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Response of Chickpea (*Cicer arietinum* L.) Varieties to Irrigation and Phosphrous Levels in Vertisols

S. Jaffar Basha*, V. Jayalakshmi, A. Trivikram Reddy, N. Kamakshi and S. Khayum Ahammed

Regional Agricultural Research Station, Acharya N.G.Ranga Agricultural University

Nandyal-51850, Kurnool District, Andhra Pradesh

*Corresponding Author E-mail: shaik.jaffarbasha@gmail.com

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ABSTRACT

A field experiment was undertaken at Regional Agriculture Research Station, Nandyal, Andhra Pradesh during rabi 2017-18 on vertisols to estimate of growth and yield parameters of chickpea varieties relative to irrigation and phosphorus levels under irrigated dry condition. The present investigation was carried out with two irrigation levels (without irrigation and with irrigation) as main plots, two varieties (NBeG 49 and NBeG 119) as sub plots and four phosphorus levels (0,25,50,75 kg/ha) as sub sub plots at plant geometry of (30 x 10 cm in split split plot design and replicated thrice. The soil of the experimental soil is Moderately alkaline (pH-8.3), non saline (EC-0.15 dSm^{-1}), Low in Nitrogen (113 kg/ha), medium in phosphorus (48.5 kg/ha) and high in potassium (366 kg/ha). Significantly Higher seed yield (1434 kg/ha) and net returns (Rs 37284/ha) was recorded with irrigation compared to without irrigation (1108 kg/ha and Rs 23552/ha). NBeG 49 recorded higher seed yield (1392 kg/ha) when compared to NBeG 119 (1150 kg/ha). Different Phosphorus levels did not influenced growth, yield parameters and seed yield.

Key words: *Chickpea, Irrigation, Varieties, Phosphorus, Seed yield*

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is an important pulse legume cultivated and consumed across the world. India is the largest producer and consumer of chickpea in the world. It is the major pulse crops of the subcontinent grown on an area of about 9.54 mha with a production of 9.08 mt and productivity of 951 kg ha^{-1} (http://www.dacnet.nic.in/ean.). Chickpea is cultivated in residual soil moisture and it is often subjected to water stress. Water stress adversely affects many aspects of plant growth, which ultimately reduce production and yield. Such reduction in yield depends on the intensity and duration of stress, and the stage of crop growth at which stress occurs. Thus chickpea varieties response to irrigation with optimum yield potential have to be identified and developed. P is the most limiting nutrient for the production of crops. It plays primary role in many of the physiological processes such as the utilization of sugar and starch, photosynthesis, energy storage and transfer.

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Legumes generally have higher P requirement because the process of symbiotic nitrogen (N) fixation consumes a lot of energy. Phosphorus is fascinating plant nutrient as it involved a wide range of plant processes from permitting cell division to the development of a good root system ensuring timely and uniform ripening of crop. Under the above circumstances, the present work was undertaken to study the effect of different irrigation and phosphorus levels on morpho-physiological characters of chickpea varieties under field conditions.

MATERIAL AND METHODS

The present investigation was carried out with two irrigation levels (without irrigation and with irrigation) as main plots, two varieties (NBeG 49 and NBeG 119) as sub plots and four phosphorus levels (0,25,50,75 kg/ha) as sub sub plots at plant geometry of (30 x 10 cm in split split plot design and replicated thrice during Rabi 2017-18 at Regional Agriculture Research Station, Nandyal (ANGRAU), Andhra Pradesh. The soil of the experimental soil is Moderately alkaline (pH-8.3), non saline (EC-0.15 dSm^{-1}), Low in Nitrogen (113 kg/ha), medium in phosphorus (48.5 kg/ha) and high in potassium (366 kg/ha). All the recommended package of practices was adopted to raise the crop. The experiment was sown on 21-10-17 and harvested on 23-01-18. One irrigation was given at pre flowering stage i.e. 28 DAS (18-11-17). Five randomly selected plants from each genotype in each replication were used for recording the observations. The data was recorded on soil moisture through gravimetric method and quantitative traits such as plant height (cm), number of branches, Days to 50 % flowering, number of pods $plant^{-1}$, test weight (g), seed yield(kg/ha), net returns and benefit cost ratio (BCR). The mean values of all the quantitative characters were subjected to statistical analysis by adopting Fisher's method of analysis of variance as outlined by Gomez and Gomez[4]. The level of significance used in 'F' test was at 5 per cent.

RESULT AND DISCUSSION

The analysis of variance was significant for quantitative traits due to irrigation levels and varieties. The data on soil moisture did not influenced by irrigation levels at 25 and 50 DAS. Significantly higher soil moisture (17.7 %) was observed with irrigation when compared to without irrigation (14.9 %) at 50 DAS (Table 1). Significantly higher plant height (37.6 cm), days to 50 % flowering (44.4 days), pods $plant^{-1}$ (30.3), test weight (34.2 gm), seed yield (1434 kg/ha), net returns (Rs 37284/ha) and BCR of 2.15 was observed with irrigation when compared to without irrigation (35.0 cm, 41.8 days, 24.9, 32.8 gm, 1108 kg/ha, Rs 23552/ha and BCR of 1.77 respectively). One irrigation increased the grain yield of chickpea by 29.4 per cent. The result is in confirmation with Palled *et al.*[8], where they reported that the number of branches $plant^{-1}$ increased due to irrigation (in Black gram). Significantly higher number of pods plant-1 and 100 seed weight with irrigation at pod development stage over irrigation at flowering and no irrigation might be due to better translocation of absorbed nutrients coupled with supply of soil moisture which coincided with peak pod and grain development stages[3]. The results indicated that number of pods $plant^{-1}$ increased with increasing soil water level. Reduced number of branches plant-1 might be due to inhibition of cell division/cell enlargement under water stress[6]. Significantly lower plant height (34.4 cm), higher days to 50 % flowering (44.5 days), pods $plant^{-1}$ (32.6), lower test weight (28.1 gm), higher seed yield (1392 kg/ha), net returns (Rs 30923/ha) and BCR of 2.01 was observed with desi variety NBeG 49. Significantly higher plant height (38.2 cm), lower days to 50 % flowering (41.7 days), pods $plant^{-1}$ (22.6), higher test weight (38.9 gm), lower seed yield (1150 kg/ha), net returns (Rs 29913/ha) and BCR of 1.90 was observed with kabuli variety NBeG 119. A wide range of variation was observed for all traits under study suggesting variability among the genotypes for these traits. Results of the present investigation are in conformity with Ramanappa *et al.*[10]. The estimates of variability revealed that genetic variability was significant among the genotypes under study.

The present findings were in accordance with Parameswarappa *et al.*[9], for plant height and days to fifty per cent flowering. Similar result was reported by Alkadev *et al.*[2], for 100 seed weight. The soaring variation for different qualitative and quantative traits in chickpea could help breeders to release better and superior lines and varieties Malik *et al.*[5], and Rozina and Hamayoon[11]. Different phosphorus levels did not influence growth, yield parameters and seed yield. Similar results were also reported by Nawange *et al.*[7], and Yadav *et al.*[12], in chickpea.

Table 1. Growth and yield parameters of chickpea varieties as influenced by irrigation and phosphorus levels

Treatments	Soil moisture (%)			Plant height (cm)	No of branches /plant	Days to 50 % flowering	Pods/ plant	Test weight (gm)	Seed yield (kg/ha)	Net returns (Rs)	BCR
	25 DAS	50 DAS	75 DAS								
Irrigation levels											
Without irrigation	22.9	14.9	14.2	35.0	9.8	41.8	24.9	32.8	1108	23552	1.77
With irrigation	22.2	17.7	15.8	37.6	11.9	44.4	30.3	34.2	1434	37284	2.15
CD (P=0.05)	NS	1.7	NS	0.7	NS	0.8	2.5	1.3	102		
Varieties											
NBeG 49 (Desi)	22.2	15.8	15.0	34.4	11.2	44.5	32.6	28.1	1392	30923	2.01
NBeG 119 (Kabuli)	22.9	16.9	15.0	38.2	10.5	41.7	22.6	38.9	1150	29913	1.90
CD (P=0.05)	NS	NS	NS	2.6	NS	1.4	1.0	1.8	143		
Phosphorus levels (kg/ha)											
P0	22.0	15.7	14.8	36.0	10.5	43.2	27.0	33.5	1246	31379	2.05
P25	22.6	16.1	14.9	36.3	10.1	43.0	28.0	33.9	1282	31722	2.01
P50	22.7	16.4	14.9	36.6	11.6	43.0	28.1	33.1	1284	30256	1.93
P75	23.1	17.1	15.4	36.2	11.2	43.2	27.4	33.5	1271	28314	1.84
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS		

CONCLUSION

From the above discussion it was concluded that, most of the morpho-physiological characters such as plant height, pods plant^{-1}, test weight, seed yield was enhanced significantly due to application of irrigation. Desi variety performed better than kabuli variety. No significant response to phosphorus was observed in vertisols.

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