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Effect of spacing on hybrid seed yield of pigeonpea hybrid COPH2 (Cajanus cajan L. Millsp)

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Abstract: Field experiments conducted during Sep. 2000 and July 2001 with the parental lines of COPH 2 pigonpea hybrid revealed that seed yield attributes were not influenced by different spacings. However, the plants spaced at 45 x 20 cm spacing (44446 plants ha⁻¹) recorded significantly higher seed yield of 728 kg ha⁻¹ in September sown crop, which was 7.69 per cent increase over July sown crop. The resultant seed showed nonsignificant differences in seed quality.

Keywords: Pigeonpea hybrid, Spacing, Seed yield and quality

Introduction

The optimum plant population per unit area is an important non monetary input to decide the maximum productivity of the seed crop. Closer spacing due to competitive effect resulted in lesser yield in soybean (Kacha et al. 1990). Seed crop may require specific spacing level which may or may not be the same as commercial crops. For obtaining higher seed yield and quality seed, suitable spacing should be maintained. Influence of spacing on seed yield has been observed by many researchers. In pigeonpea, hybrid is developed by utilizing genetic male sterility system, since, half of the male fertile plants are uprooted from the female parents before anthesis in the seed production plot. Hence, information on maintenance of optimum plant population per unit area needs investigation.

Materials and Methods

Two field trials were conducted at the Eastern block of Tamil Nadu Agricultural University, Coimbatore during September, 2000 (S₁) and July, 2001 (S₂) with nine spacings viz. 45 x 20 cm, 60 x 20 cm, 75 x 20 cm, 45 x 40 cm, 60 x 40 cm, 75 x 40 cm, 45 x 60 cm 60 x 60 cm and 75 x 60 cm. A planting ratio of 4:1 could be adopted and the experiment was laid out in RBD with four replications. The recommended agronomic package of practices for seed crop were followed during the entire growth period. Observations on plant height (cm) and number of branches on 60, 90 and 120 days after sowing (DAS), number

recorded in five randomly tagged plants. The days to first and 50% flowering was also recorded. The seed yield ha-1 was worked out. In the resultant seeds, 100 seed weight (g), germination (%), vigour index (Abdul-Baki and Anderson, 1973), drymatter production (mg 10 seedlings-1) and protein content (%) were evaluated. The collected data were analysed statistically by adopting the procedure described by Panse and Sukhatme (1978).

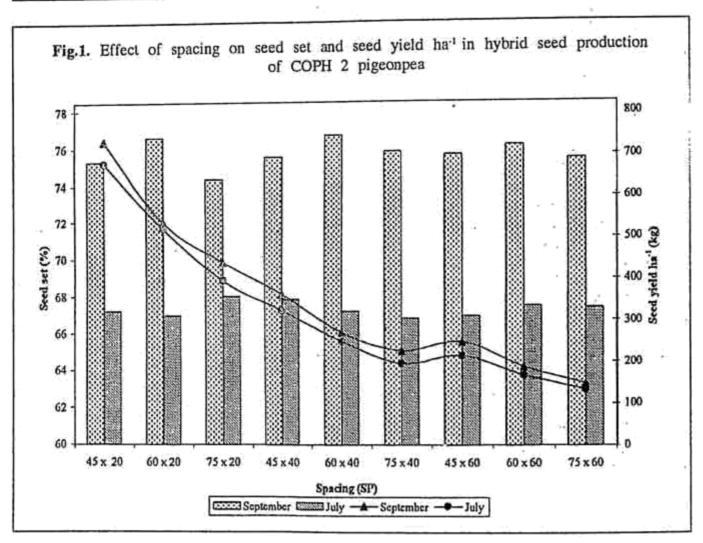
Results and Discussion

In the present study, during the flowering stage and before anthesis, based on the pollen colour i.e. plant with yellow fertile pollen in female parent were uprooted. The percentage of plants uprooted was around 59 per cent. The mean plant population in September and July was 44446 (45 x 20 cm), 33320 (60 x 20 cm), 26548 (75 x 20 cm), 22163 (45 x 40cm), 16554 (60 x 40 cm), 13240 (75 x 40 cm), 14738 (45 x 60 cm), 11036 (60 x 60 cm) and 8786 (75 x 60 cm) per hectare (Table 1).

The spacing of the crop significantly influenced the plant height and number of branches at 60, 90 and 120 DAS (days after sowing) in both seasons. The 45 x 20 cm spacing with a plant population of 44446 plants had recorded the highest plant height (67.8 and 53.1 cm) and least number of branches (6 and 4) at 60 DAS in both September and July sown crop (Table 2). There was a gradual increase with respect to plant height and number

Table 1. Plant population (Number of plants ha-1) in different space	Table 1	Plant	nonulation	(Number	of	plants	ha-1)	in	different	spacin
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Spacing (cm)	September, 2000	July, 2001	Mean
	11116	44446	44446
45 x 20	44446	33317	33320
60 x 20	33325	26545	26548
75 x 20	26550	T 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	22163
45 x 40	22164	22162	16554
60 x 40	16552	16557	
75 x 40	13240	13240	13240
	14740	14737	14738
45 x 60		11079	11036
60 x 60	10992	8781	8786
75 x 60	8790	0/01	0,00



of branches were observed due to plant spacing from 45 x 20 cm to 75 x 60 cm in both seasons. A similar trend for plant height and number of branches was also noticed at different growth stages viz. 90 and 120 DAS.

Increased plant height under 45 x 20 cm might be attributed to competition between

the plants for light and space which inturn produced lean and lanky plants. Consequently, lanky plants would produce lesser number of branches. This result is in good agreement with the findings of Trivedi and Vyas (2000) in chickpea and Deshmukh and Bhoi (2000) in groundnut.

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Spacing (SP) (cm)	ate	Plant heigh at 60 DAS ((cm)	at 9	Plant height at 90 DAS (cm)	cm)	at 1	Plant height at 120 DAS (cm)	ght S (cm)	No.	of branches at 60 DAS	nches \S	No.	o. of brancl at 90 DAS	nches .	No.		of branches
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60×20	65.2	51.6	58.4	840	69.1	992	116.9	88	1070	.	t •	י ח	- 1	٥,	- 1	∞	7	00
75×20	8.49	50.2	57.5	83.7	687	76.2	116.0	08.4	107.5	י כ	t u	٠,	~ 0	0 (- 0	ς,	00	6
45 x 40	640	49.7	573	83.5	88	75.8	115.7	000	1 2	۷ د	n 4	٥	0	- 1	00	6	00	0
60 x 40	63.7	49.0	56.4	83.0	879	75.4	115.7	000	200	0 1	n 4	٥١	o o	- 1	∞°(6	00	0
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60×60	63.0	484	55.7	82.0	899	744	114.0	6	105.0	- 1	o v	٥,	25	00	5, 0	=:	6	2
75 x 60	63.0	48.1	55.6	81.7	899	74.3	1140	026	105.5	- [٥ ٧	0 V	2,5	×	2	=:	ο,	2
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(P=0.05)			2	1,00	0.100	0.220	0.270	0.271	0.851	0.011	0.004	0.015	0.010	0.002	0.013	0.012	0.004	0.017
S, - Sept	September, 2000;	2000;	s,	S ₂ - July, 2001	100													

Table 3. Effect of spacing on days to first and 50 per cent flowering and number of pods and seeds plant in hybrid seed production of COPH 2 pigeonpea

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Table 4. Effect of spacing on pod set and seed yield plant in hybrid seed production of COPH 2 pigeonpea

Spacing	<u> </u>	Pod set (%)		Seed	yield plant	-1 (g)
(SP)	S	S ₂	Mean	S	S ₂	Mean
45 x 20 60 x 20 75 x 20 45 x 40 60 x 40 75 x 40 45 x 60 60 x 60 75 x 60	21.57 (27.67) 22.18 (28.10) 21.31 (27.49) 22.01 (27.98) 21.01 (27.28) 21.18 (27.40) 22.00 (27.97) 21.68 (27.65) 21.47 (27.60)	18.95 (25.81) 19.26 (26.03) 18.87 (25.75) 19.05 (25.88) 19.87 (26.47) 20.00 (26.57) 19.56 (26.25) 19.73 (26.37) 19.22 (26.00)	20.26 (26.75) 20.72 (27.08) 20.09 (26.03) 20.53 (26.94) 20.44 (26.88) 20.59 (26.97) 21.59 (27.69) 20.71 (27.07) 20.35 (26.81)	16.37 16.02 16.48 16.33 16.27 17.00 16.78 17.21 16.56	15.21 15.13 14.73 14.56 14.98 14.68 14.48 15.05 15.13	15.79 15.58 15.63 15.45 15.63 15.84 15.63 16.13 15.85
Mean	21.60 (27.69)	19.39 (26.13)		16.56	14.88	· ana
CD (P=0.0	SP NS	S 2.573	SPS NS	SP NS	0.643	SPS NS

(Figures in parentheses indicate arcsine values) S2 - July, 2001 S, - September, 2000;

Fig.2. Effect of spacing on hundred seed weight and germination of resultant seeds of pigeonpea hybrid COPH 2 100 11 98 10.5 96 10 100 seed weight (g) Germination (%) 92 9,5 90 9 88 8.5 86 45 x 20 60 x 20 75 x 20 45 x 40 60 x 40 75 x 40 45 x 60 60 x 60 75 x 60 Spacing (SP) September July - September - July

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	(mg 10 s	(mg 10 seedlings ¹)	()				4	*	
S		S,	Mean	S	S,	Mean	s'	Sz	Mean
27 06		606	633	3226	3176	3201	19.9 (26.49)	20.5 (26.92)	20.2 (26.71)
07 07 00		3 5	9	3189	3153	3171	20.0 (26.57)	20.3 (26.78)	20.2 (26.71)
07 10	88	205	624	3286	30%	3191	20.5 (26.92)	19.7 (26.35)	20.1 (26.64)
07.70		38	615	3173	3056	3115	20.0 (26.57)	20.3 (26.78)	20.2 (26.71)
07.40		505	607	3256	3132	3194	19.6 (26.28)	20.2 (26.71)	19.9 (26.49)
2 2		218	779	3269	3157	3213	20.1 (26.64)	20.0 (26.57)	20.1 (26.64)
27.40		200	000	3232	3048	3140	19.8 (26.42)	20.9 (2720)	20.4 (26.85)
0 00 X C		8	070	2000	200	1010	(00 90) 9 00	100 5075 00	20 6(26 99)
90 x 60 ec	959	612	639	3180	2020	2171	20.0 (20.33)	(2000)	(NY 20) 1 VC
_	_	591	625	3199	3077	3138	20.3 (26.78)	19.8 (20.42)	70.1 (20.04)
	959	603		3224	3106		20.1 (26.64)	20.2 (26.71)	
	es es	v.	SdS	8	s	SPS	S	S	SAS
A		65.56	SE	SZ	130.683	SN	SS	NS	S
(P=0.05)									

The present study revealed that the yield attributes namely days to first and 50 per cent flowering, number of pods and seeds and pod and seed set were not significantly influenced by spacing in both seasons. Seed yield plant1 also did not vary with spacings (Table 3 and 4). While the seed yield ha-1 was significantly influenced by different spacing in both seasons. The highest seed yield of 728 and 676 kg ha-1 treatment were recorded by plants under 45 x 20 cm spacing (44446 plants ha-1) in September and July sown crop, respectively (Figure 1). Further, it was observed that, as the spacing increased there was a reduction in seed yield per hectare (Table 3 and 4; Figure 1). The higher seed yield in 45 x 20 cm spaced crop was due to optimum plant population per unit area, which could not be compensated by an increase in yield attributes like plant height, number of branches, number of pods and seeds plant' under wider spaced crop. Ahlawat et al. (1985) and Sarvaiya et al. (1993) also reported similar results in cowpea and pigeonpea, respectively. Kauthale et al. (1995) also found that closer spacing of 45 x 10 cm could be recommended for hybrid seed production of ICPH 8 pigeonpea. Therefore, it can be concluded that, a spacing of 45 x 20 cm could be recommended for hybrid seed production of COPH 2 pigeonpea.

Seed quality parameters namely, hundred seed weight, germination, seedling vigour and protein content remained unaffected by different spacing in both seasons (Figure 2; Table 5). The result of present study is in accordance with Srivastava et al. (1992) in radish, Sarvaiya et al. (1993) in pigeonpea, Ujinaiah et al. (1995) in sunflower BSHI hybrid and in cowpea Ananthi (2001). However, the quality of seeds harvested in September sown crop was superior to July sown crop. Therefore, for hybrid seed production of COPH 2 pigeonpea September sowing was found ideal.

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