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Effect of sowing dates, row spacings and nitrogen levels on productivity, quality and economics of garden cress (*Lepidium sativum*)*

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Garden cress (*Lepidium sativum* L.), popularly known as *sialoo* tolerates adverse climatic conditions like low rainfall and temperature fluctuations. The crop has been known to have health-promoting properties and medicinal value (Gokavi *et al*. 2004, Paranjape and Mehta 2004). Being a minor crop, it gets least importance and is sown after main crop in winter (*rabi*) season. The yields obtained from late-sown crop is always lower than optimum sown. Late-sown crop also shorten the crop maturity. Crop geometry (row spacing) is the important deciding factor for exploiting genetic yield potential of the crop. Another constraint for garden cress is its cultivation on poor fertility soils. Nitrogen plays important role in the growth and development of the plant and its deficiency leads to sharp decline in the yield in semi-arid region of Rajasthan. Hence, an experiment was conducted to optimize the sowing time, row spacing and nitrogen dose for garden cress.

The experiment was conducted during *rabi* season of 2005–06 and 2006–07 at Agronomy farm, SKN College of Agriculture, Jobner (Jaipur) on loamy sand soil being alkaline in reaction (*p*H, 8.1), having 129 kg/ha available N, 17.2 kg/ha available P and 149 kg/ha available K. The study consisted of 24 treatment combinations in split-plot design with 3 replications, keeping sowing dates (31 October, 15 and 30 November) and row spacings (30 and 40 cm) in main plots, and nitrogen levels (0, 20, 40 and 60 kg /ha) in sub-plots. Locally available seeds were sown at the rate of 12 kg/ha. Half dose of nitrogen as per treatments and full dose of phosphorous and potash were applied as basal dose through urea, single superphosphate and muriate of potash, respectively. The first light irrigation was given immediately after sowing. Remaining half dose of nitrogen was top-dressed with second irrigation. The leaf area was recorded at 30 days interval with the help of portable leaf area meter. Economics of different treatments was worked out on the basis of input and output on the prevailing market prices.

The growth parameters were influenced significantly by different treatments (Table 1). The crop sown on 31 October recorded maximum plant height (84.4 cm) than the crop sown on 15 and 30 November (Table 1). The leaf area index (LAI), crop growth rate (CGR), net assimilation rate (NAR) and seeds/plant were also significantly higher under 31 October sown crop as compared to 15 and 30 November sowing. Similar results were also reported at Jodhpur in garden cress (RAU 2005). Contrarily, significantly higher relative growth rate (RGR) was found under late sowings. Different spacings could not influence the plant height and relative growth rate. Maximum leaf area index was recorded at row spacing of 30 cm. Wider row spacing of 40 cm recorded significantly higher crop growth rate, net assimilation rate, number of branches/plant and seeds/plant than 30 cm row spacing. Singh *et al*. (2006) also reported similar results in African mustard (*Brassica carinata* L). Application of 60 kg N/ha significantly increased the plant height (80.1 cm), leaf area index at 90 days after sowing (5.82), crop growth rate (3.10 g/m/d), relative growth rate (12.27 mg/g/d) at 90 days after sowing to harvest, net assimilation rate (0.758 mg/plant/d)during 60-90 days after sowing, branches/plant (16.4) and seeds/plant (2390) as compared to control and 20 kg N/ha. The present results are in close conformity with Shukla *et al*. (2005).

The 31 October sown crop gave significantly higher seed (1.78 tonnes/ha) and stover yield (5.22 tonnes/ha) as compared to 15, 30 November (Table 2). The difference in the seed yield of garden cress due to different sowing dates has also been reported at several locations (RAU 2005). The crop sown at 40 cm apart gave significantly higher seed (1.56 tonnes/ha) and stover yield (4.71 tonnes/ha) than 30 cm. Application of nitrogen at 60 kg/ha resulted in significantly

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Table 1 Effect of dates of sowing, spacings and nitrogen levels on plant height, growth indices,branches and seeds/plant of garden cress (pooled data of 2 years)

Treatment	Plant height (cm) at harvest	LAI (90DAS)	CGR (g/m/d) at 90 DAS to harvest	RGR (mg/g/d) at 90 days to harvest	NAR (mg/pl/d) at 60–90 days	Branches/ plant at harvest	Seeds/plant
Date of sowing							
31 October	84.0	6.01	2.30	8.57	0.774	16.7	2 754
15 November	72.0	5.02	2.10	9.48	0.591	14.3	2 290
30 November	66.1	4.16	2.04	9.76	0.598	11.1	1 714
SEm±	1.4	0.10	0.03	0.30	0.031	0.6	34
CD (*P*=0.05)	4.1	0.29	0.10	0.87	0.090	1.6	100
Row spacing (cm)							
30	73.3	6.00	2.11	9.52	0.583	11.6	2 006
40	74.8	4.12	2.19	9.02	0.725	16.5	2 486
SEm±	1.1	0.08	0.03	0.24	0.025	0.5	28
CD (*P*=0.05)	NS	0.24	0.08	NS	0.074	1.3	81
N level (kg/ ha)							
0	68.1	4.00	1.10	5.74	0.589	11.0	2 048
20	71.5	4.91	1.69	7.82	0.608	13.4	2 227
40	76.5	5.53	2.70	11.26	0.663	15.3	2 320
60	80.1	5.82	3.10	12.27	0.758	16.4	2 390
SEm±	1.0	0.08	0.03	0.27	0.031	0.4	32
CD (*P*=0.05)	2.9	0.23	0.09	0.77	0.087	1.2	89

LAI, Leaf area index; CGR, crop growth rate; NAR, net assimilation rate; DAS, days after sowing

Table 2 Effect of dates of sowing, spacings and nitrogen levels on seed and stover yield, protein content and yield and oil content and oil yield of garden cress (pooled data of 2 years)

Treatment	seed yield (tonnes/ha)	Stover yield (tonnes/ha)	Protein content (%)	Protein yield (kg/ha)	Oil content (%)	Oil yield (kg/ha)	Net returns (Rs/ha)
Date of sowing							
31 October	1.78	5.22	15.2	270.6	26.8	478.5	30 052
15 November	1.49	4.47	16.9	251.8	24.4	363.0	22 752
30 November	1.18	3.84	18.0	212.4	23.0	270.8	14 935
SEm±	0.02	0.06	0.3	6.1	0.6	13.6	386
CD (*P*=0.05)	0.06	0.19	0.9	19.0	1.9	40.3	1 137
Row spacing (*cm*)							
30	1.40	4.33	16.7	233.8	24.1	340.7	20 581
40	1.56	4.71	16.8	262.1	25.4	400.9	24 578
SEm±	0.02	0.05	0.3	5.2	0.5	11.1	315
CD (*P*=0.05)	0.05	0.15	NS	17.0	NS	32.9	929
N level (*kg/ ha*)							
0	1.10	3.71	15.5	170.5	25.4	281.4	13 263
20	1.42	4.40	16.3	231.5	25.3	365.4	21 227
40	1.64	4.80	17.1	280.5	24.4	406.8	26 507
60	1.77	5.16	17.9	316.8	24.0	429.4	29 323
SEm±	0.02	0.06	0.3	5.5	0.6	11.0	359
CD (*P*=0.05)	0.05	0.16	0.7	18.0	NS	31.1	1 012

higher seed yield (1.77 tonnes/ha) and stover yield (5.16 tonnes/ha) over the preceding nitrogen levels (Table 2). The improved growth due to nitrogen fertilization increased the net assimilation rate and greater mobilization of photosynthates towards reproductive structures has led to more yield. Similar results have also been reported by Tiwari and Kulmi (2006).

The interactive effect of nitrogen levels and sowing dates

Table 3 Interactive effect of dates of sowing and nitrogen levels on seed yield (tonnes/ha) on pooled mean basis

Treatment	N_0	N_{20}	N_{40}	N_{60}
31 October	1.29	1.75	1.97	2.11
15 November	1.09	1.45	1.67	1.77
30 November	0.91	1.09	1.23	1.41
			SEm±	*CD (P =0.05)*
N level at same date of sowing			0.032	0.09
D at same or different levels of nitrogen			0.028	0.08

were found significant on seed yield of garden cress. The crop sown on 31 October and fertilized with 60 kg N/ha gave the maximum seed yield (2.11 tonnes/ha) and proved significantly superior to all other treatment combinations (Table 3).

Garden cress sown on 31 October recorded significantly higher protein yield (270.6 kg/ha),oil content in seed (26.8) and oil yield (478.5 kg/ha) over 15 and 30 November sown crop. Contrarily, protein content was higher in 30 November sown crop than 31 October sowing due to the dilution effect under higher seed yield. Crop sown at 40 cm spacing represented significantly higher protein yield (262.1 kg/ha) and oil yield (400.9). Application of 60 kg N/ha significantly enhanced the protein content in seed (17.9), protein yield (316.8 kg/ha) and oil yield as compared to control and lower nitrogen levels.

The 31 October sown crop resulted in significantly higher net returns over 15 and 30 November sown crop (Table 2). The increased seed yield under early sown crop with same cost of cultivation for all 3 sowing dates resulted in higher net returns. Sowing of garden cress at 40 cm row spacing gave higher net returns as compared to 30 cm row spacing. Nitrogen application at 60 kg/ha to garden cress significantly increased the net returns as compared to preceding levels.

SUMMARY

An experiment was conducted during 2 consecutive winter (*rabi*) seasons of 2005–06 and 2006–07 to study the effect of sowing dates (31 October, 15 and 30 November), row spacings (30 and 40 cm) and nitrogen levels (0, 20, 40 and 60 kg /ha) on productivity of garden cress (*Lepidium sativum* L.) in irrigated loamy sand soil. Garden cress sown on 31 October at 40 cm row spacing gave higher seed yields and net returns compared to crop sown at 30 cm rows apart on 15 and 30 November. Application of nitrogen at all levels significantly increased the seed yield, yield attributes and net returns over the control. Crop sown on 31 October and fertilized with 60 kg N/ha gave maximum seed yield (2.11 tonnes/ha) and net returns (Rs 37 879/ ha).The crop sown on 31 October also recorded higher protein content, protein and oil yield (478.5 kg/ha).

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