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Effect of Planting Geometry and Nutrient Management on Seed Yield 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 seed yield 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.*, Seed yield were significantly superior in the planting geometry P_1 (60 cm x15 cm) and nutrient management N_3 (125% of RDF). On the basis of above findings, planting geometryP_1 (60 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_1 (60 cm x15 cm) and nutrient management N_3 (125% of RDF) may be prefer for higher yield in pigeonpea.

Introduction

Pigeonpea (*Cajanus cajan*L.) belonging to the family Leguminosae is an important crop. It is drought resistant and can be grown in an area with less than 650 mm annual rainfall and with low input requirement. It makes an important contribution to our daily diet containing protein (19- 23%), fat (1-2%), carbohydrates (45-55%), fibers (1-5%), energy (16-18%) and soluble sugars (3-5%) (Troedson*et*

al.,1990). Protein content in pigeonpea seeds is about 2-3 times more than the cereals. It also contains B- complex vitamins, and minerals like calcium, iron andphosphorus. Pigeonpea has a wide range of products, including the dried seed, pods and immature seeds used as green vegetables, leaves and stems used for fodder and the dry stems as fuel. It also improves soil fertility through nitrogen fixation as well as from the leaf fall and recycling of the nutrients (Snapp *et al*., 2002).

India has a virtual monopoly in pigeonpea production by accounting 90 per cent of world's total production. Pigeonpea is one of the protein rich legume crops of semi-arid and sub tropics and domestic requirement. This crop has the privilege of occupying the first place both in area and production among *kharif* grown legumes. Although pigeonpea ranks sixth in area and production in the world in comparison to other grain legumes such as beans, peas and chickpeas, it is used in more diverse ways than others (Nene and Sheila, 1990).

At the global level in 2019 total area, production and productivity of pigeonpea is around 93.54 million ha, 92.13 milliontonnes and 994 kg ha^{-1}, respectively, (Anonymous 2019a). India stands 1^{st} position in production of pigeonpea in the world.

Pigeonpea production in Chhattisgarh 39.9 million tonnes from 65.9 million ha area and average productivity 605 kg ha^{-1}, which was for below than the national productivity 967 kg ha^{-1}, respectively, (Anonymous 2020). In Chhattisgarh state, the maximum pigeonpea producing district is Rajnandgaon (6.02 tonnes) followed by Balrampur (2.98 tonnes) and Kawardha (2.43 tonnes) respectively, (Anonymous, 2020b).

Materials and Methods

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 2019-20 and 2020-21. The topography of the experimental site was fairly uniform and well drained. 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 experimental site, soil samples were collected randomly from the experimental area at 0-15 cm depth with the help of soil auger and then a composite sample was drawn for mechanical and chemical analysis.

The experiment on kharif pigeonpea was carried out in split plot design with three replications having 09 treatment combinations. In *kharif* pigeon pea, the main plot comprised of three plant geometry, while sub plot treatment consisted of three nutrient management. 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. First spray of Propenophos @ 2-3 ml per liter of water was given at pre flowering stage as a precautionary measure to control *Hilicoverpa armigera.* The second spray of propenophos @ 2-3 ml per liter of water was given at pod filling stage to control pod borer and third spray was given propenophos @ 3 ml per liter of water to control podborer.

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 seed yield due to different planting geometry were obtained during both the years of experimentation.

The *kharif* pigeonpea sown through P_1(60 cm x15 cm) produced significantly highest seed yield (16.49, 17.79 and 17.14 qha^{-1} during 2019-20, 2020-21and in mean data, respectively) over other treatments, while the lowest seed yield was observed under P_3(120 cm x 15 cm). The seed yield is the

chain reaction of growth parameters and yield attributing characters. In the present investigation, wider spacing recorded high value of vegetative and reproductive growth parameters of individual plants over narrow spacing. However, in terms of seed yield, narrow spacing was statistically found superior over wider spacing might be due to the fact that total number of plants per unit area was higher over wider spacing and this higher number of plants per unit area neutralized the effect of vegetative and reproductive parameters registered in wider spaced crops. Optimum plant population is a pre-requisite for obtaining high yields. The results are in accordance with the findings by Potdar *et al.,* (2010) Karl and Pawar (1998) and Tigga *et al.,* (2017).

Effect of nutrient management

Seed yield also varied significantly due to different nutrient management during 2019-20, 2020-21 and in mean data. Significantly highest seed yield (15.13, 16.37 and 15.75qha^{-1} during 2019-20, 2020-21and 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 lowest seed yield. An increase in the above-mentioned characters due to NPK application is quite reasonable. The higher dose of NPK was more effective than thereby that of the lower dose was not sufficient. Similar findings were also reported by Kumar *et al.,* (2014) and Gowda *et al.,* (2015).

Interaction effect between planting geometry and nutrient management did not have any significant variation in seed yield.

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

Treatments	Seed yield (qha^{-1})		
	2019-20	2020-21	Mean
Planting geometry			
P1-60 cm x 15 cm	16.49	17.79	**17.14**
P2-90 cm x 15 cm	14.68	15.94	**15.31**
P3-120 cm x 15 cm	12.64	13.55	**13.09**
SEm±	**0.31**	**0.26**	**0.28**
CD (P=0.05)	**1.23**	**1.00**	**1.10**
Nutrient Management			
N1-75 % RDF	14.03	15.08	**14.56**
N2-100% RDF	14.65	15.83	**15.24**
N3-125% RDF	15.13	16.37	**15.75**
SEm±	**0.26**	**0.26**	**0.26**
CD (P=0.05)	**1.40**	**0.82**	**0.80**
Interaction (P x N)	**NS**	**NS**	**NS**

Plate.1 Fertilizer calculation and weight

Plate.2 Yield attributes observation

Plate.3 Field visit

Plate.4 View of experimental field

Among the different planting geometry in *kharif* pigeonpea, P_1 (60 cm x15 cm) was recorded to have highest Seedyield (17.14 q ha^{-1}). Nutrient management, N_3 (125% of RDF) have the highest yield (15.75 q ha^{-1}) in both the years of experimentation while it remained at par with N_2 (125% of RDF). The interactions effect between planting geometry and nutrient management did not showed significant variation in any parameters.

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