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Effect of season, spacing and planting time on seed yield and quality in cucumber

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ABSTRACT

In an experiment conducted during spring summer and *kharif* season to find the effect of season, spacing and planting time on seed yield and quality in cucumber, suitable season, spacing and planting time in each season were standardized. *Kharif* season crop were shorter by 10 days (40.79 days) as compared to summer season crop (50.67 days). Seed yield and number of seeds per fruit increased with decrease in spacing up to (1.25 m × 0.30 m) irrespective of season. The germination percentage was recorded lower in summer than *kharif*. Seed yield per fruit, 1000-seed weight, seed yield per hectare, seedling length, seedling dry weight and vigour index-I was recorded higher in summer than *kharif.* January 20th sowing gave higher seed yield per hectare (63.13 kg) with good germination (81.38 %) during spring summer. 31st July and 7th August sowing gave higher seed yield per hectare (31st July, 41.58 kg & 7th Aug 39.37 kg) and germination (31st July, 93.31% & 7th Aug 87.31%).

Key words: *Cucumis sativus*, seed production, spacing, planting time, seed yield, seed quality, seed vigour.

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is one of the most important cucurbitaceous vegetable in the world and ranks fourth after tomato, cabbage and onion (Ram, 10). The crop has a wide range of utilities, such as pickling, salad, cooked vegetable as an ingredient in Unani medicines. The world wide demand for cucumber is increasing day by day both as salad and in pickling industries. The world average productivity of cucumber is 16.53 t/ha (Anon, 1) but on contrary it is only 6.67 t/ha (Anon, 2) in India. The wide gap in productivity can be attributed to the lack of availability of high yielding varieties, promising hybrids, parthenocarpic varieties suited for glass or polyhouse cultivation and quality seed. Considering seed yield and quality as the major limiting factor in production and productivity an experiment was conducted with objectives to study the effect of season, spacing and planting time on seed yield and quality attributes. The relationship among physical parameters of fruit with seed yield and quality were also studied.

MATERIALS AND METHODS

Cucumber variety Pusa Uday was grown in Seed Production Unit field IARI, New Delhi (28°N, 77°E) located in the northern plains. The crop was grown in two seasons *viz*., spring summer and *kharif* 2004 & 2005. For spring summer crop the seedlings were raised in protected (glasshouse) conditions. Seedlings (25-day-old) were transplanted to the main field. Trials were laid out in split plot design. There were 16 treatments with four planting dates (D1, D2, D3 & D4) and four spacings (S1 = 1.25 × 0.30 m, S2 =1.25 × 0.45 m, S3 = 1.25 × 0.60 m & S4 = 1.25 × 0.75 m). In spring summer, the date of planting were 20th January (D1), 27th January (D2), 3rd February (D3) and 10th February (D4) and in *kharif* planting the dates were 24th July (D1), 31st July (D2), 7th August (D3) and 14th August (D4). Each treatment was replicated four times. The recommended cultural practices were given as that of a commercial crop. All observations, directly or indirectly related to seed yield and quality, *viz*. days to first female flower opening, No. of fruits per plant, fruit weight (g), fruit length and width (cm), No. of seeds per fruit, seed yield per fruit (g), seed yield per ha (kg), 1000-seed weight (g), seed yield index, germination percentage, seedling length (cm), seedling dry wt (g), vigour index-I and vigour index-II were taken. Vigour index-I was calculated by multiplying germination percentage with seedling length. Vigour index-II was calculated by multiplying germination percentage with seedling dry weigh. Fermentation method was adopted for seed extraction. Germination test was carried out 25 days after each harvest as per ISTA rules (Anon, 1). Seed yield index was calculated by dividing fruit yield (g by seed yield (g) as per Nerson *et al.* (7). The observations on germination were transformed to angular (arc sin) values before carrying out statistical analysis. Correlation studies were carried out among physical parameters of fruit with seed yield and quality attributes. Statistical analysis was carried out as per Panse and Sukhatme (8).

RESULTS AND DISCUSSION

Kharif season crop flowered 10 days in advance (40.79 days) as compared to spring summer crop

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(50.67 days). The results are in conformity with Lower and Edwards (5). The delay in flowering during spring summer was because of environmental conditions (chilling weather) coupled with transplant shock during the months January and February. Number of fruits per plant was higher in *kharif* (1.7) to spring summer (1.57). The reason can be attributed to the development of more secondary branches bearing female flowers during the *kharif* season. Seed dormancy ranged between 8-10% during spring summer season owing to high air temperature during seed maturity. This effect can be attributed to the low germination percentage in spring summer crop as compared to *kharif* crop. Seed yield per fruit, seed yield per ha and 1000-seed weight was recorded higher for spring summer crop. Therefore, spring summer is better to *kharif* for seed production. The studies are in conformity with Devdas *et al.* (3).

Days to first female flower opening was found to be independent of spacing (Table 1) in both the seasons. The results are in conformity with Peil *et al* (9). Number of fruits per plant increased with increase in spacing in *kharif* and varied non-significantly in spring summer. Fruit weight increased with increase in spacing both in spring summer and *kharif* and this can be attributed to better availability of nutrients and sunlight. Number of seeds per fruit was maximum in S2 in both seasons. These results are in conformity with Ravikumar (11). In spring summer, S3 recorded the maximum germination percentage (87.00) while in *kharif* S4 recorded the maximum germination percentage (93.56).

Days to first female flower opening showed significant difference among planting time in both spring summer and *kharif* (Table 2). This was due to the variation in environmental parameters such as high temperature which favour maleness as per El-Aidy (4). Fruit weight was non-significant in spring summer with different sowing dates while 31st July (0.93 kg) and 7th August (0.92 kg) sowing recorded the highest fruit weight in *kharif*. Number of seeds per fruit showed a decreasing trend from DI (20th Jan) to D4 (10th February) sowing indicating that increase in temperature reduces fertility by way of pollen mortality or stigma dryness. Moreover, honeybee activity during peek summer was generally less. 31st July (D2) sowing in *kharif* recorded the highest seed number per fruit. 1000-seed weight showed non-significant variation among planting while in *kharif,* 31st July (D2) recorded significantly higher 1000-seed weight. In spring summer 27th January (D2) sowing recorded the highest germination (87.31%) while 24th July (D1) recorded the highest (93.63 %). This established sink source relationship in seeds during development.

Fruit weight showed significant positive correlation with number of seeds per fruit, germination percentage and vigour index-II and significant negative correlation with seed yield per hectare, 1000-seed weight and vigour index-I. Fruit length had significant positive correlation with number of seeds per fruit, seed yield per fruit, seed yield per hectare, germination percentage and vigour index-II (Table 3). The results are in conformity with Mini *et al.* (6).

Table 1. Comparison of seed yield contributing parameters, seed yield and seed quality parameters between spring summer and *kharif* seasons among spacing (S).

Character	S1 (1.25 × 0.30 m)		S2 (1.25 × 0.45 m)		S3 (1.25 × 0.60 m)		S4 (1.25 × 0.75 m)	
	Summer	*Kharif*	Summer	*Kharif*	Summer	*Kharif*	Summer	*Kharif*
Days to first female flower opening	50.68	40.77	50.68	40.65	50.50	40.43	50.81	41.20
No. of fruits per plant	1.50	1.71	1.46	1.99	1.41	2.06	1.41	1.66
Fruit wt. (kg)	0.62	0.79	0.60	0.88	0.47	0.78	0.58	0.87
Fruit length (cm)	19.79	21.12	18.64	21.67	18.51	21.12	18.16	20.30
Fruit width (cm)	8.73	7.78	8.44	7.79	8.15	7.38	8.45	7.49
No. of seeds/ fruit	186.99	227.00	206.61	228.06	160.66	187.75	154.06	202.25
Seed yield/ fruit (g)	5.14	4.42	5.18	4.64	3.85	4.21	4.70	4.32
Seed yield (kg/ha)	56.58	33.71	50.05	51.03	42.25	44.32	31.22	29.28
1000-seed wt. (g)	25.86	20.86	26.43	21.16	25.29	19.52	27.88	20.49
Seed yield index	121.03	180.43	124.34	205.16	158.15	197.49	114.72	215.71
Germination (%)	82.63	91.75	83.31	88.50	87.00	92.81	83.06	93.56
Seedling length (cm)	31.75	23.59	32.00	25.16	32.63	26.52	33.50	26.76
Seedling dry weight (g)	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.04
Vigour index-I	2628.81	2157.80	2675.25	2195.21	2841.06	2371.21	2787.50	2318.42
Vigour index-II	1.42	2.48	1.66	2.23	1.46	2.69	1.80	3.13

Table 2. Comparison of seed yield contributing parameters, seed yield and seed quality parameters between spring summer and *Kharif* season among planting time (D).

Character	D1		D2		D3		D4	
	Summer	*Kharif*	Summer	*Kharif*	Summer	*Kharif*	Summer	*Kharif*
Days to first female flower opening	51.67	45.54	51.00	40.21	50.00	38.24	50.00	39.00
No. of fruits per plant	2.00	1.74	1.65	1.88	1.34	2.18	1.30	1.62
Fruit wt. (kg)	0.54	0.70	0.56	0.93	0.57	0.92	0.57	0.78
Fruit length (cm)	19.63	20.68	18.77	21.00	18.20	21.62	18.50	20.90
Fruit width (cm)	9.00	7.74	8.45	7.92	8.11	7.52	8.22	7.27
No. of seeds/ fruit	210.18	208.06	203.63	225.13	153.21	211.88	141.31	200.25
Seed yield/ fruit (g)	6.00	4.55	5.66	4.87	4.09	5.00	3.84	3.19
Seed yield (kg/ha)	63.13	39.71	52.62	41.58	38.38	39.37	35.96	37.62
1000-seed wt. (g)	26.53	22.17	26.38	23.37	25.49	19.48	27.06	17.04
Seed yield index	103.83	155.98	99.69	191.87	150.97	195.94	163.75	255.00
Germination (%)	81.38	93.63	87.31	93.31	83.00	87.13	84.31	92.56
Seedling length (cm)	28.44	25.36	33.13	25.53	33.88	25.86	34.43	25.28
Seedling dry weight (g)	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03
Vigour index-I	2315.00	2067.20	2891.94	2378.24	2867.63	2253.12	2858.06	2344.08
Vigour index-II	1.39	2.58	1.73	2.69	1.65	2.40	1.57	2.79

Table 3. Correlation coefficient between different characters in cucumbers.

Character	1	2	3	4	5	6	7	8	9	10
1. Fruit weight (g)		1.00**	-.22**	.51**	.14	-.05	-.44**	.74**	-.46**	.55**
2. Fruit length (cm)			-.06	.57**	.28**	.30**	-.31**	.61**	-.58**	.30**
3. Fruit width (cm)				.16**	.46**	.46**	.66**	-.66**	.08	-.47**
4. No, of seeds/fruit					.58**	.54**	-.11	.38**	-.46**	.13
5. Seed yield/fruit (g)						.56**	.38**	-.15	-.07	-.15
6. Seed yield (kg/ha)							.18**	-.16*	-.26**	.38**
7. 1000 seed weight (g)								-.70**	.32**	-.48**
8. Germination %									-.49**	.68**
9. Vigour index-I										-.11
10. Vigour index-II										

**Correlation is significant at the 0.01 level.

*Correlation is significant at the 0.05 level.

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