



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
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www.agronomyjournals.com
2024; 7(7): 564-566
Received: 09-04-2024
Accepted: 19-05-2024

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Influence of RDF and seed priming with bio-fertilizers on growth and yield attributes of chickpea (*Cicer arietinum* L.)

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DOI: <https://doi.org/10.33545/2618060X.2024.v7.i7g.1092>

Abstract

The present study was carried out during *Rabi* 2023 at Crop Research Farm, Department of Agriculture, Ideal college of Arts and Sciences, Vidyut nagar, Kakinada, Andhra Pradesh entitled Influence of RDF and seed priming with Bio-fertilizers on growth and yield attributes of Chickpea (*Cicer arietinum* L.). The experiment was laid out in Randomized Block Design with ten treatments which are replicated thrice on the basis of one year experimentation. The treatments consisted of 3 levels of RDF (60%, 80%, 100% kg/ha), and Bio-fertilizers (Rhizobium 50 g, PSB 30 g, Azotobacter 30 g/ seed) and a control. Application of Nitrogen (100 kg/ha) + Phosphorus 80 kg/ha (Treatment 9) recorded maximum Plant height (67.42 cm), Dry weight (32.47 g) per plant, Number of pods per plant (27.00), Number of seeds per pod (2.10), seed index (34.00 g).

Keywords: Azotobacter, Chickpea, bio-fertilizers, nitrogen, phosphorus, potassium

Introduction

The importance of pulses is crucial, and they hold a special place in Indian agriculture. It offers a diet high in protein to the nation's vegetarian majority. Leguminosae is the family to which the chickpea (*Cicer arietinum* L.) belongs. It is often referred to as Bengal gram, gram, and the king of pulses. During the *Rabi* (winter) season, it is mostly grown as a rain-fed crop using stored soil moisture from the previous monsoon [Singh 2011]. Desi chickpea (chromosome number $2n = 14, 16$) and Kabuli chickpea (chromosome number $2n = 16$) are the two types of chickpea.

“The importance of bio-fertilizers, which provide the macro and micronutrients required for plant growth, is also well acknowledged. By preserving soil fertility, soil physical qualities, ecological balance, and providing stability to the production without contaminating soil, water, or air, bio-fertilizers also help to establish a sustainable agriculture system. Crop productivity and nutrient use efficiency are increased when bio-fertilizers are used in conjunction with chemical fertilizers, organic manures, and crop wastes” [Mahajan 2003] [4]. The efficient use of fertilizers is greatly improved by the use of bio-fertilizers.

Rhizobium-inoculated pulse seeds are seeded in such soils, which boosts the rhizosphere's population. Rhizobium and pulse plants work together to increase soil fertility. Living microorganisms are present in bio-fertilizers, which improve soil biochemistry and reduce pathogens. Rhizobium is special because it is the only nitrogen-fixing bacterium that coexists symbiotically with legumes. Rhizobium inoculation may increase the production of leguminous crops grown on dry soil [Abdelgani 2003] [1]. “The number of nodules and dry weight of the chickpea shoots, roots, and nodules were considerably increased after Rhizobium multi strain inoculation. It has also been shown that Rhizobium sp. can suppress chickpea illnesses” [Arfaoui 2006] [2]. In India, chickpeas are a significant pulse crop. By utilizing improved root and rhizosphere colonization caused by the addition of potent nitrogen-fixing bacteria to the seed or soil, there is a good chance that production will increase. This can reduce the amount of nitrogenous fertilizer used, which is quite expensive in this nation.

According to [Rudresh *et al.* 2005] ^[7], “Rhizobium and phosphate solubilizing bacteria (PSB) have advantages in boosting chickpea productivity”. Plant nutrients can be obtained via microbial inoculants, which are affordable, environmentally benign, and renewable [Khan 2007] ^[11]. Due to their crucial roles in N₂-fixation and P-solubilization, Rhizobium and PSB acquire a significant amount of significance.

Materials and Methods

Experiment on the influence of RDF and seed priming with Bio-fertilizers along with recommended dose of fertilizers (RDF) on the growth and yield enhancement of chickpea were conducted at Rabi season of 2023 at Crop Research Farm, Department of Agriculture, Ideal college of Arts and Sciences, Vidyut nagar, Kakinada, Andhra Pradesh. Before seed sowing operation, it was ensured that sufficient moisture for germination of seed is present in the soil. The seeds were sown at the rate of 80 kg/ha and treated with recommended application of bio-fertilizers for 6 hours and sown in lines at spacing of 30 x 10 cm. Immediately after sowing the lines were closed with soil and slightly pressed so as to have good contact of seed with soil to ensure good germination.

Results

Plant height

Maximum plant height (67.42 cm) was recorded with application of RDF 100% + Rhizobium 50 g. Whereas the minimum plant height (57.00 cm) was recorded with Control (RDF) 40:60:40 kg/ha (NPK). There was significant difference between different treatment combinations. However, RDF 100% + PSB 50 g (64.90 cm) are found statistically at par to T₃.

Plant dry weight

Maximum plant dry weight (32.47 g) was recorded with application of RDF 100% + Rhizobium 50 g. Whereas the minimum plant dry weight (27.33 g) was recorded with Control (RDF) 40:60:40 kg/ha (NPK). There was significant difference between different treatment combinations. However, RDF 100% + PSB 50 g (31.00 g) are found statistically at par to T₃.

Number of pods per plant

Highest number of pods per plant (27.00) was recorded with application of RDF 100% + Rhizobium 50 g. Whereas the

minimum number of pods per plant (21.00) was recorded with Control (RDF) 40:60:40 kg/ha (NPK). There was significant difference between different treatment combinations. However, RDF 100% + PSB 50 g (26.20) are found statistically at par to T₃.

Number of seeds per pod

Highest number of seeds per pod (2.10) was recorded with application of RDF 100% + Rhizobium 50 g. Whereas the minimum number of seeds per pod (1.50) was recorded with Control (RDF) 40:60:40 kg/ha (NPK). There was significant difference between different treatment combinations. However, RDF 100% + PSB 50 g (2.00) are found statistically at par to T₃.

Seed index (g)

maximum seed index (34.00 g) was recorded with application of RDF 100% + Rhizobium 50 g. Whereas the minimum number of seeds per pod (30.11) was recorded with Control (RDF) 40:60:40 kg/ha (NPK). There was significant difference between different treatment combinations. However, RDF 100% + PSB 50 g (33.78) are found statistically at par to T₃.

Discussion

Significant increase in stover yield with Dual inoculation of Rhizobium, PSB increase in nitrogen availability in soil leads to increase in content of nitrogen in seed and increase in P availability through solubilization of insoluble native P and production of plant growth promoting substances. Results were similar to [Singh 2014] ^[5]. “Significant and higher stover yield was with application of phosphorus might have contributed for better growth of plant as expressed in terms of plant height, number of nodules/plants, dry weight, which improved nutrient uptake, resulted increased in stover yield” [Choubey *et al.* 2013] ^[3]. This might be due to benefits accruing from the integrated use of organic with inorganic fertilizer resulting in better supply of nutrients along with congenial environment leading to better root activity and higher nutrient absorption, which resulted in better plant growth like plant height, dry matter production and dry root biomass contributes to increase the stover yield. Similar results were also recorded by Lakpale *et al.* (2003) ^[8] in chickpea, Tyagi *et al.* (2014) ^[10] in green gram and Rameshwar *et al.* (2017) ^[9] in chickpea-okra cropping system.

Table 1: Effect of RDF and bio-fertilizers on growth and yield of chickpea

S No	Treatments	Plant height (cm)	Plant dry weight (g)	Number of pods per plant	Number of seeds per pod	Seed index (g)
1.	RDF 60% + Rhizobium 50 g	61.00	29.12	23.40	1.30	31.90
2.	RDF 80% + Rhizobium 50 g	63.60	30.51	25.10	1.70	33.29
3.	RDF 100% + Rhizobium 50 g	67.42	32.47	27.00	2.10	34.00
4.	RDF 60% + PSB 30 g	60.40	28.76	23.00	1.30	31.54
5.	RDF 80% + PSB 50 g	63.00	30.02	24.60	1.50	32.80
6.	RDF 100% + PSB 50 g	64.90	31.00	26.20	2.00	33.78
7.	RDF 60% + Azatobacter 30 g	58.70	28.00	22.10	1.20	30.78
8.	RDF 80% + Azatobacter 50 g	62.50	29.35	24.30	1.40	32.13
9.	RDF 100% + Azatobacter 50 g	64.30	30.68	26.00	1.90	33.46
10.	Control (RDF) 40:60:40 kg ha ⁻¹ (NPK)	57.00	27.33	21.00	1.50	30.11
	S.Em±	1.19	0.36	0.46	0.03	0.46
	CD (p=0.05)	3.54	1.07	1.36	0.09	1.37
	CV	3.32	2.10	3.26	3.15	2.47

Conclusion

The study highlights significant growth enhancements with RDF 100% combined with Rhizobium (50 g), showing maximum plant height (67.42 cm), plant dry weight (32.47 g), pods per plant (27.00), seeds per pod (2.10), and seed index (34.00 g). Conversely, RDF 40:60:40 kg/ha (NPK) demonstrated lower performance across all parameters. These results underscore the efficacy of integrated nutrient management, enhancing nitrogen and phosphorus availability through rhizobial and phosphate-solubilizing bacteria. Findings are consistent with prior research, emphasizing improved root activity, nutrient absorption, and yield. This approach supports sustainable agriculture by optimizing crop productivity and nutrient utilization efficiency, aligning with broader efforts for enhanced food security and environmental sustainability.

References

1. Abdelgani ME, Osman AG, Mohamed SS. Restoring soil fertility of desertified lands through biological nitrogen fixation. In: Sharhan AS, Wood WW, Goudie AS, Fowler EM, Abdellatif AA, editors. Desertification in the third millennium. Lisse, the Netherlands: Balkema Publishers; c2003. p. 335-338.
2. Arfaoui A, Sifi B, Boudabous A, Hadrami IE, Cherif M. Identification of Rhizobium isolates possessing antagonistic activity against *Fusarium oxysporum* f. sp. ciceris, the causal agent of Fusarium wilt of chickpea. J Plant Pathol. 2006;88:67-75.
3. Choubey SK, Dwivedi VP, Srivastava NK. Effect of different levels of phosphorus and sulphur on growth, yield and quality of lentil. Indian J Sci Res. 2013;4(2):149-150.
4. Mahajan A, Anil K, Chandhani RC, Jaggi D, Degre RK. Importance of Biofertilizers in sustainable Agriculture. Farmers Forum; c2003. p. 17-19.
5. Singh Y, Singh B, Kumar D. Effect of phosphorus levels and biofertilizer on yield attributes, yield and nutrient uptake of chickpea (*Cicer arietinum* L.) under rainfed condition. Res Crops. 2014;15(1):90-95.
6. Singh G, Sekhon HS, Sharma P. Effect of irrigation and biofertilizer on water use, nodulation, growth and yield of chickpea (*Cicer arietinum* L.). Arch Agron Soil Sci. 2011;57:715-726.
7. Rudresh DL, Shivaprakash MK, Prasad RD. Effect of combined application of Rhizobium, phosphate solubilizing bacterium and Trichoderma spp. on growth, nutrient uptake and yield of chickpea (*Cicer arietinum* L.). Appl Soil Ecol. 2005;28(2):139-146.
8. Lakpale R, Shrivastava GK, Chaube NK, Singh AP, Joshi BS, Pandey RL. Response of gram to integrated nutrient management in Vertisols of Chattisgarh plains. Indian J Agric Sci. 2003;73:162-163.
9. Rameshwar NA, Saini JP, Sharma RP, Punam, Seth M. Performance of chickpea under organic and inorganic sources of nutrients at different soil moisture regimes in chickpea-okra cropping system. Himachal J Agric Res. 2017;43(1):23-28.
10. Tyagi PK, Upadhyay AK, Raikwar RS. Integrated approach in nutrient management of summer green gram. Bioscan. 2014;9(4):1529-1533.
11. Khan MS, Zaidi A, Wani PA. Role of phosphate-solubilizing microorganisms in sustainable agriculture: a review. Agron Sustain Dev. 2007;27(1):29-43.