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RESEARCH ARTICLE

Pigeonpea (*Cajanus cajan* L.) growth and yield with varying spacing and fertilizer

V. K. Goswami*

Abstract

A field experiment was conducted during *kharif* season of 2020 at the research farm of Amar Singh College Lakhaoti. Treatment consisted of 3 Row spacing (30, 60 and 90 cm) and 3 levels of DAP application (control, 100 and 200 kg/ha). Results showed that treatment of 30 cm row spacing produced at par plant height compared to 60 cm row spacing. Treatment of 100 kg DAP per hectare produced significantly plant height as compared to 200 kg DAP per hectare. The same trend was observed for a number of branches, leaves and dry matter accumulation. Treatment of 60 cm row spacing was found to be significantly superior over 30 cm raw spacing for yield and yield attributes treatment of 30 cm raw spacing recorded significantly higher protein content as compared to 60 cm raw spacing, whereas treatment of 100 kg DAP per hectare was found significantly superior over control and 200 kg DAP per hectare for various growth parameters, yield attributes and yield.

Keywords: Pigeon pea, Fertilizer, Row spacing, Yield, Fertilizer application.

Introduction

Pulse, constitute a major component of Indian Agriculture owing to their varied importance as food, fodder and maintenance of soil fertility. On the one hand, pulse production has been stagnant from last two decades and on the other population pressure is building up at very fast rate in the country. Such trend has led to drastic reduction in per capita pulse availability from 69 gm in 1961 to 53 gm per day in 2022 against the minimum requirement of 85 gm according to reports of world Health Organization (Anonymous, 2020). Among pulses pigeon pea occupies second place after chickpea in India from area and production point of view. By virtue of being legume and its soil renovating properties, pigeon pea has been one of the important components of various cropping systems followed in different parts of the country. The space in the field which is made available to individual plant is one of the most crucial factors determining the growth of the crop and ultimately the final yield. The ultimate crop yield which is the result of individual plant productivity and the plant population maintained per unit area may be increased by increasing the plant population only to a certain limit. Beyond this, an increase in plant population leads to reduction in individual plant productivity, to the extent that the ultimate yield is reduced. On the other hand too wide spacing will also result in lower crop yield because of sub optimal plant population thus establishment of optimum plant density (row spacing and plant spacing) is important for achieving higher yields.

Nitrogen, being the constituent of chlorophyll and protoplasm, controls the vegetative growth of the plant Since fixation of atmospheric nitrogen in the soil through Rhizobium bacteria rules out any additional supply of this nutrient through fertilizer application in pigeon pea , still small doses of nitrogen to the pigeon pea have proved to be beneficial because they enable the plants to grow well in the situation of lower supply of fixed nitrogen due to less activity of Rhizobium during early growth stages.

Phosphorous, because of it direct effect on root development and thereby expanding the surface area for *Rhizobium*, plays a vital role in growth, development and ultimately final yield of pulses. Therefore, moderate dose of phosphorus depending upon the fertility status of the soil are generally recommended in the pigeon pea.

Department of Agronomy, Amar Singh College, Lakhaoti, Bulandshahr, Uttar Pradesh, India

***Corresponding Author:** V. K. Goswami, Department of Agronomy, Amar Singh College, Lakhaoti, Bulandshahr, Uttar Pradesh, India, E-Mail: vinaykumar1781968@gmail.com

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Materials and Methods

The experiment was conducted at the research farm of A. S. College, Lakhaoti during *Kharif* season 2020. The soil of the experimental site was loamy sand in texture and low in organic matter, the soil pH was 7.6. The organic carbon (%) was 0.21 and available nitrogen, phosphorus and potassium was 219, 9.5 and 127.4 kg/ha, respectively. Treatment comprised of 3row spacing 30, 60, and 90 cm and 3 level of DAP, namely, control, 100 and 200 kg/ha. In all there were nine treatment combinations. There were three replications. For sowing about 5 cm deep, furrow were opened at 30, 60 and 90 cm spacing. Each row was sown uniformly with reweighed seed @ 12 kg/ha and covered by soil immediately. The crop was fertilized as per treatment, using DAP (18% N and 46% P_2O_5) as source of phosphorus. Full dose of DAP was applied as basal dose. Sowing was done on July 11, 2020.

Table 1: Effect of row spacing and fertilizer application on growth attribute of Pigeonpea at maturity

Treatments	*Plant height (cm) at harvest*	*Number of branches/ plant*	*Number of leaves/plant*	*Dry matter accumulation gram / plant*
Row Spacing				
30	234.64	25.76	364.90	50.51
60	239.10	27.00	363.45	51.37
90	226.70	20.85	304.03	44.88
S.Em. ±	1.85	1.43	10.96	0.47
C.D.at 5%	5.31	4.10	31.48	1.36
DAP level (kg/ha)				
0	225.33	20.97	299.62	44.83
100	242.32	29.08	403.66	53.67
200	232.78	23.55	329.10	48.36
S. Em. ±	1.85	1.43	10.96	0.47
CD at 5 %	5.31	4.10	31.48	1.36

Table 2: Effect of row spacing and fertilizer application on yield, yield attribute and quality parameters of Pigeon pea

Treatments	*No. of pods per plant*	*No. of grains for pod*	*Test weight (gm)*	*Harvest Index (%)*	*Protein content (%)*	*Grain yield (kg/ha)*
Row spacing (cm)						
30	147.72	3.43	63.82	23.97	19.99	1698.89
60	144.40	3.22	64.60	24.14	19.51	1767.00
90	129.03	2.96	50.40	22.75	21.71	1492.11
S.Em.±	1.88	0.05	1.08	0.20	0.09	14.64
CD at 5 %	5.40	0.15	3.12	0.58	0.26	42.05
DAP level (kg / ha)						
0	125.43	2.81	54.26	22.52	21.60	1478.67
100	157.20	3.68	69.62	24.78	18.89	1853.22
200	138.52	3.12	60.93	23.55	20.72	1629.11
S.Em.±	1.88	0.05	1.08	0.20	0.09	14.64
CD at 5%	5.44	0.15	3.12	0.58	0.26	42.05

Results and Discussion

Effect of Row Spacing

Row spacing of 60 cm produced significantly higher plant height as compared to 30 cm row spacing and 90 cm row spacing. Numbers of branches were also significantly higher in 60 cm row spacing as compared 90 cm row spacing (Table 1). The 60 cm row spacing produced a significantly higher number of branches per plant as compared to 90 cm row spacing but it was at par with 30 cm row spacing of 60 cm also produced a significantly higher number of leaves are compared to 90 cm row spacing but it was at par with 30 cm row spacing. Same type of trend was observed by Kaur and Saini (2018). Regarding dry matter accumulation is concerned 60 cm row spacing was found to be significantly superior over the remaining row spacing. These results were in close conformity with Sultana *et al.* (2018).

Yield attributes of pigeon pea i.e., number of pods per plant, number of grains per pod and test weight were significantly higher by 60 cm row spacing as compared to the 90 cm row spacing (Table 2). Though, it was at par with 30 cm row spacing. Such type of findings were also reported by Sharma *et al.* (2001)

Grain yield of 1767 kg ha^{-1} was significantly higher as compared to 30 and 90 cm row spacing which was produced by 60 cm row spacing. At the same time protein content of 60 cm row spacing was significantly lower as compared to other two treatments which confirmed the law of agrobiology. Such type of finding guess were also reported by Tripathi and Chauhan (1990)

Effect of DAP

Application of 100 kg DAP produced significantly higher growth attributes i.e. plant height, number of branches, number of leaves and dry matter accumulation (gram/plant) as compared to control and 200 kg DAP per hectare (Table 1). Although 200 kg DAP produced significantly higher plan height than control, Dhaka and *et al.* (2020) also reported such findings.

Various yield attributes *i.e.* numbers of pods per plant, number of grains per pod, test weight and harvesting index were significantly higher by 100 kg DAP as compared to control and 200 kg DAP per ha (Table 2) such type of trend was also observed by the Kumav *et al.* (2013). A significantly higher harvest index was produced by 100 kg DAP per hectare compared to control and 200 kg DAP per hectare. However, control and 200 kg DAP per hectare were at par with respect to harvest index. Treatment of 100 kg per hectare also produced significantly higher grain yield as compared to control and 200 kg DAP per hectare, whereas treatment of 200 kg was found to be significantly superior over control with respect to grain yield. These results are in close conformity with Singh *et al.* (2014**)** as observed in pigeon peas.

Conclusion

On the basis of present experimentation, it can be concluded that the application of 100 kg DAP per hectare and maintaining a row distinct of 60 cm in pigeon pea is suitable for achieving higher yield under western Uttar Pradesh conditions.

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