

Original Research Article

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Growth and Yield of Pigeonpea (*Cajanus cajan* L. Mill sp) as Influenced by Different Nutrient Management Approaches

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ABSTRACT

The investigation was conducted at farmer field (Kallur Village), Manvi Tq., Raichur Dt. The soil was clayey in nature and slightly alkaline (7.9) in reaction, low in nitrogen as well as available phosphorus and rich in available potassium. The environmental conditions were favorably congenial for normal growth and maturity of pigeonpea crop. The experiment was laid out in Randomized Block Design with three replications and ten treatments. The results revealed that the application of 150 per cent recommended dose of fertilizers (T₄) significantly found higher plant height at harvest stage (183.55 cm) followed by T₇: soil test based N ± 25% and P ± 50% (181.88 cm). The dry matter production at harvest was higher (236.85 g plant⁻¹) in T₄ compared to other treatments. However, application of 150 per cent recommended dose of fertilizer nutrient approach significantly increased the yields of crops over other nutrient approaches. The maximum pigeonpea seed yield, stalk yield, husk yields and harvest index were 1743, 3247 and 1257 kg ha⁻¹, respectively.

Keywords

Nutrient
management,
Pigeonpea, RDF

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Introduction

Legumes are considered as soil recuperative crops. Pigeonpea occupies a prominent position as rainy season (*kharif*) pulse crop. It is the 5th prominent pulse crop in the world and 2nd in India after chick pea. In India, pigeonpea ranks second in both acreage (5.13 million ha) and production (4.23 million

tonnes) among the pulses with average productivity of 824 kg ha⁻¹ (Anonymous 2015). It occupies an area of 0.77 mha with a production of 0.53 mt with an average productivity of 596 kg ha⁻¹ in Karnataka (GOI, 2012). Nutrient management is the most basic factor and is found to exert a great influence not only on growth and yield attributes of crops but also for obtaining

sustained productivity. Among all nutrients N, P, K are most important nutrients which contribute to proper growth and yield of crop plant and it also has direct effect on metabolism of plant. At present, the state or regional recommendations are very general and does not consider soil test results for crop nutrient requirements. Among the various methods of fertilizer applications, the one based on 'yield targeting' is unique in the sense that this method not only indicates soil test based fertilizer dose but also the level of yield which the farmer can hope to achieve if good agronomic practices are followed in cultivating the crop. This approach provides a scientific basis for balanced fertilization not only among the fertilizer nutrient themselves but also soil available nutrients. Soil test based fertilizer recommendations result in efficient fertilizer use and maintenance of soil fertility. Soil test and crop response (STCR) approach is based on soil contribution and yield level is used for recommending fertilizer dose. Keeping these points in view, a field investigation was carried out to work out the suitable nutrient management practices for higher growth and yield of pigeonpea.

Materials and Methods

The field experiment was conducted under rainfed condition during *kharif* season of 2016 and 2017 at farmer's field, Kallur village, Manvi tq. Raichur to study the suitable nutrient management approach to pigeonpea for getting higher growth and yield. The details of the materials used and techniques adopted during the course of investigation are described in this chapter. The soil was clayey in nature with slightly alkaline reaction (7.9) being lower in nitrogen (254 kg ha⁻¹), lower in available phosphorus (19.70 kg ha⁻¹) but rich in available potassium (355 kg ha⁻¹). The environmental conditions were favorably congenial for normal growth and maturity of pigeonpea crop.

The experiment was laid out in Randomized Block Design with three replications and ten treatments. Treatment consisted *viz.*, T₁: Absolute control, T₂: Farmer practice, T₃: RDF (25:50:00 kg ha⁻¹ as per POP), T₄: 150% RDF, T₅: Soil Test Laboratory Method, T₆: Soil Test based NPK ± 25%, T₇: Soil Test based N ± 25% and P ± 50%, T₈: STCR Approach (Targeted yield of 15 q ha⁻¹), T₉: STCR Approach (Targeted yield of 18 q ha⁻¹) and T₁₀: STCR Approach (Targeted yield of 20 q ha⁻¹). Well decomposed FYM containing 0.5 % N, 0.2% P₂O₅ and 0.5 % K₂O was applied 10 days prior to sowing as per treatments. Seed was inoculated with a culture of *Rhizobium* plus *Pseudomonas striata* as per treatments before sowing. Other cultural operations were done as per recommendation and crop requirements.

Results and Discussion

The effect of different treatments was noticed on important growth parameters *viz.*, plant height and total dry matter production was influenced significantly due to the application of (RDF) different dosage of fertilizers at harvest stage. The application of 150% RDF produced more vegetative growth in early period of crop growth. The effect of different nutrient management approaches on plant height was found to be significant and higher plant height (183.50 cm) was observed by the application of 150% Recommended Dose of Fertilizer (T₄) at all the growth stages followed by Soil Test based N ± 25% and P ± 50% (T₇) (178.69 cm) and significantly superior over control (143.31 cm). The increase in plant height due to higher levels of phosphorus might be resulted towards beneficial effect of phosphorus on root proliferation, nodulation and accelerating effect of P on the synthesis of protoplasm thereby helping the plants to grow taller. Similar results were reported by Singh and Singh (2012), Singh *et al.*, (2014) and Ade *et al.*, (2018).

Dry matter production was highly influenced by nutrient application. The observations for dry matter production indicated in Table 1 at harvest stage. The dry matter production at harvest was mainly influenced by assimilatory surface area and its photosynthetic ability. Dry matter production increased steadily with advancing growth stages and reached maximum at harvest (Udhaya nandini *et al.*, 2015). Significantly higher dry matter production (173.89 g plant⁻¹) was recorded in treatments assisted with 150 per cent RDF (T₄) followed by Soil Test based N ± 25% and P ± 50% (T₇). Beneficial effect of P attributed towards root proliferation, nodulation and synthesis of protoplasm gave higher space of dry matter accumulation. The results are in close conformity with the findings of Kumar *et al.*, (2012), Singh and Singh (2012), Malik *et al.*, (2013).

The yield contributory attributes *viz.*, seed yield, stalk yield, husk yield and harvest index. The application of 150% RDF (T₄) recorded higher seed yield kg ha⁻¹ (1743 kg ha⁻¹) followed by the application of fertilizer through Soil Test based N ± 25% and P ± 50% (T₇) (1728 kg ha⁻¹) and control (936 kg ha⁻¹) (Table 2). Combined application of nitrogen and phosphorus plays a pivotal role in the higher yield, by stimulation of root development, energy transformation and metabolic processes in the plants, which turn, resulted in greater translocation of photosynthates towards the sink development. Ultimately the seed yield plant⁻¹ was improved which resulted in higher seed yield (kg ha⁻¹) which were similar to findings reported by Kumar *et al.*, 2012 and Ade *et al.*, 2018.

Table.1 Plant height and dry matter production of pigeonpea as influenced by different nutrient management approaches at harvest stage

Treatments	Plant height (cm)	Dry matter production (g plant ⁻¹)
T₁: Absolute Control	141.56	164.61
T₂: Farmers Practice	153.49	176.96
T₃: Recommended Dose Fertilizer (as per POP)	157.60	190.11
T₄: 150% Recommended Dose Fertilizer	183.55	236.85
T₅: Soil Test Laboratory Method	167.74	202.78
T₆: Soil Test based NPK ± 25%	177.92	229.06
T₇: Soil Test based N ± 25% and P ± 50%	181.88	231.22
T₈: STCR Approach (Targeted yield of 15 q ha⁻¹)	155.16	182.73
T₉: STCR Approach (Targeted yield of 18 q ha⁻¹)	155.49	186.09
T₁₀: STCR Approach (Targeted yield of 20 q ha⁻¹)	164.39	194.59
S. Em.±	3.60	2.71
C.D. at 5 %	10.687	8.21

Note: 1) Fertilizer applications for STCR and STL are based on soil test values
 2) FYM @ 6 t ha⁻¹ and deficient secondary and micronutrients application are common for all treatments except absolute control.

Table.2 Yield attributes of pigeonpea as influenced by different nutrient management approaches at different growth stages

Treatments	Seed yield (kg ha ⁻¹)	Stalk yield (kg ha ⁻¹)	Husk yield (kg ha ⁻¹)	Harvest index (%)
T₁: Absolute Control	804	2702	673	19.24
T₂: Farmers Practice	1357	2908	1023	25.65
T₃: Recommended Dose Fertilizer (as per POP)	1611	3135	1186	27.15
T₄: 150% Recommended Dose Fertilizer	2053	3693	1308	29.08
T₅: Soil Test Laboratory Method	1768	3321	1280	27.75
T₆: Soil Test based NPK ± 25%	1809	3367	1290	27.96
T₇: Soil Test based N ± 25% and P ± 50%	1870	3395	1299	28.47
T₈: STCR Approach (Targeted yield of 15 q ha⁻¹)	1468	2975	1063	26.65
T₉: STCR Approach (Targeted yield of 18 q ha⁻¹)	1533	3049	1097	26.99
T₁₀: STCR Approach (Targeted yield of 20 q ha⁻¹)	1667	3196	1245	27.29
S. Em.±	15.70	42.49	16.16	0.25
C.D. at 5 %	46.66	126.25	48.01	0.74

Note: 1) Fertilizer applications for STCR and STL are based on soil test values
 2) FYM @ 6 t ha⁻¹ and deficient secondary and micronutrients application are common for all treatments except absolute control.

The crop fertilized with 150% RDF (T₄) and Soil Test based N \pm 25% and P \pm 50% (T₇) were found equally effective and significantly superior over other treatments (Table 2) with respect to stalk (3247 and 3219 kg ha⁻¹, respectively) and husk yield (1257 and 1245 kg ha⁻¹, respectively). Harvest index had followed the same trend. This increase may be due to increase in N fixation as influenced by P application. Adu-Gyamfi *et al.*, (1989) reported a significant increment in di-nitrogen fixation in pigeonpea cultivars due to the increase in phosphorus application.

In conclusion, the 150% Recommended Dose Fertilizer (T₄) and Soil Test based N \pm 25% and P \pm 50% (T₇) nutrient management approaches exhibited its superiority by recording higher growth and yield attributes of pigeonpea crop when compared to different nutrient management approaches during this study.

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