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Effect of Varieties and Phosphorus Levels on Growth and Yield of Chickpea (*Cicer arietinum*L.)

Key words : *Chickpea, Phosphorus, Varieties.*

Chickpea (*Cicer arietinum L.*), is the premier pulse crop of India, popularly known as Gram or Bengalgram mainly grown during *rabi* season. It is an important protein rich crop with 21.1 percent protein and has multiple uses. India is the largest chickpea producing country, which accounts for 64% of the global chickpea production. In India, chickpea is grown in 8.25 million hectares with an annual production of 7.33 million tonnes and productivity of 889 kg ha^{-1}. In Andhra Pradesh, it is being grown in an area of 4.72 lakh hectares with annual production and productivity of 3.91 lakh tonnes and 1143 kg ha^{-1}, respectively (Indiastat, 2015). Chickpea is extensively grown in prakasam district of Krishna Agro-Climatic Zone.The major reasons for low productivity are non-adoption of high yielding varieties and improper input management practices. Selection of proper variety for a set of agro-climatic conditions is very important to achieve maximum potential, because of differential growth and development behaviour. The root growth as well as plant development may differ in new plant types of chickpea cultivars. Nutrient management especially phosphorus application in legumes assumes a significant role in increasing the productivity. Low soil fertility, particularly phosphorus deficiency is one of the major constraints to increase chickpea productivity (Srinivasarao *et al*., 2003).Phosphate fertilization of chickpea promotes growth nodulation and enhances yield. It imparts hardiness to shoots, improves grain quality, regulates the photosynthesis, governs other physio-bio-chemical processes and also helps in root enlargement, nodule production and there by increases nitrogen fixation.The present investigation was, therefore undertakento study varietal performance of certain new chickpea varieties and also to optimize the phosphorus dose for chickpea under Krishna Agro Climatic Zone of Andhra Pradesh.

The experiment was carried out at Agricultural College Farm, Bapatla, Andhra Pradesh, during *rabi* 2016.The soil of experimental field was clay in texture, slightly alkaline in reaction (7.82), low in organic carbon (0.55 %), low in available nitrogen (217.5 kg ha^{-1}), medium in available phosphorus(23.4 kg ha^{-1}), high in available potassium(270.8 kg ha^{-1}). The experiment was laid out in randomised block design with factorial concept and replicated thrice with twelve treatments comprising of threevarietiesV_1 (NBeG 47) V_2 (NBeG 49) V_3 (NBeG 3)and four phosphorus levels 0 kg P_2O_5 ha^{-1} (P_0), 25 kg P_2O_5 ha^{-1} (P_{25}), 50 kg P_2O_5 ha^{-1} (P_{50}), 75 kg P_2O_5 ha^{-1} (P_{75}). Sowing was done on 04-11-2016. Nitrogen was applied in the form of urea as per the recommendation and entire quantity of phosphorus was applied basally as per the treatments. Recommended cultural practices and plant protection measures were followed throughout the crop growing season. The data were analysed statistically by adopting the standard procedures described by Panse and Sukhatme (1978).

Growth parameters

Results revealed that growth parameters like plant height at harvest, dry matter accumulation, primary and secondary branches per plant, no. of nodules per plant was significantly influenced by both Varieties and phosphorus levels.varieties significantly influenced the plant height. Taller plants (59.2 cm) were recorded with NBeG 47 which was significantly superior to that of other varieties tested due to its erect nature whereas other two varieties were short and bushy in nature.Highest dry matter accumulation, primary and secondary branches per plant, were recorded withNBeG 49 due tobetter utilization of moisture and nutrients from soil and improved characters as compared to other varieties which was significantly superior with NBeG 47and NBeG 3.

Among the phosphorus levels, the growth attributing characters *viz.,* plant height, number of primary and secondary branches per were significantly influenced by phosphorus levels. The significant increase for all these was observed at 50 kg P_2O_5 ha^{-1} which was found to be statistically at par with 75 kg P_2O_5 ha^{-1}.Highest drymatter accumulation was recorded at 75 kg P_2O_5 ha^{-1} due to the fact that phosphorus fertilization made the plants more efficient in photosynthetic activity resulting in increased dry matter accumulation.

Number of pods per plant was significantly superior with variety V_2 (NBeG 49) compared to V_1 (NBeG 47) and V_3 (NBeG 3) which were at par with each other. Similar results were observed by Shivakumar, (2001), Saini and Faroda, (1998).Maximum seed yield(908 kg ha^{-1}) and haulm yield (1963 kg ha^{-1}) was recorded with variety V_2 (NBeG 49) which was significantly superior over other two varieties V_1 (NBeG 47) and V_3 (NBeG 3). Lowest

Table 1: Growth and yield of chickpea as influenced by varieties and phosphorus levels

Treatments	Plant height (cm) At harvest	Drymatter accumulation (kg ha-1) At harvest	Primary branches per plant	Secondary branches per plant	No.of pods per plant	Seed Yield (kg ha^{-1})	Haulm yield (kg ha-1)
Varieties(V)							
NBeG 47(V_1)	59.2	2744	3.7	8.1	40.1	793	1850
NBeG 49(V_2)	52.9	2841	4.2	8.8	49.5	908	1963
NBeG 3(V_3)	50.3	2671	3.8	7.8	38.2	764	1802
SEm	0.78	7.14	0.11	0.2	1.49	31.4	29.69
CD (P=0.05)	2.3	21	0.34	0.6	4.4	92.3	87.5
Phosphoruslevels(kg P_2O_5 ha^{-1})							
P_0	50.1	2673	3.5	7.5	35.4	661	1690
P_{25}	52.8	2726	3.8	7.8	39.6	776	1816
P_{50}	56.5	2796	4.3	8.6	47.4	907	1924
P_{75}	57.2	2812	4.4	8.9	48.1	943	2010
SEm	0.9	8.2	0.13	0.24	1.73	36.31	34.29
CD (P=0.05)	2.6	24	0.4	0.7	5	106.5	100.6

seed yield (703 kg ha^{-1}) was observed in V_3. However V_1 and V_3 were at par with each other in case of haulm yield.

Regarding phosphorus levels, maximum seed yield was obtained with P_{75} (943 kg ha^{-1}) and was at par with P_{50} (907 kg ha^{-1}) and these were superior to phosphorus levels P_{25} and P_0.

Similar trend was observed in haulm yield and application of 75 kg P_2O_5 ha^{-1} did not bring significant increase in haulm yield over 50 kg P_2O_5 ha^{-1}. Both P_{75} and P_{50} were on par with each other and proved to be significantly superior over control and 25 kg P_2O_5 ha^{-1}. However interaction between varieties and phosphorus levels did not attain level of significance in response to all growth parameters, yield and yield attributing characters. Similar findings were reported by SudhirKulakarni *et al*., (2000) and Mustafa *et al.*, (2008).

CONCLUSION

It can be concluded that application of 50kg P_2O_5 ha^{-1} with NBeG 49 variety was best for Krishna Agro Climatic Zone of Andhra Pradesh compared to higher level of phosphorous and other varieties of chickpea tested.

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