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Effect of agronomic practices on productivity and profitability of anise (*Pimpinella anisum* L.)

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Abstract

A field experiment was carried out at Ajmer (Rajasthan) to find out the optimum sowing time and crop geometry for realising higher productivity and profitability in anise (*Pimpinella anisum* L.). Fifteen treatment combinations comprising of five dates of sowing *viz*., 15th October, 30th October, 15th November, 30th November and 15th December in main plot and three crop geometry *viz*., 20 cm × 10 cm, 25 cm × 10 cm and 30 cm × 10 cm spacing in sub plot were taken. The results revealed that sowing of anise on 15th October produced significantly higher plant height (7.94 cm, 40.98 cm and 54.88 at 60,90 DAS and at harvest, respectively), number of branches plant^{-1} (14.70 and 13.92 at 90 DAS and harvest respectively), number of umbels plant^{-1} (40.91), number of umbellates umbel^{-1} (17.4), number of seeds umbellate^{-1} (19.45), test weight (2.60 g), seed yield (892 kg ha^{1}), gross returns (Rs. 80,280 ha^{-1}), net returns (Rs. 74,280 ha^{-1}) and benefit: cost ratio (12.38). Crop geometry of 20 cm × 10 cm significantly resulted in highest plant height, number of branches plant^{-1} at all stages, number of umbels plant^{-1} (31.57), number of umbellates umbel^{-1} (14.72), number of seeds per umbellate (17.58), test weight (2.40 g), seed yield (507 kg ha^{-1}), net returns (Rs. 39630 ha^{-1}) and Benefit Cost Ratio (6.61). Therefore, sowing of anise on I5th October at 20 cm × 10 cm spacing was optimum for realising higher productivity and profitability of the crop.

Keywords: crop geometry, *Pimpinella anisum*, sowing date

Introduction

Anise (*Pimpinella anisum* L.) is an under exploited minor seed spice crop mainly grown during *rabi* season in parts of Rajasthan, Punjab, Uttar Pradesh, Orissa, Madhya Pradesh0 and Delhi. Meagre information is available on spacing and time of sowing on productivity of anise. Therefore, an investigation was undertaken with the objective of finding out optimum sowing time and crop geometry for realising better growth, yield and net returns of anise.

Materials and methods

The field experiment was carried out for two consecutive years (2009–10 and 2010–11) at the research farm of National Research Centre on Seed Spices, Ajmer (Rajasthan). The soil of the experimental area is loamy sand having low

organic matter (0.23%), with low available nitrogen (178.6 kg ha^{-1}), medium in available phosphorus (12.0 kg ha^{-1}) medium in available potassium (165.0 kg ha^{-1}) with slightly alkaline pH (8.04) and EC of 0.076 dSm^{-1}. Fifteen treatment combinations comprising of five dates of sowing *viz.*, 15th October, 30th October, 15th November, 30th November and 15th December in main plot and three crop geometry *viz.*, 20 cm × 10 cm, 25 cm × 10 cm and 30 cm × 10 cm spacing in sub plot were taken in split plot design with three replications. The plot size was 3.0 m × 3.5 m. The seeds of var. Ajmer Anise-1 was sown at 6 kg ha^{-1} on respective dates as per treatments during both the years. Recommended dose of fertilizer *viz.*, 80 kg N and 30 kg P_2O_5 ha^{-1} were supplied through urea and DAP, respectively. Full quantity of P and half of the N was applied as basal at the time of sowing and the remaining N was applied 30 days after sowing (DAS). Irrigation was done at recommended IW/CPE ratio of 0.8. Other agrotechniques were followed as per recommendations for anise. Five plants were selected from each plot for recording various yield attributes and plot wise net yield was recorded. Statistical analysis of the data was done on pooled basis as per the procedure suggested by Panse & Sukhatme (1985).

Results and discussion

Date of sowing

Various dates of sowing significantly influenced plant height at various growth stages, days taken to branching, number of branches $plant^{-1}$, days taken to flower initiation, number of umbels $plant^{-1}$, number of umbellates $umbel^{-1}$, seeds $umbellate^{-1}$, 1000 seed weight, seed yield $plant^{-1}$, seed yield, gross returns, net returns and benefit: cost ratio (BCR) (Tables 1, 2 and 4). Sowing of anise on 15th October resulted in highest plant height at 60 DAS (7.94 cm), 90 DAS (40.98 cm) and at harvest (54.84 cm). The number of umbels $plant^{-1}$ (40.91), number of umbellates $umbel^{-1}$ (17.04), number of seeds $umbellate^{-1}$ (19.45), test weight (2.60 g), seed yield (892 kg ha^{-1}), gross returns (Rs. 80,280 ha^{-1}), net returns (Rs. 74,280 ha^{-1}) and BCR (12.38) were significantly higher with sowing on 15th October. This may be due to suitable climatic conditions, which facilitated better germination, crop establishment and less chances of occurrence of diseases and pests as compared to other sowing dates. Maheshwari *et al.* (1989) also reported higher yield of anise with sowing on 15th October.

Table 1. Effect of sowing dates and crop geometry on growth parameters of anise (Pooled data of two years)

Treatment	Plant height (cm)			Branches $plant^{-1}$	
	60 DAS	90 DAS	At harvest	90 DAS	At harvest
Date of sowing					
15th October	7.94	40.98	54.84	14.70	13.92
30th October	6.03	25.48	50.92	8.49	13.63
15th November	5.43	24.01	44.36	7.25	12.13
30th November	5.87	21.68	41.57	7.34	11.27
15th December	4.00	17.18	34.12	5.87	9.19
SEm ±	0.18	0.94	1.46	0.31	0.38
CD (P=0.05)	0.59	3.05	4.77	1.01	1.25
Crop geometry					
20 cm × 10 cm	6.28	28.54	47.52	9.46	12.65
25 cm × 10 cm	6.02	25.41	44.73	8.75	11.97
30 cm × 10 cm	5.26	23.65	43.24	7.97	11.45
SEm ±	0.13	0.65	1.00	0.23	0.26
CD (P=0.05)	0.38	1.91	2.94	0.67	0.77

Table 2. Effect of sowing dates and crop geometry on yield attributes and yield of anise (Pooled data of two years)

Treatments	Umbels plant^{-1}	Umbellates umbel^{-1}	Seeds umbellate^{-1}	Test weight (g)
Date of sowing				
15th October	40.91	17.04	19.45	2.60
30th October	36.95	15.30	18.50	2.59
15th November	30.48	14.14	15.17	2.41
30th November	19.80	13.19	15.15	2.03
15th December	11.51	10.73	12.91	1.96
SEm ±	0.93	0.46	0.51	0.08
CD (P=0.05)	3.03	1.50	1.67	0.26
Crop geometry				
20 cm × 10 cm	31.57	14.72	17.58	2.40
25 cm × 10 cm	27.18	13.92	15.61	2.16
30 cm × 10 cm	25.04	13.60	15.52	2.40
SEm ±	0.67	0.31	0.34	0.05
CD (P=0.05)	1.97	0.93	1.01	0.15

Table 4. Effect of sowing dates and crop geometry on yield, net returns and BCR of anise (Pooled data of two years)

Treatment	Seed yield (kg ha^{-1})	Gross returns (Rs. ha^{-1})	Cost of cultivation (Rs. ha^{-1})	Net returns (Rs. ha^{-1})	BCR^{a}
Date of sowing					
15th October	892	80280	6000	74,280	12.38
30th October	695	62550	6000	56,550	9.425
15th November	283	25470	6000	19,470	3.245
30th November	273	24570	6000	18,570	3.095
15th December	133	11970	6000	5,970	0.995
SEm ±	16	-	-	-	0.20
CD (P=0.05)	51	-	-	-	0.66
Crop geometry					
20 cm × 10 cm	507	45630	6000	39,630	6.61
25 cm × 10 cm	455	40950	6000	34,950	5.83
30 cm × 10 cm	404	36360	6000	30,360	5.06
SEm ±	12	-	-	-	-
CD (P=0.05)	37	-	-	-	-

Cost of anise seed=Rs. 90 kg^{-1}; ^{a}BCR=Benefit : Cost ratio

Crop geometry

Varying crop geometry significantly influenced plant height at various growth stages, days taken to branching, number of branches plant^{-1}, days taken to flower initiation, number of umbels plant^{-1}, number of umbellates umbel^{-1}, number of seeds umbellate^{-1}, test weight and seed yield (Tables 1, 2 and 4). Sowing of anise at 20 x 10 cm spacing resulted in highest plant height at 60 DAS (6.28 cm), 90 DAS (28.54 cm) and harvest (47.52 cm), number of umbels plant^{-1} (31.57), number of umbellates umbel^{-1} (14.72), number of seeds umbellate^{-1} (17.58), test weight (2.40 g), seed yield (507 kg ha^{-1}), gross return (Rs. 45,630 ha^{-1}), net returns (Rs. 39,630 ha^{-1}) and BCR (6.61). This might be due to presence of higher plant population in unit area as compared to wider spacing which ultimately

Table 3. Interaction effect of sowing dates and crop geometry on plant height and number of branches plant^{-1} in anise (Pooled data of two years)

Date of sowing/	Plant height at 90 DAS			Number of branches at 60 DAS		
Crop geometry	20 × 10 cm	25 × 10 cm	30 × 10 cm	20 × 10 cm	25 × 10 cm	30 × 10 cm
15th October	49.0	37.0	36.9	2.77	2.17	2.86
30th October	28.9	27.2	20.3	2.41	2.66	2.70
15th November	24.2	24.2	23.7	2.79	2.15	2.30
30th November	22.9	21.3	20.8	2.01	1.87	2.21
15th December	17.7	17.3	16.5	2.00	1.97	1.93
SEm ±		1.45			0.12	
CD (P=0.05)		4.27			0.34	

Table 5. Interaction effect of sowing dates and crop geometry on seed yield, net return and BCR in anise (Pooled data of two years)

Date of sowing/	Seed yield (kg ha^{-1})			Net returns (Rs ha^{-1})			BCR^a		
Crop geometry	20 × 10 cm	25 × 10 cm	30 × 10 cm	20 × 10 cm	25 × 10 cm	30 × 10 cm	20 × 10 cm	25 × 10 cm	30 × 10 cm
15th October	914	905	857	76,260	75,450	71,130	12.71	12.58	11.86
30th October	886	667	533	73,740	54,030	41,970	12.29	9.01	7.00
15th November	305	295	248	21,450	20,550	16,320	3.58	3.43	2.72
30th November	286	276	257	19,740	18,840	17,130	3.29	3.14	2.86
15th December	143	133	124	6870	5970	5160	1.15	1.00	0.86
SEm ±		28			2508			0.36	
CD (P=0.05)		82			7399			1.06	

Cost of anise seed=Rs. 90 kg^{-1}; ^{a}BCR=Benefit: Cost ratio

resulted in higher seed yield. Though, wider spacing resulted in higher seed yield plant^{-1} but on account of less population, the increased yield plant^{-1} did not compensate the yield loss. Maheshwari *et al.* (1989) also obtained higher seed yield of anise in closer row spacing. Line sowing of anise at 30 cm spacing resulted in higher yield as compared to narrower and wider spacing (Randhawa *et al.* 1992).

Interaction effect

Plant height at 90 DAS, number of branches plant^{-1} at 60 DAS, test weight, seed yield, gross returns, net returns and BCR were significantly influenced with interaction effects of varying date of sowing and crop geometry (Table 3 and 5). Significantly, the highest plant height at 90 DAS (49 cm), maximum number of branches plant^{-1} at 60 DAS (2.77), seed yield (914 kg ha^{1}), net returns (Rs. 76,260 ha^{-1}) and BCR (12.71) were recorded with sowing of anise on 15th October at 20 cm x 10 cm spacing being at par with sowing on 30th October at 20 cm × 10 cm and 25 cm × 10 cm crop geometry. Thus, sowing of anise on 15th October at 20 cm × 10 cm geometry will be optimum for realising higher productivity and profitability and BCR in anise.

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