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Performance of Kasuri Methi (*Trigonella corniculata* L) under Hill Zone of Karnataka

Sunanda Babaleshawar, G. Raviraja Shetty*, D. A. Pooja and Rajani Bhat

Department of Plantation, Spices, Medicinal and Aromatic Crops
College of Horticulture, Mudigere, UAHS, Shivamogga, India

**Corresponding author*

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A B S T R A C T

An experiment was conducted at college of Horticulture, Mudigere, Chikmagaluru to study the effect of integrated nutrient management on yield and quality of kasuri methi (*Trigonella corniculata* L.) under hill zone of Karnataka. Among all the treatments higher values of dry herb yield (1.88 t/ha), fresh herb yield (8.02 t/ha), No. of pods plant^{-1} (620.17), Pod length (2.14) and quality attributes like crude protein in herb (13.31 %) and in seed (21.33 %) was recorded in the treatment supplied with 75% N+ RD PK +FYM (7.5 t ha^{-1}) + *Rhizobium* (1.5t ha^{-1})+ *Azospirillum* (5 kg ha^{-1})+ PSB (5 kg ha^{-1}). While it was found statistically *on par* with application of 50% N+ RD PK + FYM (7.5 t ha^{-1}) + *Rhizobium* (1.5 kg ha^{-1}) + *Azospirillum* (5 kg ha^{-1}) + PSB (5 kg ha^{-1}). It was found that integrated nutrient management has played an important role in improvement of yield and quality of kasuri methi and also in maintenance of soil health.

Introduction

Kasuri methi (*Trigonella corniculata* L.) is an herbaceous, bushy, slow growing annual spice crop mainly grown for herbage that too dry herb and seed. Dried leaves are used as a spice to add aroma and flavor to the food products. It is believed that regular intake of kasuri methi seeds reduces the level of glucose, total cholesterol and triglycerides in blood, the amino acid called 4-hydroxyisoleucine helps in stimulating the secretion of insulin and also it lowers the blood glucose levels by slowing down the absorption process of carbohydrates there by regulating glucose levels in the blood. It is important herb spice crop grown as winter season crop of planes of north India.

Free-living nitrogen-fixing bacteria were found to have not only the ability to fix nitrogen but also the ability to release phytohormones similar to gibberellic acid and indole acetic acid, which could stimulate plant growth, absorption of nutrients, and photosynthesis (Fayez *et al.*, 1985).

Integrating chemical fertilizer with organic manures has been found to be quite promising not only in maintaining higher productivity but also in providing great stability in crop production (Nambiar and Abrol 1989).

Farm yard manure or vermicompost when integrated with reduced doses of inorganic fertilizers resulted in improved soil fertility, growth and yield of plant (Subbian and Palaniappan, 1992). Balanced nutrition that is integrated nutrient management which enhances the crop growth and yield of crop and mentains the soil health for long time. Keeping all these points in view the present study was carried out.

Materials and Methods

The experiment was conducted at farm field of Zonal Agricultural and Horticultural Research station Mudigere during 2013-14. In this study inorganic fertilizers, organic manures and biofertilizers consisting of twelve treatment combinations were tried in the Randomized Block Design with three replications

Treatments are as follows

T_1: RD NPK (80:25:50 kg ha^{-1}) + RD FYM (7.5t ha^{-1})
T_2: RD NPK + Vermicompost (4t ha^{-1})
T_3: 75% N + RD PK+ FYM (7.5t ha^{-1}) + *Rhizobium* (1.5 kg ha^{-1}) + PSB (5 kg ha^{-1})
T_4: 75% N+ RD PK+ Vermicompost (4t ha^{-1}) + *Rhizobium* (1.5 kg ha^{-1}) + PSB (5 kg ha^{-1})
T_5: 75% N+ RD PK +FYM (7.5t ha^{-1}) + Azospirillum (5 kg ha^{-1}) + PSB (5 kg ha^{-1})
T_6: 75% N+ RD PK +Vermicompost (4t ha^{-1}) + *Azospirillum* (5 kg ha^{-1}) + PSB (5 kg ha^{-1})
T_7: 75% N+ RD PK +FYM (7.5t ha^{-1}) + *Rhizobium* (1.5 kg ha^{-1}) + *Azospirillum* + PSB (5 kg ha^{-1})
T_8: 50% N+ RD PK + FYM (7.5t ha^{-1}) + Rhizobium (1.5 kg ha^{-1}) + PSB (5 kg ha^{-1})
T_9: 50% N+ RD PK + Vermicompost (4t ha^{-1}) + *Rhizobium* (1.5 kg ha^{-1}) + PSB (5 kg ha^{-1})
T_{10}: 50% N+ RD PK +FYM (7.5t ha^{-1}) + *Azospirillum* (5 kg ha^{-1}) + PSB (5 kg ha^{-1})
T_{11}: 50% N+ RD PK + Vermicompost (4t ha^{-1}) +*Azospirillum* (5 kg ha^{-1}) + PSB (5 kg ha^{-1})
T_{12}: 50% N+ RD PK + FYM (7.5t ha^{-1}) + *Rhizobium* (1.5kg ha^{-1}) + *Azospirillum* (5kg ha^{-1}) + PSB (5 kg ha^{-1})

The experimental plot was ploughed thrice by tractor drawn cultivator and leveled. The clods were crushed weeds were removed and brought to fine tilt. The land was divided into plots of required size (2.9 m^2 x 2.1 m^2). Provision was made for bunds and irrigation channels. The seeds of the variety Pusa Kasuri were used with the seed rate of 18 -20 Kg ha^{-1}.

It's an early bearing and high yielding variety. Seeds were sown with a spacing of 30x10 cm. Furrows were properly covered with a thin layer of soil and the plots were irrigated lightly. Excess seedlings were thinned out at 30 days after sowing, to maintain the 10 cm distance between the plants. The plots were kept free from weeds by hand weeding at 15, 30, 45, 70 and 95 days after sowing.

Irrigation was given at an interval of 4-5 days during the whole cropping period depending on the soil moisture conditions. About 32-37 irrigations were given. In order to evaluate the effect of different treatments on growth and yield of crop under hill zone of Karnataka, necessary periodical observations were recorded.

Results and Discussion

The performance of Kasuri methi was found to be better under combined application of organic and inorganic fertilizers. All the treatments influenced the yield and quality attributes of kasuri methi appreciably (Table 1

and Table 2.) highest fresh herb yield (1.88 t/ha), dry herb yield (1.13 t/ha), No. of pods plant^{-1} (620.17), pod length (2.14 cm), seed yield (465.31kg/ ha), crude protein content in herb (13.31%),Crude protein content in seed (21.33%) were recorded in the treatment T_7 which consisting of 75% N+ RD PK + FYM (7.5t ha^{-1})+ *Rhizobium* (1.5 kg ha^{-1})+ *Azospirillum* (5 kg ha^{-1}) + PSB (5 kg ha^{-1}) which was followed by 50% N+ RD PK + FYM (7.5t ha^{-1}) + *Rhizobium* (1.5 kg ha^{-1})+ *Azospirillum* (5 kg ha^{-1})+ PSB (5 kg ha^{-1}) (T_5).

Increased fresh herb yield and dry herb yield could be attributed to better vegetative growth in terms of plant height, number of branches and plant spread due to the application of balanced nutrients in integrated sources which promotes better photosynthetic activity resulted in increased carbohydrate synthesis and better plant growth. Similar results were obtained by Mehta *et al.,* (2010), Garg, (2007), Choudhary *et al.,* (2011) in fenugreek.

Increased no. of pods plant^{-1}, pod length and seed yield could be due to significant increase in the number of branches, plant height, number of leaves, pods per plant and pod length and also integrated nutrient management provided basic source for yield attributes and seed yield is an output of sequential metamorphosis from the chain of source to sink relationship.

It was also related to INM practice which improved soil physical, chemical and biological properties, resulting in higher fertilizer use efficiency. Dutta *et al.,* (2011), Patel *et al.,* (2010), Choudhary *et al.,* (2011) and Mehta *et al.,* (2010), (Mehta *et al*., 2011) (Mukesh kumar *et al*., 2012) in fenugreek.

The minimum days taken for 1st and 50 percent of flowering was noticed with RD NPK + Vermicompost (4t ha^{-1}) this may be due to minimum availability of nitrogen for a limited period which made the plants to enter the reproductive stage early. Maximum days taken for 1st and 50 % of flowering was recorded in the treatment T_7 which was supplied with 75% N+ RD PK +FYM + *Rhizobium* + *Azospirillum* + PSB and 50% N+ RD PK + FYM (7.5t ha^{-1}) + *Rhizobium* (1.5 kg ha^{-1})+ *Azospirillum* (5 kg ha^{-1}) + PSB (5 kg ha^{-1}) (T_5).

This might be due to the slow and prolonged availability of major and micronutrients and growth promoting hormones, released by organic manures biofertilizers and primary nutrient nitrogen, which may have positive influence on vegetative growth. Similar results were reported by Giridhar Kalidasu *et al.,* (2008) in coriander.

The plants supplied with 75% N+ RD PK +FYM (7.5t ha^{-1}) + *Rhizobium* (1.5 kg ha^{-1}) + *Azospirillum* (5 kg ha^{-1}) + PSB (5 kg ha^{-1}) (T_7) recorded maximum crude protein content in seed (21.33 %) and herb (13.31 %).

It might be due to the supplementary application of FYM, vermicompost and N fixing biofertilizers which supply the available nitrogen throughout the cropping period and resulting in better uptake and assimilation of crude protein in herb and seed. The results are in conformity with Deora and Jitendra Singh (2004), Pramod Kumar Dubey *et al.,* (2012) and Purbey and Sen (2005) in fenugreek.

On the basis of results, it may be concluded that the combined application of 75% N+ RD PK +FYM (7.5t ha^{-1}) + *Rhizobium* (1.5 kg ha^{-1}) + *Azospirillum* + PSB (5 kg ha^{-1}) and 50 % N+ RD PK +FYM (7.5t ha^{-1}) + *Rhizobium* (1.5 kg ha^{-1}) + *Azospirillum* + PSB (5 kg ha^{-1}) treatments was found to better in terms of yield and quality attributes of kasuri methi is recommended for hill zone location.

Table.1 Effect of integrated nutrient management on yield attributes of kasuri methi (*Trigonella corniculata* L.)

Treatment	Number of days taken to 1st flowering	Number of days taken for 50 % of flowering	Fresh herb yield (kg/ plot)	Fresh herb yield (t/ha)	Dry herb yield (kg/ plot)	Dry herb yield (t/ ha)
T_1	55.13	82.32	4.70	7.83	0.99	1.64
T_2	46.25	71.06	3.94	6.56	0.77	1.28
T_3	55.62	82.07	4.78	7.95	0.97	1.62
T_4	51.3	80.07	4.68	7.79	0.83	1.54
T_5	49.03	75.11	4.32	7.20	0.88	1.47
T_6	52.38	75.71	4.52	7.53	0.92	1.54
T_7	56.34	83.72	4.81	8.02	1.13	1.88
T_8	49.81	71.81	4.09	7.02	0.81	1.35
T_9	47.94	72.09	4.22	7.02	0.84	1.31
T_{10}	48.23	72.53	4.30	7.16	0.87	1.44
T_{11}	51.30	78.85	4.63	7.71	0.98	1.63
T_{12}	55.62	82.46	4.79	7.97	1.01	1.68
F- test	*	*	*	*	*	*
S. Em ±	1.78	2.62	0.16	0.29	0.05	0.09
C.D. @ 5%	5.21	7.69	0.47	0.85	0.22	0.26

Table.2 Effect of integrated nutrient management on yield and quality attributes of kasuri methi (*Trigonella corniculata* L.)

Treatment	No. of pods plant^{-1}	Pod length (cm)	No. of seeds pod^{-1}	Seed yield kg/ ha	Test weight (g) (weight of 1000 seeds)	Crude protein content in herb (%)	Crude protein content in seed (%)
T_1	562.00	1.80	5.73	420.03	1.64	11.79	19.50
T_2	513.67	1.23	5.56	325.02	1.46	10.27	17.08
T_3	570.67	1.71	5.61	387.17	1.47	11.56	18.83
T_4	567.67	1.76	5.67	380.06	1.60	11.35	18.33
T_5	535.60	1.49	5.60	367.63	1.54	10.23	17.81
T_6	544.61	1.50	5.60	371.18	1.61	10.58	11.10
T_7	620.17	2.14	6.06	465.31	1.75	13.31	21.33
T_8	528.48	1.50	5.28	330.34	1.55	10.58	17.85
T_9	532.00	1.72	5.59	344.54	1.72	10.96	17.93
T_{10}	520.71	1.29	5.50	355.20	1.58	10.27	17.62
T_{11}	570.45	1.72	5.67	383.62	1.72	10.95	18.44
T_{12}	572.67	1.94	5.61	445.73	1.68	12.75	20.04
F- test	*	*	NS	*	NS	*	*
S. Em ±	14.72	0.13	0.18	17.69	0.07	0.35	0.60
C.D. @ 5%	43.18	0.39	0.54	51.90	0.20	1.03	1.82

The nutrients play an important role in the crop production but under intensive cultivation use of chemical fertilizers alone for long period could result in deterioration of soil fertility and quality of produce. The use of organic manure in combination with

inorganic fertilizers and biofertilizers helps in balancing soil fertility, environment and reduce the cost of inputs was reported by several workers. In view of better quality, sustainable yield, returns and to promote combined use of mineral, organic and biological resources in a reasoned way to balance efficient use of limited/finite resources and ensure ecosystem sustainability against nutrient mining and degradation of soil and water, kasuri methi grown by adopting INM practices was found to be quite beneficial.

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