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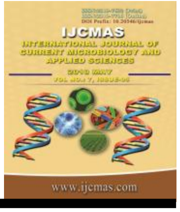

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Productivity of Pigeon pea (*Cajanus cajan* L.) Under Different Row Spacing and Genotypes

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ABSTRACT

Keywords

Row spacing, Genotype, Yield Attributes, Yield.

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An experiment was carried out during *kharif* season 2015 at Student's research farm, Punjab Agricultural University, Ludhiana on a loamy sand soil under irrigated conditions. The research is conducted to evaluate the "Productivity of Pigeon pea (*Cajanus cajan* L.) under Different Row Spacing and Genotypes". The field experiment was laid out in factorial randomized block design (RBD) with four replications. The treatment consisted of five planting geometries viz. 45 cm x 28 cm, 50 cm x 25 cm, 60 cm x 21 cm, 75 cm x 17 cm and 90 cm x 14 cm with two genotypes viz. PAU 881 (indeterminate) and AL 15 (determinate). Among the planting geometries, wider planting geometry of 60 cm x 21 cm and AL 15 recorded significantly better yield attributes as compared to other treatments. The treatment combination of 60 cm x 21 cm (14.92 q ha^{-1}) and AL 15 (13.24 q ha^{-1}) was significantly higher seed yield.

Introduction

Pulses form an integral part of vegetarian diet in Indian subcontinent. India is the major pulse growing country, accounting for about one third of the total world area under pulses and one-fourth of the world production of pulses. Certain unique features of pulses *viz.*, their ability to fix atmospheric nitrogen in symbiotic association with rhizobium, deep penetrating root system enabling them to draw moisture from deeper moist soil layers and high seed protein content ranging from 20 to 30 % makes them indispensable (Selvi *et al.*, 2009). The area under pulses is not enough to meet the requirement of per capita availability of pulses. It has led to the severe shortage of pulses in India, which has aggravated the problem of malnutrition in large section of vegetarian population. Therefore, there is a great need for attentive measures against pulses i.e. increase the production of pulses. Pigeon pea is the major *kharif* pulse crop of India and comes second after chickpea. Thus, there is a good scope of increasing productivity of pigeon pea through different agronomic manipulations (Mallikarjun *et al.*, 2014).

The combination of row spacing with respect to genotype may have a big deal from production point of view. Proper row spacing arrangement helps in efficient utilization of resources and genotype plays an important role in determining the crop yields.

Materials and Methods

A field experiment was conducted at the Student's Research Farm of the Punjab Agricultural University, Ludhiana, Punjab, during *kharif* 2015. The soil of the experimental plot was sandy loam with irrigated conditions having normal pH (7.2), low in organic carbon (0.26%) and available nitrogen (81.5 kg ha^{-1}), medium in available phosphorus (17.5 kg ha^{-1}), low in available potassium (103.0 kg ha^{-1}).

The experiment consisted of ten treatment combinations, comprising of five row spacings; (45 cm x 28 cm), (50 cm x 25 cm), (60 cm x 21 cm), (75 cm x 17 cm) and (90 cm x 14 cm) which were allotted with two genotypes viz. PAU 881 (indeterminate) and AL 15 (determinate) and were laid out in factorial randomized block design (RBD) with four replications. Five plants were tagged at random in net plot area for recording various yield components. The crop was sown and harvested at recommended date of sowing and harvesting. At the end, threshing operations were performed manually. The seed yield of every net plot was put in separate bags with specific tags. The data on various yield and yield parameters were statistically analysed by using CPCS1, software developed by Department of Statistics, Punjab Agricultural University, Ludhiana based on the procedure of Cochran and Cox (1967).

Results and Discussion

Pods plant^{-1}

The data given in table 1 depicted the number of pods plant^{-1} *i.e.* an important primary yield component, was affected significantly by different row spacing and ranged from 147.6 to 142.5. Maximum average pods plant^{-1} (147.6) were recorded in 60 cm row spacing followed by 50 cm row spacing with 145.3 pods plant^{-1} while the lowest number of pods (142.5) were recorded in 90 cm row spacing. The AL 15 genotype had significantly higher number of pods than PAU 881. The interactional effect of both treatments i.e. row spacing and genotypes remained non-significant.

Seeds pods^{-1}

Number of seeds pod^{-1} is considered an important factor that directly imparts an exploiting potential recovery in leguminous crops. The data regarding number of seeds per pod given in table 1 showed that it was significantly affected by row spacing. Maximum number of seeds per pod (4.8) were recorded in 60 cm row spacing followed by 50 cm row spacing (4.5 seeds pod^{-1}) and 45 cm row spacing (4.3 seeds pod^{-1}), but 50 cm and 45 cm row spacing also statistically at par with 60 cm. while the minimum number of seeds pod^{-1} (3.9) were recorded in 90 cm row spacing. Among the genotypes, AL 15 had more number of seeds pod^{-1} than PAU 881, but both genotypes become statistically non-significant.

Pod length (cm)

The data on pod length presented in table 1 revealed that the row spacing and genotypes had significant effect on the pod length. The 60 cm row spacing had higher pod length than 45 cm, 50 cm, 75 cm and 90 cm, but it was at par with 45 cm and 50 cm. The genotypes AL 15 and PAU 881 had non-significant results in pod length. The less pod length due to less vegetation which would be decreased the photosynthetic assimilation from source to sink.

100 seed weight (g)

Among various parameters contributing towards final yield of a crop, 100 seed weight is of prime importance. Data given in table 1 showed that different row spacing significantly affected the 100 seed weight (g). Maximum average 100 seed weight (8.9 g) was recorded in 60 cm row spacing followed by 50 cm (7.2 g), 45 cm (6.4 g), 75 cm (5.7 g) and 90 cm with 100 seed weight of 5.4 g. While the 50 cm and 45 cm row spacings were recorded 100 seed weight at par with 60 cm row spacing.

Among the genotypes, AL 15 (7.3) genotype was significantly higher than treatment of PAU 881 (7.6).

The maximum 100-seed weight of genotype AL 15 than PAU 881was due to its higher efficiency in translocations of the photosynthates to the reproductive parts. Similar findings have been reported by (Chandrakar *et al.*, 2015).

Yield

Seed yield

Seed yield is the function of pods length, number of pods per plant, seeds per pod and seed weight. The data showed that seed yield varied significantly due to different row spacing (Table 2). 60 cm row spacing (14.92 q ha^{-1}) produced the significantly higher seed yield than 45 cm (12.86 q ha^{-1}), 50 cm (13.24 q ha^{-1}), 75 cm (12.06 q ha^{-1}) and 90 cm (11.07 q ha^{-1}). The higher seed yield in 60 cm row spacing than other row spacing of 45 cm, 50 cm, 75 cm and 90 cm. Similarly, determinate genotype AL 15 resulted more yield than the indeterminate genotype PAU 881 due to uniform growth behavior during vegetative and reproductive phase of pigeon pea. Similar results were found by Mula *et al.*, (2013) (Fig. 1).

Table.1 Yield attributes as influenced by different row spacing and genotypes of pigeon pea

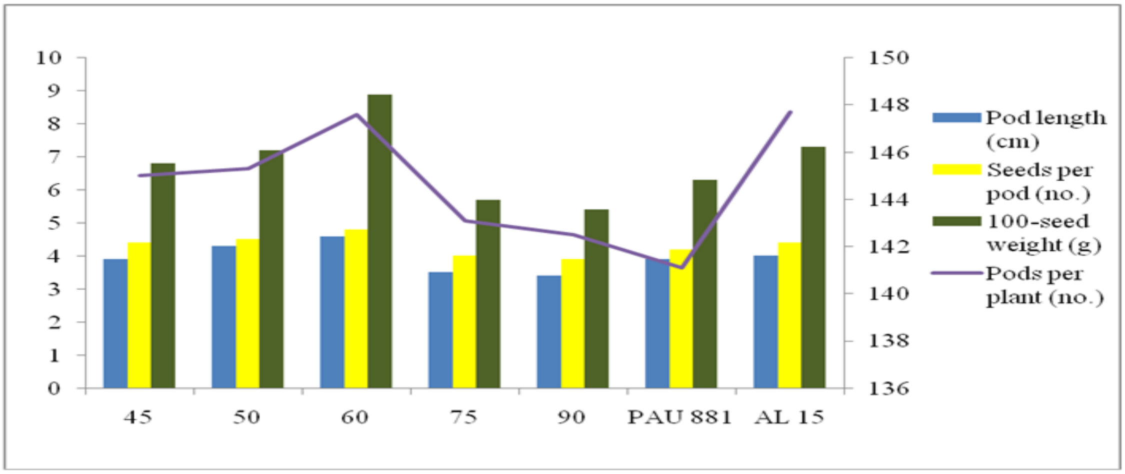
Treatment	Pods per plant (no.)	Pod length (cm)	Seeds per pod (no.)	100-seed weight (g)
Row spacing (cm)				
45 cm x 28 cm	145.0	3.9	4.4	6.8
50cm x 25 cm	145.3	4.3	4.5	7.2
60 cm x 21 cm	147.6	4.6	4.8	8.9
75 cm x 17 cm	143.1	3.5	4.0	5.7
90 cm x 14 cm	142.5	3.4	3.9	5.4
SEm ±	1.6	0.2	0.1	0.2
CD (p=0.05)	2.2	0.8	0.5	0.6
Genotypes				
PAU 881	141.1	3.9	4.2	6.3
AL 15	147.7	4.0	4.4	7.3
SEm ±	1.0	0.1	0.09	0.1
CD (p=0.05)	5.86	NS	NS	0.4
Interaction	NS	NS	NS	NS

Table.2 Effect of different row spacing and genotypes on seed yield, stover yield, and biological yield and harvest index of pigeon pea

Treatment	Seed yield (q ha^{-1})	Stover yield (q ha^{-1})	Biological yield (q ha^{-1})	Harvest Index (%)
Row spacing (cm)				
45 cmx 28 cm	12.86	41.54	54.40	23.64
50 cm x 25 cm	13.24	42.23	55.47	23.87
60 cm x 21 cm	14.92	44.41	59.33	25.14
75 cm x 17 cm	12.06	41.31	53.37	22.60
90 cm x 14 cm	11.07	40.39	51.46	21.52
SEm ±	0.4	0.3	0.7	1.9
CD (p=0.05)	1.23	1.14	2.18	NS
Genotypes				
PAU 881	12.42	41.33	53.75	23.1
AL 15	13.24	42.62	55.86	23.7
SEm ±	0.2	0.2	0.5	1.2
CD (p=0.05)	0.78	0.72	1.37	NS
Interaction	NS	NS	NS	NS

Variable Cost- (18,982 Rs. ha^{-1})

Fig.1 Response of different yield attributes under different row spacing and genotypes of pigeon pea



Stover yield

The superiority of growth characters like plant height, branches, LAI and dry matter accumulation may be the possible reasons for the production of higher stover yield. Among the planting geometry, significantly higher stover yield was recorded from the 60 cm (44.41q ha^{-1}) planting geometry, while the lowest stover yield (40.39 q ha^{-1}) was recorded in wider spacing 90 cm planting geometry. Similar results have also been reported by Worku and Demisie (2012). Similarly, due to better and uniform plant stand and growth habits of determinate genotype AL 15 resulted significantly higher stover yield than indeterminate genotype PAU 881.

Biological yield

Biological yield is sum total of all dry matter produced through physiological and biochemical processes occurring in the plant system.

Data given in table 2 shows the effect of different row spacings and genotypes on biological yield. Among the different row spacings 60 cm (59.33 q ha^{-1}) had significantly higher biological yield than 50 cm (55.47 q ha^{-1}), 45 cm (54.40 q ha^{-1}), 75 cm (53.37 q ha^{-1}) and 90 cm (q ha^{-1}). The AL 15 (55.86 q ha^{-1}) performed significantly better than PAU 881 (53.75 q ha^{-1}).

Harvest index

Harvest index is a measure of physiological productivity potential of crop genotypes. It is the ability of a plant to convert the dry matter into economic yield. The difference in harvest index percentage genotypes was found to be non-significant. The highest value of harvest index (25.14%) was recorded under 60 cm planting geometry and the minimum harvest index percentage was found in 90 cm row spacing. This might be low due to less dry matter accumulation, number of seed pod^{-1} and 100-seed weight.

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