

Performance of ajwain (*Trachyspermum ammi*) varieties at varying nitrogen levels under semi-arid tropics of Northern Karnataka

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ABSTRACT

An experiment was conducted at University of Horticultural Sciences, Bagalkot, Karnataka, during *Kharif* 2016 and 2017 to study effect of ajwain (*Trachyspermum ammi* L. Sprague) varieties and nitrogen levels on its plant growth and yield attributes in semi-arid tropics of Northern Karnataka. The experiment was laid out in a split plot design with three replications by keeping varieties in main plots (Ajmer Ajwain 1, Ajmer Ajwain 93, Lam Selection 1, Lam Selection 2 and Local cultivar) and nitrogen levels in sub plots (50, 75, 100 and 125 kg/ha). The growth and yield attributes were significantly higher in improved varieties compared to local cultivar. Ajmer Ajwain 1 recorded highest plant height (81.82 and 80.56cm), number of secondary branches (52.36 and 50.98), plant spread (72.66 and 50.98cm), number of umbels/plant (177.15 and 171.88), number of umbellate/umbel (11.81 and 11.65), seed yield (14.44 and 14.26 q/ha, during both year, respectively), which was on a par with Lam Selection-1 (13.93 and 13.56 q/ha, respectively). Earliest 50 per cent flowering was observed in Ajmer Ajwain 93. Application of nitrogen up to 125 kg/ha significantly increased growth and yield attributes which were on a par with 100 kg N/ha. Maximum seed yield g/plant, seed yield q/ha and essential oil yield kg/ha were recorded with 125 kg N/ha. Earliest 50 per cent flowering was observed under 50 kg N/ha application. Ajmer Ajwain1 and Lam Selection 1 were found better with an optimum dose of 100 kg N/ha.

Key Words: Nitrogen, Varieties, Essential oil, Yield, Secondary branches, Plant spread

Ajwain (*Trachyspermum ammi* L. Sprague) is a well-known seed spice with multiple medicinal properties. It is grown in *rabi* season and prefers a cool and dry climate. However, farmers are growing crop by using available cultivars, with or without a very low rate of nitrogenous fertilizers. Owing to its cultivation in marginal lands and non-availability of improved varieties, its productivity is very low in semi-arid tropics of Northern Karnataka. Therefore, an experiment was conducted to identify suitable varieties with optimum use of nitrogenous fertilizers for semi-arid tropics.

MATERIALS AND METHODS

The experiment was laid out in a split-plot design with three replications, main plots consisting of five varieties (Ajmer Ajwain1, Ajmer Ajwain 93, Lam selection-1, Lam selection-2 and Local cultivar)

and nitrogen levels in subplots (50, 75, 100 and 125 kg/ha) and conducted during *kharif* 2016 and 2017 at University of Horticultural Sciences, Bagalkot, Karnataka. The soil was sand loamy, poor in fertility and water-holding capacity, having pH 8.61 and organic carbon 0.63%, available N 246.18 kg/ha, P₂O₅ 17.35 kg/ha, K₂O 185.6 kg/ha. The crop was sown in second week of June during both years with a seed rate of 5 kg/ha.

Half of the nitrogen as per the requirement of respective treatment along with a common dose of phosphorus and potassium @ 40 kg/ha was applied as a basal dose at sowing. The remaining half of nitrogen was applied in two equal split doses at monthly intervals. All recommended cultural and plant-protection measures were followed. The data on growth and yield attributing characters and seed yield were recorded and analyzed statistically.

RESULTS AND DISCUSSION

The varieties, Ajmer Ajwain 1 and Lam Selection 1, performed better and produced significantly higher growth and seed yield than other varieties. Ajmer

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Ajwain 1 showed significantly higher plant height (82.82 and 80.56 cm), number of secondary branches (52.36 and 50.98), plant spread (72.66 and 71.84 cm), number of umbels/plant (177.15 and 171.88), number of umbellate/umbel (11.81 and 11.65), seed yield/plant (18.01 and 17.54g) and seed yield (14.44 and 14.26 q/ha, during both years, respectively) which was on a par with Lam Selection-1. The present findings are confirmed by Wahab, Mahamed (2007) and Prem *et al.* (2008), Bhardwaj and Kumar (2016) and Thakral and Tehlan (2006), Phurailatpam *et al.* (2016) and Lal and Singh (2016).

The maximum essential oil was recorded in Lam Selection 1. (61.96 and 59.39 kg/ha during both years), which was at par with Lam Selection 2 (60.72 and 58.29 kg/ha), Ajmer Ajwain 1 (60.51 and 60.86 kg/ha) and Ajmer Ajwain 93 (54.41 and 53.77 kg/ha). The essential oil content varied significantly with different varieties (Fig 1). The maximum essential oil content was recorded in local cultivar (5.21 and 5.14 % during both years), while minimum essential oil content was recorded in Ajmer Ajwain 1 (4.20 and 4.13%, respectively). Similar results were found by Singh *et al.* (2003) and Rathore *et al.* (2016) and Phurailatpam *et al.* (2016).

All the varieties showed significant differences in fresh and dry weight of plants 30 days after sowing (DAS). The highest fresh weight was obtained from Ajmer Ajwain 1 (26.01 and 24.63 g/plant) and dry weight (4.10 and 3.85 g/plant during both years, respectively) which were on a par with Lam Selection-1 (25.07 and 23.85 g/plant fresh weight) and (4.02 and 3.78 g/plant dry weight, respectively).

Reproductive parameters

The early flowering was recorded in Ajmer Ajwain 93 (50.06 and 51.38 days during both years) (Table 2). Lam Selection1 (75.00 and 76.03 days), Lam Selection 2 (76.60 and 77.33 days) and Ajmer Ajwain 1 (77.62 and 78.60 days, respectively) noticed medium flowering. The late flowering was observed in Local cultivar (105.55 and 106.87 days, respectively). On account of days to 50% flowering Ajmer Ajwain 93 (63.71 and 64.91 days) and minimum number of day's maturity (131.75 and 131.80 days during both years, respectively). Local cultivar recorded maximum number of days to 50% flowering

(123.69 and 124.67 days) and late maturity (178.52 and 179.78 days, respectively) reported by Sanjay *et al.* (2022). The maximum biological yield was recorded in Ajmer Ajwain 1 (65.82 and 65.60 q/ha during both years), which was on a par with Lam Selection 1 (63.88 and 63.39 q/ha, respectively). Local cultivar recorded maximum straw yield (53.71 and 53.70 q/ha during both years). The maximum harvest index was recorded in Ajmer Ajwain 1 (21.89 and 21.69 %), which was on a par with Lam Selection 1 (21.78 and 21.35%) and Lam Selection 2 (21.62 and 21.22 %, respectively).

Effect of nitrogen levels

Application of 125 kg N/ha recorded highest plant height (82.44 and 80.40 cm), number of secondary branches/plant (53.60 and 53.92), plants spread (70.91 and 69.63 cm), number of umbels/plant (189.61 and 185.22), umbellets/umbels (11.95 and 11.86), seed yield/plant (17.62 and 17.08 g), seed yield (13.85, 13.65 q/ha), essential oil content (4.67 and 4.62%) and oil yield (64.00 and 62.61 kg/ha, during both years, respectively) which was at par 100 kg N/ha application. Mourya and Kushwah (2018); Asharf and Noman (2006); Wahab and Mohamed (2007); Nath *et al.* (2008) support the findings. It was observed that maximum fresh and dry weight were obtained from the application of 125 kg N/ha (26.31 and 24.88 g fresh weight) and 4.08 and 3.86 g dry weight, respectively), which were on a par with 100 kg N/ha. (25.44 and 24.01 g fresh weight) and (3.92 and 3.72 g dry weight, respectively). The straw yield and harvest index were significantly affected by different nitrogen levels during both years (Table 1). The maximum biological, straw yield and harvest index were recorded with application of 125 kg N/ha, which was on a par with 100 kg N/ha application.

CONCLUSION

It is concluded that Ajmer Ajwain 1 and Lam Selection 1 are most suitable varieties for semi-arid tropics of Northern Karnataka.

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Table 1: Effect of varieties and nitrogen levels on fresh and dry weight, reproductive parameters, biological, straw yield and harvest index of ajwain

Treatment Varieties (V)	Fresh weight (g/plant) @ 30 DAS		Dry weight (g/plant) @ 30 DAS		Initiation of flowering		Days taken to 50 % flowering		Days to maturity		Biological yield (q/ha)		Straw yield (q/ha)		Harvest index (%)	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
V ₁	26.01	24.63	4.10	3.85	77.62	78.60	91.19	92.48	161.27	161.37	65.82	65.60	51.38	51.34	21.89	21.69
V ₂	23.56	22.29	3.74	3.49	50.06	51.38	63.71	64.91	131.75	131.80	62.15	61.12	49.57	48.78	20.16	20.11
V ₃	25.07	23.85	4.02	3.78	75.00	76.03	89.56	90.73	153.46	153.24	63.88	63.39	49.95	49.83	21.78	21.35
V ₄	23.72	22.69	3.80	3.64	76.60	77.33	89.91	91.11	153.73	153.59	62.40	61.93	48.89	48.77	21.62	21.22
V ₅	23.75	23.04	3.83	3.64	105.55	106.87	123.69	124.67	178.52	179.78	62.67	62.77	53.71	53.70	14.29	14.40
S Em±	0.42	0.45	0.07	0.06	1.78	1.53	2.09	2.12	3.20	2.62	0.77	0.74	0.63	0.53	0.25	0.29
CD (5%)	1.38	1.46	0.22	0.20	5.79	5.00	6.81	6.91	10.43	8.55	2.51	2.42	2.04	1.74	0.81	0.94
Nitrogen levels (kg/ha)																
N ₁	21.74	21.20	3.72	3.50	74.82	75.91	89.50	90.35	152.93	153.22	57.31	57.36	46.57	46.88	18.72	18.25
N ₂	24.20	23.12	3.87	3.64	76.47	77.60	91.32	92.26	155.27	155.44	62.78	62.66	50.31	50.21	19.85	19.85
N ₃	25.44	24.01	3.92	3.72	77.24	78.33	92.42	93.26	156.30	156.53	65.68	64.98	52.01	51.66	20.80	20.50
N ₄	26.31	24.88	4.08	3.86	79.33	80.32	93.22	95.24	158.50	158.64	67.76	66.84	53.91	53.19	20.42	20.42
S Em±	0.35	0.33	0.06	0.05	1.37	1.22	1.62	1.64	2.38	2.23	0.78	0.77	0.68	0.65	0.19	0.19
CD 5%	1.02	0.96	0.16	0.15	3.96	3.51	4.68	4.74	6.88	6.44	2.24	2.23	1.96	1.89	0.54	0.54
N X V	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
V X N	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Main plot: varieties (V)																
V ₁	Ajmer Ajwain 1		V ₄ : Lam Selection 2		N ₁ : 50 kg N/ha		N ₃ : 100 kg N/ha									
V ₂	Ajmer Ajwain 93		V ₅ : Local cultivar		N ₂ : 75 kg N/ha		N ₄ : 125 kg N/ha									
V ₃	Lam Selection 1		NS: Non-Significant													
Sub plot: nitrogen levels (N)																

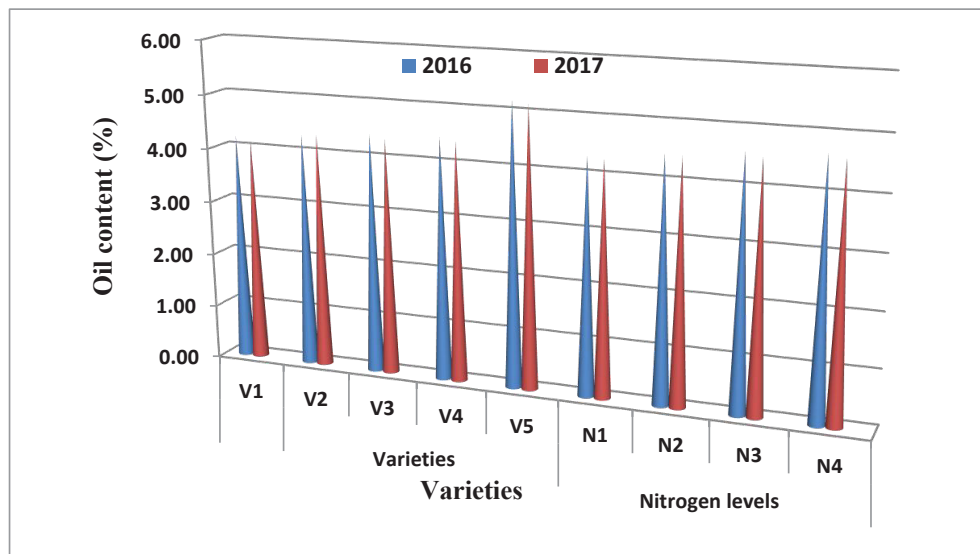


Fig. 1: Oil content of ajwain varieties as influenced by different levels of nitrogen during *kharif* 2016 and 2017

REFERENCES

- Agrawal S, Singh D and Rajput S S. 2003. Evaluation of fennel (*Foeniculum vulgare* Mill.) germplasm for production and quality. *Journal of Spices Aromatic Crops* **12**(2): 174-78.
- Ashraf M and Noman A. 2006. Influence of applied nitrogen on growth and tissue nutrient concentration in the medicinal plant Ajwain (*Trachyspermum ammi* L.). *Australian Journal of Experimental Agriculture* **46**: 425-28.
- Bhardwaj R L and Kumar D. 2016. Effect of varying levels of nitrogen on growth, yield, quality and profitability of transplanted fennel (*Foeniculum vulgare* Mill.). *Journal of Spices Aromatic Crops* **25**(2): 141-48.
- Krishnamoorthy V and Madalagari M B. 2002. Effect of nitrogen and phosphorus on growth of ajwain genotypes (*Trachyspermum ammi* L.). *Journal of Medicinal and Aromatic Plant Sciences* **24**: 45-49.
- Lal G, Mehta R S, Singh R, Kakani R K, Meena N K and Maheria S P. 2016. Effects of nitrogen levels on plant growth and leaf yield of off season coriander under shade nets. *International Journal of Seed Spices* **6**(2): 46-49.
- Mourya B S and Kushwah S S. 2018. Effect of nitrogen levels on growth, yield, seed quality and economics of French bean (*Phaseolus vulgaris*) varieties. *Current Horticulture* **6**(1): 27-31.
- Phurailatpam A K, Geetha K A, Meena R S and Mait S. 2016. Evaluation of coriander (*Coriandrum sativum* L.) cultivars for yield and yield contributing characters in Gujarat. *Journal of Spices Aromatic Crops* **25**(1): 7-12.
- Prem N, Jaiswal R C, Verma R B and Yadav G C. 2008. Effect of date of sowing, nitrogen levels and spacing on growth and yield of ajwain (*Trachyspermum ammi* (L.) Sprague). *Journal of Spices Aromatic Crops* **17**(1): 1-4.
- Sanjay K, Maya L and Lalu P Y. 2022. Characterization of coriander (*Coriandrum sativum*) genotypes based on floral traits. *Current Horticulture* **10**(2): 56-58.
- Thakra K K and Tehlan S K. 2006. Performance of fennel varieties for growth and seed yield traits. *Haryana Journal of Horticultural Sciences* **35**(3): 351-52.
- Wahab Abd E and Mohamed A. 2007. Effect of nitrogen and magnesium fertilization on the production of *Trachyspermum ammi* L. plants under sinai conditions. *Journal of Applied Sciences Research* **3**(8): 781-86.