Journal of Advances in Biology & Biotechnology

Volume 27, Issue 7, Page 257-263, 2024; Article no.JABB.117639
ISSN: 2394-1081

Response of Nitrogen Management on Growth and Yield of Groundnut (*Arachis hypogea* L.)

Dinesh Pareek [a++*], Victor Debbarma [a#], Ravindra Kumar [a++] and Magendra Karan Karnot [a++]

[a] Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj- 211007, Uttar Pradesh, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/jabb/2024/v27i7985

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/117639

Original Research Article

Received: 01/04/2024
Accepted: 05/06/2024
Published: 08/06/2024

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'' The result 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%).

[++]M.Sc. Scholar;
[#]Assistant Professor;
**Corresponding author: E-mail: Dineshpareek1818@gmail.com;*

Cite as: *Pareek, Dinesh, Victor Debbarma, Ravindra Kumar, and Magendra Karan Karnot. 2024. "Response of Nitrogen Management on Growth and Yield of Groundnut (Arachis Hypogea L.)". Journal of Advances in Biology & Biotechnology 27 (7):257-63. https://doi.org/10.9734/jabb/2024/v27i7985.*

Keywords: Groundnut; organic manure; nitrogen; growth; yield.

1. INTRODUCTION

The groundnut, or *Arachis hypogaea* L., is an annual, herbaceous, autotetrapliod legume that belongs to the leguminoseae (Fabaceae) family and is self-pollinated. It has 2n = 40 chromosomes. Because of its great nutritional content and versatility in uses, including as feed, oil, and soy food items, groundnuts are known as the "miracle" or "golden" bean. It has a high protein content of 38–42% and 18–22% edible oil. It goes by a number of titles, including "wondernut," "Poor man's Cashew nut," "Peanut," "Monkey nut," "Earth nut," and "King of Oilseeds." It ranks as the thirteenth most significant food crop globally, the fourth most significant source of edible oil, and the third most significant source of vegetable protein.This crop is significant because of its high edible oil content, the nutritional value of the kernels for human use, and the haulm for rich animal feed. A significant source of minerals (calcium, phosphorus, iron), vitamins (vitamin B complex, thiamine, riboflavin, niacin, and vitamin E), oil (40–45%), protein (26%), carbohydrates (25%), and unsaturated fatty acids (higher proportion of linolenic and linoleic acids) are found in peanuts.

“Groundnuts are cultivated in nearly every region of the nation under a variety of agroclimatic conditions, ranking first in area and second in output after soybeans. 28.89 million hectares of groundnuts are produced worldwide, with a yield of 54.41 million tonnes and a productivity of 1.88 tonnes/ha” [1]. In India, 10.11 million tonnes of groundnuts are produced over an area of around 5.75 million hectors, with a productivity of 1.7 t/ha [2]. In Uttar Pradesh, there are 1.21 million hectares of groundnuts grown, producing 1.24 million tonnes and yielding 1.02 t/ha [2,3].

The nation is now addressing the problem of edible oil as well as the rise in edible oil consumption brought on by population expansion. To overcome these challenges, farmers should adopt suitable and improved groundnut production techniques. The crop's confined kharif season cultivation, which is vulnerable to monsoon changes and foliar disease outbreaks, is the main reason for the low yield of peanuts.

“Throughout the deficient monsoon, crops suffer varied degrees of soil dryness; water logging exacerbates the problem during above-average rainfall seasons. Due to favourable conditions like high temperatures, more sunshine hours, guaranteed irrigation under controlled conditions, and a relatively low incidence of disease and pests, summer groundnut productivity is significantly higher than that of kharif groundnuts. Additionally, the use of chemical fertiliser is reduced and the use of organic manure is increased” [3].

It is recommended to use poultry manure since it can significantly reduce environmental pollution worldwide. Applying organic manure improves the physical, chemical, and biological qualities of the soil, which helps to improve the environment for growth and development while also reducing several nutritional deficits. Poultry farming is growing in India.

Using organic materials, like vermicompost, can assist to improve the fertility, aggregation, and structure of the soil, as well as its ability to store moisture and produce more crops.For the majority of plants, nitrogen is a crucial and constricting component of growth and development. Another essential component of chlorophyll, the main absorber of light energy required for photosynthesis, is nitrogen.

In order to maximise the use of fertilisers in light of the rising cost of chemical fertilisers, it is crucial to use both organic and inorganic sources of plant nutrition sparingly and in combination. This will help determine how organic and inorganic sources of nutrients affect summer groundnut growth, yield, and economics.

The experiment was carried out to determine the "Response of Nitrogen Management on Growth and Yield of Groundnut" in light of the aforementioned fact.

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 [4].

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. [5]. 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. [6].

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 [7]. 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. [8].

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% 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. [9]. 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 [10].

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 60-80 DAS, 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. [11]. 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 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. [5].

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 [7]. 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. [8].

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 recorded Significant 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. [12].

3.2.5 Haulm yield (t/ha)

“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” [13]. 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. [5].

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
	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	Number of pods/ plant	Number of kernels /pods	Seed index (g)	Seed Yield (t/ha)	Haulm Yield (t/ha)	Harvest Index (%)
1	100% Nitrogen through urea	24.81	1.98	40.17	1.97	5.79	25.42
2	75% Nitrogen through vermicompost + 25% Nitrogen through urea	27.30	2.81	41.21	3.16	7.41	29.80
3	50% Nitrogen through vermicompost + 50% Nitrogen through urea	25.91	1.87	40.58	1.97	6.09	24.40
4	25% Nitrogen through vermicompost + 75% Nitrogen through urea	24.38	1.77	39.87	1.72	5.53	23.73
5	100% Nitrogen through vermicompost	22.79	1.47	38.71	1.31	4.89	21.14
6	75% Nitrogen through poultry manure + 25% Nitrogen through urea	28.31	2.87	41.50	3.30	8.04	29.95
7	50% Nitrogen through poultry manure + 50 % Nitrogen through urea	26.51	2.37	40.97	2.58	6.48	28.42
9	25% Nitrogen through poultry manure + 75% Nitrogen through urea	24.00	1.60	39.68	1.52	5.53	21.59
10	100% Nitrogen through poultry manure	23.27	1.55	39.20	1.42	5.12	21.63

S.No.	Treatment combination	Number of pods/ plant	Number of kernels /pods	Seed index (g)	Seed Yield (t/ha)	Haulm Yield (t/ha)	Harvest Index (%)
	F test	S	S	NS	S	S	S
	SEm(±)	0.77	0.09	0.73	0.06	0.26	0.58
	CD (p=0.05)	2.31	0.27	2.20	0.19	0.78	1.74

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" [14,15].

4. CONCLUSION

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

ACKNOWLWDGEMENT

The authors are thankful to Department of Agronomy, Naini Agricultural Institute, Prayagraj, Sam Higginbottom University of Agriculture Technology and sciences, (U.P) India for providing necessary facilities to undertake the studies.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. USDA. United states Department of Agriculture. World Agricultural Production; 2023.
2. GOI. Agricultural statistics at a glance. Agricultural statistics division, directorate of economics and statistics, department of agriculture and cooperation, ministry of agriculture, government of India, New Delhi; c2022.
   Available: https://eands.dacnet.nic.in
3. Sreerenjiny S, Debbarma V. Influence of integrated nutrient management on growth and yield of mustard (*Brassica juncea L.*). International Journal of Plant & Soil Science. 2022;34(21):435-2.
4. Gomez KA, Gomez AA. Statistical procedures for agriculture research, 2nd edition, John Wiley and Son, New York. 1976;680.
5. Patel T, Patel RA, Patel P. Effect of irrigation scheduling and nitrogen management on growth and yield of summer groundnut. The Pharma Innovation Journal. 2022;11(9): 1623-1627.
6. Kharetwal N, Ghatak RG, Thaokar A, Gawali K, Sarda A, Nagmote A. Effect of different nutrient management practices on growth, yield and economics in chickpea. The Pharma Innovation Journal. 2021; 10(9): 993-996.
7. Mishra KS, Chaturvedi PK. Effect of integrated nutrient management on growth and yield of green gram. The Pharma Innovation Journal. 2023;12(1): 671-673.
8. Vala FG, Vaghasis PM, Zala KP, Buha DB. Effect of integrated nutrient management on productivity of summer groundnut. International journal of current microbiology and applied sciences. 2017;6(10): 1951-1957.
9. Patel R, Patel P, Patel H, Patel H, Patel, T. Nitrogen management through organic sources and biofertilizers in summer groundnut. The Pharma Innovation Journal. 2022;11(9):1342-1347.
10. Palsande VN, Nagral MR, Kasture MC, Gokhale NB, Dhekale JS, Salvi VG. Growth, yield and quality of kharif groundnut as affected by different levels of, potassium and zinc in lateritic soils of konkan. Journal of pharmacognosy and phytochemistry. 2019; 8(5): 790-794.
11. Patel T, Patel RA, Patel P. Effect of irrigation scheduling and nitrogen management on growth and yield of

summer groundnut. The Pharma Innovation Journal. 2022;11(9): 1623-1627.
12. Gowasalya M, Murugan G, Suseendran K, Stalin P, Perumal MS. Effect of Integrated Application of Organic Manure and Inorganic Fertilizer on Yield, Quality and Economics of Machine Sown Groundnut. Journal of Emerging Technology and Innovative Research. 2023;10(2):2349-5162.
13. Devi R, Singh V, Tiwari D, Sudhakar M Rakesh M. Influence of organic manures and moiybdenum on growth and yield of groundnut. An International Journal. 2021; 13(3): 402-406.
14. Arif M, Tasneem M, Bashir F, Yaseen G, Iqbal RM. Effect of integrated use of organic manures and inorganic fertilizers on yield and yield components of rice. Journal of agriculture research. 2014; 52(2):197-206.
15. Patil DB, Pawar PP, Wadile SC, Patil HM. Effect of integrated nutrient management on growth and yield of kharif groundnut. International Journal of Horticulture And Science. 2017;1(1): 21-23.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/117639