

Effect of varieties and phosphorus levels on growth and Yield of chickpea (*Cicer arietinum* L.)

V.K. GULPADIYA, B.P. SINGH, D.S. CHHONKAR AND DINDAYAL GUPTA
Department of Agronomy, R.B.S. College, Bichpuri, Agra-283105

Abstract

A field experiment was conducted during the Rabi season of 2011-12 at R.B.S. College Agricultural Research Farm, Bichpuri, Agra in sandy loam soil, to study the effect of phosphorus levels on growth and Yield of chickpea. The three varieties (Haryana-1, BG-7 and PBG-7) and four levels of phosphorus (P_0 , P_{30} , P_{60} and P_{90}) were tested. Finding revealed that the highest growth parameters were recorded with the variety Haryana-1 and this was found significantly superior as compare to all other varieties. The maximum growth parameters were recorded with 90 kg P_2O_5 ha⁻¹ but this was found statistically at par with 60 kg P_2O_5 ha⁻¹. The total bio-mass, grain and straw yields were significantly higher obtained with the variety Haryana-1 but harvest index did not differ significantly. Total bio-mass, grain, straw yields as well as harvest index were increased significantly with every increase in the level of phosphorus up to 60 kg ha⁻¹. Although the maximum total bio-mass, grain, straw yields as well as harvest index were recorded with 90 kg P_2O_5 ha⁻¹ but these was found statistically at par 60 kg P_2O_5 ha⁻¹.

Key words: Bio-mass, grain, straw yields, harvest index, growth parameters

Introduction

Chickpea (*Cicer arietinum*) is the premier pulse crop of Indian subcontinent. It is a highly nutritious grain legume crop and one of the cheapest sources of protein. Many improved varieties have been developed in India but their performance varies in different regions. Critical evaluation and selection of the superior varieties with high yield potential and good quality for particular region is, therefore, always has a good promise. Phosphorus stimulates early root development, leaf size, tillering, flowering, grain yield and hastens maturity. It is a constituents of certain nucleic acids i.e. phospholipids, chromosomes and the coenzymes nicotinamide adenine dineucleotide (NAD), adenosine triphosphate (ATP) and nicotinamide adenine dineucleotide phosphate (NADP). Phosphorus is essential for cell division, seed and fruit development. (Masood Ali *et al.* 2010).

Materials and methods

The field experiment was conducted during Rabi season of 2011-12 at R.B.S. College Agricultural Research Farm, Bichpuri, Agra in sandy loam soil, to study the effect of varieties and phosphorus levels on growth and yield of chickpea (*Cicer arietinum* L.). Experiment was conducted in Factorial RBD design with three replications. The three varieties (Haryana-1, BG-7 and PBG-7) and four levels of phosphorus (P_0 , P_{30} , P_{60} , and P_{90}) were tested. The amount of fertilizers was calculated and applied on the basis of

amount of nitrogen and potash needed for per ha. @ 35 kg N and 30 kg K_2O as basal i.e. by urea and muriate of potash uniformly in all the plots and phosphorus through single super phosphate was added as per treatment.

Results and Discussion

Growth parameters

Effect of varieties

The data summarized in Table 1 revealed that growth parameters of chickpea (plant height, number of branches and dry matter accumulation) were significantly affected by the varieties. It is clear from the table that different varieties did not affect the plant stand significantly. The maximum plant height, number of branches (primary and secondary) and dry matter accumulation were recorded with the variety Haryana-1 and this was found significantly superior as compare to all other varieties. Similar results have been reported by Singh and Chaudhary (2006).

Effect of phosphorus

A close study of Table 1 revealed that growth parameters of chickpea were significantly affected by levels of phosphorus. Table 1 further indicated that application of levels of phosphorus did not show any significant impact on plant stand. The maximum plant height, number of branches and dry matter accumulation were recorded with 90 kg P_2O_5 ha⁻¹ (P_4) but this was found statistically at par P_3 (60 kg P_2O_5

Table 1: Growth parameters and yield of chickpea as affected by various treatments

Treatments	Growth parameters				Yields				
	Plant stand	Plant height (cm)	Branches Primary branches	Branches Secondary branches	Dry matter accumulation (g)	Biological yield (Kg ha ⁻¹)	Grain yield (Kg ha ⁻¹)	Straw yield (Kg ha ⁻¹)	Harvest index (%)
Varieties									
Haryana-1	8.96	44.12	4.28	9.07	14.22	33.42	10.18	23.24	30.46
BG-7	8.93	41.15	3.70	8.15	12.88	30.23	8.84	21.39	29.24
PBG-7	8.78	40.13	3.63	8.07	12.44	29.50	8.40	21.10	28.47
SEm±	0.24	0.94	0.08	0.21	0.34	0.93	0.33	0.60	0.73
CD (P=0.05)	NS	2.70	0.22	0.25	0.99	2.67	0.94	1.72	NS
Levels of phosphorus (Kg ha ⁻¹)									
0	8.70	36.37	2.92	7.13	9.56	24.36	6.45	17.91	26.48
30	8.83	40.78	3.72	8.21	12.68	30.38	9.22	21.16	30.35
60	9.00	44.30	4.40	9.17	15.20	34.03	10.02	24.01	29.44
90	9.03	45.85	4.44	9.21	15.28	35.43	10.87	24.56	30.68
SEm±	0.28	1.08	0.09	0.61	0.40	1.07	0.38	0.69	0.85
CD (P=0.05)	NS	3.10	0.25	0.71	1.14	3.08	1.08	1.99	2.43

ha⁻¹). Similar trend was noted by Singh *et al* (2010).
Yield

Effect of varieties

A close study of the Table 1 clearly indicated that the yield has been expressed in terms of total biomass, grain and straw (kg ha⁻¹) was significantly affected by different varieties. Maximum biological yield was recorded with the variety Haryana-1 and also was significantly higher by 10.55 and 13.29 per cent than that of BG-7 and PBG-7, respectively. Variety Haryana-1 produced significantly higher grain by 15.16 and 21.19 per cent than that of BG-7 and PBG-7, respectively. Maximum straw yield was obtained with the variety Haryana-1 which was significantly higher by 8.49 and 10.14 per cent than that of BG-7 and PBG-7, respectively. These results are in constituents with the findings of Bahadur *et al.* (2002). Table 1 further revealed that all varieties did not affect the harvest index significantly. However, the maximum harvest index was obtained with the variety Haryana-1.

Effect of phosphorus

The data expressed in Table 1 evinced that yields (total bio-mass, grain and straw (kg ha⁻¹) of chickpea was significantly affected due to the levels of phosphorus. Table 1 further indicated that total biomass, grain, straw yields as well as harvest index were increased significantly with every increase in the level of phosphorus up to 60 kg ha⁻¹. Although the maximum total bio-mass, grain, straw yields as well as harvest index were recorded with 90 kg P₂O₅ ha⁻¹ (P₄) but these was found statistically at par P₃ (60 kg P₂O₅ ha⁻¹).

This finding is in agreement with the findings of Kumar and Sharma (2005), and Islam *et al.* (2011).

References

- Ali, Abbas; Ali, Zulfiqar; Iqbal, Javed; Nadeem, M.A.; Akhtar, N.; Akram, H.M. and Sattar A. (2010). Impact of N and P on chickpea yield. *J. Agric. Res.*, 48(3): 221-225.
- Bahadur, M.M.; Ashrafuzzaman, M.; Kabir, M.K.; Chaudhary, M.F. and Majumdar, D.N.A. (2002). Response of chickpea varieties on different levels of phosphorus. *Crop Research*. 32 (2): 293-299.
- Islam, M.; Mohsan, S.; Ali, A.; Khalid, R.; fayyaz-ul-hassan A.; Mohmood, A. and Subhani, A. (2011). Growth, nitrogen fixation and nutrient uptake by chickpea in response to phosphorus and sulphur application under rain condition in Pakistan. *International Journal of Agriculture and Biology*.
- Kumar, J. and Sharma, M. (2005). Effect of phosphorus and molybdenum on yield and nutrient uptake by chickpea. *Advances in Plant Sciences*. 18 (2): 869-873.
- Singh, Y.P. and Chaudhary, Smita (2006). Response of varieties to sources of phosphorus and irrigation schedule on growth, quality, yield sulphur uptake and water use by chickpea. *Research on crop*. 7 (1): 84-87.
- Singh, K.K.; Shrinivasarao, C. and Masood, Ali (2010). Root, growth nodulation, grain yield and phosphorus use efficiency of chickpea as influenced by phosphorus, irrigation and inoculation. *Communication in Soil Science and Plant Analysis*. 36(13/14): 1919-1929.