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Effects of sowing dates on plant growth and seed yield of ajmer green coriander-1 in winter season

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Abstract

Present investigation was carried out to see the effect of different sowing dates on plant growth and seed yield of winter season coriander cultivar Ajmer Green Coriander-1 (AGCr-1) at ICAR-National Research Centre on Seed Spices, Ajmer, Rajasthan during 2014-15, 2015-16 and 2016-17. The experiment comprised of five date of sowing including 13th October, 23rd October, 02nd November, 12th November and 22nd November with four replications under randomized block design keeping plot size 2.0m x 3.0 m. Observations with respect to seed germination, plant growth, seed yield in each treatment were recorded. Results revealed that parameters like minimum days to germination initiation (7.33), minimum days to complete germination (10.50), plant height at 60 DAS (26.88 cm), 90 DAS (108.93 cm) and at harvest (128.43 cm) were recorded in the plants grown on 23rd October date of sowing. Similarly, maximum number of primary branches (8.95), secondary branches (30.23), highest first leaf length (25.76 cm), second leaf length (24.32 cm), maximum number of basal leaves plant^{-1} (16.88), number of umbel plant^{-1} (42.33), number of umbellate umbel^{-1} (8.0), seed yield plot^{-1} (1188.33 g) and seed yield (1980.56 kg ha^{-1}) was also recorded with 23rd October date of sowing. All the parameters were highest in the crop sown on 23rd October as compared to lowest seed yields (221.33 g plot^{-1} and 368.89 kg ha $^{-1}$) was recorded in the crop sown on 22nd November. The maximum gross return and net return was recorded in the crop sown on 23rd October (` 178250.40, ` 127212.40) followed by 13th October (` 174987.90, ` 123949.90). The trend was observed similar during all the individual years. The maximum B: C ratio was recorded in the crop sown on 23rd October (3.49) followed by 13th October (3.43)

Key words : Coriander, date of sowing, plant growth, seed yield.

Introduction

Coriander is *Apiaceae* family annual herb plant and seeds are important for taste, flavour in various food meals. AGCr-1 is a leafy type variety suitable for dual purpose (leaves and seed production). Seeds are small in size and good quality. Green leaf is having 0.071% essential oil with good aroma and flavour. It is precocious ingredient in the preparation of Unani and ayuvedic medicines and more use in rheumatism, gastrointestinal complaints etc. Coriander is generally sown in winter season for seed production. Time of sowing is high-priority for the crop for vegetative growth and primarily pronouncement of seed. More advanced and delayed sowing may hamper the vegetative growth, seed yield as well as quality of the crop produce. In case of coriander, early sowing leads to early flowering but may be vulnerable to damage in case of aphids and frost. Another hand, late sowing affected the growth and seed yield in adverse condition. Meena and Malhotra (2006) reported that early sowing and selection of less susceptible variety proved a suitable component for the control of aphid in coriander. Ghobadi *et al*. (2012), Soleimani, *et al*. (2011), Sharangi, *et al*. (2011) also worked for standardization of agro techniques towards enhanced production of coriander. However, most of the detection on date of sowing is local in nature and very low findings are sufficient to be conclusive in general. The environment created by temperature, humidity, rainfall and other meteorological factors has profound influence on growth, biomass partitioning and ultimately the yield of coriander which may individually or collectively limit the plant growth and production. The phenological development of the crop along with efficient conversion of biomass into yield is precisely influenced by time of sowing Khichar and Niwas (2006). Better vegetative growth expressed by plant height in earlier date of sowing is perhaps due to more favourable temperature and more sunshine reaching the crop during its growth period Pan *et al*. (2003). Since, AGCr-1is a new emerging variety of coriander especially for green leaf in off season and seed in winter season, the standardization of date of sowing is very much pertinent to boost the yield of quality produce. The present investigation on the different sowing dates was carried out for identifying the important sowing times towards the maximum seed production of coriander.

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Material and methods

The experiment was conducted to study the effect of different sowing dates on plant growth and seed yield of winter season coriander cultivar Ajmer Green Coriander-1 (AGCr-1). The experiment was laid out in RBD with four replications. Different sowing dates *viz*., 13th October, 23rd October, 02nd November, 12th November and 23rd November were taken into consideration for sowing of seeds. The unit plot size was 2.0 m ×3.0 m. The seeds (fruits) were rubbed for separating the mercers (seeds) and were also treated with Bavistin @ 2 g kg^{-1} of seeds before sowing. The seeds were sown with the crop geometry of 25 cm × 7.5 cm using 15 kg ha^{-1} according to the sowing dates. First weeding was done at 35 days after sowing (DAS). Plant thinning was also done with weeding to maintain the required plant population. The irrigation was done at 20 days interval after emergence according to the need of the field soil. Data were collected from the inner rows of each plot to avoid the border effect. In each unit plot 5 plants were selected randomly for recording data on plant growth and yield parameters. Plot yield was converted to per hectare yield. The collected data were properly analyzed statistically through method suggested by Panse and Sukhatme (1985).

Results and discussion

Growth parameters

The findings of this field investigation revealed that the date of sowing influenced significantly the germination and plant growth of coriander crop. Minimum days to germination initiation (7.33), complete germination (10.50), maximum plant height at 60 DAS (26.88 cm), 90 DAS (108.93 cm) and at harvest (128.43 cm) were recorded in the crop sown on 23rd October. Similarly number of primary branches (8.95), secondary branches (30.23), first leaf length (25.76 cm), second leaf length (24.32 cm) and maximum number of basal leaves $plant^{-1}$ (16.88 cm) ware also recorded in the crop sown on 23rd October (Table-1). It is clear that a delay in sowing from 02nd November decreased all growth parameters and fruit maturity decreased significantly. The significant decrease in morphological characters associates with the delay in sowing can be related to higher temperature at the time of harvesting that the plant at the late sowing dates experienced which limited their growing period. The plant did not have optimum opportunity for photosynthesis and turn their height and branch bearing capacity decreased. Better vegetative growth expressed by plant height in earlier date (appropriate) of sowing is perhaps due to more favourable temperature and more sunshine reaching the crop during its growth period Pan *et al*. (2003). Data *et al*. (2008) also found an increase in plant height as well as increasing trend in primary and secondary branches per plant in early sown plants in black cumin. Same trends are found by Singh *et al*. (2005), Carrubba *et al*. (2006), Moosavi (2012) in coriander.

Yield parameters

Results further revealed that the date of sowing influenced significantly the enhancement plant yield of coriander crop. Yield parameters like number of Umbel $plant^{-1}$ (42.33), number of umbellate $umbel^{-1}$ (8.0), seed yield $plot^{-1}$ (1188.33 g) and seed yield ha^{-1} (1980.56 kg ha^{-1}) ware also recorded maximum in the crop sown on 23rd October and lowest in the crop sown on 22nd November (Table-2). It is clear that a delay in sowing decreased all yield parameters and fruit maturity decreased significantly. Lower yield in delayed sowing is due to insufficient time for vegetative growth as the plant entered reproductive phase at faster rates. Higher seed yield can be exhibited in early and timely sown crop due to higher the number of umbels per plant, number of seeds per umbels and plant height Zolleh *et al*. (2009). Same trends are found Data *et al*. (2008) in black cumin, Pan *et al*. (2003), Bhadkariya *et al*. (2007), Carrubba *et al*. (2006), Moosavi *et al*. (2012), Moosavi (2012) and Sharangi *et al*. (2014) in coriander.

Economics of treatments

The economics of all five treatments was calculated. The data presented (Table 3) revealed that the average cost of cultivation in all treatments is more or less similar; the maximum in 13th October sowing (` 51038) may be due to irrigation management practices. The maximum gross return and net return was recorded in crop sown on 23rd October (` 178250.40, ` 127212.40) followed by 13th October (` 174987.90, ` 123949.90) and 02nd November (` 144950.40, ` 94912.40). The trend was observed similar during all the individual years. The maximum B : C ratio was recorded in crop sown on 23rd October (3.49) followed by 13th October (3.43) and minimum in crop sown on 22nd November (0.68). It might be due to fluctuation in the environmental condition like low and high temperature, humidity etc. The B: C ratio is one of most important aspects for selection of sowing time of crop by the farmers. It is suggested from the study that the farmers should start growing of coriander crop in suitable times (2nd to 4th week of October month) to fetch better return.

Table 1. Effect of dates sowing on germination and others growth characters at different stages (Year 2014-15, 2015-16, 2016-17 pooled)

Treatment	Year	Days to germination initiation	Days to complete germination	Days to flowering initiation	Days to 50% flowering	Plant height at 60 DAS	Plant height at 90 DAS	Plant height at harvest	No. of Basal Leaves plant^{-1}	1st Leaf Length (cm.)	IInd Leaf Length (cm.)
	2014-15	7.25	10.50	93.00	101.00	27.27	105.85	126.88	17.33	25.91	24.76
13th October	2015-16	7.75	10.75	85.25	93.00	25.37	108.70	128.14	15.13	23.69	21.99
	2016-17	7.50	10.50	84.00	91.25	25.90	109.40	129.09	16.53	25.44	23.74
	Pooled	7.50	10.58	87.42	95.08	26.18	107.98	128.04	16.36	25.01	23.50
	2014-15	7.00	10.25	92.50	100.50	27.97	106.48	127.71	17.85	26.66	25.74
23rd October	2015-16	7.50	10.50	84.50	92.50	26.07	109.81	128.83	15.85	24.44	22.74
	2016-17	7.50	10.75	83.00	90.50	26.59	110.51	129.55	17.15	26.19	24.49
	Pooled	7.33	10.50	86.67	94.50	26.88	108.93	128.43	16.88	25.76	24.32
	2014-15	7.50	10.75	93.50	101.50	26.71	105.19	125.98	16.90	25.64	24.82
02nd	2015-16	8.00	11.25	86.00	93.50	24.81	107.69	127.24	14.70	23.42	21.72
November	2016-17	7.75	11.25	84.50	91.50	25.34	107.64	122.23	16.20	25.17	23.47
	Pooled	7.75	11.08	88.00	95.50	25.62	106.84	125.15	15.93	24.74	23.34
	2014-15	8.50	11.00	79.25	88.50	21.90	78.17	105.97	12.18	20.07	18.90
12th	2015-16	9.50	12.50	71.25	80.50	20.00	81.50	107.23	9.98	17.65	16.15
November	2016-17	9.75	12.25	69.75	78.50	20.52	80.20	101.80	11.48	19.60	17.90
	Pooled	9.25	11.92	73.42	82.50	20.81	79.98	105.00	11.21	19.17	17.65
	2014-15	10.75	14.00	76.00	85.75	19.78	68.02	100.38	11.48	18.29	17.04
22nd	2015-16	10.25	13.25	68.00	77.75	17.88	71.35	101.64	9.28	16.07	14.37
November	2016-17	10.50	13.50	66.50	75.75	18.41	70.55	88.77	10.58	17.62	16.12
	Pooled	10.50	13.58	70.17	79.75	18.69	69.97	96.93	10.48	17.39	15.84
SEm±		0.54	0.65	1.68	0.86	1.37	3.71	3.36	1.27	3.33	1.07
CD(P=0.05)		0.78	0.94	2.43	1.24	1.98	5.36	4.85	1.83	4.81	1.54
CV %		6.43	5.65	2.07	0.97	6.48	3.92	2.85	9.01	2.85	5.14

Table 2. Effect of dates sowing on number of primary, secondary branches, number of umbel, umbellates, seed yield/plot and seed yield/ha. (Year 2014-15, 2015-16, 2016-17 and pooled)

Treatment	Year	No. of primary branches Plant^{-1}	No. of secondary branches plant^{-1}	No. of Umbel plant^{-1}	No. of umbellate umbel^{-1}	Seed yield plot^{-1} (g)	Seed yield (kg ha^{-1})
13th October	2014-15	9.15	31.05	43.90	8.25	991.75	1652.92
	2015-16	7.85	29.23	40.30	7.15	1117.75	1862.92
	2016-17	9.10	29.45	41.30	7.35	1340.25	2233.75
	Pooled	8.70	29.83	41.83	7.58	1166.58	1944.31
23rd October	2014-15	9.40	31.70	44.40	8.68	1008.25	1680.42
	2015-16	8.10	29.00	40.80	7.58	1134.25	1890.42
	2016-17	9.35	29.75	41.80	7.73	1372.50	2287.50
	Pooled	8.95	30.23	42.33	8.00	1188.33	1980.56
02nd November	2014-15	8.93	30.36	43.20	8.10	955.00	1591.67
	2015-16	7.63	28.16	39.60	7.00	1081.00	1801.67
	2016-17	8.88	28.41	35.15	6.85	913.00	1521.67
	Pooled	8.48	28.98	39.32	7.32	966.33	1610.56
12th November	2014-15	6.23	23.91	27.05	6.15	294.75	446.25
	2015-16	4.93	21.71	23.45	5.05	420.75	701.25
	2016-17	6.18	21.21	21.60	5.00	332.50	554.17
	Pooled	5.78	22.28	24.03	5.40	349.33	567.22
22nd November	2014-15	5.05	18.65	23.58	5.70	173.00	288.33
	2015-16	3.75	16.45	19.98	4.60	305.50	509.17
	2016-17	5.00	16.70	18.38	4.30	186.25	310.42
	Pooled	4.60	17.27	20.65	4.87	221.33	368.89
S Em±		0.42	2.02	1.10	0.28	72.55	120.91
CD(P=0.05)		0.61	2.92	1.59	0.40	104.76	174.58
CV %		5.82	7.89	3.27	4.61	9.36	9.36

Table 3. Economics of coriander growing on various date of sowing.

Treatment	Cost of cultivation (` ha^{-1})	Gross return (` ha^{-1})	Net return (Rs/ha)	Benefit : cost ratio
13th October	51038	174987.9	123949.90	3.43
23rd October	51038	178250.4	127212.40	3.49
02nd November	50038	144950.4	94912.40	2.90
12th November	50038	51049.8	1011.80	1.02
22nd November	49038	33200.1	-15837.90	0.68

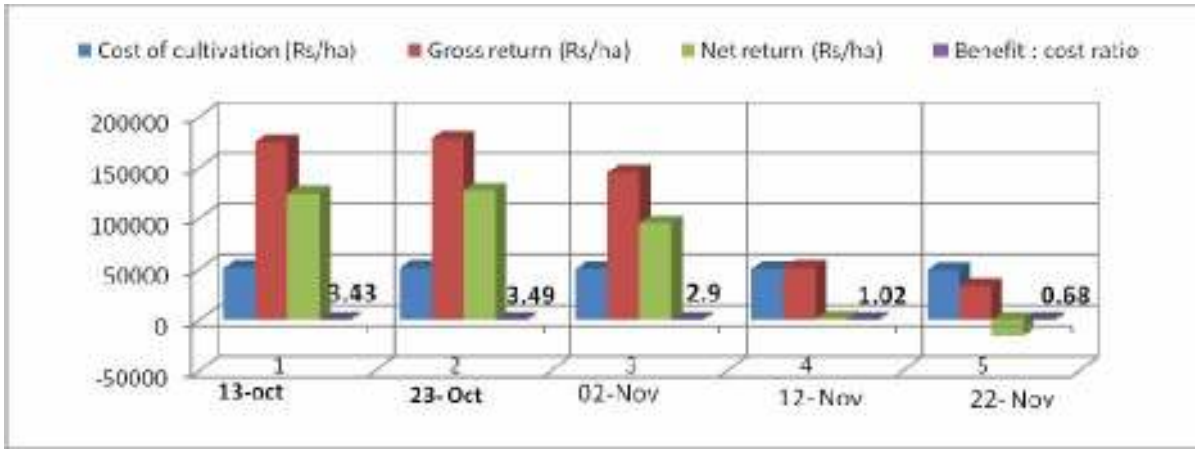

Fig. 1. Economics of coriander growing on various date of sowing.

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