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Effect of phosphorus level and nipping operation on yield potential Chickpea (*Cicer arietinum* L.)

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Abstract

Results of a field experiment entitled “Effect of chickpea (*Cicer arietinum* L.) to phosphorus level and nipping operation” was carried out Research farm of the department of Agronomy, School of Agriculture Science, Technology & Research, Sardar Patel University, Balaghat (M.P.) during Rabi season of 2022-23. Twelve treatments comprised of combination of four phosphorus levels and three nipping operations were tried in a Factorial Randomized Block Design with three replications. The observation such as Effect of level of phosphorous and nipping operation on plant height, Number of branches per plant, Number of root nodules per plant, Fresh weight of plant, Dry weight of plant, Days taken to 50% of flowering at 30,60 and 90 DAS. Effect of level of phosphorous and nipping operation on yield attributing characters and yield of chickpea i.e. Number of pods per plant, Number of seed per plants, Test weight, seed yield per plant, Seed yield per plot, Seed yield per hectare, Stover yield per hectare, Harvest index. Effect of level of phosphorous and nipping operation on quality character of chickpea i.e. Protein content. The data pertaining to economic analysis of the treatment in term of cost of cultivation, Gross monetary return (GMR), Net monetary return (NMR) and benefit cost ratio (B:C) ratio. It was revealed from the FRBD experimentation that found significantly superior values of plant growth characters viz., plant height (58.09 cm at 90 DAS), number of branches per plant (10.00 at 90 DAS), number of root nodules per plant at 45 DAS (18.13), fresh weight of plant at 45 DAS (16.32 g) as well as dry weight of plant (9.38 g) were recording under treatment combinations of phosphorus @ 60 kg/ha with nipping operation at 40 DAS. The maximum values of yield attributing features, namely, number of pods per plant (45.60), number of seeds per pod (2.77) and test weight (133.06g), were recorded. The application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS recorded significantly higher protein content in seed 21.21%.

Keywords: *Cicer arietinum*, photostatic fertilizers, fresh weight, dry weight, nipping operation, growth parameter

Introduction

India is one of the few nations that can cultivate the majority of the world's major pulses. Furthermore, a significant portion of the Indian population is vegetarian and pulses play a major role in their diet is also providing roughly 30% of the daily intake for protein. The reason India is focusing on improving pulses is because they provide a unique nutrient excellent source of protein is chickpeas. In addition to being high in phosphorus, calcium, iron, niacin, vitamin C (in green stage), and vitamin B1, it also has 18–22% protein, 62% carbs and 4% fat. All necessary amino acids apart from those containing sulfur are present in high concentrations in chickpeas. It has therapeutic properties for intestinal and blood purification due to the presence of malic and oxalic acid. In addition to providing a plentiful source of protein, it is critical for sustainable agriculture. Since gram is a leguminous crop, a sizable amount of its nitrogen needs can be satisfied by fixing atmospheric nitrogen. Phosphorus and nitrogen are also required for the highest possible crop yield and quality ripening of crops. It is needed by most young, faster-growing tissues and performs several functions related to development and growth it is a constituent of ADP and ATP, two of the most important substances in life processes. Among the nutrients, phosphorus deficiency is considered to be a major cause for low pulse yield and responses to phosphorus application by the temperatures, humidity, illnesses, insects and poor crop management are all contributing factors to the decline in chickpea production. Nipping in chickpeas is one of the most important

agronomic strategies for raising yield and productivity-boosting variables. Nipping means the removal of top shoot (apical meristem) of a plant to induce branching on the plant at the remaining nodes (Khan, 1993). Nipping at various stages tended to enhance number of branches and number of pods that in turn boost chickpea yield (Aziz, 2002) ^[1]. Chaube and Pundhir (2005) reported that chickpea nipping after 45 days after sowing increased yield as well as controlled disease severity. The nipping is known to accumulate more photosynthates which are utilized for development of higher number of pod (Singh and Devi, 2006). One nipping at 30 to 45 DAS recorded higher number of pods plant⁻¹ compared to no nipping (Sonboir *et al.*, 2017 and Sujatha *et al.* 2016). Nipping results in an increase of productive branches, pods plant⁻¹ and grain yield. Considering the significant role of phosphorus and nipping practices in the production of chickpeas and also given very little work done on this aspect, it was thought imperative to undertake the present investigation entitled "Effect of phosphorus level and nipping operation on yield potential of Chickpea (*Cicer arietinum* L.)" to the following objective:

1. To assess the effect of phosphorus level on the growth, yield, and quality of chickpea.
2. To assess the effect of nipping operation on growth, yield and quality of chickpea.
3. To investigate the interactive effect of phosphorus and nipping operation on the growth, yield and quality of chickpea.
4. To work out the economic feasibility of the treatments

Materials and Methods

The effect of phosphorus level and nipping operations on growth and yield of chickpea variety i.e. JG-14 were investigated in the present experiment was conducted during the *rabi* season of 2022-23 at the Research farm of the Department of Agronomy, School of Agriculture Science, Technology & Research, Sardar Patel University, Balaghat (M.P). Balaghat is the district of Madhya Pradesh is located at 24°58' N latitude and 80°82'E longitude and at an altitude of 329 m above mean sea level. Based on agro-climatic division Balaghat is situated in the seven agro-climatic regions of India i.e. Eastern Plateau and the hills Region. The experiment was laid out in three replicated Factorial Randomized Block Design with plot size of 5.0 m x 3.5 m.sq with the spacing of 30.0 x 10.0 cm. In this experiment we used the chickpea variety JG-14. It was released by Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur (M.P.). It has brown, medium bold seed High yielding Normal sown: 22-25 q/ha Late sown (18-19 q/ha). It is an early maturity variety that usually matures in 100-105 days. it is recommended under late-sown condition. The experimental field was prepared, after the harvest of the preceding crop by ploughing with a disc plough and then harrowing by tractor-drawn plough/ harrow followed by planking to obtain the desired tilth for proper germination and establishment of plant stand, after pre-sowing irrigation. The sowing of chickpea JG-14 was done on 19th October, 2022 in rows (furrows) 30 cm apart. A seed rate of 80 kg/ha was taken to maintain the required optimum plant population. The seed were sowing manually by hand drilling at about 5 cm deep in furrows. Phosphorus was applied as per the treatments through single super phosphate at the time of sowing. Due to treatment adjustment a common dose of 25 kg/ ha applying to all treatments including control as basal application. Fertilizers were applied by placement i.e., 5 cm away from seed row and of 5 cm below the seed zone. Vermicompost was applied just before sowing. The Recommended agronomic

practices were followed throughout experiment for raising the crop. Three irrigations were given at the time of sowing, 55 and 75 days during the crop period. No disease and pest attack were observed during the life span of crop. A slight infestation of pod borer was observed during January. It was controlled by spraying of Triazophos 40 EC insecticide @ 2 ml per liter of water. The crop was harvested manually with the local name of hansiya (Sickal).

Observations and Parameters Measured

Data collection focused on evaluating the crop's performance at various stages and at harvest across five main categories:

1. **Growth Parameters:** Plant height (cm), number of leaves per plant, number of branches per plant (at 30, 60 and 90 Days after Sowing (DAS)), and root length (cm).
2. **Yield Attributes:** Number of pods per plant, number of seeds per pod, and 1000-grain weight (test weight in g).
3. **Yield Parameters:** Seed yield per plant (g), seed yield per plot (kg), seed yield per hectare (q/ha), stover yield per hectare (q/ha) and harvest index (%).
4. **Quality Parameter:** Oil content (%) of the seeds.
5. **Economics:** Cost of cultivation (₹/ha), Gross Monetary Return (₹/ha), Net Monetary Return (NMR) (₹/ha) and Benefit: Cost (B: C) ratio.

Statistical Analysis

The collected data for all parameters were subjected to the Analysis of Variance (ANOVA) technique, following the methodology appropriate for the Factorial Randomized Block Design. The significance of the mean differences was tested using the Critical Difference (C.D.) at a 5% probability level ($p=0.05$).

Results and Discussion

The application of different levels of phosphorous fertilizers and their interactions with nipping operations, significantly influenced all measured parameters: plant height, Number of branches, Number of root nodules, Fresh weight, Dry weight, Number of pods per plants, Test weight, Seed yield, Stover yield, Harvest index, Protein content and economic viability. The results are presented below, with the discussion on the underlying mechanisms integrated into each section

1) Effect of phosphorous levels and nipping operation on Growth characters of chickpea

The increasing levels of phosphorus significantly increased the plant height, number of branches at different stages viz., 30,60 and 90 DAS and at harvest, the fresh and dry weight of the plant at 45 DAS increased significantly up to 60 kg P₂O₅/ha. This might be due to as phosphorus is a fascinating plant nutrient as it involves 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. It is needed by most by young, fast-growing tissues and performs several functions related to development and growth. It is a constituent of ADP and ATP, two of the most important substances in life processes. Similar findings were also reported by Shivakumar *et al.* (2001) in green gram, Nawange *et al.* (2011) ^[3], Neenu *et al.* (2014) ^[4], Hussena *et al.* (2015) ^[2] in chickpea, Yadav *et al.* (2016) ^[5] in chickpea.

A) Plant height

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at

40 DAS (T_8 , P3D2) produced significantly highest plant height (53.09cm) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T_{12} , P3D3, 52.52 cm) as compared to all the remaining treatment combinations. The lowest plant height (46.11 cm) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T_1 , P0D1) treatment combination.

B) Plant height at harvest

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T_8 , P3D2) produced significantly highest plant height (58.09 cm) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T_{12} , P3D3, 57.52 cm) as compared to all the remaining treatment combinations. The lowest plant height (51.11 cm) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T_1 , P0D1) treatment combination.

C) Number of branches per plant

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T_8 , P3D2) produced significantly highest number of branches per plant (10.00) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T_{12} , P3D3, 9.67) as compared to all the remaining treatment combinations. The lowest number of branches per plant (6.80) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T_1 , P0D1) treatment combination.

D) Number of root nodules per plant

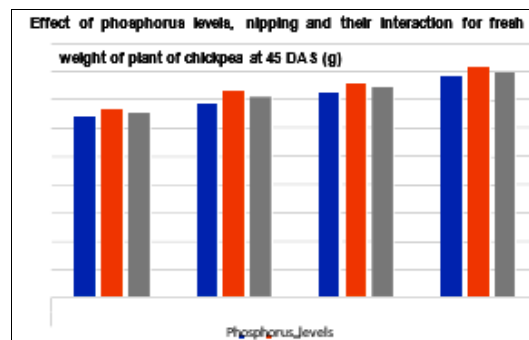
The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T_8 , P3D2) produced significantly highest root nodules per plant (18.13) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T_{12} , P3D3, 17.27) as compared to all the remaining treatment combinations. The lowest root nodules per plant (6.80) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T_1 , P0D1) treatment combination.

E) Fresh weight

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T_8 , P3D2) produced significantly highest fresh weight of plant (16.32 g) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T_{12} , P3D3, 15.94 g) as compared to all the remaining treatment combinations. The lowest fresh weight of plant (12.79 g) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T_1 , P0D1) treatment combination.

Nitrogen level	Phosphorus levels (kg/ha)				
	P1 (0)	P2 (40)	P3 (50)	P4 (60)	Mean
D1 (30 DAS)	12.79	13.72	14.43	15.62	14.14
D2 (40 DAS)	13.33	14.57	15.12	16.32	14.83
D3 (50 DAS)	13.02	14.15	14.83	15.94	14.48
Mean	13.04	14.14	14.79	15.96	

	S.E.m $\pm$	C.D. (p= 0.05)
Phosphorus levels (P)	0.009	0.027
Nipping (D)	0.008	0.024
Interaction (P x D)	0.016	0.047

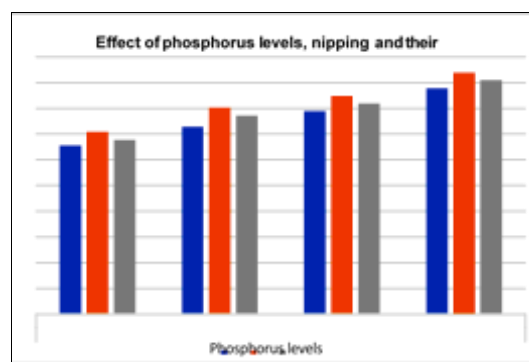


F) Dry weight

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T_8 , P3D2) produced significantly highest dry weight of plant (9.38 g) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T_{12} , P3D3, 9.10 g) as compared to all the remaining treatment combinations. The lowest dry weight of plant (6.55 g) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T_1 , P0D1) treatment combination.

Nitrogen levels	Phosphorus levels (kg/ha)				
	P1 (0)	P2 (40)	P3 (50)	P4 (60)	Mean
D1 (30 DAS)	6.55	7.28	7.89	8.78	7.63
D2 (40 DAS)	7.09	8.03	8.48	9.38	8.24
D3 (50 DAS)	6.78	7.71	8.19	9.10	7.94
Mean	6.80	7.67	8.19	9.09	

	S.E.m $\pm$	C.D. (p= 0.05)
Phosphorus levels (P)	0.008	0.025
Nipping (D)	0.007	0.022
Interaction (P x D)	0.015	0.043



G) Days taken to 50% of flowering

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T_8 , P3D2) produced significantly minimum days taken to 50% flowering (63.67) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T_{12} , P3D3, 64.33) as compared to all the remaining treatment combinations. The maximum days taken to 50% flowering (69.00) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T_1 , P0D1) treatment combination.

1. Effect of phosphorous levels and nipping operation on yield attributing character of chickpea

The yield attributes and yield viz., number of pods per plant, number of seeds per pod, harvest index, seed yield, stover yield and biological yield, all these parameters are significantly influenced by various levels of phosphorus. Application of 60 kg

P2O5/ha recorded significantly the highest values for these yield attributes and yield. Similar results were also reported by Thiyageshwari and Perumal (2000) in blackgram, Singh *et al.* (2008) in blackgram, Nawangeet *al.* (2011) ^[3] in chickpea, Parmar *et al.* (2014) in kharif green gram, Kadam and Khanvilkar, (2015) in summer green gram, Kadam and Khanvilkar (2015) in green gram, Yadav *et al.* (2016) ^[5] in chickpea.

A) Number of pods per plant

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T₈, P3D2) produced significantly highest number of pods per plant (45.60) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T₁₂, P3D3, 44.67) as compared to all the remaining treatment combinations.

B) Number of seeds per pod

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T₈, P3D2) produced significantly highest number of seeds per pod (2.77) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T₁₂, P3D3, 2.53) as compared to all the remaining treatment combinations. The lowest number of seeds per pod (1.10) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T₁, P0D1) treatment combination.

C) Test weight (g)

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T₈, P3D2) produced significantly highest test weight (133.06 g) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T₁₂, P3D3, 131.74 g) as compared to all the remaining treatment combinations. The lowest test weight (117.00 g) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T₁, P0D1) treatment combination.

D) Seed yield per plant (g)

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T₈, P3D2) produced significantly highest seed yield per plant (14.07 g) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T₁₂, P3D3, 13.40 g) as compared to all the remaining treatment combinations. The lowest seed yield per plant (8.40 g) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T₁, P0D1) treatment combination.

E) Seed yield per plot (kg)

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T₈, P3D2) produced significantly highest seed yield per plot (2.91 kg) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T₁₂, P3D3, 2.81 kg) as compared to all the remaining treatment combinations. The lowest seed yield per plot (2.35 kg) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T₁, P0D1) treatment combination.

F) Seed yield per hectare (q/ha)

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T₈,

P3D2) produced significantly highest seed yield per hectare (19.40 q/ha) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T₁₂, P3D3, 18.75 q/ha) as compared to all the remaining treatment combinations. The lowest seed yield per hectare (15.67 q/ha) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T₁, P0D1) treatment combination.

G) Stover yield per hectare (q/ha)

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T₈, P3D2) produced significantly highest Stover yield per hectare (26.34 q/ha) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T₁₂, P3D3, 25.67 q/ha) as compared to all the remaining treatment combinations. The lowest Stover yield per hectare (24.66 q/ha) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T₁, P0D1) treatment combination.

H) Harvest index (%)

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T₈, P3D2) produced significantly highest harvest index (42.41%) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T₁₂, P3D3, 42.21%) as compared to all the remaining treatment combinations. The lowest harvest index (38.85%) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T₁, P0D1) treatment combination.

Effect of phosphorous levels and nipping operation on Quality character of chickpea

A) Protein content (%)

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T₈, P3D2) produced significantly highest protein content (21.21%) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T₁₂, P3D3, 20.94%) as compared to all the remaining treatment combinations. The lowest protein content (19.13%) was noticed under without application of phosphorus @ 0 kg/ha with nipping operation at 30 DAS (T₁, P0D1) treatment combination.

Economic analysis of the treatments

The economic viability of the treatments was assessed using Gross Monetary Return (GMR), Net Monetary Return (NMR), and the Benefit: Cost (B:C) ratio.

Net monetary return (Rs/ha) and GROSS MONETARY RETURN (Rs/ha)

Nitrogen levels	Phosphorus levels (kg/ha)				
	P1 (0)	P2 (40)	P3 (50)	P4 (60)	Mean
D1 (30 DAS)	61506.00	64568.50	67245.38	71022.25	66085.53
D2 (40 DAS)	64971.00	68698.50	69325.38	76412.25	69851.78
D3 (50 DAS)	63041.00	66993.50	69580.38	73152.25	68191.78
Mean	63172.67	66753.50	68717.04	73528.92	

The interaction P4D2 achieved the maximum NMR of ₹76412.25/ha.

Return per rupee invested (B: C ratio)

The treatment combination consisting of application of phosphorus @ 60 kg/ha with nipping operation at 40 DAS (T₈,

P3D2) produced significantly maximum B: C ratio (3.18:1) followed by application of phosphorus @ 60 kg/ha with nipping operation at 50 DAS (T₁₂, P3D3, 3.04:1) as compared to all the remaining treatment combinations. The minimum B: C ratio (2.79:1) was noticed under application of phosphorus @ 40 kg/ha with nipping operation at 30 DAS (T₂, P1D1) treatment combination.

Conclusion

After going through the findings of the present study, it was concluded that sowing of chickpea crops with the application of phosphorus @ 60 kg/ha gave the highest seed yield and benefit-cost ratio. Nipping operation at 40 DAS recorded the highest seed yield and benefit-cost ratio. Sowing of chickpea variety with the application of phosphorus @ 65 kg/ha with nipping operation at 40 DAS was found to be the best for growth and yield attributing characters as well as seed yield and benefit-cost ratio.

References

1. Aziz MA. Response of chickpea to nipping. J Sci Ind Res. 2002;43(3):191-3.
2. Hussen S, Yirga F, Tibebe F. Effect of phosphorus fertilizer on yield and yield components of chickpea. Int J Agric Ext Rural Dev Stud. 2015;1(1):29-35.
3. Nawange DD, Yadav AS, Singh RV. Effect of phosphorus and Sulphur fertilization on growth and yield attributes and yield of chickpea (*Cicer arietinum* L.). Legume Res. 2011;34(1):48-50.
4. Neenu S, Ramesh K, Ramana S, Biswas AK, Subba Rao A. Growth and yield of different varieties of Chickpea (*Cicer arietinum* L.) as influenced by the phosphorus nutrition under rainfed conditions on Vertisols. Int J Bio- Resource Stress Manage. 2014;5(1):053-7.
5. Yadav SL, Verma A, Nepalia N. Effect of Phosphorus, Sulphur and Seaweed Sap on Growth, Yield and Nutrient Uptake of Chickpea (*Cicer arietinum* L.). Res Crops. 2016;17(3):496-502.