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Effect of bio fertilizers on cultivation of chickpea (*Cicer arietinum*)

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Abstract
The experiment was carried out on the field of Mr. Gurmel Singh, V.P.O. Kaliyan, Tehsil and District Sri Ganganagar, Rajasthan, India. The crop was grown in Rabi season of 2017-18 to study the effect of bio fertilizers on cultivation of Chickpea. The bio fertilizers used in the experiment were *Azotobacter*, *Rhizobium* and *Azotobacter* + *Rhizobium*. In this experiment the effect of these bio fertilizers was studied on parameters i.e. plant height, number of branches per plant, dry matter per plant, number of pods per plant and yield per plot. From this experiment, it was observed that maximum plant height, number of pods, dry matter, number of branches and yield per plot was obtained from the plot having the combined effect of *Azotobacter* + *Rhizobium*. Results revealed that there is decrease in these parameters as observation from the plot having no application of *Azotobacter* and *Rhizobium*. From this experiment it was studied that the combination of these two bio fertilizers is best for chickpea.

Keywords: Bio fertilizers, chickpea, *azotobacter*, *rhizobium*

Introduction
Pulses are the major source of protein for the vegetarians. Pulses constitute an important component in Indian agriculture since centuries. India is the premier pulse growing country. India, being the world's largest pulse producer, consumer and importer, accounts for 27 per cent of the global pulse production. Chickpea is commonly known as gram which is one of the important pulse crops of the State. The chickpea or chick pea (Cicer arietinum) is a legume of the family Fabaceae, subfamily Faboideae. The chickpeas are also known as garbanzo bean, Ceci bean, Sanagalu, Chana, hummus and Bengal gram. The plant grows to between 20–50 cm (8–20 inches) high and has small feathery leaves on either side of the stem. Chickpea crop grows well under good moisture conditions with ideal temperatures between 24 ºC and 30 ºC. This crop is grown on moderately heavy soils, black cotton soils and sandy loam soils. Ideal pH range of 5.5 to 7.0 is suitable for chickpea farming. Alam *et al.* [1] studied that the bacteria of the genus Rhizobium play a very important role in agriculture by inducing nitrogen fixing nodules on the roots of legumes such as peas, beans, clover and alfalfa. This symbiosis can relieve the requirements for added nitrogenous fertilizers during the growth of leguminous crop. Many heterotrophic bacteria live in the soil and fix significant levels of nitrogen without the direct interaction with other organisms. Azotobacter bacteria are example of this type of nitrogen fixing. (Siddiqui *et al.*) [2].

Materials and Methods
The experiment was carried out on the field of Mr. Gurmel Singh, V.P.O. Kaliyan, Tehsil and District Sri Ganganagar, Rajasthan, India. The crop was grown in Rabi season of 2017-18. The experiment was conducted in four plots having dimensions of 5m × 5m, length and breadth respectively. The field was properly prepared with disc harrow followed by two ploughings with cultivator followed by planking. A local variety GNG 1581 was sown at the rate of 40 kg seed per acre at a depth of 8-10 cm. Sowing was done by seed drill on November 16, 2017. Nitrogen (10 kg per acre) was applied in the form of urea and 60 grams urea per plot was applied. For controlling weeds, two weedings were done with khurpa.

Chemical control was not used. Water was supplied by flood irrigation. Two irrigations were applied. Plant height was measured with the help of measuring tape from ground level up to top of the plant at interval of 30 days. Number of branches per plant and Number of pods per plant were counted manually from each plot also at interval of 30 days. The plants were first sun dried, then dried in an oven at the temperature of 60 ºC for 24 hours to achieve constant weight. After that, the plants were weighed by using weighing machine. Dry matter per plant was calculated after 30 days of sowing. The seeds produced from each plot were weighed separately and the yield was calculated accordingly.

Treatments

T_1 - Control
T_2 - *Azotobacter*
T_3 - *Rhizobium*
T_4 - *Azotobacter + Rhizobium*

Results and Discussions

Plant height (cm)

As from experiment, maximum height was recorded from all four plots was in T4 plot, 56.5cm and minimum in T1, 47.16cm after 120 days 0f sowing. Similarly, Choudhary *et al.* [3] studied the effect of biofertilisers on growth and yield of black gram. They concluded that the maximum plant height was obtained in treatment Biofertiliser + Black gram (ITI 94-1) was 41.60 cm and minimum in control was 38.80 cm. As the similar results from Rabieyan *et al.* [4] which observed that maximum plant height was obtained in treatment receiving nitragin+biosuper i.e., 31 cm and minimum in control i.e., 29 cm.

Number of branches

From the conducted experiment on chickpea, it was concluded that the maximum value observed from all four plots is in T4, 37.66 and minimum in T1, 24.66. Similarly, Kushwaha *et al.* [5] reported that the dual inoculation of *Rhizobium* and PSB resulted significant increase in yield attributes *viz*, plant height, number of branches per plant, grain and straw yield of chickpea. Also, Hussain *et al.* [6] proves the similar results from a field experiment on the response of biofertilisers on growth and yield attributes of black gram (*Vigna mungo* L.) and concluded that more number of branches, 20.82 per plant, were found in the treatment receiving combined effect of *Rhizobium* + PSB as compared to 17.80 and 18.28 branches per plant in treatment receiving *Rhizobium* and PSB respectively.

Dry weight per plant (g)

As from the conducted experiment, the value of T1, T2, T3 and T4 at 120 days interval was 4.2 g, 4.9 g, 4.4 g and 7.3 g. Results revealed that the maximum value observed from all four plots was in T4, 7.3 g and minimum in T1, 4.2 g. As the similar results were revealed by the Rokhzadi and Toashih [7] which studied the effects of single and combined inoculation of plant growth-promoting rhizobacteria *viz., Azospirillum, Azotobacter, Mesorhizobium and Pseudomonas* on nutrient uptake, growth and yield of chickpea plants under field conditions. Nodulation and nutrient concentration in shoots were significantly affected by the treatments at the beginning of flowering stage. Grain yield, dry weight and nitrogen & phosphorus uptake of grains were statistically improved in inoculated plants compared to control plants. Similarly, Tiwari *et al.* [8] conducted an experiment on the integrated effect of *rhizobium* and *azotobacter* cultures on the leguminous crop black gram (*Vigna mungo*). The maximum root and shoot fresh and dry weight was achieved in the treatment receiving both *azotobacter* and *rhizobium.* This treatment enhanced the shoot fresh and dry content of 12.99 and 3.21 g per plant over the control.

Number of pods per plant

From the experiment, it is observed that the value of T1, T2, T3 and T4 at 120 days interval was 64, 67, 63 and 110. The maximum value observed from all four plots is in T4, 110 and minimum in T3, 63. Similarly, Yasari *et al.* [9] conducted an experiment on *Azotobacter* and *Azospirillum* inoculants as biofertilisers in canola (*Brassica napus* L.) cultivation. They reported that treating canola with *Azotobacter* and *Azospirillum* inoculants resulted in maximum number of pods/plant and helped in obtaining maximum seed yield. Also, Zaman *et al.* [10] conducted an experiment on effect of *Rhizobium* inoculant on nodulation, yield and yield traits of chickpea (*Cicer arietinum* L.) in four different soils of greater Rajshahi. The plants treated with *Rhizobium* showed more number of pods per plant in all soils, i.e., 97.28, 105.68, 133.33, 102.66 and the lowest was recorded in control, i.e., 82.32, 99.17, 119.56, 92.48 in Barind soil, Campus soil, Cholonbil soil and Padma soil respectively. The results were similar to the conducted experiment.

Yield per plot (kg)

As from the experiment, it is observed that the yield per plot in T1, T2, T3 and T4 after harvesting was 1.025 kg, 2.725 kg, 2.130 kg and 3.170 kg. The maximum value observed from all four plots is in T4, 3.170 kg and minimum in plot T1, 1.025 kg. Similarly, Gupta [11] reported that seed inoculation with *Rhizobium* and PSB individually and *Rhizobium*+PSB together could significantly increase the nodules number, nodule dry weight per plant and also the average grain yield of chickpea by 16.7%, 11.90% and 24.3% respectively over control. Similarly, Monira [12] also reported that the seeds of chickpea inoculated with *Rhizobium* showed that there was increase in seed yield and minimum seed yield per plant in the interaction means was revealed by un-inoculated genotypes. Treatment mean for seed yield per plant was 10.0 g for uninoculated and 15.1 g for inoculated treatments.

Observations and Tables

Table 1: Plant height (cm) of chickpea as affected by the different biofertilizers.

Days interval/ Plots	30 days	60 days	90 days	120 days
T1	10.50	16.83	24.83	47.16
T2	12.16	17.16	31.16	52.50
T3	11.16	19.33	28.16	49.33
T4	11.16	16.33	36.50	56.5

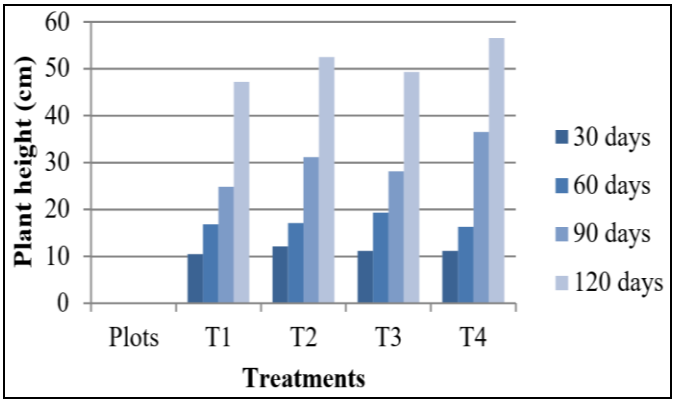

Fig 1: Plant height (cm) of chickpea as affected by the different biofertilizers.

Table 2: Number of branches of chickpea as affected by the different biofertilizers.

Days interval/ Plots	30 days	60 days	90 days	120 days
T1	3.33	7.66	14.33	24.66
T2	3.66	8.00	27.33	31.33
T3	2.33	6.00	24.00	27.33
T4	3.66	8.33	29.33	37.66

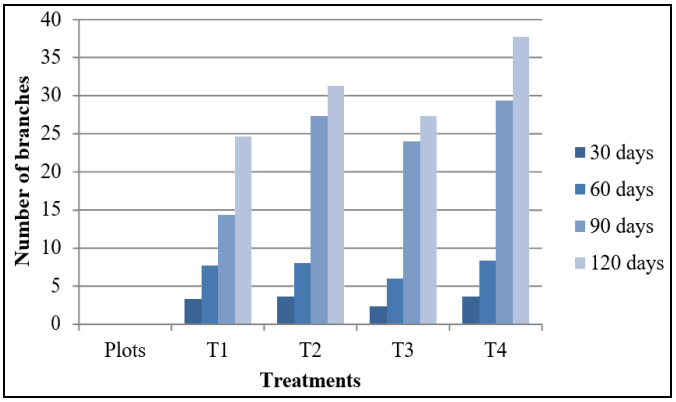

Fig 2: Number of branches of chickpea as affected by the different biofertilizers.

Table 3: Dry weight (g) per plant of chickpea as affected by the different biofertilizers.

Days interval/ Plots	30 days	60 days	90 days	120 days
T1	0.310	0.470	1.2	4.2
T2	0.440	0.670	1.6	4.9
T3	0.360	0.970	1.4	4.4
T4	0.510	1.340	3.6	7.3

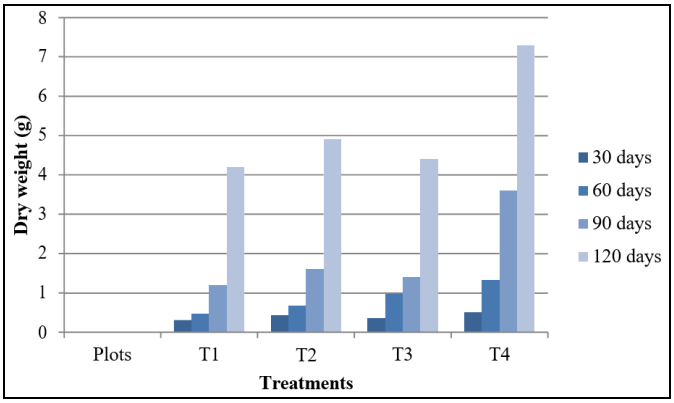

Fig 3: Dry weight (g) per plant of chickpea as affected by the different biofertilizers.

Table 4: Number of pods of chickpea as affected by the different biofertilizers

Days interval/ Plots	Number of pods
T1	64
T2	67
T3	63
T4	110

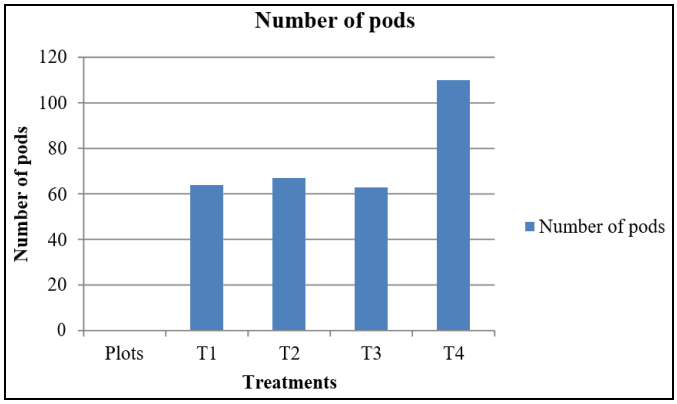

Fig 5: Number of pods of chickpea as affected by the different biofertilizers.

Table 6: Yield per plot (kg) of chickpea as affected by the different biofertilizers.

Days interval/ Plots	Yield per plot (kg)
T1	1.025
T2	2.725
T3	2.130
T4	3.170

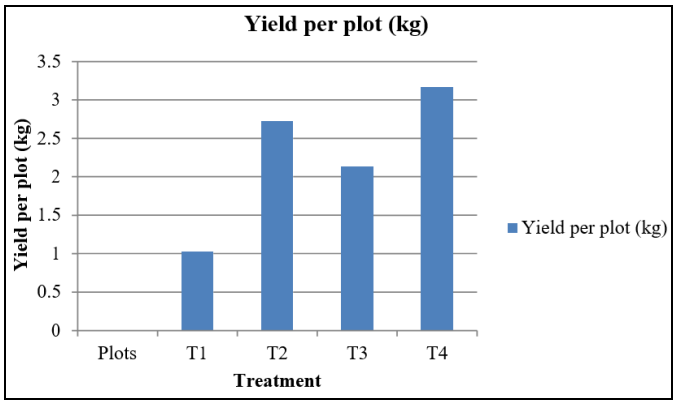

Fig 6: Yield per plot (kg) of chickpea as affected by the different biofertilizers.

Conclusion

The present investigation was carried at village Kaliyan, Sri Ganganagar during the month of November 2017 to study the effect of biofertilisers on the growth and cultivation of chickpea. The results revealed that the maximum plant height was observed in plot receiving mixed treatment of rhizobium and azotobacter, the maximum value was observed from all four plots is in T4 plot having value 56.5 cm and minimum value was observed in plot T1 having value 47.16 cm. The maximum number of branches were observed in T4 plot having value 37.66 and minimum value was observed in plot T1 having value 24.66. The maximum value of dry weight observed from all four plots is in T4 plot having value 7.3 g and minimum value was observed in plot T1 having value 4.2 g.

The maximum number of pods were observed from all four plots in T4 plot having value 110 and minimum value was observed in plot T3 having value 63. The maximum value of 1000 grain weight was observed from all four plots is in T4 plot having value 158.89g and minimum value was observed in plot T1 having value 118.3g. The maximum yield was observed from all four plots in T4 plot having value 3.170 kg and minimum value was observed in plot T1 having value 1.025 kg. From all the above readings, it is concluded that plot receiving combined treatment of rhizobium and azotobacter perform better in all the aspects.

References

1. Alam MJ, Solaimon ARM, Karim AJMS. Nutrient uptake, yield, yield attributes and protein content of chickpea as influenced by some Rhizobium strain, Annals Bangladesh Agric. 2001; 9(2):131-138.
2. Siddiqui A, Shivle R, Magodiya N, Tiwari K. Mixed effect of rhizobium and azotobacter as biofertiliser on nodulation and production of chickpea, Cicer arietinum, Biosci Biotech Res Comm. 2014; 7(1):46-49.
3. Choudhary P, Singh G, Reddy GL, Jat BL. Effect of Biofertiliser on different varieties of black gram (*Vigna mungo* L.), Int. J Curr Microbial App Sci. 2017; 6(2):302-16.
4. Rabieyan Z, Yarnia M, Kazemi-e-Arbat H. Effects of biofertilisers on yield and yield components of chickpea (*Cicer arietinum* L.) under different irrigation levels, Australian J Of Basic and App Sci. 2011; 5(12):3139-45.
5. Kushwaha HS. Response of chickpea to bio-fertilizer, nitrogen and phosphorous fertilization under rainfed condition, J of Food Legumes Res. 2007; 20(2):179-181.
6. Hussain N, Hassan B, Habib R, Chand L, Ali A, Hussain A. Response of biofertilisers on growth and yield attributes of black gram (*Vigna mungo* L.), Int. J of Curr Res. 2011; 2(1):148-50.
7. Rokhzadi A, Toashih V. International Rules for Seed Testing, Seed Science and Technology. 2011; 24:1-335.
8. Tiwari S, Chauhan RK, Singh R, Shukla R, Gaur R. Integrated effect of rhizobium and azotobacter cultures on the leguminous crop black gram (*Vigna mungo*), Adv Crop Sci. Tech. 2017; 5(3):1-9.
9. Yasari E, Patwardhan AM. Effect of (Azotobacter and Azospirillum) inoculants and chemical fertilizers on growth and productivity of canola (*Brassica napus* L.), Asian J Plant Sci. 2007; 6(1):77-82.
10. Zaman S, Mazin MA, Kabir G. Effect of rhizobium inoculant on nodulation, yield and yield traits of chickpea (*Cicer arietinum* L.) in four different soils of greater Rajshahi, J Life Earth Sci. 2011; 6:45-50.
11. Gupta SC. Effect of combined inoculation, nutrient uptake and yield of chickpea in vertisol, J. of Indian Soc. of Soil Science. 2006; 54(2):251-254.
12. Monira S. Performance of biofertilisers on growth and yield of chickpea, 2018.