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Efficacy of liquid, powder and gel-based rhizobium and RDN levels on growth and yield of groundnut

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Abstract
The field experiment was conducted during *Zaid* 2023 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P). The experiment was laid out in Randomized Block Design with ten treatments which are replicated thrice on the basis of one year experimentation. The treatment combinations are T_1 Powder based rhizobium + 50% RDN, T_2 Liquid based rhizobium + 50% RDN, T_3 Gel based rhizobium + 50% RDN, T_4 Powder based rhizobium + 75% RDN, T_5 Liquid based rhizobium + 75% RDN, T_6 Gel based rhizobium + 75% RDN, T_7 Powder based rhizobium + 100% RDN, T_8 Liquid based rhizobium + 100% RDN, T_9 Gel based rhizobium + 100% RDN, T_{10} Control (20:40:40) are used. Results obtained that the application of Powder based rhizobium + 100% RDN recorded significantly higher Plant height (94.81 cm), Plant dry weight (47.65 g/plant), Significantly maximum number of pods/plant (49.20), Seeds/pod (3.00), Test weight (36.76 g), Seed yield (1966.22 kg/ha), were recorded with the treatment of Powder based rhizobium + 100% RDN.

Keywords: Groundnut, nitrogen, rhizobium inoculant, response gel

Introduction
Groundnut (*Arachis hypogaea* L.) is also known as "The king of oilseeds". Groundnut is an important oilseed crop in India which occupies first position in terms of area and second position in terms of production after soyabean. China ranks first in groundnut production with 17.57 million tonnes followed by India 6.73 million tonnes. According to the all India kharif crop coverage report, Government of India, as on 17th September 2021, groundnut was sown in around 49.14 lakh hectares as compared to last year (50.97 lakh ha). Among the states, Gujarat stood first in area coverage with 19.09 lakh ha followed by Rajasthan (7.76 lakh ha), Andhra Pradesh (6.27 lakh ha), Karnataka (4.75 lakh ha) and Madhya Pradesh (3.82 lakh ha) (Groundnut Outlook - November 2021). The optimization of the mineral nutrition is the key to optimize the production of groundnut, as it has very high nutrient requirement and the recently released high yielding groundnut varieties remove still more nutrients from the soil. On contrary groundnut farmers, most part of the semi-arid region use very less nutrient fertilizer and sometime only one or two nutrients resulting in severe mineral nutrient deficiencies due to inadequate and imbalance use of nutrients is one of the major factors responsible for low yield in groundnut. India is the world's largest producer of groundnut where nutritional disorders cause yield reduction from 30 to 70% depending upon the soil types. Thus it is high time to look into the mineral nutrition aspects of groundnut for achieving high yield and advocate the suitable package of practices for optimization of yield (Veeramani *et al*., 2012) [5]. Many studies have shown that organic farming methods can produce even higher yields than conventional methods. Significant difference in soil health indicators such as nitrogen mineralization potential and microbial abundance and diversity, which were higher in the organic farms can also be seen.

Material and Methods
The experiments on the effect of efficacy of liquid, powder and gel-based rhizobium and RDN levels on the growth and yield enhancement of groundnut were conducted at *Zaid* season of

2023 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj which is located at 250 24 42 N latitude, 810 50 56 E longitude and 98 m altitude above the mean sea level. This area is situated on the right side of the river Yamuna by the side of Prayagraj Rewa Road about 5 km away from Prayagraj city. A composite soil sample was collected at a depth of 0-30 cm. It was air dried, crushed, and tested for physical and chemical properties. The soil was sandy clay loam in texture with soil reaction of (pH 7.6), 0.69 organic matter (0.72%), available nitrogen (152.7 kg/ha), phosphorus (10.4 kg/ha), potassium (174.0 kg/ha), sulphur (7.2 mg/kg), Zn (0.72 mg/kg) and available B (0.56 mg/kg). Groundnut (*Arachis hypogea* L) variety K1812 were selected for sowing. Seeds were sown in line manually on 2023. Seeds were covered with the soil immediately after sowing. The spacing adopted was plant to plant 10 cm and row to row 30 cm according to the treatment details and the seeds were drilled at 3-4 cm depth. All the treatments were applied by balancing to the initial soil test values and crop requirements to justify the crop response to the supplied nutrients in both years. Influence of liquid, powder and gel-based rhizobium and RDN levels on growth and yield of both parameters.

Results and Discussion

Write conclusion in 100-120 following

Plant height: At harvest there was significant difference among the treatments. However, highest plant height (94.81 cm) was recorded with the application of Powder based rhizobium + 100% RDN, whereas treatment Liquid based rhizobium + 100% RDN (92.16 cm) and Gel based rhizobium + 100% RDN (90.22 cm) were found to be statistically at par with T_7, and minimum was reported in control (86.46 cm).

Plant dry weight: At harvest there was significant difference among the treatments. However, highest dry weight (47.65 g) was recorded with the application of Powder based rhizobium + 100% RDN, whereas treatment Liquid based rhizobium + 100% RDN (46.79 g) was found to be statistically at par with T_7, and minimum was reported in control (38.78 g).

Number of pods per plant: Significantly Maximum number of pods per plant (49.20) was recorded with the treatment in application of Powder based rhizobium + 100% RDN and minimum was recorded in control (20:40:40) (32.00), whereas Liquid based rhizobium + 100% RDN (47.40) was statistically at par with T_7.

Number of kernels per pod: Significantly Maximum number of seeds per pod (3.00) was recorded with the treatment in application of Powder based rhizobium + 100% RDN and minimum was recorded in control (20:40:40) (2.00), whereas Liquid based rhizobium + 100% RDN (2.87) was statistically at par with T_7

Test weight (g): The perusal of the data of Test weight was recorded at harvest, is presented in Table 1. The data pertained that there was significant effect among different treatments on Test weight (g). Significantly Maximum test weight (36.76 g) was recorded with the treatment in application of Powder based rhizobium + 100% RDN and minimum was recorded in control (20:40:40) (31.01 g), whereas Liquid based rhizobium + 100% RDN (35.22 g) was statistically at par with T_7

Seed yield (kg/ha): Significantly Maximum seed yield (1966.32 kg/ha) was recorded with the treatment in application of Powder based rhizobium + 100% RDN and minimum was recorded in control (20:40:40) (1735.85 kg/ha), whereas Liquid based rhizobium + 100% RDN kg/ha) was statistically at par with T7. The optimum growth of the plant due to favourable nutritional environment and higher uptake of nutrients might have favoured significant increase in number of pegs per plant and thus a greater number of pods per plant. However, Panwar and Singh (2003) [2], Satpute *et al*. (2021) [4], and Zalate and Padmani (2009) [6] reported same. The important growth and yield contributing characters *viz*., plant spread, number of branches, dry matter accumulation, number of pods and kernels and their weight and thousand kernel weight were significantly increased with the application of P solubilizer treatments with poultry manure due to additional nitrogen and phosphorous uptake, resulting in increased dry pod yield. Increase in root nodules due to P-solubilizer and nitrifying bacteria also helped in increasing better root development and dry pod yield by fixing more nitrogen and consequently increasing its absorption. These results were found to be in conformity with Raychaudari *et al*. (2003) [3] and Chavan *et al*. (2013) [1].

Table 1: Effect of Bio-fertilizers and Levels of RDN on yield attributes and yield of groundnut

S No	Treatments	Plant height	Plant dry weight	Number of pods per plant	Number of seeds per pod	Test weight	Seed yield (Kg/ha)
1.	Powder based rhizobium + 50% RDN	88.74	40.89	39.00	1.27	32.00	1774.90
2.	Liquid based rhizobium + 50% RDN	87.57	40.27	37.00	1.27	31.28	1780.82
3.	Gel based rhizobium + 50% RDN	86.93	38.92	37.00	1.93	31.04	1774.46
4.	Powder based rhizobium + 75% RDN	89.82	43.01	43.07	2.07	34.09	1866.22
5.	Liquid based rhizobium + 75% RDN	89.34	42.14	41.20	2.07	33.15	1864.51
6.	Gel based rhizobium + 75% RDN	88.71	41.03	40.20	2.07	32.34	1849.02
7.	Powder based rhizobium + 100% RDN	94.81	47.65	49.20	3.00	36.76	1966.32
8.	Liquid based rhizobium + 100% RDN	92.16	46.79	47.40	2.87	35.22	1943.91
9.	Gel based rhizobium + 100% RDN	90.22	46.06	45.00	2.73	35.00	1930.69
10.	Control (20:40:40)	86.46	38.78	32.00	2.00	31.01	1735.85
	F – Test	S	S	S	S	S	S
	SE m (±)	1.69	0.62	0.64	0.06	0.52	29.48
	CD (p=0.05)	5.02	1.85	1.92	0.20	1.56	87.59

Conclusion

In conclusion, the study demonstrated significant differences in various growth and yield parameters among different treatments. The application of Powder based rhizobium + 100% RDN consistently resulted in superior plant height, dry weight, number of pods per plant, number of kernels per pod, test weight, and seed yield compared to other treatments, including the control. These findings suggest that the utilization of Powder based rhizobium in conjunction with optimal nutrient supplementation enhances plant growth, nutrient uptake, and ultimately, seed yield. The observed improvements in growth and yield parameters can be attributed to the favorable nutritional environment created by the treatment, leading to enhanced nutrient uptake and utilization by the plants. Furthermore, the increase in root nodules facilitated by P-solubilizer and nitrifying bacteria contributed to better root development and ultimately higher yield. These results align with previous research, highlighting the importance of innovative agricultural practices in maximizing crop productivity.

References

1. Chavan AP, Jain NK, Mahadkar UV. Direct and residual effects of fertilizers and biofertilizers on yield, nutrient uptake and economics of groundnut (*Arachis hypogaea* L.)-rice (*Oryza sativa*) cropping system. Indian Journal Agronomy. 2014;59(1):53-58.
2. Panwar AS, Singh NP. Effect of conjunctive use of phosphorus and bio-organics on growth and yield of groundnut (*Arachis hypogaea* L.). Indian Journal of Agronomy. 2003;48(3):214-216.
3. Raychandhuri M, Ngachan SV, Raychaudhari S, Singh AL. Yield response of groundnut (*Arachis hypogaea* L.) to dual inoculation and liming of an acid hill ultisol of Manipur. Indian Journal of Agricultural Sciences. 2003;73(2):86-88.
4. Satpute AV, Patil JB, Ghule NS, Patil MJ. Effect of inorganic and bio-fertilizers on yield attributes, yield and economic of summer groundnut (*Arachis hypogaea* L.) International Journal of Chemical Studies. 2020;9(1):3289-3293.
5. Veeramani P, Subrahmaniyan K, Ganesaraja V. Organic manures management on groundnut: A review. Woodpecker Journal of Agricultural Research. 2012;1(7):238-243.
6. Zalate PY, Padmani DR. Effect of organic manure and bio-fertilizers on growth, yield attributes and economics of kharif groundnut (*Arachis hypogaea* L). GAU Research Journal. 2009;34:106-108.