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EFFECT OF DATES OF SOWING AND FERTILIZER LEVELS ON NUTRIENT UPTAKE AND ECONOMICS OF GARDEN CRESS (*LEPIDIUM SATIVUM* L.)

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Abstract

The present investigation was carried out at the Department of Medicinal and Aromatic Plants, K.R.C.C.H., Arabhavi (Karnataka), India during October 2010 to February 2011. A field experiment was laid out in split plot design with 3 dates of sowing as main plot treatments and 5 levels of fertilizer as sub plot treatments and with three replications. Garden cress crop sown on 1st November (D_2) recorded significantly highest nitrogen and phosphorus uptake. Application of 80:80:30 kg of NPK per hectare (F_4) recorded significantly highest nitrogen and phosphorus uptake. D_2F_4 combination recorded significantly higher nitrogen uptake (92.51 kg/ha), while the interactions for phosphorus and potassium uptake were found to be non-significant. Higher net returns of Rs. 2,07,145/- and benefit: cost ratio of 6.55:1 was also recorded with the same treatment combination, under northern dry zone of Karnataka.

Key words : Garden cress (*Lepidium sativum* L.), dates of sowing, fertilizer levels, nutrient uptake and benefit: cost ratio.

Introduction

Lepidium is a polymorphous species and is believed to have originated primarily in the high land region of Ethiopia and Eritrea. Garden cress (*Lepidium sativum* L.) is an erect annual edible herb belonging to the family Cruciferae. In India, it is grown mainly in Uttar Pradesh, Madhya Pradesh, Rajasthan, Gujarat and Maharashtra. Apart from India, it is also cultivated in North America and parts of Europe (Gokavi *et al*., 2004).

Seeds, leaves and roots are the economic parts of this crop. However, the crop is mainly cultivated for seeds in India. The seeds are known to contain a light yellow colored fixed oil and alkaloids such as lepidin, glucotropeolin, besides sinapin and sinapic acid. They are mainly used in Ayurveda, Unani and Siddha systems of medicine used as thermogenic, depurative, galactogouge, tonic, aphrodiasiac, ophthalmic, antiscorbutic, antiasthamatic, diuretic etc.

The seed mucilage is known as cress seed mucilage, which is used as a substitute for arabica gum. The seeds are used for increasing milk yield in animals and human beings. They are beneficial in promoting digestion and growth in children. Seed oil is externally used in rheumatism. The extracts of seed have hypotensive effect with transient respiratory stimulation. They are boiled with milk and are used to induce abortion (Chopra, 1986). Fresh leaves and young seedlings are mainly used as spice and are rich source of glucosinolates (Gil and Macleod, 1980) and also used as salads. Roots are bitter, acrid and are useful in treatment of secondary syphilis.

Due to its diversified uses, demand and popularity, cultivation of garden cress is increasing on a commercial scale. But the scientific information on nutrient management of this crop is very scanty. Sowing date is very important aspect in cultivation of garden cress and decides the success of crop. Among the nutrients, soil nitrogen, phosphorus and potassium content are the major

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limiting factors for any crop production. Application of chemical fertilizers is a necessary tool to achieve the targeted yield levels. Hence, nutrient uptake and economics of this crop was worked out in the present investigation.

Materials and Methods

An experiment was laid out with 3 dates of sowing (D_1- 15th October, D_2-1st November and D_3-15th November) as main plot treatments and 5 levels of fertilizer (F_0- control, F_1- 20:20:30 kg of NPK/ha, F_2- 40:40:30 kg of NPK/ha, F_3- 60:60:30 kg of NPK/ha, F_4- 80:80:30 kg of NPK/ha) as sub plot treatments in split plot design with three replications, at the Department of Medicinal and Aromatic Plants, Kittur Rani Channamma College of Horticulture, Arabhavi, University of Horticultural Sciences, Bagalkot (Karnataka), India during October 2010 to February 2011.

Geographically, Arabhavi lies in the Zone-3 of Region-2 in the agro-climatic zone of Karnataka. It is situated at 16°15' North latitude and 74° 45' East longitude and at an altitude of 612 m above the mean sea level. The soil of the experimental site was medium deep black. The available nitrogen, phosphorus and potassium contents were determined using alkaline potassium permanganate method (Subbaiah and Asija, 1956), molybdophosphoric acid blue colour method (Jackson, 1973) and flame photometer (Jackson, 1973), respectively and expressed in Kg per hectare. The soil was low in available nitrogen (265.84 kg/ha), medium in available phosphorus (20.35 kg/ha) and high in potash (384.16 kg/ha) with pH of 8.31.

Sowing was done with the healthy seeds of local variety of garden cress. The crop was line sown at the depth of 2-3 cm using 4 kg seed per hectare at spacing of 30 × 10 cm. Farm yard manure was applied one week before the sowing of crop at the rate of 10 tonnes per hectare as a common dose for all the treatments. The plots were supplied with half the dose of nitrogen (in the form of urea) and full dose of phosphorus (in the form of single super phosphate) and potassium (in the form of muriate of potash) at the time of sowing as per the treatments. The remaining half dose of nitrogen was supplemented 30 days after sowing as top dressing and the light earthing up was done.

Nutrient uptake was calculated from the soil and plant analysis. The collected data was subjected to statistical analysis using the Fischer's method of analysis of variance technique as given by Panse and Sukhatme (1967). Economics was worked out for the cultivation of garden cress. The prices of all the inputs and the labour charges that were prevailing at the time of their use were considered to work out the cost of cultivation. The gross returns was worked out based on the prevailing market rate of garden cress seeds. The net returns per hectare for each treatment was calculated by deducting the cost of cultivation from the gross returns per hectare. The benefit: cost ratio was worked out by using the formula.

$$\text{Benefit:cost ratio} = \frac{\text{Net returns (Rs./ha)}}{\text{Cost of cultivation (Rs./ha)}}$$

Results and Discussion

Nutrient uptake

Nitrogen and phosphorus uptake was found to be significant for dates of sowing and fertilizer levels. Potassium uptake and the interactions except for nitrogen were found to be non-significant. The results are presented in table 1.

Significantly highest nitrogen and phosphorus uptake (70.47 kg/ha and 12.56 kg/ha, respectively) was observed when the crop was sown on 1st November (D_2) and the lowest nitrogen and phosphorus uptake (58.71 kg/ha and 10.26 kg/ha, respectively) was noticed in 15th October sowing (D_1).

Application of 80:80:30 kg of NPK per hectare (F_4) recorded significantly higher nitrogen and phosphorus uptake (87.58 kg/ha and 16.15 kg/ha, respectively). The lowest nitrogen and phosphorus uptake (48.33 kg/ha and 8.04 kg/ha, respectively) was observed in control (F_0). This is due to the higher available nitrogen and phosphorus in the soil supplied with 80:80:30 kg of NPK per hectare (F_4). Similar results were earlier reported by Gupta (2006) in garden cress, Dinesh *et al.* (2006) Roul *et al.* (2006) in Indian mustard.

Among the interactions, D_2F_4 combination recorded significantly higher nitrogen uptake (92.51 kg/ha). Minimum nitrogen uptake (45.82 kg/ha) was noticed in D_1F_0. Similar trend was observed in Jain *et al.* (2003) and Singh *et al.* (2003) in isabgol. Interactions for phosphorus and potassium uptake were found to be non-significant.

Economics

The data on the economics of cultivation of garden cress as influenced by dates of sowing, fertilizer levels and their interaction are presented in table 2.

Maximum net returns of Rs. 2,07,145 per hectare was obtained with the crop sown on 1st November and supplied with 80:80:30 kg of NPK per hectare (D_2F_4) followed by the crop sown on 15th November and supplied

Table 1 : NPK uptake as influenced by different dates of sowing and fertilizer levels in garden cress (*Lepidium sativum* L.).

Treatments	N (Kg/ha)				P (Kg/ha)				K (kg/ha)			
	Sowing dates											
Fertilizer Levels (F)	D_1	D_2	D_3	Mean	D_1	D_2	D_3	Mean	D_1	D_2	D_3	Mean
F_0	45.82	51.54	47.62	48.33	7.24	9.01	7.87	8.04	33.98	40.13	40.87	38.33
F_1	49.88	55.53	63.68	53.03	8.63	10.10	9.24	9.32	33.67	37.47	43.50	38.22
F_2	54.81	64.51	59.87	59.73	9.42	11.19	10.66	10.42	40.62	40.66	46.53	42.60
F_3	63.43	88.27	74.32	75.34	11.39	15.24	13.16	13.26	44.94	43.78	38.60	42.44
F_4	79.61	92.51	90.62	87.58	14.62	17.28	16.54	16.15	45.75	48.49	41.62	45.29
Mean	58.71	70.47	65.22		10.26	12.56	11.49		39.79	42.11	42.22	

To compare the means of	S.Em±	C.D. @ 5%	S.Em±	C.D. @ 5%	S.Em±	C.D. @ 5%
Dates of Sowing (D)	0.45	1.78	0.13	0.50	1.19	NS
Fertilizer levels (F)	0.84	2.44	0.27	0.79	2.04	NS
F at same D	1.45	4.23	0.47	NS	3.54	NS
D at same or different F	1.37	4.01	0.44	NS	3.38	NS

NS- Non-significant.

Dates of sowing : D_1=15th October, D_2=1st November, D_3=15th November
Fertilizer levels : F_0= control, F_1= 20:20:30 NPK kg/ha, F_2= 40:40:30 NPK kg/ha, F_3= 60:60:30 NPK kg/ha, F_4= 80:80:30 NPK kg/ha.

Table 2 : Economics of cultivation as influenced by different dates of sowing and fertilizer levels in garden cress (*Lepidium sativum* L.).

Treatments	Cost of fertilizers (Rs./ha)	Total cost of cultivation (Rs./ha)	Seed yield (q/ha)	Gross income (Rs./ha)	Net returns (Rs./ha)	B:C ratio
D_1F_0	10,000	30,500	22.70	1,13,500	83,000	2.72:1
D_1F_1	10,445	30,945	25.43	1,27,150	96,205	3.11:1
D_1F_2	10,665	31,165	27.41	1,37,050	1,05,885	3.40:1
D_1F_3	10,885	31,385	30.75	1,53,750	1,22,365	3.90:1
D_1F_4	11,105	31,605	37.86	1,89,300	1,57,695	4.99:1
D_2F_0	10,000	30,500	27.86	1,39,300	1,08,800	3.57:1
D_2F_1	10,445	30,945	31.15	1,55,750	1,24,805	4.03:1
D_2F_2	10,665	31,165	34.18	1,70,900	1,39,735	4.48:1
D_2F_3	10,885	31,385	46.70	2,33,500	2,02,115	6.44:1
D_2F_4	11,105	31,605	47.75	2,38,750	2,07,145	**6.55:1**
D_3F_0	10,000	30,500	24.68	1,23,400	92,900	3.05:1
D_3F_1	10,445	30,945	28.74	1,43,700	1,12,755	3.64:1
D_3F_2	10,665	31,165	31.47	1,57,350	1,26,185	4.05:1
D_3F_3	10,885	31,385	37.68	1,88,400	1,57,015	5.00:1
D_3F_4	11,105	31,605	47.53	2,37,650	2,06,045	6.52:1

Sale price of seeds = Rs. 50/kg

Dates of sowing: D_1=15th October, D_2=1st November, D_3=15th November
Fertilizer levels: F_0= control, F_1= 20:20:30 NPK kg/ha, F_2= 40:40:30 NPK kg/ha, F_3= 60:60:30 NPK kg/ha, F_4= 80:80:30 NPK kg/ha.

with 80:80:30 kg of NPK per hectare (D_3F_4) (Rs. 2,06,045/ ha) and the crop sown on 1st November and supplied with 60:60:30 kg of NPK per hectare (D_2F_3) (Rs. 2,02,115/ ha) and minimum net returns of Rs. 83,000 per hectare was obtained in the crop sown on 15th October and without any fertilizer application (D_1F_0). The highest Benefit: Cost ratio (6.55:1) was obtained in D_2F_4 treatment combination followed by D_3F_4 (6.52:1) and D_2F_3 (6.44:1), while the lowest (2.72:1) was found in D_1F_0.

Highest net returns and B: C ratio in D_2F_4 treatment combination was due to higher seed yield, which was probably due to optimum sowing dates and fertilizer application. Similar results were reported by Santosh *et al*. (2010), Gupta (2006) and Tiwari and Kulmi (2004) in garden cress and Kattimani and Hindiholi (2009) in isabgol.

Based on these results, it may be concluded that the maximum net returns and Benefit: Cost ratio was obtained when garden cress was sown on 1st November and supplemented with 80:80:30 kg of NPK per hectare (D_2F_4) and is beneficial for obtaining the higher profits, under the northern dry zone of Karnataka and hence can be recommended for cultivation by the farmers.

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