
	North - South				East - West			
	30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest
T_1	7.65	19.04^{b}	24.85^{b}	27.81^{b}	8.25	21.03^{b}	25.92^{ab}	28.20^{b}
T_2	7.20	18.40^{bcd}	24.12^{bcd}	27.04^{bc}	8.07	20.28^{bcd}	25.53^{b}	27.69^{b}
T_3	7.35	18.72^{bc}	24.49^{bc}	27.34^{bc}	8.14	20.70^{bc}	25.76^{b}	27.85^{b}
T_4	7.16	18.27^{bcd}	23.80^{bcd}	26.71^{bcd}	7.87	20.10^{bcd}	25.23^{b}	27.50^{b}
T_5	6.95	18.04^{bcde}	23.19^{bcd}	26.09^{cde}	7.58	19.78^{cd}	24.92^{b}	27.10^{b}
T_6	7.08	18.13^{bcde}	23.36^{bcd}	26.32^{bcde}	7.75	20.00^{bcd}	25.10^{b}	27.23^{b}
T_7	6.79	17.77^{cde}	22.81^{bcd}	25.80^{cde}	7.40	19.50^{d}	24.55^{b}	26.76^{b}
T_8	6.27	17.07^{e}	22.18^{d}	25.06^{e}	7.16	19.15^{d}	24.06^{b}	26.08^{b}
T_9	6.67	17.40^{de}	22.53^{cd}	25.35^{de}	7.27	19.27^{d}	24.37^{b}	26.43^{b}
T_{10}	8.83	21.15^{a}	27.13^{a}	29.82^{a}	9.01	23.17^{a}	28.33^{a}	31.20^{a}
T_{11}	4.33	14.78^{f}	19.81^{e}	20.93^{f}	4.97	16.89^{e}	20.84^{c}	22.75^{c}
SEm ±	0.76	0.4	0.74	0.54	0.68	0.38	0.82	0.74
CD at 5%	NS	1.17	2.18	1.6	NS	1.13	2.42	2.17

DAS, days after sowing.

Table 3: Effect of organic manures and biofertilizers on yield parameters of kasuri methi var. Pusa Kasuri

Treatments	Fresh herb yield (g plant^{-1})	Fresh herb yield (kg ha^{-1})	Dry herb yield (g plant^{-1})	Dry herb yield (kg ha^{-1})	Days taken to 1st flowering	Days taken to 50% flowering
T_1	21.97^{b}	6787.67^{b}	5.14^{bc}	1361.04^{b}	64.47	94.88
T_2	20.76^{c}	6263.73^{c}	4.95^{bcde}	1256.46^{c}	64.05	94.08
T_3	21.49^{bc}	6366.73^{c}	5.02^{bcd}	1283.25^{bc}	64.36	94.59
T_4	18.94^{d}	5681.13^{d}	4.66^{def}	1143.98^{de}	63.85	93.88
T_5	18.05^{de}	5319.47^{e}	4.37^{fg}	1049.99^{f}	63.23	93.03
T_6	18.32^{d}	5407.73^{e}	4.53^{ef}	1090.59^{ef}	63.40	93.48
T_7	17.21^{ef}	4504.89^{f}	4.07^{gh}	891.36^{gh}	62.58	92.80
T_8	16.85^{f}	4197.20^{g}	3.83^{h}	827.07^{h}	62.13	92.13
T_9	17.04^{ef}	4236.13^{g}	3.93^{h}	856.76^{h}	62.48	92.54
T_{10}	24.63^{a}	8090.53^{a}	5.78^{a}	1615.69^{a}	64.87	95.55
T_{11}	9.89^{g}	2164.31^{h}	2.83^{i}	559.18^{i}	61.43	91.30
SEm ±	0.35	37.74	0.14	30.09	1.32	1.12
CD at 5%	1.04	111.32	0.42	88.77	NS	NS

Table 4: Effect of organic manures and biofertilizers on yield parameters of kasuri methi var. Pusa Kasuri

Treatments	No. of pods plant^{-1}	Pod length (cm)	No. of seeds pod^{-1}	Seed yield (g plant^{-1})	Seed yield (kg ha^{-1})	Test weight (g)
T_1	576.66^{b}	1.90^{ab}	5.88^{ab}	1.45^{b}	347.81^{b}	1.55
T_2	532.39^{c}	1.80^{bcd}	5.78^{bc}	1.36^{bc}	310.73^{bcd}	1.50
T_3	546.09^{bc}	1.84^{bc}	5.85^{ab}	1.39^{bc}	320.05^{bc}	1.53
T_4	504.96^{cd}	1.75^{cde}	5.60^{cd}	1.30^{c}	269.04^{de}	1.48
T_5	471.59^{de}	1.64^{efg}	5.42^{de}	1.17^{de}	233.20^{ef}	1.40
T_6	487.03^{d}	1.70^{def}	5.53^{d}	1.28^{cd}	246.63^{ef}	1.43
T_7	442.45^{ef}	1.57^{fgh}	5.30^{ef}	1.15^{e}	215.49^{f}	1.37
T_8	402.27^{f}	1.48^{hi}	5.16^{f}	1.03^{f}	203.45^{f}	1.30
T_9	413.99^{f}	1.55^{ghi}	5.25^{ef}	1.08^{ef}	209.17^{f}	1.33
T_{10}	634.56^{a}	2.02^{a}	6.03^{a}	1.61^{a}	482.41^{a}	1.63
T_{11}	286.30^{g}	1.40^{j}	4.25^{g}	0.74^{g}	107.97^{g}	1.20
SEm ±	14.53	0.05	0.07	0.04	17.08	0.09
CD at 5%	42.85	0.13	0.22	0.11	50.39	NS

Results and Discussion

Growth parameters

Growth parameters such as plant height, number of branches per plant, plant spread (North-South and East-West).

The results related to growth parameters indicated that, among the treatments T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) recorded significantly higher plant height, more number of branches per plant (26.47), significantly maximum plant spread (North-South and East-West) over other treatments showed in Table 1 and Table 2.

The data enunciated on plant height at 30, 60, 90 DAS revealed that, among the treatments T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) recorded the highest value. Which might be due to optimum dosage and beneficiary effect of organic manures and biofertilizers. The growth promoting effect of FYM as a source of plant nutrients and humus, improves physiological condition of the soil in terms of good aeration and proliferation of microbial activity (Joy *et al.* 2005) [4]. Similar observation was also reported by Khiriya *et al.* (2001) [5], Kumawat *et al.* (2003) [13], Raiyani *et al.* (2018) [11] and Rakesh *et al.* (2019) [12] in fenugreek and Agarwal *et al.* (2016) in coriander.

Maximum number of branches per plant was recorded in T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) which was due to the application of organic manures and biofertilizer which led to continuous and prolonged availability of the nutrients, helped in breaking of apical dominance and produced more number of branches per plant. These results are in agreement with the findings of Raiyani *et al.* (2018) [11] and Rakesh *et al.* (2019) [12] in fenugreek.

The highest plant spread (North - South) and (East - West) at 30, 60, 90 days after sowing and harvest stage was recorded in T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) might be due to the same treatment registered maximum plant height and more number of branches per plant as compared to rest of the treatments. The results are similar with the findings of Khiriya *et al.* (2001) [5], Aiyanathan and Salairajan (2008) [1] in fenugreek and Naveen (2010) [9] in kasuri methi.

Yield parameters

Yield parameters such as fresh herb yield per plant and per hectare, dry herb yield per plant and per hectare, number of days taken to first and 50 per cent flowering, pods per plant, pod length, number of seeds per pod, seed yield per plant and per hectare and maximum test weight showed a significant difference between treatment combinations.

Among the treatments, T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) recorded significantly the highest fresh herb yield per plant and per hectare, dry herb yield per plant and per hectare, Non-significant differences were observed among the treatments with respect to days taken to first flowering and 50 per cent flowering, (Table 3)

Similarly, significantly more number of pods per plant, pod length, maximum number of seeds per pod and the same treatment also registered significantly the highest seed yield

per plant and per hectare and maximum test weight was recorded in the same treatment combination (Table 4.).

The highest fresh herb yield per plant and per hectare was registered in T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) which might be due to the same treatment recorded better vegetative growth in terms of plant height, number of branches per plant and widen plant spread over other treatments. Moreover it was due to the application of optimum and balanced nutrients through organic sources and biofertilizers, promoted better photosynthetic activity that resulted in increased carbohydrate synthesis. The present investigation was in consistent with other reports of Mehta *et al.* (2010) [7] and Rakesh *et al.* (2019) [12] in fenugreek.

The highest dry herb yield per plant and per hectare was registered in T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) might be due to the same treatment recorded maximum fresh herb yield per plant and per hectare as compared to the rest of the treatments. The present investigation was in consistent with other reports of Mehta *et al.* (2010) [7] in fenugreek, Rakesh *et al.* (2019) [12] in fenugreek.

The highest number of pods per plant was recorded in T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) which might be due to the application of balanced nutrition through different organic sources as well as biofertilizer *viz*., AMC, resulted in increased vegetative growth and synthesis of relatively more amount of food materials and photosynthates were translocated and accumulated in the reproductive parts, led to maximum number of pods per plant. The results of the present study are comparable with that Naimuddin *et al.* (2014) [8] in fenugreek.

The highest pod length was recorded in T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) might be due to the same treatment registered maximum leaf area resulted in better photosynthesis, led to more accumulation of photosybthates in pod. This result was in conformity with the findings of Yadav and Kumawat (2003) [6], Purbey and Sen (2005) [10] and Godara *et al.* (2012) [3] in fenugreek.

The highest number of seeds per pod was recorded in T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) might be due to the same treatment registered maximum leaf area resulted in better photosynthesis, led to more accumulation of photosybthates in pod. This result was in conformity with the findings of Yadav and Kumawat (2003) [13], Purbey and Sen (2005) [10] and Godara *et al.* (2012) [3] in fenugreek.

The highest seed yield per plant and per hectare was recorded in T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) which might be due to the same treatment registered maximum seed yield per plant over other treatments. Moreover it was due to the application of optimum quantity of different nutrient sources improved soil physical, chemical and biological properties resulted in higher fertilizer use efficiency, ultimately led to more seed yield. Similar results were also reported by Rakesh *et al.* (2019) [12].

Thus, it can be concluded that application of 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) showed positive effect on growth and yield parameters. The present study indicated that practicing organic manures and biofertilizers promoted favourable soil environment for the growing crop by improving soil organic carbon and soil physico-chemical properties leading to better growth and herb and seed yield of kasuri methi.

Conclusion

- Among the treatments, T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) recorded higher plant height, more number of branches per plant and significantly maximum plant spread in both the directions as compared to other treatments.
- The plants provided with T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) recorded significantly maximum fresh and dry herb yield per plant and per hectare over other treatments.
- Maximum number of days taken to first and 50 per cent flowering was recorded in T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}), while less number of days taken to first and 50 per cent flowering was recorded in T_{11} – Control (without any application) as compared to the other treatments.
- The plants supplied with T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) recorded significantly maximum number of pods per plant and pod length as compared to other treatments. While, test weight (1000 seed weight) was non-significant among the treatments.
- The highest seed yield per plant and per hectare was recorded significantly in T_{10} - 50% RDN through FYM (8 t ha^{-1}) + 50% RDN through Neem cake (1 t ha^{-1}) + 50% RDN through Vermicompost (2 t ha^{-1}) + AMC (7.5 lit ha^{-1}) as compared to other treatments.

References

1. Aiyanathan KA, Salalrajan. Organic amendments for managements of root rot of fenugreek. Indian Journal of Plant Protection 2008;36(2):277-278.
2. Babaleshwar SB, Shetty GR. Influence of integrated nutrient management on nutrient uptake of kasuri methi (*Trigonella corniculata* L.) under hill zone of Karnataka. International Journal of Pure Applied Bioscience 2017;5(6):1183-1188.
3. Godara AS, Gupta US, Singh R, Mehta RS. Effect of different combinations of organic and inorganic nutrient sources on productivity and profitability of fenugreek (*Trigonella foenum-graecum* L.). International Journal of Seed Spices 2012;2(2):34-37.
4. Joy PP, Savithri KE, Mathew S, Thomas J, Kurien K. Effect of sole and combined application of FYM and fertilizer on growth, yield and quality of black musli (*Curculigo orchioides*). Journal of Medicinal and Aromatic Plants Sciences 2005;27:454-461.
5. Khiriya KD, Sheoran RS, Singh BP. Growth analysis of fenugreek (*Trigonella foenum-graecum* L.) under various levels of farmyard manure and phosphorus. Journal of Spices and Aromatic Crops 2001;10(2):105-110.

6. Kumawat PD, Choudhary GR, Pareek RG. Response of fenugreek (*Trigonella foenum-graecum* L.) to iron, molybdenum and *Rhizobium* inoculation. Advances in Plant Science 2003;16(1):83-85.
7. Mehta RS, Patel BS, Meena SS, Meena RS. Influence of nitrogen, phosphorous and bio fertilizers on growth and yield of fenugreek (*Trigonella foenum-graecum*). Journal of Spices and Aromatic crops 2010;19(1, 2)23-28.
8. Naimuddin Aishwath OP, Lal G, Kant K, Sharma YK, Ali SF. Response of *Trigonella foenum-graecum* to organic manures and *Rhizobium* inoculation in a Typic Haplustept. Journal of Spices and Aromatic Crops 2014;23(1):110-114.
9. Naveen MN. Standardization of nutrient requirement of kasuri methi (*Trigonella corniculata* L.) through organics. M.Sc. (Hort) thesis, submitted to the University of Agricultural Sciences Bangalore 2010.
10. Purbey SK, Sen NL. Effect of bioinoculants and bioregulators on productivity and quality of fenugreek (*Trigonella foenum.graecum* L.). Indian Journal of Agriculture Sciences 2005;75(9):608-611.
11. Raiyani VN, Kathiriya RK, Thummer VM, Rupareliya VV. Effect of FYM and biofertilizers on growth, yield attributes and yield of fenugreek (*Trigonella foenum-graecum* L). International Journal of Chemical Studies 2018;6(4):746-748.
12. Rakesh V, Shah SN, Patel PB, Patel HK, Vikas P. Feasibility of organic nutrient management in fenugreek (*Trigonella foenum-graecum* L). International Journal of Agriculture Sciences 2019;11(6):8106-8108.
13. Yadav GL, Kumawat PD. Effect of organic, inorganic fertilizer and *Rhizobium* inoculation on the yield and yield attributes of fenugreek (*Trigonella foenum. graecum* L.). Haryana Journal of Horticulture Science 2003;32(1/2):147-148.