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Response of *Kharif* pigeonpea (*Cajanus Cajan*) to different levels of NPK fertilization under rainfed in black soil

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Abstract

A Field experiment was conducted during rainy seasons of 2015-16 and 2016-17 to study the response of *kharif* pigeonpea (*Cajanus cajan*) to different levels of NPK fertilization under rainfed in black soil. Pooled data shows that application of phosphorus with 50 and 75 kg/ha and nitrogen with 20 and 40 kg/ha gave significantly higher grain and stalk yield and harvesting index of pigeonpea. Maximum grain yield (1829 kg/ha) was realised with application of 40-75-20kgNPK/ha it was at par with application of 20-50-0kgNPK/ha (1755 kg/ha). Absolute control resulted in 1283kg/ha. This treatment also gave the higher total plant uptake of N P K by pigeonpea. The study recommended that soil application as basal Phosphorus 75 kg/ha increased 4-5 percent grain yield of pigeonpea over a existing recommendation Phosphorus 50kg/ha, and pigeonpea crop fertilizer with 20-50-0kg NPK/ha was most productive and profitable.

Keywords: Response of pigeonpea, NPK fertilization, yield, nutrient uptake

Introduction

Pigeonpea [*Cajanus Cajan* (L.) Millsp.] is a multipurpose leguminous crop that can provide food, fuel, wood and fodder for the small scale farmer in subsistence agriculture (Egbe and kalu 2009) [2]. India accounts for 90% of world's pigeonpea growing area and 85% of world's production of pigeonpea. In india, it is grown in an area of 4.19mha with a production of 3.29mt and productivity of 785kg/ha, the productivity of Pigeonpea in India is below the average productivity of world 848kg/ha in Telangana, it is grown an area of 0.33mha with a production of 0.26mt and productivity of 797kg /ha. Telangana accounts for 7.45% of India's pigeonpea growing area and 6.18% of India's production of pigeonpea (Agristatglance 2018) [1]. Pigeonpea grown on wide range of soil with varying physical and chemical properties. The outstanding deep root system of pigeonpea breaks the hard pans and utilized available nutrients from the soil. NPK is most important elements in controlling the normal growth and yield of crops including pigeonpea] the low productivity of pigeonpea has been attributed to the fact that large area is under rainfed situation and fertilizer recommendation Practices for pulse crop have been paid farmers less attention. Generally farmers either do not apply fertilizers or apply at lower or higher doses than recommended to the pigeonpea crop fertilizer is the most important factor in determining yield of pigeonpea. Therefore, there is need for standardizing of NPK nutrients in order to increase the productivity. The lack of information on these aspects under rain-fed in block soil conditions made as impetus to undertake the present study.

Materials and Methods

A Field experiment was conducted during rainy seasons of 2015-16 and 2016-17 at Regional Agricultural Research Station, Warangal in sandy clay loam texture soil. The experimental soil was poor in organic carbon (0.40%) and an alkaline reaction having pH of 8.0. the fertility status in terms of available nitrogen was low status with 265.5kg/ha and Medium in available phosphorus 19.3kg/ha and available potassium 385.5kg/ha. The rainfall received during the growth period of crop was 969.6mm in 2015-16 and – mm in 2016-17.

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The experiment was laid out in randomized block design with four replication and eight treatments the treatment combinations 3 levels of nitrogen (20, 40 and 60 kg/ha), 2 levels of phosphorus (50 and 75 kg/ha) and 2 levels of potassium (20 and 40 kg/ha) with absolute control (0kg NPK/ha) were compared in rainfed sown WRG-65 (Rudreshwara) variety of pigeonpea in block soil. The crop was sown on 25 July 2015 and 30 July 2016. the grass and net plot size were 24m² (6×4m) and 15.36m² (4.8 ×3.2m). The pigeonpea seeds was sown @7.5kg/ha with 120×20cm spacing dibbling by manually. The recommended dose of NPK (20.50.0kg/ha). levels of nitrogen (20 and 40kg/ha); phosphorus (50 and 75kg/ha) were applied at sowing and nitrogen level 60kg/ha and potassium 40kg/ha were applied two equal split each at sowing and flowering the other cultural operations were done as per recommendation and crop requirement. Seed yield was computed by threshing pods from net plot, cleaned and the seeds weight was recorded. From this seed yield per hectare was computed. The data for two seasons was pooled for final statistical analysis. Nutrient uptake in grain and stalk of pigeonpea crop was calculated in

kg/ha in relation to dry matter production/ha by using the formula.

$$\text{Nutrient uptake (kg/ha)} = \frac{\text{nutrient content (\%)} \times \text{yield (grain/stalk in kg/ha)}}{100}$$

Results and Discussion

Effect of weather

The meteorological data depicted in fig.1 showed marked variation in weather condition during two year of experimentation. Rainfall received during 2015-16 (969.6mm) was quit high as compared to 2016-17 (714.0mm). In the rainy season 2015-16, in the month of July there was deficit rainfall against 208mm only 56.8mm in a 7 rainy days which was effected crop seedling stage and budding to pod development stage there were no significant rain in the month of last week of September to October 2015, prolonged dry period effected crop with soil moisture stress. Second year crop received good amount and even distribution of rainfall. Further, the temperature particularly at crop reproductive phase was more conducive. This resulted in slightly better performance of the crop during 2016-17 than 2015-16.

Fig 1: Monthly rainfall and mean temperature during the two growing seasons of the experimentation

Yield response to the nutrients applied

Yield attributes

Three levels of nitrogen (20, 40 and 60 kg/ha), two levels of phosphorus (50 and 75 kg/ha) and two levels of potash (20 and 40 kg/ha) with absolute control (0 kg NPK/ha) pooled data of two years were compared in rainfed pigeonpea sown in block soil. The 40-75-20 levels of nitrogen, phosphorus and potassium combinations of nutrients significantly affect on the yield attributes of pigeonpea i.e., number of fruiting branches per plant (9.2), number of pods per plant (236.3), seed test weight (9.69) and number of seeds per pod (3.93) which was statistically at par with 20-50-0, 60-75-20 and 60-75-40 kg NPK/ha.

Grain Yield, Stalk and harvest index

Significantly increased grain and Stalk yield, and harvesting index of pigeonpea with application of phosphorus with 50 and 75 kg/ha and nitrogen with 20 and 40 kg/ha, over absolute control. Maximum grain yield (1829 kg/ha) was recorded with application of 40-75-20kg NPK/ha it was at par with application of 20-50-0kg NPK/ha (1755 kg/ha). Absolute control resulted in 1283kg/ha. Application of 40-75-20kg NPK/ha increased grain yield in terms of percentage 4.21 over a existing recommendation of NPK 20-50-0 kg/ha. Application of 60 kg/ha nitrogen fertilizer top dressing in two equal split each at sowing and flowering was negative resulted. Stalk yield of pigeonpea significantly increased with

application of phosphorus with 50 and 75 kg/ha and nitrogen with 20, 40 kg/ha influenced the growth, to the fact that higher level of fertilizers enhanced the availability of these nutrients to plants from the soil. Harvest index was also found to be significantly higher (25.56%) with application 40-75-20 kg NPK/ha which was at par with 20-50-0 kg NPK/ha (25.11%). The results were in close conformity with the work done by Kumar *et al.* (2012) [4], Singh *et al.* (2013) [6] and Kumawat *et al.* (2015).

Total nutrient uptake (kg/ha)

The pooled data on total N, P and K uptake of pigeonpea are provided in Table 1. Application of 60 kg/ha nitrogen fertilizer top dressing in two equal split each at sowing and flowering stage recorded significantly higher total uptake of nitrogen as compared to rest of the treatments. The significantly maximum phosphorous (24.9kg/ha) uptake by pigeonpea crop was recorded at higher level of phosphorous (75kg/ha) and potassium (20 and 40kg/ha), it was at par with 20-50-0kg NPK/ha application. Application of higher level of potassium nutrient 40kg/ha which might have been increased the potassium (105.2 kg/ha) also similar to nitrogen and phosphorous uptake. The value of total uptake of N, P and K has positive and significant correlation to grain yield. All of which have a strong bearing on the grain yields as they are the yield determining components (Goud and Kale 2010) [3].

Table 1: Yield and yields attributes, and total plant nutrient uptake of pigeonpea as influenced by different doses of NPK (Pooled data of 2 years)

Treatment N P K (kg/ha)	plant height (cm) at harvest	No. of Fruiting branches per plant	No. of pods per Plant	No. of seeds per Pod	100 seed weight (g)	Grain yield (kg/ha)	Grain yield deviation (%)	Pod shells (kg/ha)	Stalk yield (kg/ha)	Harvest index (%)	Total plant nutrient uptake (kg/ha)		
											N	P	K
0-0-0 (Control)	195.5	7.4	177.2	3.53	8.38	1283	- 26.89	714	3882	21.82	85.7	11.0	59.5
20-50-0	211.0	8.1	222.8	3.87	9.53	1755	RD-N P K	617	4616	25.11	115.9	15.9	76.0
40-50-20	211.0	7.8	194.2	3.50	8.98	1447	- 17.55	527	4383	22.76	117.3	17.0	105.2
60-50-20	210.0	7.5	187.5	3.67	8.69	1418	- 19.20	596	4431	22.00	132.1	19.7	103.7
60-50-40	211.5	7.6	188.0	3.70	8.75	1394	- 20.56	617	4321	22.02	119.6	23.2	95.3
40-75-20	222.5	9.2	236.3	3.93	9.69	1829	+ 4.21	589	4737	25.56	116.3	24.9	101.3
60-75-20	221.5	9.2	232.8	3.77	9.53	1664	- 5.18	700	4899	22.91	142.1	24.1	93.5
60-75-40	223.5	8.9	228.6	3.70	9.52	1731	- 1.37	721	4699	24.20	150.3	23.8	90.8
SEm ±	7.0	0.3	7.4	0.09	0.22	31.3	---	62	116	0.33	4.6	0.75	3.17
CD (P=0.05)	NS	1.0	23.0	0.30	0.70	96.0	---	NS	355	1.2	14.3	2.3	9.7
CV (%)	5.7	6.2	6.3	4.13	4.3	3.5	--	17	5.0	7.3	6.5	6.5	6.1

Conclusion

The present study clearly suggests that soil application as basal Phosphorus 75 kg/ha increased 4-5 percent grain yield of pigeonpea over a existing recommendation Phosphorus 50kg/ha, and pigeonpea crop fertilizer with 20-50-0kg NPK/ha was most productive and profitable

Reference

1. Agristat Glance. Agricultural Statistics at a Glance, Government of India Ministry of Agriculture and Farmers Welfare, Department of Agriculture, Cooperation and Farmers Welfare. Directorate of Economics and Statistics, 2018.
2. Egbe OM, kalu BA. Evaluation of pigeonpea [*Cajanus cajan* (L.) Millsp.] Genotypes for intercropping with tall sorghum [*Sorghum bicolor* (L) moench] In southern guinea savanna of Nigeria. ARPN Journal of Agricultural and Biological Science 2009; 4(4):54-65.
3. Goud VV, Kale HB. Productivity and profitability of pigeonpea under different source of nutrients in rainfed condition of Central India. Legume Research. 2010; 23(3, 4):212-217
4. Kumar P, Rana KS, Rana DS. Effect of planting systems and phosphorus with biofertilizers on the performance of sole and intercropped pigeonpea (*Cajanus cajan*) under rainfed conditions. Indian Journal of Agronomy. 2012; 57(2):127-32.
5. Kumawat N, Singh RP, Kumar R, Yadav TP, Hari OM. Effect of planting systems and phosphorus with biofertilizers on the performance of sole and intercropped pigeonpea (*Cajanus cajan*) under rainfed conditions. Indian Journal of Agricultural Sciences 2012; 85(2):171-6.
6. Singh R, Malik JK, Thenua OVS, Jat HS. Effect of phosphorous and biofertilizers on productivity, nutrient uptake and economics of pigeonpea (*Cajanus cajan*) + mungbean (*Phaseolus radiates*) intercropping system. Legume Research. 2013; 36(1):41-8.