Original Research Article

Response of Nitrogen Management on Growth and Yield of Groundnut

(*Arachis hypogea* L.)

Abstract

A field experiment was conducted during *Zaid* season of 2023 at Crop Research Farm Department of Agronomy, Naini Agriculture Institute, Sam Higginbottom University of Agriculture Sciences and Technology, To determine "Response of Nitrogen Management on Growth and Yield of Groundnut''Theresult revealed that treatment 6[75% Nitrogen through poultry manure + 25% Nitrogen through urea]recorded significantly higher plant height (42.28 cm), maximum number of nodules/plant (21.06), higher plant dry weight (28.44 g), maximum number of pod/plant (28.31), higher number of kernels/pod (2.87), higher seed index (41.50 g),higher seed yield (3.30 t/ha), higher haulm yield (8.04 t/ha)and higher harvest index (29.95%).

Keywords: Groundnut, Organic manure, nitrogen, Growth and yield.

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1. INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is a self pollinated, annual, herbaceous, autotetrapliod legume with 2n = 40 chromosomes belonging to the family leguminoseae (Fabaceae). Groundnut is recognized as golden or miracle bean due to its high nutritive value and various usage viz., for feed, oil and soy food products. It is rich in protein (38-42%) and contains 18- 22 per cent edible oil. It is known by various names as “wondernut”, “Poor man’s Cashew nut”, “Peanut” “Monkey nut”, “Earth nut” or “King of Oilseeds”. It is the thirteenth most important food crop of the world; fourth most important source of edible oil and the third most important source of vegetable protein. This crop has own importance due to high edible oil content and nutritional value of kernel as human food, and haulm as rich feed for animals. Peanut is very important source of oil (40-45%), protein (26%), carbohydrates (25%), minerals (Phosphorus, calcium and iron) and vitamins (vitamin B complex like thiamine, riboflavin, niacin and vitamin E) in addition to higher proportion of unsaturated fatty acids, including essential fatty acids like linolenic and linoleic acids.

Groundnut rank fist in area and second in production after soyabean and is grown in almost all part of the country over wide range of agro-climatic condition. Globally, groundnut cover on area of 28.89 million hectares with the production of 54.41 million tons with the productivity of 1.88 tonnes/ha **(USDA, 2024)**. In India Groundnut is grown over an area of about 5.75 million hectors with a production of 10.11 million tons and productivity of 1.7 t/ha **(GOI 2022)**. Total area coverage under groundnut in Uttar Pradesh 1.21 million hectares with a production of 1.24 million tone and the productivity 1.02 t/ha **(GOI, 2022)**.

The country is currently dealing with an edible oil issue as well as rising edible oil consumption due to population growth. Therefore, farmers should implement appropriate and improved groundnut production strategies to solve these obstacles. The primary cause of the low peanut production is the crop's restricted *kharif* season cultivation, which is subject to monsoon variations and foliar disease epidemics. Crops experience varying degrees of soil dehydration throughout deficiency monsoon, and the issue is made harder during above-average rainfall seasons by water logging.The productivity of summer groundnut is considerably higher than the *kharif* groundnut due to favourable condition such as high temperature, more sunshine hours, assured irrigation under control condition and comparatively low incidence of disease and pests reduction in the use of chemical fertilizer and increased used of organic manure.

Poultry manure advisable as, the global environment pollution can be controlled considerably. The application of organic manure helps in mitigating multiple nutrient deficiencies and at same time

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provides better environment for growth and development by improving in physical, chemical and biological properties of soil. In India, poultry farming is increasing.

The use of organic sources such as vermicompost generally helpful for improving soil aggregation, structure and fertility improving the moisture holding capacity and increasing crop yield.

Nitrogen is a critical and limiting element for the growth and development of most of the plants. Nitrogen is also integral part of chlorophyll, which is the primary absorber of light energy needed for photosynthesis.

Therefore, judicious and combined use of organic and inorganic sources of plant nutrients plays important role in the econominizing the use of fertilizers under increasing cost of chemical fertilizer out to find out the effect of organic and inorganic sources of nutrients on growth, yield and economics of summer groundnut.

Keeping in view of the above fact, the experiment was conducted to find out “Response of Nitrogen Management on Growth and Yield of Groundnut”

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2. MATERIALS AND METHODS:

The experiment was conducted during *Zaid* season 2023 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P). The soil of the experimental field was sandy loam in texture, with soil (pH 7.8), low level of organic carbon (0.62%), available N (225 Kg/ha), P (38.2 kg/ha), K (240.7 kg/ha) and zinc (2.32 mg/kg). The experiment was laid out in RBD with 09 treatments each replicated thrice. The treatment combinations are T1- 100% Nitrogen through urea,T2- 75% Nitrogen through vermicompost + 25% Nitrogen through urea, T3- 50% Nitrogen through vermicompost + 50% Nitrogen through urea, T4- 25% Nitrogen through vermicompost + 75% Nitrogen through urea, T5- 100% Nitrogen through vermicompost, T6- 75% Nitrogen through poultry manure + 25% Nitrogen through urea, T7- 50% Nitrogen through poultry manure + 50 % Nitrogen through urea, T8- 25% Nitrogen through poultry manure + 75% Nitrogen through urea, T9- 100% Nitrogen through poultry manure. Data recorded on different aspects of crop, *viz*., growth, yield attributes& yield were subjected to statistically analysed by analysis of variance method as described by **(Gomez and Gomez,1976).**

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3. RESULT AND DISSCUSSION

3.1 Growth Attributes

3.1.1 Plant height (cm)

The data revealed that significant and higher plant height (42.28 cm) was recorded in treatment 6 (75% Nitrogen through poultry manure + 25% Nitrogen through urea). However, treatment 2 (75% Nitrogen through vermicompost + 25% Nitrogen through urea) was found statistically at par with treatment 6 (75% Nitrogen through poultry manure + 25% Nitrogen through urea).significant and higher plant height was observed with the application of 75% Nitrogen through poultry manure, might be due to poultry manure increased the nutrient supply to the plants and played a vital role in better root proliferation, higher cell division, higher biological nitrogen fixation, and nutrient availability uptake, which would have resulted in increased high plant height similar to that reported by **Patel *et al.* (2022).** Further, the higher plant height was observed with the application 25% Nitrogen trough urea might be due to when urea was utilized via foliar application an increased in macro and micro nutrient content and enhancing photosynthesis above it takes place and consequently affects the height of plant. These result are similar to that reported by **Kharetwal*et al.* (2021).**

3.1.2 Number of nodules/plant

The data revealed that significant and maximum number of nodules/plant (21.06) was recorded in treatment 6 (75% Nitrogen through poultry manure + 25% Nitrogen through urea). However, treatment 2 (75% Nitrogen through vermicompost + 25% Nitrogen through urea) which was found statistically at par with treatment 6 (75% Nitrogen through poultry manure + 25% Nitrogen through urea).Significant and maximum number of nodules/plant was observed with the application of 75% nitrogen through poultry manure, might be due to basal application of poultry manure increased nodules, supplied all essential nutrients, growth hormones and enzymes to plant, which favour rapid cell division and ultimately increased nodules. The similar result were reported by **Mishra and chaturvedi (2023).** Further the higher number of nodules/plant was observed with the application of 25% Nitrogen through urea might be due to influence of nutrients to produce larger cells with thinner cell wall and its contribution in cell division and cell elongation which improved vegetative growth and ultimately increased root nodules/plant. Similar result was reported by **Vala *et al.* (2017).**

3.1.3 Plant dry weight (g)

Results revealed that significant and higher dry weight (28.44 g) was recorded in treatment 6 (75% Nitrogen through poultry manure + 25% Nitrogen through urea). However, treatment 2 (75%

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Nitrogen through vermicompost + 25% Nitrogen through urea) which was found statistically at par with treatment 6 (75% Nitrogen through poultry manure + 25% Nitrogen through urea).Significant and maximum plant dry weight was observed with application of 75% Nitrogen through poultry manure, which might be due to application of poultry manure increased total dry matter, higher production of new call and increase photosynthesis resulted maximum plant dry weight. Similar report were also in agreement by **Patel *et al.* (2022).** Further significant maximum plant dry weight was 25% Nitrogen through urea increased may be due to nitrogen at higher level might have accelerated photosynthetic activity by increasing the source size (plant height and branch), there by providing the developing bud with more photosynthates, there by greater dry matter production **(Palsande*et al.* 2019)**

3.1.4 Crop Growth Rate (g/m2/day)

The data recorded during 60-80 DAS,intervals highest crop growth rate (18.46 g/m2/ day) was observed in treatment 6 [75% Nitrogen through poultry manure + 25% Nitrogen through urea] Howere there was found no significant difference was found among all the treatments.

3.1.5 Relative Growth Rate (g/g/day)

The data revealed that during 60-80DAS, intervals higher relative growth rate (0.0298 g/g/day) was recorded in treatment 5 [100% Nitrogen through vermicompost] However there was found no significant difference was found among all the treatments.

3.2 Yield and Yield Parameters:

3.2.1 Number of pods/plant

The data recorded that Significant and maximum number of pod/plant (28.31) was recorded treatment 6 [75% Nitrogen through poultry manure + 25% Nitrogen through urea]. However, treatment 2 [75% Nitrogen through vermicompost + 25% Nitrogen through urea] were found to be statistically at par with the treatment 6 [75% Nitrogen through poultry manure + 25% Nitrogen through urea]. Significant and maximum number of pods/plant was with the application of 75% Nitrogen through poultry manure might be due to poultry manure supply of almost all plant essential nutrient by translocation of photosynthates accumulated under the influence of the source of organic nutrient. These results are Similar to that reported by **Patel *et al.* (2022).** Further, significant and maximum number of pods/ plants was with the application of 25% Nitrogen through urea may be due to supply of nutrient from inorganic nutrient sources and prolonged availability of nutrients to the

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growing plant, which results into tissue differentiation from somatic to reproductive meristematic activity and increase in development of floral primordial, resulting in higher number of pods/plant. These results were corroborated by **Patel *et al.* (2022).**

3.2.2 Number of kernels/pod

The data recorded that Significantly maximum Number of kernels/pod (2.87) were recorded in treatment 6 [75% Nitrogen through poultry manure + 25% Nitrogen through urea]. However, the treatment 2 [75% Nitrogen through vermicompost + 25% Nitrogen through urea] was found statically at par with treatment 6 [75% Nitrogen through poultry manure + 25% Nitrogen through urea].Significant and maximum number of kernels/pod obtained with the application of 75% Nitrogen through poultry manure might be due to greater availability of metabolites (photosynthates) and nutrients to developing reproductive structures seems to have resulted in increase in the yield attributing characters particularly number of kernels/pod. Similar result was reported by **Mishra and Chaturvedi (2023).** Further, significant and maximum number of kernels/pod was with the application of 25% Nitrogen through urea might be due to improvement in nutritional environment which might have favourably influenced carbohydrate metabolism which in turn increased the uptake of nutrients and ultimately resulted in increased kernel weight and shelling percent. The findings agreed with those of **Vala *et al.* (2017).**

3.2.3 Seed index (g)

Treatment 6 [75% Nitrogen through poultry manure + 25% Nitrogen through urea] recorded highest seed index (41.50). Though there is no significant difference found among all the treatments.

3.2.4 Seed yield (t/ha)

The data recordedSignificant and higher seed yield (3.30 t/ha) was recorded in treatment 6 [75% Nitrogen through poultry manure + 25% Nitrogen through urea]. However, treatment 2 [75% Nitrogen through vermicompost + 25% Nitrogen through urea] were found to be statistically at par with the treatment 6 [75% Nitrogen through poultry manure + 25% Nitrogen through urea].Significant and higher seed yield was recorded with the application of RDN and poultry manure might be due to adequate supply of nutrients through organic and inorganic sources enhanced the biological nitrogen fixation which might facilitates better root proliferation and increased the seed yield. Similar results were reported by **Gowsalya*et al.* (2023).**

3.2.5 Haulm yield (t/ha)

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Significant and higher haulm yield (8.04 t/ha) was recorded in treatment 6 [75% Nitrogen through poultry manure + 25% Nitrogen through urea]. However, treatment 2 [75% Nitrogen through vermicompost + 25% Nitrogen through urea] which was found to be statistically at par with the treatment 6 [75% Nitrogen through poultry manure + 25% Nitrogen through urea].Significant and higher haulm yield was recorded with the application of poultry manure might be due to the better yield performance by increasing activities of N-fixing bacteria and increased rate of humification, Humic acid present in poultry manure may be enhanced the availability of added micronutrients in soil, thus improved yield attributes and haulm yield. The present findings are within the close proximity of **Devi *et al.* (2021).** Further higher haulm yield was with the application of nitrogen might be due to proper fertilization coupled with increased net photosynthates on the one hand and greater mobilization of photosynthates towards reproductive structures on the other hand which might have increased the haulm yield. The present findings are within the close proximity of **Patel *et al.* (2022).**

3.2.6 Harvest index (%)

Significant and higher harvest index (30.01%) was recorded in treatment 6 [75% Nitrogen through poultry manure + 25% Nitrogen through urea]. However, treatment 2 [75% Nitrogen through vermicompost + 25% Nitrogen through urea] which was found to be statistically at par with the treatment 6 [75% Nitrogen through poultry manure + 25% Nitrogen through urea]. Significant and higher harvest index was observed with application of poultry manure and RDF might be due to the indicates better partitioning of photosynthetic substance to economic yield, appreciably high harvest index shows the efficiency of converting biological yield into economic yield. The present findings are within the close proximity of **Arif *et al.* (2014).**

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Table 1: Response of nitrogen management on growth attributes of groundnut.

S.No.	Treatment combinations	Plant height (cm) (80 DAS)	Number of nodules/plant	Plant dry weight (g)	CRG ($g/m^2/day$)	RGR (g/g/day)
1	100% Nitrogen through urea	35.33	16.46	23.32	16.35	0.0273
2	75% Nitrogen through vermicompost + 25% Nitrogen through urea	40.04	19.93	27.1	17.58	0.0246
3	50% Nitrogen through vermicompost + 50% Nitrogen through urea	36.41	16.86	23.51	16.27	0.0269
4	25% Nitrogen through vermicompost + 75% Nitrogen through urea	32.28	15.53	22.68	16.5	0.0287
5	100% Nitrogen through vermicompost	30.46	14.73	21.47	16.08	0.0298
6	75% Nitrogen through poultry manure + 25% Nitrogen through urea	42.28	21.06	28.44	18.46	0.0246
7	50% Nitrogen through poultry manure + 50 % Nitrogen through urea	36.76	17.73	24.44	15.08	0.0232
8	25% Nitrogen through poultry manure + 75% Nitrogen through urea	34.72	16.13	23.06	16.52	0.0281
9	100% Nitrogen through poultry manure	30.98	15	22.01	15.96	0.0286
	F-test	**S**	**S**	**S**	**NS**	**NS**
	SEm(±)	0.75	0.55	0.55	1.43	0.0020

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CD (P=0.05)	2.26	1.64	1.66	-	-	

Table 2 : Response of nitrogen management on yield and yield attributes of Groundnut.

S.No.	Treatment combination	Numberof pods/plant	Number ofkernels/ pod	Seedindex (g)	SeedYield (t/ha)	HaulmYield (t/ha)	Harvest Index(%)
1	100% Nitrogen through urea	24.00	1.98	40.17	1.97	5.79	25.42
2	75% Nitrogen through vermicompost + 25% Nitrogen through urea	24.00	2.81	41.21	3.16	7.41	29.80
3	50% Nitrogen through vermicompost + 50% Nitrogen through urea	24.00	1.87	40.58	1.97	6.09	24.40
4	25% Nitrogen through vermicompost + 75% Nitrogen through urea	24.00	1.77	39.87	1.72	5.53	23.73
5	100% Nitrogen through vermicompost	24.00	1.47	38.71	1.31	4.89	21.14
6	75% Nitrogen through poultry manure + 25% Nitrogen through urea	24.00	2.87	41.50	3.30	8.04	29.95
7	50% Nitrogen through poultry manure + 50 % Nitrogen through urea	24.00	2.37	40.97	2.58	6.48	28.42
8	25% Nitrogen through poultry manure + 75% Nitrogen through urea	24.00	1.60	39.68	1.52	5.53	21.59
9	100% Nitrogen through poultry manure	24.00	1.55	39.20	1.42	5.12	21.63

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Ftest	**S**	**NS**	**S**	**S**	**S**
SEm(±)	0.09	0.73	0.06	0.26	0.58
CD(p=0.05)	0.27	2.20	0.19	0.78	1.74

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CONCLUSION

It is concluded that (treatment 6), application of 75% Nitrogen through poultry manure and 25% Nitrogen through urearecorded highest growth and seed yield.

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