

## Response of drilled rabi fennel (*Foeniculum vulgare* Mill) to spacing under varying levels of nitrogen

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### Abstract

An experiment was conducted to study the response of drilled rabi fennel (*Foeniculum vulgare* Mill.) to spacing under varying levels of nitrogen. Fennel crop sown at 45 cm row spacing reported significantly higher seed yield (1521 kg ha<sup>-1</sup>) over 30 and 60 cm row spacing. Similarly, stover yield (2270 kg ha<sup>-1</sup>) and oil yield (21.92 kg ha<sup>-1</sup>) was significantly superior over 30 and 60 cm row spacing. The monetary returns from fennel crop sowed at 45 cm increased manifolds reaching to Rs 19122 ha<sup>-1</sup>. Similarly, the effect of nitrogen levels from 60 to 120 kg ha<sup>-1</sup> was significant on seed and stover yield, but increase in yield from 90kg nitrogen ha<sup>-1</sup> to 120 kg nitrogen ha<sup>-1</sup> was at par.

**Keywords:** Fennel, row spacing, levels of nitrogen, seed yield

India is the largest producer, consumer and exporter of spices in the world market (Peter *et. al.*, 3). Among different spices, fennel (*Foeniculum vulgare* Mill.) is an important seed spice crop grown in India. Fennel seeds are used as spice in Indian culinary for flavoring soups, sauces, pickles and for seasoning breads and cakes. Fennel seeds are having digestive, appetizing, stimulant and carminative properties also used in cough, flatulence, colic, thirst, dysentery and diarrhea (Randhawa *et. al.*, 5). Suitable planting pattern is important non-cash input avoiding intra spacing competition, cooperative interaction and competitive interaction; it is of vital importance for interception of sunlight in plant canopy. It is an established fact that there is a positive correlation between fertilizer and agricultural production. There are no evidences on response of drilled rabi fennel to row spacing and levels of nitrogen. This study was therefore made to find out optimum row spacing and level of nitrogen for obtaining the most economical grain yield.

The field study was conducted in a split plot design with four replications at Agronomy Instructional Farm of Chimanbhai Patel College of Agriculture, Gujarat Agriculture University. Three main plot treatments were row spacing i.e. 30cm, 45cm and 60cm while sub plot treatment were five levels of nitrogen i.e. 60kg, 75kg, 90kg, 105 and 120kg of nitrogen ha<sup>-1</sup>. Fennel was drilled manually by previously opened rows in 5.0 x 3.0m<sup>2</sup> plot for 30cm row spacing, 5.0x2.7m<sup>2</sup> plot for 45cm row spacing and 5.0 x 2.4m<sup>2</sup> for 60 cm row spacing. Sowing was done in last week of October using crop variety GF-

2. Recommended agronomic practices were followed for all the treatments. First three irrigations were given just after sowing, after a week and 30 DAS for better establishment of crop. After establishment six more irrigation were given to all treatments. The crop was fertilized with nitrogen as per treatment with half of total nitrogen and full dose of phosphorus provided through basal application. The remaining half of nitrogen according to treatment was given in two splits i.e. 30 and 60 DAS. Attempts were made to keep experimental field weed free by following two hand weeding and two inter-culturing. The seed yield from individual plots were also recorded and converted in per hectare basis.

The data of different row spacing and levels of nitrogen showed significant effect on biometric as well as yield attributes. Significant effect on plant height was observed when plant were sown at 45 cm row spacing and fertilized with 90 kg of nitrogen ha<sup>-1</sup>. The numbers of primary, secondary and tertiary branches were reported maximum in 45cm row spacing as to 30 and 60 cm row spacing (Table 1). Application of 90 kg of nitrogen ha<sup>-1</sup> reported par result to 105 and 120 kg nitrogen ha<sup>-1</sup>.

The yield attributes showed significant results for spacing and varying levels of nitrogen. Maximum number of umbels and umbellate per umbels were recorded in 45cm row spacing, which were significantly higher in comparison to 30 and 60cm row spacing. While for level of nitrogen maximum umbel per plant and number of umbellate per umbel was reported in application of 120 kg nitrogen ha<sup>-1</sup> and it was at par with application of 90 kg nitrogen ha<sup>-1</sup> (Table 2).

**Table 1:** Effect of spacing and nitrogen on growth attributes

Treatment Details	Plant height at harvest	No. of primary branches per plant	No. of secondary branches per plant	No. of tertiary branches per plant
<b>Row spacing</b>				
S <sub>1</sub>	105.47	4.3	4.4	3.76
S <sub>2</sub>	128.17	6.47	6.6	5.6
S <sub>3</sub>	124.87	5.4	5.5	4.67
S. Em. ±	2.45	0.2	0.11	0.07
CD at 5%	8.47	0.69	0.37	0.27
CV%	9.15	16.57	8.63	7.37
<b>Levels of Nitrogen</b>				
N <sub>1</sub>	112.75	4.67	5.22	3.79
N <sub>2</sub>	114.75	4.79	5.32	3.96
N <sub>3</sub>	122.92	5.82	5.64	5.2
N <sub>4</sub>	123.5	5.83	5.65	5.21
N <sub>5</sub>	123.6	5.85	5.67	5.22
S. Em. ±	2.5	0.11	0.04	0.04
CD at 5%	7.19	0.32	0.11	0.12
S ⊗ N	NS	NS	NS	Significant
CV%	7.26	7.22	2.43	2.96

**Table 2:** Effect of spacing and nitrogen on yield attributes

Treatment Details	Umbels per plant	Umbelates per umbel	Stover yield (kg ha <sup>-1</sup> )	Seed yield (kg ha <sup>-1</sup> )
<b>Row spacing</b>				
S <sub>1</sub>	15.23	15.83	1705	1099
S <sub>2</sub>	21.11	17.89	2270	1521
S <sub>3</sub>	18.12	17.41	2030	1307
S.Em. ±	0.53	0.15	36	32
CD at 5%	1.83	0.94	124	111
CV%	13.05	7.09	8	11
<b>Levels Of Nitrogen</b>				
N <sub>1</sub>	15.03	15.14	1762	1083
N <sub>2</sub>	16.66	15.83	1872	1200
N <sub>3</sub>	19.36	17.98	2090	1395
N <sub>4</sub>	19.85	18.08	2133	1430
N <sub>5</sub>	19.86	18.19	2151	1438
S.Em. ±	0.92	0.17	53	67
CD at 5%	2.65	0.49	153	192
S ⊗ N	NS	NS	Significant	NS
CV%	17.61	3.45	9	18

The yield results showed significant result for spacing and varying levels of nitrogen. The maximum seed and stover yield was reported in 45 cm row spacing. Similarly, in case of varying levels of nitrogen maximum seed and stover yield was recorded with application of 120 kg nitrogen ha<sup>-1</sup> and it was at par with application of 90 kg nitrogen ha<sup>-1</sup>.

From the results of the experiment, it is concluded that the row spacing has significant effect on vegetative as well as yield attributes. Plant height and number of primary, secondary and tertiary branches as well as yield attributes were maximum in 45 cm row spacing. Randhawa and Gill (4) and Patel (2) also reported increase in biometric and yield attributes in 45 cm row spacing. The levels of nitrogen on plant height and yield attributing characters showed significant effect and yield increase with increasing level of application of nitrogen. Amin (1) also reported that that yield in fennel increases with increase in level of nitrogen.

## References

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