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Effect of interaction of nitrogen and phosphorus on seed and essential oil yield of ajowan (*Trachyspermum ammi* L.) genotypes

V Krishnamoorthy & M B Madalageri

Division of Horticulture
University of Agricultural Sciences, Dharwad - 580 005, India.

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Abstract

Field experiments conducted at Dharwad (Karnataka, India), to study the effect of interaction of nitrogen and phosphorus on seed yield and essential oil yield of ajowan (*Trachyspermum ammi*) genotypes, revealed that number of tertiary branches increased significantly with increasing levels of interaction of phosphorus and nitrogen in the genotypes BEN-1 and BEN-2. The number of umbels increased significantly with increasing levels of phosphorus and nitrogen combinations. Significantly higher number of seeds was recorded in BEN-1 at $P_{50} + N_{100}$ and at $P_{50} + N_{25}$ in BEN-2. Thousand seed weight significantly decreased in BEN-1 with increasing levels of phosphorus and nitrogen combination, whereas in BEN-2 it increased with increasing levels of phosphorus and nitrogen combinations. Seed yields were signifiantly higher at $P_{50} + N_{100}$ in BEN-1 (20.50 q ha^{-1}) and BEN-2 (14.61 q ha^{-1}), respectively. Essential oil yields were significantly higher at $P_{50} + N_{100}$ in BEN-1 (82.04 kg ha^{-1}) and BEN-2 (26.30 kg ha^{-1}), respectively.

Key words : ajowan, essential oil, nutrition, *Trachyspermum ammi*, yield.

Ajowan (Bishop's weed) (*Trachyspermum ammi* L., Apiaceae) is widely cultivated in various regions in India and is used in small quantities for flavouring food and as antioxidant and preservative in confectionery and beverages. The present study was undertaken to study the effect of interaction of nitrogen and phosphorus on growth, seed yield and essential oil yield of ajowan genotypes for increasing the productivity of the crop.

The field experiment was carried out at University of Agricultural Sciences, Dharwad (Karnataka, India) during *kharif* 1997. The trial was laid out in factorial randomized design with three replications, consisting of two genotypes (V_1 : BEN-1 and V_2 : BEN-2), two levels of phosphorus (25 and 50 kg ha^{-1}) and three levels of nitrogen (25, 50 and 100 kg ha^{-1}). The seeds were sown at a spacing of 50 cm between rows and 20 cm between plants. Fifty per cent of nitrogen and full dose of phosphorus were applied as basal dose and the remaining 50% nitrogen was applied 45 days after sowing. A common dose of 50 kg potassium per ha was applied to all the experimental plots. Observations on growth parameters, seed yield and yield attributing parameters were recorded at the time of harvest. The essential oil content was estimated by hydro distilling a known quantity of seeds in Clevenger glass unit (Clevenger 1928).

Production of tertiary branches significantly increased with interaction of increasing levels of P and N. The highest number of tertiary branches (273.67 and 232.00 for BEN-1 and BEN-2, respectively) was recorded at highest level of interaction of P and N (50 + 100 kg ha^{-1}). These results are in agreement with the results obtained by Surendra *et al.* (1994) in coriander (Table 1).

The number of umbels significantly increased with increasing levels of P and N combinations. The highest number of umbels (253.67 and 238.00 for BEN-1 and BEN-2, respectively) were recorded at $P_{50} + N_{100}$, which can be attributed to higher tertiary branches, which terminated into umbels. Number of seeds per umbel decreased with increasing levels of P and N interactions in BEN-2, whereas in BEN-1, the response was

Table 1. Effect of interaction of nitrogen and phosphorus on seed yield and essential oil yield of ajowan genotypes

Treatment		No. of tertiary branches/ plant	No. of umbels/ plant	No. of seeds/ umbel	1000 seed weight (g)	Seed yield (q/ha)	Essential oil yield (kg/ha)
Genotype	N & P combination						
BEN-1	$P_{25} + N_{25}$	146.33	73.17	24.80	2.01	3.43	11.66
	$P_{25} + N_{50}$	201.67	113.00	27.33	1.99	6.05	20.54
	$P_{25} + N_{100}$	209.33	135.00	34.33	1.93	6.39	23.03
	$P_{50} + N_{25}$	144.67	114.00	41.90	2.02	10.32	35.23
	$P_{50} + N_{50}$	137.67	142.33	60.10	1.86	13.23	44.73
	$P_{50} + N_{100}$	273.67	253.67	90.27	1.79	20.50	82.04
BEN-2	$P_{25} + N_{25}$	172.67	43.00	99.73	1.76	3.24	5.17
	$P_{25} + N_{50}$	187.67	95.17	92.87	1.80	6.22	9.92
	$P_{25} + N_{100}$	201.33	140.00	80.33	1.82	9.30	15.77
	$P_{50} + N_{25}$	194.67	86.00	133.67	1.69	9.91	15.95
	$P_{50} + N_{50}$	217.33	141.00	93.67	1.89	12.28	22.06
	$P_{50} + N_{100}$	232.00	238.00	75.07	2.04	14.61	26.30
SE±m		6.43	4.22	2.18	0.01	0.70	2.13
CD ($P<0.05$)		18.85	12.37	6.39	0.04	2.40	6.26

positive in which it increased from 24.80 seeds at $P_{25} + N_{25}$ to 90.27 seeds at $P_{50} + N_{100}$. In BEN-2, seed number (133.67) was significantly higher in P_{50} + N_{25} interaction than $P_{25} + N_{25}$ interaction (99.73) indicating that increasing levels of phosphorus increased seed number at lower levels of nitrogen. Plants with less number of umbels recorded more number of seeds per umbel in BEN-2 genotype. The results are in agreement with the results obtained in dill (Randhawa & Singh 1988), caraway (Munshi *et al.* 1990) and coriander (Bhat & Sulikeri 1992).

Thousand seed weight decreased with increasing levels of combination of P and N in BEN-1 genotype whereas in BEN-2, it increased with increasing levels of P and N interaction. High seed weight in BEN-1 at lower levels of interaction having less number of seeds can be attributed to bigger seed size. The same reason also holds good for BEN-2 where increasing test weight of seeds with increasing levels of interaction of P and N was due to decrease in number of seeds per umbel. Thus a negative relationship between seed number and size of seeds in an umbel was observed. Seed yield increased with increasing levels of interaction of N and P in both the genotypes. The highest seed yield (14.61 and 20.50 q ha^{-1} in BEN-2 and BEN-1, respectively) was recorded at $P_{50} + N_{100}$. The significant increase in seed yield can be mainly attributed to production of higher number of umbels.

Essential oil yield increased with increasing levels of P and N interactions in both the genotypes. The highest value (82.04 kg ha^{-1} in BEN-1) was recorded at P_{50} + N_{100}. Similar results were obtained in fennel (Ahmed *et al.* 1988) and coriander (Tiwari & Bonafar 1995).

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