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Short Communication

Assessment of Planting Options for Quality Seed Production in Pigeon pea Varieties

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Pigeon pea (*Cajanus cajan* L.) is an important staple pulse food crop and rich in protein content (22%) which is almost three times that of cereals. According to FAO statistics, pigeon pea was grown in about 4.23 million hectares with a production and productivity of 4.68 million tons and 751kg/ha at worldwide. In India, pigeon pea is cultivated in an area of 3.90 mha with a production of 3.17 mt and productivity of 813 kg ha^{-1}. Pigeon pea is mainly cultivated and consumed in all the developing countries of the world. India is the largest producer and consumer of pigeon pea in the world. It is mainly grown in states of Maharashtra, Uttar Pradesh, Gujarat, Andhra Pradesh, Karnataka and Tamil Nadu and these states constitute 90 per cent of the area. Pigeon pea is also an important crop of Karnataka state and contributing around 18 percent and 12 percent to total area and production, respectively.

Seed is the vital input in crop production because through seed only the investment made on other inputs like pesticide, fertilizer, irrigation and crop maintenance can be realized. Time of sowing determines the period available for vegetative growth before the onset of flowering which is mainly influenced by photo period. Most of the varieties of pigeon pea are sensitive to photoperiod. Sowing time determines the plant height, number of branches, and height at which branching starts, flowering and pod bearing habits. Thus, the time of sowing has prominent influence on both vegetative and reproductive process of pigeon pea. Any measure of advancing the planting time reduces the risk from terminal drought stress. But, delayed onset of monsoons are being experienced more frequently which doesn't allow for timely sowing. In such situations, raising the nursery in advance (in the month of May) and transplanting around 30 -35 days old pigeon pea seedlings with the onset of monsoon is the best method to protect the crop from terminal drought stress during poor rainfall years due to enhanced deep rooting. Keeping all these aspects in view, the present investigation was planned to study the effect of varieties, spacing and seedling age on seed quality in pigeon pea.

The field experiments were conducted in the Department of Seed Science and Technology, College of Agriculture, Vijyapura during *kharif* 2013 and 2014. The treatments consisted three spacing of rows (S_1- 150 cm, S_2 -120 cm and S_3-90 cm) and transplanting of different aged seedlings (A_1- 21 days old seedlings, A_2- 28 days old seedlings, A_3- 35 days old seedlings and A_4- Direct seed dibbling). Seedlings of varieties BSMR-736 (V_1) and TS-3R (V_2) were raised using a polythene bag of 6 x 4 cm size, filled with sand, soil and compost in 1:1:1 ratio. The treated seeds were dibbled in polythene bags in three different dates so that at the end of 35 days, three batches of different aged seedlings were ready for transplanting in the field during the first fortnight of June. The field experiment was laid out in Factorial Randomized Block Design and replicated thrice for two years and pooled data was analyzed. All the recommended practices were followed to raise a normal crop. The seed harvested from this experiment was used for assessment of seed qualities. The germination test was conducted by employing paper towel method [1]. Vigour index was calculated by multiplying the germination per cent with the seedling length [2]. The results of the present investigations are discussed under following heads;

Effect of Varieties

Based on the results of two years pooled data of laboratory studies the varieties were significantly

influenced seed quality (Table 1 & 2). The variety BSMR-736 produced higher seed test weight (9.8g), germination (91.0%), seedling length (27 cm), vigour index (2437) as compared to TS-3R (9.2g, 89.0%, 23 cm, 2032, respectively). The higher test weight was due to genotypic differences. It was reported that pigeon pea variety TTB-7 exhibited more plant height with more days to flowering and maturity over BRG-2 at UAS, GKVK campus, Bangalore [3]. It was also observed that hundred seed weight, seed recovery percentage, moisture content, dry matter content, germination, vigour index and protein content were significantly more in case of cultivar ICPL-87 [4].

Effect of Row Spacing

The data on seed quality parameter was significantly influenced by inter row spacing (Table 1 to 2). The inter row spacing of 150 cm (S_1) produced bolder seeds and recorded higher 100 seed weight (10.1g), germination (91.0%), seedling length (27 cm), vigour index (2417), followed by 120 cm and minimum was seen in 90 cm. This might be due to the availability of sufficient nutrition, moisture and solar energy to plants planted in wider spacing that resulted in bold and high quality seeds which are in turn influenced germination percentage, root length, shoot length. These results are in accordance with the previous findings [5, 6]. Wider row spacing provides more area per plant which helps in optimum growth of individual plants and recorded higher test weight than closer row spacing on individual plant growth could not be compensated the grain yield/ha of lower plant population in pigeon pea. This may be due to better development of seeds at wider spacing [7].

Effect of Seedling Age

The seed quality parameters were significantly influenced by age of the seedling during transplanting (Table 1 & 2). The results of the two years pooled data are indicated that the 28 days old seedling recorded higher seed test weight (9.8g), germination (90.0%) but on par with 35

Table 1. Effect of seedling age and spacing on seed weight and percentage germination in pigeon pea (*Cajanus cajan* L.)

Spacing	Variety	Seed weight (g) (Pooled means of 2013 & 2014)					Seed germination (%) (Pooled means of 2013 & 2014)				
		Age of seedling (days)					Age of seedling (days)				
		A_1	A_2	A_3	A_4	Mean	A_1	A_2	A_3	A_4	Mean
S_1	V_1	10.1	10.8	11.0	10.4	10.5	92	93	93	92	92
	V_2	9.3	10.2	10.1	9.1	9.7	89	91	90	90	90
	Mean	9.7	10.5	10.5	9.7	10.1	90	92	92	91	91
S_2	V_1	9.5	10.1	10.1	9.3	9.8	89	92	91	89	90
	V_2	8.8	9.55	9.4	9.8	9.1	89	90	89	88	89
	Mean	9.1	9.85	9.8	9.1	9.4	89	91	90	88	89
S_3	V_1	9.2	9.6	9.3	8.8	9.2	88	90	89	88	89
	V_2	8.8	9	8.9	8.4	8.8	87	88	88	86	87
	Mean	9.0	9.3	9.1	8.6	9.0	88	89	89	87	88
Grand Mean	V1	9.6	10.1	10.1	9.5	9.8	89	92	91	90	91
	V2	9	9.6	9.5	8.8	9.2	89	90	89	88	89
	Mean	9.3	9.8	9.8	9.1	9.5	89	90	90	89	89
Comparing the Means		SEm(±)		CD (p=0.05)			SEm(±)		CD (p=0.05)		
Spacing		0.03		0.05			0.20		0.39		
Variety		0.02		0.03			0.16		0.31		
Age		0.03		0.05			0.23		0.45		
S x V		0.04		0.07			0.28		NS		
S x A		0.06		0.11			0.40		NS		
V x A		0.05		NS			0.33		NS		
S x V x A		0.09		1.7			0.57		NS		

Note: Spacing (S_1- 150 cm, S_2 -120 cm and S_3-90 cm), Age of seedlings in days (A_1- 21, A_2- 28, A_3- 35 and A_4- Direct seed dibbling). Varieties: (V_1 - BSMR-736 and V_2 - TS-3R) NS- Nonsignificant

Table 2. Effect of seedling age and spacing on seedling length and seedling vigour index in pigeon pea (*Cajanus cajan* L.)

Spacing	Variety	Seed weight (cm) (Pooled means of 2013 & 2014)					Seedling Vigour Index - I (Pooled means of 2013 & 2014)				
		Age of seedling (days)					Age of seedling (days)				
		A_1	A_2	A_3	A_4	Mean	A_1	A_2	A_3	A_4	Mean
S_1	V_1	28	29	30	28	29	2562	2688	2801	2625	2669
	V_2	23	25	25	23	24	2080	2247	2221	2111	2165
	Mean	26	27	28	26	27	2321	2467	2511	2368	2417
S_2	V_1	26	28	28	25	27	2338	2547	2524	2402	2452
	V_2	22	24	24	21	23	1944	2123	2147	1916	2033
	Mean	24	26	26	23	25	2141	2335	2336	2159	2243
S_3	V_1	24	26	26	23	25	2147	2372	2185	2015	2189
	V_2	21	23	23	20	22	1859	2018	1953	1769	1899
	Mean	23	25	25	22	23	2003	2195	2069	1909	2044
Grand Mean	V1	26	28	28	26	27	2349	2535	2503	2359	2437
	V2	22	24	24	22	23	1961	2129	2107	1932	2032
	Mean	24	25.7	26	24	25	2155	2332	2305	2146	2235
Comparing the Means		SEm(±)		CD (p=0.05)			SEm(±)		CD (p=0.05)		
Spacing		0.19		0.37			18.7		36.65		
Variety		0.15		0.29			15.2		29.79		
Age		0.22		NS			21.6		42.33		
S x V		0.27		0.52			26.4		51.74		
S x A		0.38		NS			37.4		NS		
V x A		0.31		NS			30.5		NS		
S x V x A		0.54		NS			52.9		NS		

Note: Spacing (S_1- 150 cm, S_2 -120 cm and S_3-90 cm), Age of seedlings in days (A_1- 21, A_2- 28, A_3- 35 and A_4- Direct seed dibbling). Varieties: (V_1 - BSMR-736 and V_2 - TS-3R) NS- Nonsignificant

days old seedling as compared to seed dibbling . Whereas, 35 days old seedling produced higher as vigour index (2305) but at par with 28 days old seedling. The seedling length did not differed significantly among the different age of seedling. Similar results were also obtained by previous workers [8, 9].

Interaction Effect

The interaction effect due to seedling age and inter row spacing found to be significant. The treatment combination of 35 days old seedlings of BSMR-736 transplanted at 150 cm spacing recorded higher seed weight (11.0g), germination (93.0%), seedling length (30 cm), vigour index (2801) followed by transplanting of 28 days old seedlings (10.8g, 93%, 29cm, 2688, respectively) transplanted at 150 cm spacing recorded maximum 100 seed weight where as lower seed weight was obtained in (8.4g, 86%, 20 cm,1769, respectively) in seed dibbling with 90 cm spacing by TS-3R .The other interactions did not differed varied significantly. These results are in conformity with the findings of [10] evaluated the yield and quality of seeds from rice (cv. Pusa 44) seedlings transplanted at 25, 35, 45, 55, and 65 days after sowing. Thirty-five-day-old seedlings had greater number of panicles per hill, panicle length, 1000-seed weight, test weight, and seed yield than 55- to 65-day-old seedlings. Seedling age did not significantly affect seed germination. Seed weight was positively correlated with seedling length, dry weight, and vigour. The seed quality parameters like 100 seed weight, germination percentage, seedling root length, shoot length, vigour index were found significantly higher for seedlings transplanted in inter row spacing of 150 cm followed by the inter row spacing of 120 cm [9].

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