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Effect of Planting Geometry and Nutrient Management on Yield Attributes of *kharif* Pigeonpea (*Cajanus cajan* L. Millsp.)

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A B S T R A C T

A field experiment was conducted at the farm of BTC College of agriculture and research station, Bilaspur, under Agronomy Department, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) in years 2019-20 and 2020-21with a view to study the Effect of planting geometry and nutrient management on yield attributes of *kharif* pigeonpea (*Cajanus cajan* L. Millsp.). The Pigeonpea variety Rajeevlochan used to grown and treatment was replicated three times in Split plot design. The soil of experimental field was vertisol belonging to textural class clay. In order to prevent the crop from seed and soil born pathogens, seeds were treated with bavistin @ 2.5 g kg^{-1} seed followed by inoculation with suitable *Rhizobium* culture @ 5.0 g kg^{-1} of seed. Then treated seeds were dried in shade for 3- 4 hours before sowing. As per the treatment NPK application were applied separated plot in Pigeonpea with nine treatments in main *kharif* crop. There were two factors taken in main crop *i.e.* Main plot: planting geometry (P) *viz.*, P_1: 60cm x15cm, P_2: 90cm x15 cm, P_3: 120cm x15cm and Sub-plot: nutrient management (N) *viz.*, N_1: 75% of RDF, N_2: 100% of RDF ($N:P_2O_5:K_2O$ :: 20:50:20 kg/ha), N_3: 125% of RDF. The yield attributes *i.e.*, Number of pods $plant^{-1}$, Number of seeds $pod^{-1}$and Test weight (g) were significantly superior in the planting geometry P_3 (120 cm x15 cm) and nutrient managementN_3 (125% of RDF). On the basis of above findings, planting geometry P_3 (120 cm x15 cm) and nutrient managementN_3 (125% of RDF) stand could be better performance first in position and planting geometry P_2 (90 cm x 15 cm) and nutrient management N_2 (100% RDF)stand in second order of preference. Therefore, it may be concluded that planting geometry P_3 (120 cm x15 cm) and nutrient management N_3 (125% of RDF) may be prefer for higher yield in pigeonpea.

Introduction

Pigeonpea (*Cajanus cajan*L.*)* is an important multi-use shrub legume of the tropics and subtropics. The crop originated from India and moved to Africa about 4,000 years ago. Unlike other grain legumes, pigeonpea production is concentrated in developing countries, particularly in a few South and Southeast Asia and Eastern and Southern African countries. It is the preferred pulse crop in dryland areas where it is intercropped or grown in mixed cropping systems with cereals or other short duration annuals (Ecocrop, 2016; van der Maesen, 1989).

In India, pulses have been cultivated since time immemorial under rainfed situations which is characterized by poor soil fertility and moisture stress. These crops are energy rich but cultivated largely under energy starving situations.

Unlike in cereals, varietal breakthrough in pulses has not been taken place. In India total pulse occupies 4.80 m ha area and contributes 4.32 m tonnes production with an average productivity of 900 kg ha^{-1} (Anonymous, 2021). During the last four decades, the total area under pulses remained virtually stagnant (1 to 1.2 million ha) with almost stable production (4 to 9 million tonnes), even though the population has been increased.

As a result, per capita availability of pulses has been declined from 60.7 g per day in 1951-52 to 40 g per day (Indiastat, 2020) as against FAO/WHO's recommendation of 80 g per day. It has led to the severe shortage of pulses in India, which has aggravated the problem of malnutrition in large section of vegetarian population.

Chhattisgarh is mainly rice producing state where rice of different maturity groups is cultivated. Pigeonpea is generally sown in June or July soon after the beginning of the monsoon. The most commonly used cultivars are of medium duration (150-180 days) and mature after the end of the monsoon. However, owing to their perennial nature, plants left in the field produce a new flush of pods which mature by March or April, when a second crop harvest can be taken.

Materials and Methods

The field experiment was conducted at Barrister Thakur Chhedilal College of Agriculture and Research Station, Bilaspur (Chhattisgarh) university of Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh) during *Kharif season* of2019-20 and 2020-21. The Research Farm is situated at 22.09˚N latitude, 82.15˚E longitude and at an altitude of 298 m above mean sea level. The region falls under the Eastern plateau and hill region (Agro-climatic zone-VII) of India. Chhattisgarh state is classified into three agro-climatic zones, of which Bilaspur falls under the Chhattisgarh plains zone of the state. The experimental field was sandy clay soil. The soil was neutral in reaction, medium in organic carbon, low in nitrogen and medium in phosphorus and potash content.

In order to prevent the crop from seed and soil born pathogens, seeds were treated with bavistin @ 2.5 g kg^{-1} seed followed by inoculation with suitable *Rhizobium* culture @ 5.0 g kg^{-1} of seed. Then treated seeds were dried in shade for 3- 4 hours before sowing. Five plants were randomly selected and tagged in each plot excluding the border plant. Data were on the tagged plants for the yield attributes. The tagging of plants was done 20 days after sowing. Observations were recorded on the tagged plants for the yield attributes.

Results and Discussion

Data pertaining to yield of Pigenpea attributes influenced by various treatments has been given in table 1.1.

Effect of planting geometry

The significant differences in number of pods plant$_{-1}$ due to different planting geometry was obtained found to be significant during both of the years of experimentation.

The *kharif* pigeonpea sown through P_3(120 cm x 15cm) produced significantly highest number of pods plant^{-1} (122.4, 125.2 and 123.8 pods plant^{-1} during 2019-20, 2020-21 and in mean data, respectively) as compared to other treatments, while the lowest number of pods plant^{-1} was observed under P_1(60 cm x 15cm).

Maximum number of pods plant^{-1} observed in P_3 (120 cm x 15cm) planting geometry might be due to higher plant height, number of nodules, dry matter accumulation, number of branches and flowers plant^{-1}. Similar results were also recorded by Telgote and Tamgadge (2010) and Antaravalli *et al.*, (2002 a).

The data on number of seeds pod^{-1} reveal that there is no significant variation observed due to different planting geometry. The results revealed that number of seeds pod^{-1} value ranges from 3.13 to 3.22, 3.06 to 3.21 and 3.10 to 3.24 in 2019-20, 2020- 21 and on mean basis respectively, under different treatments and found to have no variation among the treatments. The findings are also in conformity with the results of Tigga *et al.*, (2017).

The data on test weight presented revealed that there is no significant variation observed due to different planting geometry. The results revealed that test weight value ranges from 9.32 to 10.21, 10.08 to 10.19 and 9.70 to 10.20 in 2019-20, 2020-21 and in mean data respectively, under different treatments and found to have no variation among the treatments. The findings are also in conformity with the results of Tigga *et al.*, (2017).

Effect of nutrient management

Number of pods plant^{-1} also varied significantly due to different nutrient management. Maximum number of pods plant^{-1} (115.9, 119.0 and 117.4 pods plant$_{-1}$ during 2019-20, 2020-21 and in mean data, respectively) was registered in N_3 (125% of RDF), however, it was found par with N_2 (100% of RDF during both the years of experimentation. On the other hand, N_1 (75% of RDF) produced the least number of pods plant^{-1}. The yield attributing characters which caused increase in yield higher number of pods plant^{-1}. This was due to optimum amount of nutrients being applied to the pigeonpea and subsequently higher dry matter accumulation in reproductive parts and better translocation of photosynthesis to the yield attributing parameters. The results obtained in the present studies are also support by Matiwade and Sheelavantar (1991).

The data on number of seed pod^{-1} presented revealed that there is no significant variation observed due to different nutrient management. The result revealed that number of seed pod^{-1} value ranges from 3.13 to 3.22, 3.06 to 3.21 and 3.10 to 3.24 in 2019-20, 2020-21 and in mean under different treatments and found to have no variation among the treatments.

However, numerically higher seed pod^{-1} was recorded under N_3 (125% of RDF). The results obtained in the present study are supported by the works of Deshbhratar *et al.*, (2010).

The data on test weight revealed that there is no significant variation observed due to different nutrient management. The results revealed that test weight value ranges from 9.66 to 9.86, 10.11 to 10.21 and 9.93 to 9.99 in 2019-20, 2020-21 and on mean basis under different treatments and found to have no variation among the treatments. However, numerically higher test weight was recorded under N_1 (75% of RDF). The findings are also supported by the similar result reported by Lakshmi (2014).

Effect of Interaction

The interactions effect between planting geometry and nutrient management did not have any significant variation in pods plant^{-1}.

The interactions effect between planting geometry and nutrient management did not have any significant variation in seed pod^{-1}.

Interaction effect between planting geometry and nutrient management showed non-significant effect in test weight.

Table.1 Effect of planting geometry and nutrient management on yield attributes of pigeon pea during kharif season.

Treatments	Number of pods $plant^{-1}$			Number of seeds pod^{-1}			Test weight (g)		
	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean
Planting geometry									
P1-60 cm x 15 cm	103.8	106.8	105.3	3.13	3.06	3.10	9.32	10.08	**9.70**
P2-90 cm x 15 cm	113.5	115.6	114.6	3.15	3.15	3.15	9.83	10.19	**10.01**
P3-120 cm x 15 cm	122.4	125.2	123.8	3.22	3.21	3.24	10.21	10.19	**10.20**
SEm±	**2.01**	**3.01**	**2.47**	**0.08**	**0.06**	**0.05**	**0.27**	**0.13**	**0.19**
CD (P=0.05)	**7.91**	**11.81**	**9.71**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Nutrient Management									
N1-75 % RDF	109.2	111.2	110.2	3.15	3.13	3.14	9.86	10.11	**9.99**
N2-100% RDF	113.6	115.7	114.6	3.16	3.16	3.16	9.83	10.15	**9.97**
N3-125% RDF	115.9	119.0	117.4	3.19	3.13	3.19	9.66	10.21	**9.93**
SEm±	**1.61**	**1.89**	**1.62**	**0.07**	**0.06**	**0.07**	**0.21**	**0.28**	**0.19**
CD (P=0.05)	**4.97**	**5.81**	**5.00**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Interaction (P x N)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Plate.1 Fertilizer calculation and weight

Plate.2 Yield attributes observation

Plate.3 View of experimental field

Among the different planting geometry in *kharif* pigeonpea, P_1(60 cm x15 cm) was recorded to have highest Number of pods plant^{-1}, Number of seeds pod^{-1} and Test weight (g). Nutrient management, N_3(125% of RDF) have the highest yield attributes and yield (751 q ha^{-1}) in both the years of experimentation while it remained at par with N_2(100% of RDF). The interactions effect between planting geometry and nutrient management did not showed significant variation in any parameters.

References

Anonymous, 1988a. Effect of plant density and rationing on productivity of early pigeonpea. Report on research work done during kharif and *rabi* 1987-88 on *Pulse Agronomy*, A1CPIP, Rahuri. Report submitted to research review sub-committee.

Anonymous. 2019a. Agricultural Statistics at a glance. Ministry of Agriculture Department of Agriculture & cooperation.

Anonymous. 2021. Agricultural Statistics at a glance. Ministry of Agriculture Department of Agriculture & cooperation.

Antaravalli, M. B., S. I. Halikatti., S. T. Kajjidoni., S. M. Hiranath and R. V. Koti., 2002a, Influence of different population and geometry on the growth characters of pigeonpea genotypes in vertisols of Dharwad. *Karnataka J. Agric.Sci*., 15(2):246-252.

Deshbhratar, P. B., Singh, P. K., Jambhulkar, A. P. and Ramteke, D. S., 2010, Effect of sulphur and phosphorus on yield, quality and nutrient status of pigeonpea (*Cajanus cajan*). *J. Environ. Bio*., 31(6): 933-937.

Ecocrop 2016. Ecocrop Database. FAO, Rome, Italy. Determination of Selected Metals and Nutritional Compositions of Pigeon Pea (*Cajanus cajan*) Cultivated in Wolaita Zone, Ethiopia. Journal of Agricultural Chemistry and Environment, Vol.10No.1.

Indiastat, 2020. https://www.indiastat.com/table/arhar-tur-red-gram/area-production- productivity-arhar-tur-india-1950-/17337.

Lakshmi, V. K., 2014. Maximizing redgram yield through integrated agronomic management practices under alkali soil. *Res. J. Agric. Forestry Sci*., 2(3): 1-6.

Matiwade, P. S. and Sheelavantar, M. N., 1991, Effect of nitrogen and phosphorus on short duration pigeonpea (DT-2) following wheat and its economics. *Fmg. Syst*., 7: 34-38.

Telgote, N. C. and Tamgadge, S. B. 2010. Seed quality of pigeonpea [*Cajanus cajan (*L.) Millsp] cultivars as influenced by spacing and fertilizer levels. *Asian J. of Horticulture*, 5(2):336-338.

Tigga, B., Chandraker, D. K., Banjara, T. R., Bhagat, S. K. and Dev, M. 2017. Effect of Different Genotype and Planting Geometry on Growth and Productivity of Rabi Season Pigeon Pea (*Cajanus cajan* L.). *Int.J.Curr.Microbiol.App.Sci*., 6(3): 2188-2195.

Van der Maesen, L. J. G. 1989. *Cajanus cajan* (L.). Record from Proteabase. van der Maesen, L. J. G. & Somaatmadja, S. (Eds). PROSEA (Plant Resources of South-East Asia) Foundation, Bogor, Indonesia.

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