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Pre- sowing seed treatment of bio fertilizers on growth, yield and yield attributing traits of chick pea (*Cicer arietinum* L.) Variety: king Ganesh

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ABSTRACT

The experiment was conducted at Crop Research Farm unit (CRF) Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during 2020-2021. For this purpose, 13 priming treatments including control on chickpea var. king Ganesh seeds were subjected to treatment with various primers. The chickpea var. king Ganesh seeds were primed with above different priming agents in above different concentrations for a duration of 8 hours. After drying, the seeds were used to grow under field conditions. Experiment was laid out in Randomized Block Design with three replications during rabi 2020-21. Analysis of variance revealed significant mean sum of squares due to seed priming treatments. Priming with T12 (Rhizobium) (10 g) was found significantly superior which affected all the growth and yield parameters in chickpea in comparison to control and other treatments. Thus, seed priming with T12 (Rhizobium) (10 g) is useful for improving yield in chickpea

Key words: *Chickpea var. king Ganesh, Rhizobium, Yield components.*

Introduction

Chickpea (*Cicer arietinum* L.) has been a staple of Indian agriculture since the dawn of time, owing to its intrinsic worth in terms of increased protein content, carbohydrates, minerals, nitrogen-fixing capacity, and indispensability as a crop diversification alternative. Chickpea (*Cicer arietinum* L.) is the most widely grown pulse in the country, with the highest acreage, production, and nutritional value. Its origins are said to be in western Asia. It belongs to the genus Cicer and the tribe Viciacae of the order Leguminosae's Papilionaceae sub-order (Bentham and Hooker, 1870). Chickpeas are said to have originated in Southwest Asia and the Mediterranean, particularly in South-East Turkey and Syria Ethiopia is considered a secondary genesis point.

The area under chickpea in India was 9.539 million hectares, with a production of 90.75 million tonnes and a productivity of 951 kg per hectare. It was grown on 5.89 lakh ha in Uttar Pradesh in 2018-19, with a total production of 5.967 lakh tonnes and an average productivity of 1013 kg/ha (ICAR-Directorate of Pulses Development-Annual Report, 2018). (2018-19). In Uttar Pradesh, pulses cover 61 percent of the entire area and account for 65 percent of total production. Rhizobium inoculation is a well-known agronomic method that ensures legumes get enough nitrogen without using nitrogen fertilizers (Gupta, 2004). Through the injection of effective nitrogen-fixing bacteria into the seed or the soil, there is a significant chance of increasing crop production. In most agricultural systems, pulse crop production is reliant on symbiotic nitrogen fixation, the efficacy of

which is determined by the rhizobium strain and host cultivar relationship, which is regulated by a variety of environmental and soil edaphic parameters. It's possible that there aren't enough efficient rhizobial strains in the soil, or that their number is too low to generate enough nodules. Hence, it is necessary to inoculate the seed with the mostefficient strain of rhizobium species to get more nitrogen fixation therebyimprove pulse crop production (Gothwal *et al.,* 2007).

Materials and Method

A field experiment was conducted during Rabi season 2020 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U. P) which is located at 25 degree 39' 42''N latitude, 81 degree 67'56''E longitude and 98 m altitude above the mean sea level, During Rabi, 2020. The soil was sandy loam in texture, low in organic carbon and medium in available nitrogen, phosphorous and low in potassium. Nutrient sources were Urea, DAP, MOP to fulfil the requirement of Nitrogen, phosphorus and potassium. Gypsum in used to fulfil the requirement of sulphur. Nitrogen applied as split dose half as basal dose remaining as top dressing. Treatments taken were T0: Control, T1: Vesicular Arbuscular Mycorrhizae (VAM) 3gms, T2: Vesicular Arbuscular Mycorrhizae (VAM) 5 g, T3: Vesicular Arbuscular Mycorrhizae (VAM) 10 g, T4: Phosphate Solubilizing Bacteria (PSB) 2 g, T5: Phosphate Solubilizing Bacteria (PSB) 3 g, T6: Phosphate Solubilizing Bacteria (PSB) 5 g, T7: *Trichoderma viridae* 3 g, T8: *Trichoderma viridae* 5 g , T9: *Trichoderma viridae* 10 g, T10: Rhizobium 3 g, T11: Rhizobium 5 g, T12: Rhizobium 10 g used. The Experiment was laid out in Randomized Block Design, with 13 treatments which are replicated thrice. Date of sowing was on 16th November 2020. In the period from germination to harvest several growth parameters were recorded at frequent intervals along with it after harvest several yield parameters were recorded those include Field emergence, Plant height, Days to 50% flowering, Days to 50% pod setting, Numbers of primary branches per plant, Number of secondary branches per plant, Numbers of pods per plant, Number of seeds per pod, Numbers of seeds per plant, Seed yield per plant, Seed yield per plot, Biological Yield (g), Harvest index were recorded and statistically analysed using analysis of variance (ANOVA) as applicable to Randomized Block Design Panse and Sukhatme, 1967).

Results and Discussion

The mean values, the coefficient of variation (CV), standard error of difference (SE), the critical difference (CD) at 5% and range of 13 seed priming treatments for 13 quantitative characters are presented in Table 1 which revealed a wide range of variation for all the traits studied. It is necessary to describe here the mean performance of different priming treatments with respect to different characters for drawing valid conclusion for future planning as well as selection of suitable priming method to improve chickpea seed for economic importance. The mean performance of different priming treatments with respect to different characters is described as under.

Growth Attributes

The mean performance of Field emergence (%) ranged from 80.5 to 92.75 with a grand mean of 87.3. Perusal of Table 1 indicated that maximum Field emergence (%) was recorded in T12 (Rhizobium) (10 g) (92.75%) and least in T0 (Control) (80.5%). Among these treatments were significantly higher when compared with control. Among the significant treatments, Treatment T12 (Rhizobium) (10gms) (92.75%) was significantly higher in comparison to control as well as other significant treatments. Similar results were observed by Biswas *et al.,* (2009).

The mean performance of Days to 50% flowering ranged from 81.5 to 84.5 with a grand mean of 83.88 days. Among these treatments, T6 (Phosphate Solubilizing Bacteria (PSB)) (5 g) (81.5 days) and T12 (Rhizobium) (10 g) (81.5 days) was significantly lower as compared to control and other treatments.

The mean performance of Days to 50% pod setting ranged from 99.5 to 104.5 with a grand mean of 101.96. Among these treatments, T0 (Control) (103 days), T2 (Vesicular Arbuscular Mycorrhizae (VAM)) (5 g) (103.5 days), T9 (Trichoderma viridae) (10 g) (104 days), T7 (Trichoderm*a viridae) (3 g) (104 days), T8 (Trichoderma viridae*) (5 g) (104.5 days) were statistically at par to each other. While T6 (Phosphate Solubilizing Bacteria(PSB)) (5 g) (99.5 days) and T12 (Rhizobium) (10 g) (99.5 days) were at par to each other. Similar results were observed by Gupta *et al*., 2003.

The mean performance of Plant height (cm) ranged from 33.3 to 44.6 with a grand mean of 40.6

Table 1. Mean performance of Chickpea for Growth, Yield and Yield attributes:

Treatments	Field Emergence %	Days to 50% Flowering	Days to 50% Pod Setting	Plant Height (cm)	No of Primary Branches	No of Secondary Branches	Days to maturity	No of Pods Per Plant	No of Seeds Per Pod	No of seeds per plant	Seed Yield Per Plant(g)	Seed Yield Per Plot(g)	Biological yield (g)	Harvest index (%)
T_0	80.5	84.5	103	33.3	2.3	4.42	129.36	19.85	1.055	29.77	3.34	142.89	8.51	39.22
T_1	83.4	84.5	102	38.2	3.38	7.35	126.34	23.56	1.635	35.335	6.36	169.60	14.3	44.47
T_2	84.35	83.5	103.5	39.05	3.085	7.445	127.16	24.5	1.625	36.845	6.625	176.85	14.49	45.72
T_3	87.9	84.5	102.5	39.75	3.45	7.765	124.67	24.725	1.705	37.07	6.67	178.00	14.593	45.79
T_4	89.1	84.5	100.5	40.8	3.575	8.3	123.46	33.33	1.83	49.995	9.075	239.97	20.33	44.65
T_5	89.3	84.5	101.5	41.8	3.395	8.55	121.73	33.73	1.65	50.825	9.12	242.58	19.73	46.23
T_6	90.4	81.5	99.5	42.65	3.65	8.58	122.85	35.615	1.585	53.42	7.395	256.41	21.04	49.40
T_7	84.6	84.5	104	39.95	2.49	5.4	124.28	21.435	1.385	32.15	5.145	154.43	12.25	41.03
T_8	85.35	84.5	104.5	39.95	2.66	6.1	122.13	22.645	1.335	33.965	5.345	163.03	12.635	42.29
T_9	84.4	83.5	104	40.95	2.365	6.13	120.64	23.28	1.32	34.915	5.64	166.59	13.335	42.27
T_{10}	91	84.5	100.5	43	3.76	9.225	113.11	37.735	1.9	56.05	13.37	268.53	23.75	56.31
T_{11}	91.8	84.5	100.5	43.8	3.895	9.35	110.91	37.11	1.9	56.16	14.22	269.56	25.895	54.97
T_{12}	92.75	81.5	99.5	44.6	3.935	9.61	109.28	38.96	2.055	58.94	14.315	282.91	25.665	58.06
Mean	87.3	83.88	101.96	40.6	3.23	7.56	121.224	28.96	1.61	43.5	8.2	208.57	17.42	46.96
Min.	80.5	81.5	99.5	33.3	2.3	4.42	109.28	19.85	1.055	29.77	3.34	142.89	8.51	39.22
Max.	92.75	84.5	104.5	44.6	3.935	9.61	129.36	38.96	2.055	58.94	14.315	282.91	25.895	58.06
C.V.	0.32	0.62	0.71	0.61	3.64	1.69	1.09	1.44	4.61	1.01	17.8	1.15	2.09	2.32
F ratio	551.62	14	17.93	407.27	74.56	485.74	3.03	869.84	42.68	1801.75	18.6	1394.3	711.17	91.39
F Prob.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S.E.	0.16	0.3	0.42	0.14	0.07	0.07	0.76	0.24	0.04	0.25	0.84	1.38	0.21	0.63
C.D. 5%	0.47	0.87	1.21	0.42	0.2	0.21	2.23	0.7	0.13	0.74	2.46	4.02	0.61	1.84
C.D. 1%	0.63	1.19	1.65	0.57	0.27	0.29	3.02	0.95	0.17	1	3.33	5.45	0.83	2.49

T_0 (Control), T_1 (Vesicular Arbuscular Mycorrhizae (VAM)) (3 g), T_2 (Vesicular Arbuscular Mycorrhizae (VAM)) (5 g), T_3 (*Vesicular Arbuscular* Mycorrhizae (VAM)) (10 g), T_4 (Phosphate Solubilizing Bacteria(PSB)) (2 g), T_5 (Phosphate Solubilizing Bacteria (PSB) (3 g), T_6 (Phosphate Solubilizing Bacteria (PSB)) (5 g), T_7 (*Trichoderma viridae*) (3 g), T_8 (Trichoderma viridae) (5 g), T_9 (*Trichoderma viridae*) (10 g), T_{10} (Rhizobium) (3 g), T_{11} (Rhizobium) (5 g) and T_{12} (Rhizobium) (10 g)

cm. Maximum Plant height (cm) was recorded in treatment T12 (Rhizobium) (10 g) (44.6.0 cm) and least in control (33.3 cm). All treatments were found significantly in comparison to control. Among these treatments, T12 (Rhizobium) (10 g) (44.6 cm) was found significantly higher in comparison to control and other treatments. Similar results were observed by Yadav *et al*., (2013).

The mean performance of Numbers of primary branches per plant ranged from 2.3 to 3.93 with a grand mean of 3.23. For Numbers of primary branches per plant, all the treatments were significantly higher in comparison to control except T9. Among the treatments, T12 (Rhizobium) (10 g) (3.935 cm) followed by T11 (Rhizobium) (5 g) (3.895 cm), T10 (Rhizobium) (3 g) (3.76 cm) was found significantly higher in comparison to control and other treatments. However, all these treatments were statistically at par to each other.

The mean performance of Number of secondary branches per plant ranged from 4.42 to 9.61 with a grand mean of 7.56. For Number of secondary branches per plant, all the treatments were significantly higher in comparison to control. Among the treatments, T12 (Rhizobium) (10 g) (9.61cm) was found significantly higher in comparison to control and other treatments. Similar results were observed by Ali *et al*., 2011.

The mean performance of Days to maturity ranged from 109.28 to 129.36 with a grand mean of 121.22. For Days to maturity all the treatments were significantly higher in comparison to control. Among the treatments, T12 (Rhizobium) (10 g) (109.28) was found significantly higher in comparison to control and other treatments. Similar results were observed by Poonia *et al*., 2014.

Yield Attributes:

The mean performance of Numbers of pods per plant ranged from 19.85 to 38.96 with a grand mean of 28.96. For Numbers of pods per plant, all the treatments were significantly higher in comparison to control. Among the treatments, T12 (Rhizobium) (10gms) (38.96 cm), was found significantly higher in comparison to control and other treatments. Karnwal *et al*., (2012).

The mean performance of Numbers of seeds per pod ranged from 1.05 to 2.05 with a grand mean of 1.61. For Numbers of seeds per pod, all the treatments were significantly higher in comparison to control. Among the treatments, for Numbers of seeds per pod T12 (Rhizobium) (10 g) (2.055 cm) was found significantly higher in comparison to control and other treatments. Similar results were observed by K. Sandya Rani *et al*., (2019).

The mean performance of Numbers of seeds per plant ranged from 29.77 to 58.94 with a grand mean of 43.5. For Numbers of seeds per plant, all the treatments were significantly higher in comparison to control. Among the treatments, for Numbers of seeds per plant, T12 (Rhizobium) (10 g) (58.94 cm) was found significantly higher in comparison to control and other treatments. Similar results were observed by Namvar *et al*., (2011).

The mean performance of Seed yield per plot (g) ranged from 3.34 to 14.31 with a grand mean of 8.2g. For Seed yield per plant (g), all the treatments were significantly higher in comparison to control except T7, T8 and T9. Among the treatments, for Seed yield per plant (g),T12 (Rhizobium) (10 g) (14.315 cm) followed by T11 (Rhizobium) (5 g) (14.22 cm), T10 (Rhizobium) (3 gms) (13.37 cm) was found significantly higher in comparison to control and other treatments. Similar results were observed by Khoja *et al*., (2002).

The mean performance of Seed yield per plot (g) ranged from 142.89 to 282.91 with a grand mean of 208.57g. For Seed yield per plot (g), all the treatments were significantly higher in comparison to control. Among the treatments, for Seed yield per plot (g), T12 (Rhizobium) (10 g) (282.91 cm) was found significantly higher in comparison to control and other treatments.Similar results were observed by Meena *et al*., (2018).

The mean performance of biological yield (g) ranged from 8.51 to 25.89 with a grand mean of 17.42. For Biological yield (g), all the treatments were significantly higher in comparison to control. Among the treatments, for biological yield (gm), T11 (Rhizobium) (5 g) (25.895 cm) followed by T12 (Rhizobium) (10 g) (25.665 cm) was found significantly higher in comparison to control and other treatments. Similar results were observed by Messele *et al*., (2012).

The mean performance of Harvest index (%) ranged from 39.22 to 58.06 with a grand mean of 46.96. For Harvest index (%), all the treatments were significantly higher in comparison to control except T_7. Among the treatments, for Harvest index (%), T_{12} (Rhizobium) (10 gms) (58.06 cm) and T10 (Rhizobium) (3 g) (56.31 cm) was found significantly higher in comparison to control and other treat-

ments. Similar results were observed by Shivangi Negi *et al*., (2019).

Conclusion

It is concluded from the present investigation of seed treatments with different kind of priming were found affecting significantly different characters of growth and yield under study in chickpea. Priming with T12 (Rhizobium) (10 g) was found significantly superior which affected all the growth and yield parameters in chickpea in comparison to control and other treatments. Thus, seed priming with T12 (Rhizobium) (10 g)is useful for improving yield in chickpea.

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References

Ali, N. and Sharifi, R.S. 2011. Phenological and morphological response of chickpea (*Cicer arietinum* L.) to symbiotic and mineral nitrogen fertilization. *Zemdirbyste Agriculture.* 98 (2) : 121-130.

Biswas, P.K. and Bhowmick, M.K. 2009. Evaluation of different rhizobium strain on growth, nodulation and seed yield in urdbean. *Journal of Crop and Weed*. 5(2) : 87-88.

Gothwal, R.K., Nigam, V.K., Mohan, M.K., Sasmal, D. and Ghosh, P. 2007. Screening of nitrogen fixers from rhizospheric bacterial isolates associated with important desert plants. *Ecology and Environmental Research.* 6 (2): 101-109.

Gupta, A.K. 2004. The complete technology book on biofertilizers and organic farming. National Institute of Industrial Research Press. India.

Gupta, A., Saxena, A.K., Murali, G. and Tilak, K.V.B.R. 2003. Effect of co- inoculation of plant growth promoting rhizobacteria and *Bradyrhizobium* spp. on growth and yield of green gram (*Vigna radiata* L.). *Tropical Agriculture.* 80 : 28-35.

Sandya Rani, K., Satish, P., Sudha Rani, C. and Sudhakar, C. 2019. Effect of Liquid biofertilizers on Growth and Yield of Rabi Sorghum (*Sorghum bicolor L.*). *Chem Sci Rev Lett.* 8(32) : 190-194.

Karnwal, A. and Kumar, V. 2012. Influence of plant growth promoting rhizobacteria on the growth of chickpea (*Cicer arietinum* L.). *Annals of Food Science and Technology*. 13 (1): 43-48.

Khoja, J.R.R., Khangarot, S.S., Gupta, A.K. and Kulkarni, A.K. 2002. Effect of fertility and bio-fertilizers on growth and yield of Chickpea. *Ann. Plant & Soil Res.* 4: 357-358.

Meena, J.K., Ram, J.B. and Meena, M.L. 2018. Studies on bio-fertilizers on yield and quality traits of French bean (*Phaseolus vulgaris* L.) cultivars under Lucknow condition. *Journal of Pharmacognosy and Phytochemistry.* 7(2): 1571-1574.

Messele, B. and Pant, L.M. 2012. Effects of inoculation of Sino rhizobium cicero and Phosphate Solubilizing Bacteria on nodulation, yield, nitrogen and phosphorus uptake of chickpea (*Cicer arietinum* L.) in Shoa Robit area. *Journal of Biofertilizers and Biopesticides.* 3 (5) : 1-6.

Namvar, A., Sharifi, R.S. and Khandan, T. 2011. Growth analysis and yield of chickpea (*Cicer arietinum* L.) in relation to organic and inorganic nitrogen fertilization. *Ekologija.* 57 (3) : 97-108.

Panse, V. G. and Sukhatme, P. V. 1967. Statistical Methods for Agricultural Workers. *Indian Council of Agricultural Research.* 103-108.

Poonia, T.C. and Pithia, M.S. 2014. Increasing efficiency of seed inoculation with bio-fertilizers through application of micronutrients in irrigated chickpea. *African Journal of Agricultural Research.* 9 (29) : 2214-2221.

Sharon Nagpal, Poonam Sharma, Kailash, 2019. Assessment of native single and dual inoculation of *Mesorhizobium* sp. and endophytic rhizobacteria for plant growth promotion in chickpea. *J* 56 (4): 746-751.

Shivangi Negi, Narender K Bharath and Manish Kumar 2019. Effect of biopriming with indigenous PGPR, Rhizobia and *Trichoderma* sp. on growth, seed yield and incidence of diseases in French bean (*Phaseolus vulgaris* L.) 10: 18805/LR-4135.

Yadav, S.K., Dave, A., Sarkar, A., Singh, H.B and Sarma, B.K. 2013. Co- inoculated biopriming with *Trichoderma, Pseudomonas* and *Rhizobium* improves crop growth in *Cicer arietinum* and *Phaseolus vulgaris. International Journal of Agriculture, Environment and Biotechnology*. 6(2) : 255-259.