Int.J.Curr.Microbiol.App.Sci (2018) Special Issue-7: 4632-4636

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-7 pp. 4632-4636**
Journal homepage: http://www.ijcmas.com

Original Research Article

Effect of Integrated Nutrient Management on Nutrient Uptake and Nutrient Content of Garden Cress (*Lepidium sativum* L.)

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A B S T R A C T

The practice of integrated nutrient management through organic, inorganic and biofertilizers sources is gaining importance in modern agriculture by reducing usage of chemical fertilizers, which improves soil fertility, productivity and quality produce. Garden cress is an important medicinal plant needs attention from the point of medicinal value to enhance growth and yield. In view of this, field experiment was conducted to study the integrated nutrient management on the soil fertility status after harvest of garden cress grown in red sandy loam soil of Division of Horticulture, College of Horticulture, Bangalore during kharif season (2016-17). The results revealed that combined application of recommended FYM + 75% NP + K + *Azotobacter* + PSB (T_4) recorded maximum organic carbon (0.16%), available nitrogen (283.94 kg/ha) and potassium (128.89 kg/ha). Phosphorus content was highest (33.43 kg/ha) in recommended FYM + 75% P + NK + PSB + VAM (T_5). The maximum uptake of NP (47.55 and 24.21 kg/ha) was observed in the recommended FYM + 75% NP + K+ *Azotobacter* +PSB (T_4).

Keywords

Garden cress, INM, Azotobacter, PSB, NPK

Introduction

Garden cress (*Lepidium sativum* L.) is an annual herb belonging to the family Cruciferae. Lepidium is a polymorphous species, considered to have originated primarily in the high land region of Ethiopia and Eritrea. Seeds, leaves and roots of cress are of economic importance. However, the crop is mainly cultivated for seeds. The seeds contain an alkaloid lepidin, glucotropaeolin besides, sinapin, sinapic acid, mucilaginous matter (5%) and uric acid (0.108 g kg^{-1}) are also present. Seeds also contain Iron, carotene, vitamin C and vitamin B. The seeds contain 25.5% yellowish brown, semidrying oil which has a peculiar disagreeable odour. They are useful in *asthama*, cough with expectoration, poultices for sprains, leprosy, skin disease, dysentery, diarrhoea, splenomegaly, dyspepsia, lumbago, leucorrhoea, scurvey and seminal weakness. The seed mucilage is known as cress seed mucilage, which is used as a substitute for tragacanth and gum arabic. Fresh leaves are mainly used in salad as a blood cleanser. The roots are bitter, acrid and are useful in treatment of secondary syphilis and tenesmus. Roots are also used as a condiment.

Integrated Nutrient Management (INM) is judicious use of one or more sources of plant nutrients either individual or in combination to grow crops. Under INM, certain portion of inorganic sources of plant nutrients is

partially supplemented making use of existing organic sources. It mainly aims at achieving maximum fertilizer use efficiency, maintenance of soil fertility and plant nutrient supply at an optimum level through optimization of benefit from all possible sources of plant nutrients in an integrated manner.

Materials and Methods

A field experiment was conducted to study the influence of integrated nutrient management on growth and yield of garden cress (*Lepidium sativum* L.) at 'Sanjeevini Vatika' Medicinal and Aromatic crop section, Division of Horticulture, University of Agricultural Sciences, Bangalore, from the first week of October 2016 to first week of January 2017. T_1- Recommended FYM (20t ha^{-1}) + NPK (80:50:30 kg ha^{-1}), T_2- Recommended FYM + 75% N + PK + *Azotobacter*, T_3- Recommended FYM + 75% P + NK + PSB, T_4- Recommended FYM + 75% NP + K + *Azotobacter* + PSB, T_5- Recommended FYM +75% P + NK + PSB + VAM, T_6- Recommended FYM + *Azotobacter* + PSB + VAM, T_7- Recommended FYM + 50% NP + K + *Azotobacter* + PSB + VAM, T_8- 50% Recommended FYM + *Azotobacter* + PSB + VAM, T_9- 50% Recommended FYM + 50% NP + K. The straight fertilizers like urea, single super phosphate and muriate of potash were used as sources of N, P and K. Whereas, lignite based Azotobacter, PSB and VAM used in the experiment.

Local variety of garden cress was used and the seeds were mixed with the fine soil before sowing and sown. Excess seedlings were thinned out 20 days after sowing to maintain one seedling per hill at 10cm distance. 80:50:30 kg $N:P_2O_5:K_2O$ per ha^{-1} were applied in the form of urea, single super phosphate and muriate of potash respectively. The recommended dosage of bio-fertilizer like *Azotobacter*, PSB and VAM is 2 kg per hectare were mixed with the finely sieved FYM and which was applied at the time of sowing.

Observations on growth and yield parameters were recorded using five plants per plot. These five plants were selected randomly by avoiding the border plants and were labeled for recording the observations at 100 days after sowing.

Results and Discussion

Uptake of NPK nutrients was significantly influenced by the integrated nutrient management. The plants provided with recommended FYM + 75% NP + K + *Azotobacter* + PSB (T_4) showed increased uptake of nitrogen (47.55 kg ha^{-1}). Whereas, phosphorus uptake was maximum (24.21 kg ha^{-1}) when plants were provided with recommended FYM + 75% P + NK + PSB + VAM (T_5).

The increase in uptake is may be due to influence of *Azotobacter*, VAM and PSB which has helped in fixation of atmospheric nitrogen and mobilization of phosphates respectively. Maximum phosphorus uptake in VAM supplied plants could be attributed to the VAM fungi which has formed fungal sheath network known as 'Hartig net' around the roots which in turn helped in mobilization of phosphorus uptake by the roots. Beneficial soil microbes along with recommended NPK led to abundant availability of nutrients in readily available form for the crop uptake. Increase in drymatter accumulation ultimattly increases the uptake of nutrients (Imayavaramban *et al.*, 2002). Similar results were noticed by Choudhary *et al.*, (2006) in cumin; Jat *et al.*, (2006) in fenugreek; Mandal and Singh, (2002) in Indian mustard.

Table.1 Effect of integrated nutrient management on chemical properties of soil after harvest of garden cress (*Lepidium sativum* L.)

Treatments	pH	EC dS m^{-1}	OC (%)	NPK availability (kg ha^{-1})		
				N	P	K
T_1	6.74	0.19	0.59	273.45	30.06	128.56
T_2	6.75	0.16	0.60	276.52	27.49	128.89
T_3	6.74	0.15	0.59	252.67	31.70	127.54
T_4	6.78	0.18	0.61	283.94	28.63	128.73
T_5	6.74	0.14	0.58	270.20	33.43	127.81
T_6	6.69	0.12	0.53	191.21	20.87	123.23
T_7	6.71	0.13	0.57	250.37	22.39	126.79
T_8	6.69	0.12	0.52	187.42	19.39	122.93
T_9	6.71	0.13	0.55	241.25	21.17	126.06
F test	NS	NS	*	*	*	NS
SEm±	0.01	0.005	0.007	4.18	1.80	0.07
CD at 5%				12.53	5.41	-

Table.2 NPK content in plants (%) and NPK uptake (kg ha^{-1}) as influenced by integrated nutrient management in garden cress (*Lepidium sativum* L.)

Treatments	NPK content in plants (%)			NPK uptake (kg ha^{-1})		
T_1	N	P	K	N	P	K
T_1	1.42	0.27	0.84	43.99	21.79	25.51
T_2	1.41	0.27	0.84	47.33	20.17	25.16
T_3	1.40	0.27	0.84	43.99	23.40	26.56
T_4	1.49	0.29	0.85	47.55	22.59	25.66
T_5	1.32	0.30	0.83	43.66	24.21	26.43
T_6	1.26	0.22	0.83	39.99	17.75	26.53
T_7	1.32	0.25	0.84	42.99	19.37	25.36
T_8	1.20	0.20	0.82	39.33	16.14	24.45
T_9	1.30	0.24	0.83	41.99	18.28	24.40
F test	*	*	*	*	*	NS
SEm±	0.14	0.007	0.004	1.96	1.45	0.29
CD at 5%	0.42	0.023	0.013	5.90	4.35	-

Quantity of nutrients applied per gross plot (2 X 1m) as per treatment

Treatments	FYM (kg)	Urea (g)	SSP (g)	MOP (g)	*Azotobacter* (g)	PSB (g)	VAM (g)
T_1	6.72	29.25+29.25	105	17.0	-	-	-
T_2	6.72	22.00+22.00	105	17.0	20.0	-	-
T_3	6.72	29.25+29.25	79	17.0	-	20.0	-
T_4	6.72	22.00+22.00	79	17.0	20.0	20.0	-
T_5	6.72	29.25+29.25	79	17.0	-	20.0	20.0
T_6	6.72	-	-	-	20.0	20.0	20.0
T_7	6.72	15.00+15.00	52.5	17.0	20.0	20.0	20.0
T_8	3.36	-	-	-	20.0	20.0	20.0
T_9	3.36	15.00+15.00	52.5	17.0	-	-	-

The combination of recommended FYM + 75% NP + K + *Azotobacter* + PSB showed an increase in organic carbon content, availability of N and P. maximum organic carbon content (0.61%) of the soil could be attributed to recommended FYM + 75% NP + K + *Azotobacter* + PSB (T_4), which is ascribed to additive effect of partially decomposed organic matter. Similar result was noticed by Gaurishankar *et al.,* (2002) in Indian mustard. Maximum N content (283.94 kg ha^{-1}) is observed in plots received with recommended FYM + 75% NP + K + *Azotobacter* + PSB (T_4). Application of N fixer with reduced chemical fertilizer dosage resulted in marked increase in the available N content in soil. *Azotobacter* fixes atmospheric nitrogen apart from producing growth promoting substances which enhances the availability of nitrogen in the soil. Application of PSB and VAM with reduced chemical fertilizer dosage resulted in marked increase in the available P content (33.43 kg ha^{-1}) of the soil in the treatment supplied with recommended FYM + 75% P + NK + PSB + VAM. Biofertilizers perform better when soil is supplied with nutrients particularly nitrogen and phosphorus. The pronounced improvements in soil fertility through the addition of FYM and the substitution of N and P_2O_5 nutrients supplied through *Azotobacter* and PSB facilitated effective utilization of available nutrients. Similar results were noticed by Mandal and Singh (2002) in Indian mustard; Kachot *et al.,* (2001) in ground nut; Imayavaramban *et al.,* (2002) in sesame; Choudhary *et al.,* (2006) in cumin.

Application of combination of organic manures, chemical fertilizers and biofertilizers induced significant changes in the nutrient content in the tissue of the plants and nutrient uptake by the plants per hectare. The maximum nitrogen (1.49% and 47.55 kg/ha) and potassium (0.85% and 22.59 kg/ha) were recorded in treatment T_4 (recommended FYM + 75% NP + K + *Azotobacter* + PSB), while the maximum phosphorus content (0.30% and 24.21 kg/ha) was recorded in plants supplied with recommended FYM + 75% P + NK + PSB + VAM (T_5). Application of N-fixing biofertilizers enhances the soil N and PSB produces the organic acids which may partly be responsible for quick release of nutrients, resulting in more content of nutrients. Combination of *Azotobacter* and PSB enhances the K content in the tissue of the plant. Similar results were also recorded by Kachot *et al.,* (2001) in ground nut.

The present investigation reveals that, there was an improvement in the nutrient status of the soil with application of combination of organic manure, chemical fertilizers and biofertilizers. Based on the results of the study it is concluded that application of recommended FYM + 75% NP + K + *Azotobacter* + PSB (T_4) proved to be the best to improve soil status and soil fertility. Which was also on par with the recommended FYM + 100% NPK (T_1) and recommended FYM + 75% N + PK + *Azotobacter* (T_2). There is a possibility of reducing NP application of 25 per cent with the use of biofertilizers and thus bring down the cost of input resulting in higher cost benefit ratio. Hence, this fertilizer combination can be recommended for application in commercial cultivation of garden cress.

References

Choudhary, G. R., Jain, N. K. and Jat, N. J., 2006, Response of cumin (*Cuminum cyminum*) to inorganic nitrogen, farmyard manure and biofertlizer, *Indian J. Agron.*, 51(4):334-336.

Gauri Shankar, Verma, L. P. and Room

Singh, 2002, Effect of integrated nutrient management on yield and quality of Indian mustard (*Brassica juncea*) and properties of soil. *Indian J. of Agric. Sci.*, 72(9):551-552.

Imayavaeamban, V., Thanunathan, K., Singaravel, R. and Manickam, G., 2002, Studies on the influence of integrated nutrient management on growth, yield parameters and seed yield of sesame (*Sesamum indicum* L.). *Crop Res.*, 24(2):309-313.

Jat, N. L., Jain, N. K. and Choudhary, G. R., 2006, Integrated nutrient management in fenugreek (*Trigonella foenum-graecum*). *Indian J. Agron.*, 51(4):331-333.

Kachot, N, A., Malavia, D. D., Solanki, R. M. and Sagarka, B. K., 2001. Integrated nutrient management in rainy season groundnut (*Arachis hypogaea*). *Indian J. Agron.*, 46(3):516-522.

Mandal, K. G. and Sinha, A. C., 2002, Effect of integrated nutrient management on growth, yield, oil content and nutrient uptake of Indian mustard (*Brassica juncea*) in foothill soils of eastern India. *Indian J. Agron.*, 47(1):109-113.