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Effect of integrated nutrient management on growth and yield of Kalmegh (*Andrographis paniculata* Nees) variety CIM Megha

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Abstract

Kalmegh is widely used in Indian system of medicine as a blood purifier and recommended for use in cases of leprosy, boils, skin eruptions, and chronic and seasonal fevers. Juice or an infusion of fresh leaves is given to infants to relive in griping, irregular bowel habits, and in case of loss of appetite kalmegh is very useful. The active principle of kalmegh, andrographolide, has highly bitter taste and is colourless crystalline in appearance. The andrographolide contents are very sensitive to both seasonal and regional variations. The present investigation on integrated nutrient management was conducted to offer better package of practices for increased herbagae yield and andrographolide content in kalemgh. The experiment was carried out during *rabi* season, 2020-2021 at college farm, college of horticulture, Dr. Y.S.R. Horticultural university, Venkataramannagudem, west godavari district, Andhra pradesh. The experiment was laid out in randomised block design consists of ten treatment combinations with three replications. From the experiment revealed that the application of 75% of RDN through chemical fertilizers + 25% RDN through vermicompost + biofertilizers (Azotobacter+PSB+KMB) (T_{10}) has shown significantly highest growth and yield parameters *viz*., plant height, plant spread, number of primary branches per plant, number of secondary branches per plant, leaf area and fresh and herbage yield.

Keywords: PSB, KMB, bio fertilizers, integrated nutrient management

Introduction

Kalmegh (*Andrographis paniculata* Nees.) belongs to the family Acanthaceae. The fresh and dried leaves of kalmegh and juice extracted from the herb are official drugs in Indian pharmacopoeia. It is known as 'Rice bitters' in west indies and 'King of bitters' or Chiretta in England. It has been used in Indian systems of medicine since time immemorial. It was used as a blood purifier and recommended for use in cases of leprosy, boils, skin eruptions, and chronic and seasonal fevers. Juice or an infusion of fresh leaves is given to infants to relieve griping and irregular bowel habits. It is the major constituent of the Ayurvedic drug 'Switradilepa' which is effective in treating Vitiligo.

Due to its pharmacological properties, the kalmegh herb is collected indiscriminately from the wild sources causing a sharp decline in the availability of this herb to the industry. However, the production of kalmegh is constrained with lack of standardized agro techniques leading to improper nutrient management and poor returns to the farmers. Now a days, the modern and intensive agriculture calls for the heavy dependence on chemical fertilizers which have deleterious effects on soil physical, chemical and biological properties of soil. Further, use of chemical inputs alone may lead to residues in the end products which is of concern particularly in case of medicinal plants. Of late, the concept of integrated nutrient management (INM) has assumed significance particularly in the background of increasing health consciousness and demand for organic foods. The integrated nutrient management *i.e*., the use of judicious combination of organic and inorganic sources of nutrients along with biofertilizers not only improves the soil physio-chemical and biological properties, but also provides all the nutrients in available form to crop, leading to enhanced growth, yield and quality. So there is need for standardization of integrated nutrient management in kalmegh for increasing the yield and improving the quality.

Material and Methods

The present investigation was carried out at College of Horticulture, Dr. Y. S. R. Horticultural University, Venkataramannagudem, West Godavari District, Andhra Pradesh from December, 2021 to May, 2021.

The required quantities of organic and inorganic fertilizers for gross plot area were computed as per their nitrogen contents and manually applied in respective plots as per the treatments. Bio fertilziers *viz*., Azotobacter, phosphate solubilizing bacteria (PSB) (*Bacillus megaterium*) and azospirillum @ 5 kg/ha was applied with the respective organic manures.

The experiment includes 10 treatments with three replications *viz*.,T_1: RDF through chemical fertilizers (85:75:50 kg/ha), T_2: RDF through chemical fertilizers + Biofertilizers, T_3: 50% RDN through chemical fertilizers + 50% RDN from FYM, T_4: 50% RDN through chemical fertilizers + 50% RDN from FYM + Biofertilizers, T_5: 50% RDN through chemical fertilizers + 50% RDN from vermicompost, T_6: 50% RDN through chemical fertilizers + 50% RDN from vermicompost + Biofertilizers, T_7: 75% RDN through chemical fertilizers + 25% RDN from FYM, T_8: 75% RDN through chemical fertilizers + 25% RDN from FYM + Biofertilizers, T_9: 75% RDN through chemical fertilizers + 25% RDN from vermicompost, T_{10}: 75% RDN through chemical fertilizers + 25% RDN from vermicompost + Biofertilizers.

Growth parameters *viz.*, plant height, plant spread, number of primary branches plant^{-1}, number of secondary branches plant^{-1}, leaf area plant^{-1}, stem to leaf ratio are recorded at 30,60 days after transplanting in the main crop and in the ratoon crop at 30, 60 days after harvesting the main crop. Yield parameters are recorded at the time of harvesting both main and ratoon crops.

Statistical analysis

The data recorded on various growth, yield and quality parameters were tabulated and were analyzed as per ANOVA. Statistical significance was tested by employing 'F' table value at 5 per cent level of significance.

Results and Discussion

Plant height was significantly highest in T_{10} (36.83, 53.36 cm at 30 and 60 DAT respectively in main crop and in ratoon crop (39.24, 56.75 cm at 30 and 60 DAH of main crop respectively) and it was statistically on par with T_8 at 60 DAT (51.66 cm) in main crop. Plant spread was significantly highest in T_{10} (In main crop 17.61, 37.17cm^2 at 30, 60 DAT respectively and in ratoon crop 20.59, 47.56 cm^2 at 30 and 60 DAH of main crop respectively) and it was statistically on par with T_8 at 60 DAT (32.69 cm^2) in main crop.

These results are similar with findings of Ravi *et al.* (2010) in coleus and Bableshwar *et al.* (2017) in kasthuri methi.

Number of primary braches per plant was non-significant at 30 DAT in main crop and 30 DAH of main crop in ratoon crop. But at 60 DAT in main crop and in ratoon at 60 DAH of main crop, T_{10} has shown significantly highest number of primary branches (22.06 in main crop and 5.63 in ratoon crop). These results are similar with findings of Shivran *et.al* (2010) in fennel. In main and ratoon crop T_{10} has shown significantly highest secondary branches (8.26, 46.51 at 30, 60 DAT in main crop respectively and in ratoon crop 44.13, 40.73 at 30 and 60 DAH of main crop respectively). These results are similar with findings of Suman *et.al* (2018) in coriander and Suresh *et.al* (2018) in solanum.

In main and ratoon crop T_{10} has shown significantly highest leaf area per plant (in main crop 9.04, 9.37 cm^2 at 30, 60 DAT respectively and in ratoon crop 9.38, 9.66 cm^2 at 30 and 60 DAH of main crop respectively). This might be due to the application of vermicompost and bio fertilizers which provided adequate vital nutrients during the growth period for a longer time by generating a favorable microclimate for nutrient mineralization. As the worm cast includes plant growth regulators and also bio fertilizers are involved in the secretion of growth promoting hormones which are directly engaged in cell division and cell elongation. Also, 75% of chemical fertilizers might have supplemented the nitrogen requirements of the plants during the early stages of growth and integration of various sources of nutrients has further improved the nutrient availability and enhanced the plant growth. These results are in corcondance with Abhilasha (2017) in kalmegh and Sadashiv (2012) in coleus.

Table 1: Effect of integrated nutrient management on plant height, plant spread and number of primary branches per plant of kalmegh

Treatments	Plant height (cm)				Plant spread (cm^2)				Number of Primary branches plant^{-1}			
	Main crop		Ratoon crop		Main crop		Ratoon crop		Main crop		Ratoon crop	
	30 DAT	60 DAT	30 DAH of main crop	60 DAH of main crop	50 D 30 DAT	60 DAT	30 DAH of main crop	60 DAH of main crop	50 D 30 DAT	60 DAT	30 DAH of main crop	60 DAH of main crop
T1	29.08	40.0	31.26	42.71	11.34	28.15	13.00	26.45	12.33	16.8	3.60	2.7
T2	29.99	43.93	32.36	43.42	12.34	29.01	13.8	28.03	13.40	17.73	4.40	2.9
T3	30.56	45.72	32.74	44.53	12.98	29.95	13.9	28.17	13.67	17.86	4.60	3.06
T4	33.12	50.71	34.82	49.58	14.56	33.48	15.5	32.91	15.60	19.86	6.13	3.9
T5	31.34	46.33	33.10	45.68	13.58	31.38	14	30.56	14.13	18.33	4.93	3.3
T6	33.89	50.96	35.18	50.54	15.12	34.02	15.6	34.65	16.37	20.53	6.33	4.03
T7	32.08	47.63	33.24	46.44	13.93	32.38	14.4	32.00	14.53	18.8	5.33	3.63
T8	35.11	51.66	36.06	51.19	15.76	35.50	14.00	39.06	17.57	21	6.73	4.5
T9	32.96	48.95	34.75	48.16	14.31	32.69	15.05	32.52	14.87	19.2	5.67	3.73
T10	36.83	53.36	39.24	56.75	17.61	37.17	20.59	47.56	18.40	22.06	7.27	5.63
Mean	32.5	47.92	34.27	47.60	14.15	32.37	15.25	33.19	15.09	19.22	5.50	3.74
S E (m)	0.391	0.645	0.683	0.601	0.201	0.736	0.626	0.826	0.322	0.282	0.275	0.116
CD @ (0.05)	11.60	1.918	2.031	1.785	0.598	2.186	1.861	2.453	N/S	0.845	N/S	0.345

DAT: Days after transplanting DAH: Days after harvesting

Table 2: Effect of integrated nutrient management on number of secondary branches per plant and leaf area of kalmegh

Treatments	Number of secondary branches plant^{-1}				Leaf area plant^{-1} (sq.cm)			
	Main crop		Ratoon crop		Main crop		Ratoon crop	
	30 DAT	60 DAT	30 DAH of main crop	60 DAH of main crop	30 DAT	60 DAT	30 DAH of main crop	60 DAH of main crop
T1	1.57	17.68	22.4	21.2	5.84	7.42	6.21	6.87
T2	2.33	21.31	23.53	22.73	6.58	7.84	7.01	7.13
T3	2.55	24.05	25.33	25.93	6.87	7.93	7.23	7.59
T4	4.83	32.22	28.58	30.93	8.22	8.45	8.39	8.41
T5	3.083	25.91	25.93	26.4	7.05	8.12	7.35	7.78
T6	6.16	35.44	34	31.5	8.23	8.78	8.49	8.74
T7	3.5	29.08	26.66	27.66	7.75	8.16	7.62	7.98
T8	7.7	40.06	36.36	34.86	8.76	8.92	8.53	9.27
T9	4.31	30.06	28	29.6	8.09	8.42	8.03	8.20
T10	10.26	46.51	44.13	40.73	9.04	9.37	9.38	9.66
Mean	4.63	30.234	29.49	29.173	7.64	8.34	7.91	8.16
S E (m)	0.466	1.292	0.411	1.450	0.167	0.084	0.211	0.089
CD @ (0.05)	1.395	3.868	1.22	4.309	0.496	0.251	0.626	0.266

DAT: Days after transplanting DAH: Days after harvesting

Fresh herbage yield (g/plant, kg/plot and t/ha):

In main and ratoon crop T_{10} has shown significantly highest fresh herbage yield (23.62, 5.56 and 9.13 of g/plant, kg/plot and t/ha respectively) at 60 DAT in main crop and in ratoon crop (25.07, 5.56 and 9.89 of g/plant, kg/plot and t/ha respectively) at 60 DAH of main crop. Increase in yield due to the supply of essential nutrients in accessible forms that too in adequate quantities can lead to increased plant growth. Thus, the higher herbage yield recorded in the present investigation with the application of vermicompost and biofertilizers can be attributed to mineralization and mobilization of nutrients which boosts plant nutrient absorption. Also, as a result of the combined usage of organic and inorganic fertilizers results in the steady release of both micro and macro nutrients to the plant. This assists in the development of more plant tissues, resulting in luxuriant vegetative growth. These results are similar with findings of Munnu (2006) in geranium Makwana *et al.* (2009) in Kalmegh and Raina *et al.* (2012) in ocimum.

Table 3: Effect of integrated nutrient management on yield parameters of kalmegh

Treatments	Fresh herbage yield (g/plant)		Fresh herbage yield (kg/plot)		Fresh herbage yield (t/ha)	
	Main crop	Ratoon crop	Main crop	Ratoon crop	Main crop	Ratoon crop
T1	8.72	9.98	1.03	1.17	1.57	1.96
T2	10.69	10.74	1.37	1.59	2.33	2.66
T3	11.36	11.37	1.80	1.81	2.99	3.01
T4	15.94	13.79	4.18	3.65	6.79	6.08
T5	12.51	12.14	2.28	1.98	3.87	3.30
T6	18.85	14.63	4.43	4.35	7.44	7.58
T7	13.17	13.21	2.78	2.10	4.78	3.51
T8	19.72	15.27	4.62	4.55	7.86	7.24
T9	14.46	13.36	3.18	2.37	5.42	3.95
T10	23.62	25.07	5.56	5.93	9.13	9.89
Mean	14.90	13.96	3.126	2.95	5.22	4.92
S E (m)	0.739	2.228	0.282	0.645	0.465	1.075
CD @ (0.05)	2.197	6.221	0.838	1.916	1.382	3.194

DAT: Days after transplanting DAH: Days after harvesting

Conclusion

Form the present investigation it was concluded that the application of 75% RDN through chemical fertlziers + 25% RDN through vermicompost + biofertilizers (Azotobacter + PSB + KMB) has sufficiently supplied plant nutrient requirement, there by increased the yield. So, integrated use of chemical fertlziers and organic manures along with biofertilzers can increases overall growth of plant.

References

1. Abhilasha S. Role of biofertilizers in combination with organic and inorganic nutrient sources in enhancement of growth in kalmegh (*Andrographis paniculata*). International Journal of Advanced Research in Biological Sciences 2010;4(10):147-150.
2. Babaleshwar SB, Raviraja GS, Shivakumar HS, Nadukeri S. Influence of Integrated Nutrient Management on Growth and Physiological Attributes of Kasuri Methi (*Trigonella corniculata L.)* under Hill Zone of Karnataka. Environment & Ecology 2017;35(2):661-665.
3. Makwana PD, Patel DH, Patel JJ, Patel HK. Effect of different organic manures and spacing on yield and yield attiributes of Kalmegh-Panchang (*Andrographis paniculata* Wall. Ex. Nees.) under middle Gujarat conditions. International journal on plant sciences 2009;5(1):30-32.
4. Munnu S. Effect of integrated nutrient management through vermicompost and inorganic fertilizers on growth, yield, nutrient uptake and oil quality of geranium (*Pelargonium graveolens* L' Her. ex Ait.) grown on alfisol. Journal of Spices and Aromatic Crops 2010;20(2):55-59.
5. Rainal NS, Rafiq M, Sood NK, Bali AS, Gupta SK, Sehgal S. Growth and yield of *Ocimum sanctum* in

response to integrated nutrient management and plant spacing. Indian Journal of Agronomy 2012;58(1):129-132.

6. Ravikumar M, Venkatesha J, Munikrishnappa PM. Effect of mycorrhiza and phosphorus solubilising bacteria in combination with organic manures and chemical fertilizers on growth and yield of coleus. Journal of Ecobiology 2010;27(1-2):139-148 ref.15.
7. Sadashiv N, Kattimani KN. Integrated nutrient management in Coleus (*Coleus forskohlii Briq*.). Karnataka Journal of Agricultural Sciences 2012;25(3):407-408 ref.7.
8. Shivran AC, Jat NL. Integrated nutrient management influenced growth, yield and economics of fennel (*Foeniculum vulgare*) under semi arid conditions. Indian Journal of Agronomy Year 2010;60:2.
9. Suman P, Lakshminarayana D, Prasanth P, Saida ND. Effect of integrated nutrient management on growth parameters of coriander (*Coriandrum sativum* L.) Cultivars under Telangana Conditions. International Journal of Current Microbiology and Applied Sciences 2018;7:2319-7706
10. Suresh V, Senthinathan R. Integrated nutrient management on growth and yield of thuduvalai (*Solanum trilobatum* L.). Journal of Medicinal Plants Studies. 6(3):01-03.