

REPORT ON

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“ Effect of Inter–row Spacing and different level of Phosphorus on Growth and Yield of Chickpea (*Cicer arietinum* L.)”

Submitted To

Department of Agronomy

School of Agriculture

Lovely Professional University

Punjab (India) 144411



LOVELY
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CERTIFICATE

This is to certify that this synopsis entitled “ **Effect of Interrow Spacing and Different level of Phosphorus on Growth and Yield of Chickpea (*Cicer arietinum L.*)**” submitted in partial fulfilment of requirements for degree- Master of Science in Agronomy by **Aditya Raj Inaniya, Registration no.11719175** to Department of Agronomy, School of Agriculture, Lovely Professional University, has been formulated and finalized by the student himself on the subject.

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DECLARATION

I hereby declare that the project work entitled –“**Effect of Inter-row Spacing and different level of Phosphorus on Growth and Yield of Chickpea (*Cicer arietinum* L.)**” is an authentic record of my work carried at Lovely Professional University as requirements of Project Work for the award of degree – Master of Science in Agronomy, under the guidance of **Dr Poonam Pandurang Shete Assistant Professor**, School of Agriculture, Lovely Professional University, Phagwara, Punjab, India.

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Introduction

Chickpea (*Cicer arietinum* L.) is an important and popular nutritive pulse crop in India. Chickpea is an important pulse crop growing all over the country in *rabi* season. In India it is grown on an area about 7710 thousand hectares with the annual production of 5600 thousand tones and average yield of 726 kg ha⁻¹. Madhya Pradesh is the largest producer of chickpea, which covers 2561 thousand hectares area with the total annual production of 2371 thousand tones with an average production of 927 kg ha⁻¹.

Chickpea contributes 47 % of the total pulse production and about 40% of total pulse growing area in the country. Chickpea being a leguminous crop improves soil fertility by fixing atmospheric nitrogen up to 99 kg ha⁻¹ in an available form (NH₃ and NH₄) in the root through the phenomena of symbiosis. Looking to the decrease in available nitrogen content in soil and fulfil initial requirement of the plants nitrogen is required and it is supplied through fertilizer.

Phosphorus is one of the most important major nutrient of plant and Kabuli chickpea also responds significantly to phosphorus application. Phosphorus contributes directly to both the yield and quantity of chickpea. And plays an important role in physiological function of the plant. Potassium and sulphur are also required for higher yield of chickpea. Plant density is one of the important characters, which can be manipulated to obtain the maximum production from per unit land area. The optimum plant density with proper geometry of planting is depending on variety, its growth habit and agro climatic condition. The seed yield of chickpea is highly dependent on plant population (Goyal *et al.* 2010).

Research contribution regarding development of desi varieties was enough until last decades. The research on cultivar development of Kabuli chickpea is, however, meagre. Kabuli chickpea receives better price in the market because of special demand of standard khetras for the preparation of attractive and delicious dishes like chana–masala and chana bhatora. Because of its special feature and great demand, there was an urgent need to developed high yielding, bold types of Kabuli Chickpea. The efforts are therefore, made to develop a kabuli chickpea variety and its optimum plant population.

The area under cultivation of Kabuli Chickpea is increasing recently and no work on the agronomic aspect of chickpea has been done. Consequently, it is difficult to recommend

better agronomic practices for higher yield. The agronomic practices *viz.*, row to row spacing, plant to plant spacing and use of different varieties could increase the yield. Among all the factors row to row and plant to plant spacing is an important factor contributing to higher yield. It was felt necessary to study the growth and yield of different varieties of Kabuli type chickpea with different spacing. Spacing (30 x 10cm, 30 x 15cm, 45 x 10cm and 45 x 15 cm) were tried.

The soil of experimental field was clayey with low availability of nitrogen, medium in available phosphorus and high in available potassium. The recommended dose of fertilizer was applied (25: 50: 0 NPK kg ha⁻¹) as basal at the time of sowing. The seed of all varieties treated with *Rhizobium* strain before sowing. Other agronomical operation were carried out as per recommendation. The growth, yield attributes and yield were recorded at the time of harvest of crop (Bavalgave *et al.*).

Phosphorus is known to play beneficial role in legume grown by promoting extensive root development and nodulation. Phosphate dissolving micro organisms has capacity to render insoluble forms of phosphorus more available to plant, besides, metabolic products of soil microbes such as organic acids and humic substance from complexes with Fe and Al compounds thereby reducing further fixation. Phosphorus is essential for the general health and vigorous all in plant some specific factor that have been associated to phosphorus are root development increasing stack and more stem strength, improve flower formation and seed production more uniform and earlier crop maturity increase nitrogen fixing capacity of legumes, improve in crop quality and resistant to plant disease (Patel *et al.*).

OBJECTIVES

- To find out the effect of inter-row spacing on growth and yield of Chickpea.
- To find out the effect of different phosphorus level on growth and yield of Chickpea.
- To find out the economics of different treatments.

REVIEW OF LITERATURE

Bavalgave et al. (2009) reported that, the maximum seed yield (1681 kg ha⁻¹) was obtained by sowing the chickpea crop at 30 x 10 cm spacing and it was found significantly superior over rest of the spacing. The second highest position in seed yield of chickpea was acquired by sowing of the chickpea at 30 x 15 cm (1413 kg ha⁻¹) and it was found significantly higher over 45 x 15 cm spacing. The significantly lowest seed yield of chickpea (1260 kg ha⁻¹) was observed at wider spacing (45 x 15 cm). Through number of pods per plant was found maximum, but it could not compensate the yield loss because of less population. These results are in agreement with the results reported by Shaikh and Mungse (1998) and Trivedi and Vyas (2000). From the above data it is concluded that sowing of chickpea variety Virat with spacing 30 x 10 cm can obtain the higher grain yield of chickpea.

Goyal et al. (2010) reported that at higher plant density of 33 plants/m² with 30 cm rows resulted in significantly higher grain and straw yield over 22 plants/m² with 45 cm row spacing. The data on growth (except plant height) and yield attributes such as pods /plant and grain yield/plant increased in wider row spacing (45cm) having lower plant densities 22 plants/m² because of the less competition for nutrient, water and solar radiation etc. The study shows that application of 30 kg N + 60 kg P₂O₅ + 30 kg K₂O +20 kg S ha⁻¹ and 33 plants/cm (30 cm row) was optimum for Kabuli chickpea under agro climatic condition in vindhyan pleatu of Madhya Pradesh.

D.D. Nawange et al. (2011) reported that, Phosphorus had significant influence on growth characters, yield attributing traits, seed and stalk yield. The grain and straw yield increased with increasing dose of P₂O₅ up to 60 kg ha⁻¹. 60 kg P₂O₅ ha⁻¹ produced significantly higher seed yield (1761 kg ha⁻¹) and stalk yield (2754 kg ha⁻¹) as compared to control and other treatments. The increase in seed and stalk yield of chickpea with increased level of P₂O₅ may be attributed to better vegetative growth as observed by more plant height, branches and efficient nodulation and increased yield attributes (pods plant⁻¹ and seed yield plant⁻¹) resulted in higher seed and stalk yield. Mahajan et al .(1985) also reported such increase in seed and straw.

Patel *et al.* (2013) reported that, application of phosphorus management treatment found significant effect on N, P and S content in grain of chickpea. Application of 25 kg P₂O₅ ha⁻¹ + PSB (P₃) recorded significantly highest N and P content, while in case of sulphur content it was remain at par with application of 25 kg P₂O₅ ha⁻¹ (P₂). This was due to adequate application of phosphorus to the crop might have induced increased root growth and nodulation resulting in increased absorption and availability of N, P and S upper soil layer. Phosphorus management treatment had also significantly influenced on protein content in grain. The effect was similar to that of N content in grain. Increasing protein content in respective treatment was mainly on account of significantly increase in N content and also more absorption of sulphur by chickpea grain. Since, both nutrients are closely linked with protein metabolism and their relationship is synergistic.

Suthar *et al.* (2013) reported that, application of 25 kg P₂O₅ ha⁻¹ + PSB (P₃) recorded significantly higher plant height at 25 DAS and at harvest, number of branches plant⁻¹, number of nodules plant⁻¹ and number of pods plant⁻¹. While, treatment P₂ (25 kg P₂O₅ ha⁻¹) recorded significantly higher plant height at 50 DAS. It might be due to crop phosphobacteria dissolved insoluble P in soil, making it available to crop plants for profuse root and vegetative growth and growth promoting substances.

MATERIALS AND METHODS

Research Topic : “ Effect of Spacing and different level of Phosphorus on Growth and Yield of Chickpea (*Cicer arietinum* L.)”.

Location: Experiment will be conducted at the Agricultural Farm of Lovely Professional University, Phagwara situated geographically at 31⁰14'48. 0"N 75⁰41'45 .0"E and 252 m above sea level. It falls under central plain zone of agro climatic zones of India.

Experimental details:

A. Plot treatments:

T₁: 20 cm + 25kg Phosphorus ha⁻¹

T₂: 30 cm + 25 kg Phosphorus ha⁻¹

T₃: 40 cm + 25 kg Phosphorus ha⁻¹

T₄: 20 cm + 40 kg Phosphorus ha⁻¹

T₅: 30 cm + 40 kg Phosphorus ha⁻¹

T₆: 40 cm + 40 kg Phosphorus ha⁻¹

T₇: 20 cm + 55 kg Phosphorus ha⁻¹

T₈: 30 cm + 55 kg Phosphorus ha⁻¹

T₉: 40 cm + 55 kg Phosphorus ha⁻¹

T₁₀: 20 cm + 70 kg Phosphorus ha⁻¹

T₁₁: 30 cm + 70 kg Phosphorus ha⁻¹

T₁₂: 40 cm + 70 kg Phosphorus ha⁻¹

Layout:

		R1	R2			R3
MAIN IRRIGATION CHANNEL						
L E N N A H C N O I T A G I R R I B U S		T ₄ R ₁	T ₈ R ₂			T ₁ R ₃
		T ₁₁ R ₁	T ₂ R ₂			T ₅ R ₃
		T ₅ R ₁	T ₇ R ₂			T ₁₀ R ₃
		T ₈ R ₁	T ₃ R ₂			T ₁₁ R ₃
		T ₃ R ₁	T ₁ R ₂			T ₆ R ₃
		T ₆ R ₁	T ₁₂ R ₂			T ₉ R ₃
		T ₂ R ₁	T ₅ R ₂			T ₇ R ₃
		T ₁₂ R ₁	T ₁₀ R ₂			T ₄ R ₃
		T ₁₀ R ₁	T ₆ R ₂			T ₂ R ₃
		T ₉ R ₁	T ₄ R ₂			T ₈ R ₃
		T ₇ R ₁	T ₁₁ R ₂			T ₁₂ R ₃
		T ₁ R ₁	T ₉ R ₂			T ₃ R ₃
				L E N N A H C N O I T A G I R R I B U S		

Details of Layout:

- | | | |
|----------------------------|---|--------------------------------|
| 1. Design | : | RBD (Randomized Block Design) |
| 2. No. of Treatments | : | 12 |
| 3. No. of Replication | : | 3 |
| 4. Total no. of Plots | : | 36 |
| 5. Gross plot size | : | 480 m ² |
| 6. Main Irrigation Channel | : | 1 |
| 7. Sub Irrigation Channel | : | 2 |
| 8. Total length of plot | : | 40m |
| 9. Total width of plot | : | 12m |

OBSERVATION TO BE RECORDED

1. Pre – harvest observations (at 20, 40, 60, 80 & 100 DAS)
 1. Plant height (cm)
 2. Plant dry weight (g)
 3. Number of branches plant⁻¹
 4. CGR (g m²day⁻¹)
 5. RGR(g g⁻¹day⁻¹)
2. Post – harvest observations:
 1. Number of grains Pod⁻¹
 2. Number of pods plant⁻¹
 3. Test weight (gm)
 4. Grain yield (kg ha⁻¹)
 5. Harvest index (%)

EXPECTED OUTCOMES

The experiment will be conducted at the Lovely Professional University, School of Agriculture, near experimental farm of Phagwara, Punjab. By the use of a better spacing, it is expected that they will enhance the growth and yield of chickpea. Use of different inter row spacing will affect not only the economics of chickpea but also the yield and agronomic practices of chickpea crop.

PROPOSED WORK WITH TIMELINE

1. Time of Sowing : Second fortnight of November
2. Spacing:
 - i. 20cm
 - ii. 30cm
 - iii.40cm

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