



Response of Chickpea Varieties to Phosphorus Application

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ABSTRACT

A field experiment was conducted during *rabi* 2009-10 with 3 varieties of chickpea viz., Annigeri, JG-11 KAK-2 with 4 levels of phosphorus (0, 25, 50, 75 kg ha⁻¹) tested in a factorial randomized block design. The results revealed that KAK-2 showed maximum plant height (17.1, 28.5 and 32.2 cm), at different stages and produced significantly maximum primary, secondary branches, number of pods per plant (54.7), test weight (19.9 g) and grain yield (1301 kg ha⁻¹). Application of 50 kg P₂O₅ ha⁻¹ resulted in significantly higher pods per plant and seed yield compared to other levels of phosphorus application. The phosphorus, nitrogen and potassium nutrient uptake also significantly higher by KAK-2 variety similarly significant nutrients uptake was found with the application of 50 kg P₂O₅ ha⁻¹.

Key words : Nutrient uptake, Phosphorus levels, Pods, Seed Yield, Test weight, Varieties.

Chickpea (*Cicer arietinum* L.) is an important pulse crop sharing 36 percent of total area and 48 per cent of total production of grain legumes in the country. The average productivity of this crop is very low because it is traditionally cultivated under rainfed conditions with residual soil moisture. One of the ways of increasing the yield is by means of balanced fertilization of chickpea. Legumes are normally heavy feeders on phosphorus. Phosphate fertilization of chickpea promotes growth, nodulation and enhances yield (Kumpawat *et al* 1990). It imparts hardness to shoots, improves grain quality, regulates the photosynthesis, governs other physio-bio-chemical processes and also helps in root enlargement (Shaktawat and Sharma 1985), nodule production and by there increases nitrogen fixation. The root growth as well as plant development may differ in new plant types of gram cultivars (Singh and Yadav 1985). As a result the efficiency of phosphorus utilization by different varieties may differ under different phosphorus levels. The present investigation was conducted to find out the phosphorous requirement of different varieties of chickpea.

MATERIAL AND METHODS

The field experiment was conducted during *rabi* season 2009-10 at Students' Farm of Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad. The experiment at soil had a P^H of 7.8 and clay loam in texture, containing 0.68% organic carbon, 268.4, 28.4 and 340 kg ha⁻¹ available N, P₂O₅ and K₂O respectively. The experiment was laid out in a factorial randomized block design, with three replications, consisting three varieties viz., V₁ – Annigeri, V₂ – JG-11 and V₃ – KAK-2 as main treatments and four levels of phosphorus (P₁ – 0, P₂ – 25, P₃ – 50 and P₄ – 75 kg P₂O₅ ha⁻¹) as sub levels. Chickpea cultivars were sown on 5th November 2009 and harvested on 7th Feb, 2010. Fertilizers @ 20 kg N and 40 kg K₂O ha⁻¹ were applied as basal dose in general through urea and muriate of potash respectively and phosphorus was applied as basal through single super phosphate according to the treatments. The spacing and plot size were 30x10cm and 6x3.5m respectively. Rainfall received during crop season was 22.2 mm. Nutrient uptake was calculated as per the procedure outlined by Jackson (1973) and Olsen (1954).

Nutrient uptake (kg ha⁻¹) =

$$\frac{\text{Total drymatter} \times \text{nutrient concentration}(\%)}{100}$$

RESULTS AND DISCUSSION

Effect of varieties and phosphorus levels on yield and yield attributes

It is evident from the data in Table 1 and 2 that the maximum plant height, primary, secondary branches, number of pods per plant, test weight and seed yield were significantly influenced by varieties. Among the varieties KAK-2 produced highest number of pods (54.7) per plant, test weight (19.9g), no of seeds per pod (1.6) and seed yield (1301 kg ha⁻¹), yield due to more number of branches, higher canopy and dry matter production contributed to better seed filling as compared to Annigeri and JG-11. The lowest number of number of pods (43.5) per plant test weight (16.9g), no of seeds per pod (1.4) and seed yield (1040 kg ha⁻¹) were recorded with Annigeri. The branching pattern was better with more number of primary (3.1 and 4.2) and secondary (4.2, 7.1 and 8.2) branches, resulting in production of more number of pods per plant, while in Annigeri variety the branching pattern was poor with less number of primary (2.5 and 3.6) and secondary (3.6, 6.6 and 7.4) branches, resulting in production of less number of pods per plant. The number of seeds per pod of chickpea is mostly a genetic parameter and likely to be altered hardly by agronomic manipulation. Application of 50 kg P₂O₅ ha⁻¹ resulted in significantly increased the plant height, primary, secondary branches, number of pods per plant (56), seeds per pod (1.6) test weight (18.9g) and seed yield (1413 kg ha⁻¹) these findings corroborate with the findings of Bahadur *et al.*, (2002) and Chaitanya (2006) Grain yield significantly increased with increasing fertilizer application upto 50 kg P₂O₅ ha⁻¹. Further increase in the level of fertilizer application i.e, 75 kg P₂O₅ ha⁻¹ did not cause additional increase on yield and yield attributes. This clearly indicated that 50 kg P₂O₅ ha⁻¹ was optimum dose and increased in the grain yield over to control and 25 kg P₂O₅ ha⁻¹. The lowest number of pods per plant (37.3), seeds per pod (1.2), test weight (17g) and seed yield (901 kg

ha⁻¹) were recorded at control. Similar results were reported by Shiva kumar (2001), Saini and Faroda (1998) and Mustafa *et al.*, (2008).

Effect of varieties and phosphorus levels on nutrient uptake

The data on uptake of phosphorus indicated that maximum (4.17, 12.0 and 15.2 kg ha⁻¹) phosphorus uptake was found in KAK-2 at 30 DAS, 60 DAS and also at harvest (table 2). Among different crop growth stages, maximum phosphorus uptake was noticed at 60 DAS (Flowering and pod formation). Among the varieties the lowest (3.2, 9.9 and 13 kg ha⁻¹.) phosphorus uptake was recorded by Annigeri variety at all the crop growth stages. Due to the better root growth, nodulation of roots enhanced the uptake of phosphorus from the soil by KAK-2 as compared to other two varieties.

Similarly uptake of nitrogen (106.6 kg ha⁻¹) and Potassium (74.4 kg ha⁻¹) was also more with KAK-2 variety, followed by JG-11 and Annigeri. The lowest nitrogen (89 kg ha⁻¹) and potassium (66.4 kg ha⁻¹) uptake was recorded in Annigeri variety. Maximum growth associated with KAK-2 has resulted in higher uptake of nitrogen and potassium as compared to other varieties.

The highest uptake of nitrogen, phosphorus and potassium was associated with 75 kg P₂O₅ ha⁻¹, (110.4 kg ha⁻¹) and (79.8 kg ha⁻¹) followed by of 50 kg P₂O₅ ha⁻¹. The crop supplied with adequate phosphorus supply at 75 and 50 kg P₂O₅ ha⁻¹ produced more drymatter and seed yield and thus enhanced the uptake of nutrients in comparison to lower doses. The results are in accordance with the findings of Yadav *et al.*, (2003) and Meena *et al.*, (2003). The lowest nitrogen (82.2 kg ha⁻¹) and potassium (60.4 kg ha⁻¹) uptake was recorded with control.

Conclusion

Among the chickpea varieties KAK-2 was superior variety for obtain of high yield potential in southern parts of telangana zone and it shown significant response to phosphorus to application up to 50 kg ha⁻¹. Among phosphorus levels application of 50 kg ha⁻¹ was optimum dose for obtain of maximum yield.

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