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Response of pigeonpea (*Cajanus cajan*) varieties to different row spacings and levels phosphorus

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Abstract
The study was carried out during kharif season of 1997-1998 at N.D. University of Agriculture & Technology, Faizabad to see the effect of row spacings and phosphorus levels on growth, yield attributes and yield of short duration pigeonpea varieties. The variety ICPL 151 gave significantly higher grain yield than UPAS120. The 45cm row spacings resulted significantly higher grain yield over rest of the row spacings, 30kg P_2O_5/ha significantly increased grain yield over control but was at par with 60kg P_2O_5 /ha. Hence it may be thus concluded that short duration pigeonpea variety UPAS 120 should be grown at medium row spacing of 45 cm and ICPL151 at closer row spacing of 30 cm,fertilized with 30kg P_2O_5/ha for getting higher productivity.
Keyword: Pigeonpea varieties, row spacing, phosphorus levels

Introduction

Pulses, "the wizard of the health'' owe a strategic position in Agricultural economy of India. Symbolic to its nomenclature pulses (P-People, U = Umbrella, L = Livestock, S = Soil and E = Energy) is indeed a superb energy umbrella for people as dietary proteins, for live stock as green nutritious fodder and feed, for soil as mini nitrogen plant and green manure (Ali1988). Pigeonpea is the most important major kharif pulse crops grown in India next to chickpea. The efforts of plant breeders have resulted in evolution of some promising plant types of early maturing varieties, greater yield potentiality as well as better grain quality of pigeonpea. The maximum yield potential of these short duration varieties can be realized only through improved agronomic practices. Among the various factors contributing towards the attainment of potential yield of pigeonpea, optimum row spacing has a positive role in enhancing the yield of crops. Low soil fertility has been identified as the major constraints to improve pulse yields. Phosphorus is the most important nutrient limiting pulse production and phosphorus deficiency appears to be the major cause of low yields (Saraf & Gangasaran 1986).

Material and methods

The study was conducted during kharif season of 1997-1998 at Agronomy farm of N.D .University of Agriculture & Technology Faizabad. The soil of experimental site was silty loam with medium fertility. The experiment was laid in Randomized Block Design with 3 replications, consisting of three factors viz; two varieties namely, UPAS 120 and ICPL151, three row spacing as 30, 45 and 60cm comprised of three levels of phosphorus, viz. 0kg (control), 30 and 60 kg/ha, in all these were 18 treatment combinations.

Result and discussion

Effect of Varieties

Plant height, branches/plant and dry matter /plant recorded significantly higher with variety UPAS 120 than ICPL151 at maturity (Table 1). These observations are in close collaboration with the findings of Singh *et al*. (1993). The difference in yield contributing characters due to varieties were found significant (Table 1). Variety UPAS 120 recorded higher numbers of pod/plant than ICPL151 which was due to more branching than ICPL151,consequently more number of pods/plant. Numbers of grains/pod and 1000 grain weight was significantly higher with ICPL151 than UPAS 120, which was mainly

because of bold seed size. Yield is a resultant of coordinating interplay of growth and yield attributing characters. Variety ICPL 151 recorded significantly higher grain yield (16.90 qt/ha) than UPAS 120 (15.08 qt/ha). Similar findings were also reported by Dubey & Upadhaya (1991) and Padhi (1995).

Effect of row spacings

Maximum plant height (Table 1) was recorded at closer row spacing of 30 cm, which were significantly taller than medium and wider row spacing of 45 and 60 cm, respectively. However, numbers of primary branches and dry matter /plant were lower in closer row spacing of 30 cm. The maximum number of primary branches /plant was at wider row spacing of 60cm but it was on par with medium row spacing of 45 cm. Dry matter/plant was significantly higher at wider row spacing of 60 cm compared to medium (45 cm) and closer (30 cm) row spacings. The findings are in close conformity with the results of Singh *et al*. (1993). Row spacing studies (30, 45 and 60 cm) in general, did not differ significantly in their effects on yield components except the number of pods/plant. Pods/plant maintained its superiority under wider row spacing of 60 cm over medium and closer row spacing of 45 and 30 cm, respectively (Table 1). These results are in conformity with the findings of Narasareddy & Nivedeta (1989) and Kumar *et al.* (2011). The better performance of promising genotype under wider row spacing might be due to better availability of growth resources like water, nutrients, air, better cultural practices and effective weed control Salakinkoppa & Patil (2010). Row spacing caused significant difference on grain yield (Table 1). The medium row spacing of 45 cm recorded significantly higher grain yield (16.93 qt/ha) which was 7.29 and 10.87% higher over closer and wider row spacing of 30 and 60 cm, respectively. Pigeonpea plants have higher capacity to adjust in the available space. The row spacing of 45 cm provided maximum space for better growth and development of plants. This might be due to more movement of nutrients and translocation of photosynthates which ultimately resulted higher grain yield. Ahuja (1984), Yadahalli & Reddy (1987), Trpathi & Chauhan (1990) also reported similar findings.

Effect of phosphorus levels

Phosphorus is the second most critical plant nutrient over all, but for legumes it assumes primary importance. The soil of Indo-Gangetic Plain are generally low to medium in available P content and therefore, application of 17-26 kg P ha-1 has shown favourable effects in grain legumes (Ahlawat & Ali 1993). Compared with other pulses. The effect of phosphorus level on plant height, number of primary branches/plant and dry matter/plant exhibited significant response (Table 1). Plots fertilized with highest level of 60kg P_2O_5/ha produced taller plants, more number of primary branches and dry matter/plant but differences between 30 and 60 P_2O_5/ha was not significant. However, 30 kg $P2O_5$/ha showed significant response over no phosphorus application (control) and established as more remunerative dose for all growth characters. The findings are in support to those of Dubey & Upadhaya (1991). The phosphorus levels (0, 30 and 60 kg) in general, did not differ significantly in their effect on number of grains/pod. However, the number of pods/plant and 1000 grain weight showed significant response to phosphorus fertilization up to 30 kg only, which was on par with the raised dose of 60kg P_2O_5/ha. Grain yield (Table 1) increased with the increasing levels of phosphorus. Application of 30 kg P_2O_5 /ha produced significantly higher grain yield over control, being on par with 60 kg P_2O_5/ha. The findings are in accordance with those of Gondalia *et al*. (1988) and Dubey & Upadhaya (1991).

Table:1. Growth, yield attributes and yield of pigeonpea varieties as influenced by row spacings, and levels of phosphorus.

	Growth Parameters			Yield attributes			Yield
Treatments	Plant height at harvest (cm)	No. of Primary Branches at harvest (cm)	Dry matter at harvest (g)	No. of pods/ plant	No. of grains/ pod	Test weight (g)	Grain yield (qt/ha)
1. Varieties							
UPAS 120	226.57	22.10	66.28	83.36	3.69	66.27	15.08
ICPL151	174.49	19.89	60.78	55.59	4.79	96.56	16.90
S.Em	2.71	0.49	1.25	1.36	0.07	0.88	0.32
CD at 5%	7.80	1.42	3.59	3.91	0.19	2.52	0.91
2. Row spacing (cm)							
30	212.42	19.54	58.10	52.57	4.20	80.48	15.78
45	198.71	21.55	62.55	72.06	4.27	81.70	16.93
60	190.45	22.06	69.93	83.81	4.25	82.06	15.27
S.Em	3.32	0.60	1.53	1.67	0.08	1.08	0.39
CD at 5%	9.55	1.74	4.39	4.79	NS	NS	1.10
3. Phosphorus levels (Kg/ha)							
0 (Control)	191.62	19.04	57.65	61.93	4.13	78.30	13.76
30	202.07	21.38	64.47	72.20	4.27	82.58	16.64
60	202.90	22.57	68.47	74.30	4.32	83.36	17.58
S.Em	3.32	0.60	1.53	1.67	0.08	1.08	0.39
CD at 5%	9.55	1.74	4.39	4.79	NS	3.09	1.10

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