

Effect of date of sowing, nitrogen levels and spacing on growth and yield of ajwain (*Trachyspermum ammi* (L.) Sprague)

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Received 02 August 2007; Revised 02 January 2008; Accepted 03 March 2008

Abstract

The effect of three dates of sowing (15th October, 30th October and 14th November), four levels of nitrogen (0, 20, 40 and 60 kg ha⁻¹) and three spacings (30 cm x 10 cm, 30 cm x 20 cm and 30 cm x 30 cm) on growth and yield of ajwain (*Trachyspermum ammi*) was studied at Kumarganj (Uttar Pradesh). Sowing on 30th October significantly increased plant height, number of primary and secondary branches plant⁻¹, plant spread, number of umbels plant⁻¹, number of umbellets umbel⁻¹, number of seeds plant⁻¹ and yield of seeds plant⁻¹ and ha⁻¹. Maximum values of all the parameters were obtained with application of 60 kg N ha⁻¹. Wider spacing (30 cm x 20 cm and 30 cm x 30 cm) was found to be effective for all the characters except seed yield, which was higher at the closest spacing (30 cm x 10 cm). The interaction of dates of sowing and nitrogen levels significantly increased primary and secondary branches plant⁻¹ as well as seed yield ha⁻¹.

Keywords: ajwain, nitrogen, sowing dates, spacing, yield, *Trachyspermum ammi*.

Introduction

Ajwain or Bishop's weed (*Trachyspermum ammi* (L.) Sprague) is an annual herbaceous plant, the seeds of which are used for flavouring foods and preservatives. The essential oil from seeds is used in perfumery, essence and medicinal preparations. Since little information is available on the effect of date of sowing, fertilizers and spacing, on growth and yield of ajwain, the present study was undertaken.

Materials and methods

The experiment was laid out during winter season of 1998–2000 at Main Experiment Station, Narendra Dev University of

Agriculture and Technology, Kumarganj, Faizabad (Uttar Pradesh) with var. ND Ajwain-8. The soil of the experimental plot was sandy loam in texture, low in nitrogen and phosphorus and medium in potassium availability and slightly alkaline in reaction. There were 36 treatment combinations of three dates of sowing (15th October, 30th October and 14th November), four levels of nitrogen (0, 20, 40 and 60 kg ha⁻¹) and three spacings (30 cm x 10 cm, 30 cm x 20 cm and 30 cm x 30 cm). The experiment was laid out in a split plot design with three replications by keeping dates of sowing in main plots and nitrogen levels as well as spacings in sub plots. Half of the nitrogen as per requirement

Table 1. Effect of date of sowing, nitrogen level and spacing on growth and yield of ajwain*

Treatment	Plant height (cm)	No. of prim. branches plant ⁻¹	No. of sec. branches plant ⁻¹	Plant spread (cm)	Diameter of stem (cm)	No. of umbels plant ⁻¹	No. of umbellets umbel ⁻¹	No. of seeds umbel ⁻¹	Seed yield plant ⁻¹ (g)	Seed yield (q ha ⁻¹)
Date of sowing										
15 th October	76.77	16.37	46.78	163.08	4.09	147.97	15.57	182.57	5.02	9.11
30 th October	82.76	18.43	55.40	174.08	4.56	137.30	19.69	198.33	5.63	10.20
14 th November	73.69	12.45	31.96	140.75	4.09	137.30	13.56	165.60	4.48	8.16
SEm±	1.19	0.23	0.69	2.38	0.06	2.24	0.25	2.84	0.07	0.14
C D (P=0.05)	4.68	0.92	2.71	6.34	0.25	8.81	1.00	11.17	0.26	0.59
Nitrogen level (kg ha ⁻¹)										
0	58.36	9.50	29.15	124.67	3.67	129.24	12.83	157.22	4.30	7.82
20	74.39	11.90	37.29	143.55	3.95	138.36	14.11	167.00	4.92	8.93
40	85.18	18.44	59.29	178.67	4.53	157.36	17.73	195.22	5.29	9.63
60	92.88	20.00	64.46	190.33	4.83	165.13	20.41	209.22	5.66	10.24
SEm±	1.18	0.23	1.31	2.25	0.06	2.19	0.30	2.67	0.10	0.14
C D (P=0.05)	3.33	0.78	3.72	6.35	0.18	6.20	0.86	7.54	0.29	0.39
Spacing (cm)										
30 x 10	15.17	12.96	38.03	154.08	3.91	138.05	14.52	176.83	3.23	10.77
30 x 20	79.00	16.49	52.63	160.92	4.41	151.97	17.24	185.80	6.31	10.53
30 x 30	78.93	16.62	51.97	162.92	4.41	152.05	17.06	184.58	6.32	7.02
SEm±	1.02	0.20	1.14	1.94	0.05	1.90	0.24	2.41	0.06	0.12
C D (P=0.05)	2.89	0.56	3.22	5.50	0.15	5.37	0.74	6.53	0.25	0.34

* Pooled data of 2 years

of respective treatment along with common dose of phosphorus and potassium @ 40 kg ha⁻¹ were applied as basal dressing just before sowing. The remaining half of nitrogen was applied in two equal split doses at monthly intervals. All the cultural and plant protection measures were adopted as and when required. Growth parameters were studied at 120 days after sowing. The data on growth and yield attributing parameters and seed yield for two consecutive years were recorded and pooled data were analysed statistically to draw conclusions.

Results and discussion

Effect of date of sowing

Height of plant, number of primary branches plant⁻¹, spread of plant, diameter of stem, number of umbels plant⁻¹, number of umbellets umbel⁻¹, number of seeds umbel⁻¹ and seed yield plant⁻¹ and ha⁻¹ were significantly higher when the crop was sown on 30th October (Table 1). The probable reason for these results might be due to suitability of climatic factors. Similar results have also been reported by Malhotra (2002).

Effect of nitrogen level

Increasing levels of nitrogen significantly increased the height of plant, number of primary and secondary branches plant⁻¹, spread of plant, diameter of stem, number of umbels plant⁻¹, number of umbellets umbel⁻¹, number of seeds plant⁻¹ and seed yield plant⁻¹ and ha⁻¹. Maximum values of all the parameters were obtained in the plot that received 60 kg N ha⁻¹ (Table 1). The increase in these parameters may be attributed to the application of higher doses of nitrogen which enhanced protein and chlorophyll synthesis leading to marked improvement in vegetative growth of the plant as well as yield and yield attributes of the crop. Similar results have also been reported by Tiwari & Agarwal (2004) and Malhotra & Vijay (2004).

Effect of spacing

Sowing of seeds at various spacings exhibited significant differences in plant height,

Table 2. Interaction effect of date of sowing and nitrogen level on primary and secondary branches plant⁻¹ and seed yield of ajwain*

Nitrogen level (kg ha ⁻¹)	Primary branches plant ⁻¹			Secondary branches plant ⁻¹			Seed yield (q ha ⁻¹)		
	15 th Oct	30 th Oct	14 th Nov	15 th Oct	30 th Oct	14 th Nov	15 th Oct	30 th Oct	14 th Nov
0	10.44	10.78	8.42	32.01	33.66	21.78	8.08	8.34	7.03
20	11.12	14.14	13.39	34.65	46.86	30.62	8.97	9.86	7.97
40	17.51	23.57	14.98	57.75	76.58	45.54	9.34	10.93	8.67
60	19.19	25.25	16.16	62.70	80.52	50.11	10.09	11.68	8.67
N at D	SEm±	C D (P=0.05)	SEm±	C D (P=0.05)	SEm±	C D (P=0.05)			
	0.41	1.14	2028	6046	0.17	0.25			
D at N	0.34	1.07	2.43	7015	0.55	0.68			

* Pooled data of 2 years

number of primary and secondary branches plant⁻¹, spread of plant, stem diameter, number of umbels plant⁻¹, number of umbellets umbel⁻¹, number of seeds plant⁻¹ and seed yield plant⁻¹ and ha⁻¹. Maximum values of these parameters except seed yield (q ha⁻¹) were obtained by sowing seeds at wider spacing (30 cm x 20 cm) as compared to narrow spacing (30 cm x 10 cm) (Table 1). The closest spacing (30 cm x 10 cm) was at par with 30 cm x 20 cm spacing and statistically higher than 30 cm x 30 cm spacing and recorded maximum seed yield. Significant increase in parameters at wider spacing might be due to less competition among plants for solar energy, water, nutrients and other growth factors; however, maximum seed yield (q ha⁻¹) at closer spacing is due to higher plant population. These results are in accordance with the findings of Malhotra (2002), Malhotra & Vijay (2004) and Tiwari & Agarwal (2004).

Interaction effects

The interaction of dates of sowing and nitrogen levels significantly increased number of primary and secondary branches plant⁻¹ as well as seed yield (q ha⁻¹). Sowing on 30th October with 60 kg N ha⁻¹ recorded maximum

number of primary branches (25.25), secondary branches (80.52) and seed yield (11.68 q ha⁻¹). This interaction also surpassed sowing on 14th November and 15th October without nitrogen and with nitrogen @ 60 kg N ha⁻¹ with a margin of 39.81%, 30.82%, 23.20% and 13.61%, respectively with respect to seed yield q ha⁻¹ (Table 2). The suitability of environment and adequate availability of nutrients may be the probable reason for the increase in these parameters.

The study indicated that sowing on 30th October at a spacing of 30 cm x 20 cm with 60 kg N ha⁻¹ was more suitable for optimum growth and yield of ajwain under eastern Uttar Pradesh conditions.

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that for improving seed yield in fennel, more emphasis should be given to plant height, primary branches plant⁻¹, total branches plant⁻¹ and effective umbels plant⁻¹.

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