Environment and Ecology 41(3): 1444—1447, July—September 2023
Article DOI: https://doi.org/10.60151/envec/LNAD9368
ISSN 0970-0420

Influence of Phosphorus and Foliar Spraying of Zinc on Growth and Yield of Summer Groundnut

Kottala Nikitha, Umesha C., Boyapati Vandana

Received 1 March 2023, Accepted 3 May 2023, Published on 24 July 2023

ABSTRACT

A field experiment was conducted during *Zaid* 2022 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (UP). The experiment was laid out in Randomized Block Design with ten treatments which are replicated thrice based on one-year of experimentation. The treatments consists of 3 different levels of phosphorus (40, 50, 60 kg/ha) and chelated zinc (0.5, 1g, 2 g/liter) as a foliar spray and a control. The results revealed that the application of 60 kg/ha P_2O_5 + 2 g/liter chelated zinc (EDTA) was recorded significantly higher plant height (36.80 cm), No. of Nodules/plant (117.5), Plant dry weight (26.06 g/plant), Number of pods per plant (37.6), Seeds/pod (2.37), Test weight (38.00 g), Seed yield pod yield (3.80 t/ha), Seed yield (2.74 t/ha), Haulm yield (4.87 t/ha), Harvest index (46.00%), Shelling percent (59.07%), Gross returns (Rs 89,600.00/ha), Net return (Rs 62,340.00/ha) and Benefit-cost ratio (2.28).

Keywords Chelated zinc, Groundnut, Phosphorus, Yield.

INTRODUCTION

The groundnut belongs to the family Fabaceae, commonly known as the legume, bean, or pea family. Like other legumes, peanuts harbor symbiotic nitrogen-containing bacteria in root nodules. The capacity to a fixed amount of nitrogen means peanuts require less nitrogen- containing fertilizer and thus it improves soil fertility, making them beneficial in crop rotations.

Groundnut plays important role in oilseed and acts as a supplementary crop of the world. When pods are developing it produces flowers, therefore even when they are ready for harvest though some pods are immature. The time of harvest is important to maximize the yield. In the circumstances of early harvest the pods will be unripe. If the harvest, prolongs, the pods will snap off at the stalk and will remain in the soil. It is valued for its high oil content and edible seeds. It is also an important source of vegetable protein in the world. Groundnut is not only an important oilseed crop in India but also play role in an important agricultural export commodity. Globally, groundnut covers 315 lakh hectares of area with a production of 536 lakh tonnes with a productivity of 1701 kg per hectare (FAOSTAT 2020). In *kharif* 2021-22, groundnut production was 82.54 lakh tonnes (1st advanced estimates) in an area of 49.14

Kottala Nikitha[1]*, Umesha C.[2], Boyapati Vandana[3],
[2]Assistant Professor
[1,2,3] Department of Agronomy, Faculty of Agriculture, Naini Agriculture Institute, SHUATS, Prayagraj- 211007, Uttar Pradesh, India.
E mail: kottalanikitha@gmail.com
*Corresponding author

lakh hectares. Groundnut is cultivated in one or more (*kharif , rabi* and *summer*) seasons, but nearly 90% of the area and production comes from the *kharif* crops (June—October).

In Andhra Pradesh, groundnut is mostly cultivated in an area of 8.7 lakh hectares with the production of 7.74 lakh tonnes, contributing 7.63% to India's groundnut production (des.ap.gov.in) for the year 2020-21. According to 2nd advance estimates during 2021-22, groundnut was grown 8.09 lakh hectares with the production of 5.35 lakh tonnes and productivity was 661 kg/ha.

Phosphorus are an important primary nutrient that enhance root growth and is required for the synthesis of oil, protein, acid and is also involved in formation of glucosinolates which on hydrolysis increases the oil content. In nodulating legumes, the requirement of phosphorus is higher compared to non-nodulating crops as it plays an important role in the formation of nodules and atmospheric nitrogen fixation. Phosphorus also plays an important role in the number of nodules production, Uptake of N, P and K Mouri *et al.* (2018) and Kabir *et al*. (2014). Zinc is known to be the constituent of enzymes and is also involved in the synthesis of pyruvic decarboxylase and indole acetic acid. Zinc is required in various metabolic processes as catalyst. Zinc also increases the content of protein, calorific value, amino acid and fat in oilseed crops Kadam (2018).

MATERIALS AND METHODS

The experiment was conducted to know the effect of different doses of phosphorus and chelated zinc on the growth and yield attributes of groundnut cv K1812 was carried out at the Crop Research Farm of Sam Higginbottom University, Prayagraj, Uttar Pradesh in 2022. The experiment was laid out in an RBD consisting of Ten treatments including control with 3 replications, with the treatment combinations T_1 - 40 kg/ha P_2O_5 + 0.5 g/liter chelated zinc EDTA (Ethylenediamine tetraacetate), T_2 - 40 kg/ha P_2O_5 + 1 g/liter chelated zinc, T_3 - 40 kg/ha P_2O_5 + 2 g/liter chelated zinc, T_4 - 50 kg/ha P_2O_5 + 0.5 g/liter chelated zinc, T_5 - 50 kg/ha P_2O_5 + 1 g/liter chelated zinc, T_6- 50 kg/ha P_2O_5 + 2 g/liter chelated zinc, T_7 - 60 kg/ha P_2O_5 + 0.5 g/liter chelated zinc, T_8 - 60 kg/ha P_2O_5 + 1g/liter chelated zinc, T_9 - 60 kg/ha P_2O_5 + 2 g/liter chelated zinc, T_{10} - Control. The experiment was laid out in Randomized Block Design, with ten treatments replicated thrice. The observations were recorded for plant height, No. of nodules/plant, Plant dry weight, Crop growth rate (g/m^2/day), Relative growth rate (g/g/day), No. of pods/plant, Seeds/pod, Test weight, Seed yield, Pod yield, Halum yield. The collected data were subjected to statistical analysis by analysis of variance methods (Gomez and Gomez 1984).

RESULTS AND DISCUSSION

Pre - harvest parameters

The perusal of data indicates that plant height measured at (i.e., 60 DAS) was not influenced markedly by the application of different levels of phosphorus, though, a numerical increase in plant height was recorded in dose-dependent manner. At 60 DAS, (Table 1) significantly higher plant height (36.80 cm) was recorded with the treatment 60 kg/ha P_2O_5 + 2 g/liter chelated zinc EDTA (Ethylenediamine tetraacetate). However, the application of 60 kg/ha P_2O_5+ 1 g/liter chelated zinc EDTA (35.60) was statistically at par with 60 kg/ha P_2O_5 + 2 g/liter chelated zinc EDTA. Significantly higher nodules (117.5) were recorded with the treatment 60 kg/ha P_2O_5 + 2 g/liter chelated zinc EDTA. However, the application of 60 kg/ha P_2O_5+ 1 g/liter chelated zinc EDTA (117.5) was statistically at par with 60 kg/ha P_2O_5 + 2 g/liter chelated zinc EDTA. Significantly higher dry weight (26.06 g) was recorded with the treatment 60 kg/ha P_2O_5 + 2 g/liter chelated zinc. However, the application of 60 kg/ha P_2O_5+ 1 g/liter chelated zinc EDTA (25.48 g) was statistically at par with 60 kg/ha P_2O_5 + 2 g/liter chelated zinc EDTA. This might be due to an increasing in growth attributes may be attributable to the fact that P is known to help in the evolution of a more extensive root system and nodulation and thus enables plants to absorb more water and nutrients from the depth of the soil and the increase in dry weight due to phosphorus application may be because that phosphorus is known to help in the evolution of more extensive root system and thus enables plant to absorb more water and nutrients from the depth of the soil. The nodulation improvement might have

Table 1. Influence of phosphorus and foliar spraying of zinc and their combination on growth and yield of groundnut.

Treatments	Plant height (cm)	Number of nodule (No.)	Dry weight (g/plant)	Pods/ plant (No.)	Seed/ pod (No.)	Test weight (g)	Pod yield (t/ha)	Seed yield (t/ha)
T_1	29.30	107.4	23.56	32.4	1.80	32.47	3.11	2.05
T_2	30.60	107.4	23.72	32.6	1.74	32.69	3.21	2.15
T_3	31.10	107.8	23.76	33.5	1.83	33.74	3.26	2.20
T_4	31.30	108.2	24.07	34.6	1.87	34.25	3.43	2.37
T_5	32.30	108.7	24.10	36.0	1.91	36.68	3.51	2.45
T_6	32.40	109.4	24.68	36.2	1.99	34.96	3.58	2.52
T_7	32.90	110.1	24.87	36.7	2.02	37.00	3.63	2.57
T_8	35.30	110.3	25.48	37.0	2.42	37.42	3.76	2.70
T_9	36.80	117.5	26.06	37.6	2.37	38.00	3.80	2.74
T_{10} (Control)	28.50	105.2	22.54	30.5	1.79	30.24	3.08	2.02
F–test	S	S	S	S	S	S	S	S
SEm	0.50	1.06	0.99	0.57	0.02	0.60	5.57	3.76
CD (p=0.05)	1.5074	3.17	1.161	1.69	0.08	1.78	16.56	11.18

resulted in a higher amount of nitrogen fixation, better vegetative growth and production of drymatter Vali *et al.* (2020), Hinduja *et al.* (2020), Sagar *et al.* (2020). Zinc also plays as an activator of several enzymes in plants and it is directly involved in the biosynthesis of growth substances such as auxin thereby producing more plant cells and enhanced dry matter production. Similar findings were recorded by Lincoln *et al.* (2022), Radhika and Meena (2021).

Post - harvest parameters

Significantly higher pods per plant (37.6), Seeds per pod (2.37), Test weight (38 g), Pod yield (3.80 t/ha), Seed yield (2.74 t/ha) was recorded with the treatment 60 kg/ha P_2O_5 + 2 g/liter chelated zinc EDTA (Ethylenediamine tetraacetate). However, the application of 60 kg/ha P_2O_5+ 1 g/liter chelated zinc EDTA pods per plant (37.0), Seeds per pod (2.42), test weight (37.4 g), Pod yield (3.7 t/ha) and seed yield (2.7 t/ha) was statistically at par with 60 kg/ha P_2O_5+ 2 g/liter chelated zinc EDTA (Table 1). This results due to the application of phosphorus increases yield attributes due to its role in root growth, photosynthesis, and metabolism activities in a plants which ultimately increases absorption also building phospholipids and nucleic acid Kadam *et al.* (2018), Vali *et al.* (2020).

The important role of zinc in nodulation, enzyme activities, and carbohydrate breakdown for the release of energy which in turn increases the yield of pod might be due to greater availability of nutrients and photosynthesis. Similar findings were recorded by Jeetarwal *et al.* (2018), Lincoln *et al.* (2022).

CONCLUSION

It was recorded that for obtaining higher yield components of groundnut by application of 60 kg/ha P_2O_5 + 2 g/liter chealted zinc was recorded a significantly higher number of pods/plant (37.6), Seeds/pod (2.37), Seed yield (2.74 t/ha) as compared to other treatments. Since, the finding based on research done in one season.

ACKNOWLEDGMENT

I express my gratitude to my advisor Dr. Umesha C and all the faculty members of the Department of agronomy for the constant supply to carry out the whole experimental research study.

REFERENCES

Gomez KA, Gomez AA (1984) Three or more factor experiment. (In :) Statistical procedure for agricultural research 2nd edn, pp 139—141.

Hinduja N, Singh S, Dhananjay (2020) Effect of phosphorus and sulfur on growth and yield of groundnut (*Arachis hypogea*).

An Int Quarterly J Life Sci 15 (4) : 459—462.

Jeetarwal RL, Jat MS, Dhaka ML, Jat Naga SD (2014) Performance of groundnut (*Arachis hypogaea* L.) as influenced by phosphorus and zinc fertilization. *Ann Agric Res* 35 (4) : 411 — 415.

Kabir R, Yeasmin S, Islam AKMM, Sarkar MARS (2014) Effect of phosphorus, calcium and boron on the growth and yield of groundnut (*Arachis hypogaea* L.). *Int J Bio-Sci Bio-Technol* 5 (3) : 51—59.

Kadam DV, Indulkar BS, Kadam VS, Jadhav Sonune PN (2018) Effect of phosphorus and zinc on yield and quality of groundnut (*Arachis hypogaea* L.) in inceptisol. *Inceptisol Int J Pure Appl Biosci SPI* 6 (1) : 105—110.

Lincoln AA, Singh V, George GS, Vishkarma SP (2022) Effect of zinc and phosphorus on growth and yield of groundnut (*Arachis hypogaea*). *The Pharmac Innov J* 11 (7) : 1595—1599.

Mouri SJ, Sarkar MAR, Uddin MR, Sarker UR, Kaysar MS, Hoque MMI (2018) Effect of variety and phosphorus on the yield components and yield of groundnut. *Prog Agric* 117—126.

Radhika K, Meena S (2021) Effect of zinc on growth, yield, nutrient uptake and quality of groundnut. *The Pharmac Innov* 10 (2) : 541—546.

Sagar DRMSV, Dawson J, Reddy RUK (2020) Effect of phosphorus and gypsum on growth, yield and economics of groundnut (*Arachis hypogaea* L.). *Int J Curr Microb Appl Sci* 9 (10) : 1635—1638.

Vali MG, Singh S, Sruthi DS, Hinduja N, Talasila V, Tiwari D (2020) Effect of phosphorus and zinc on growth and yield of summer groundnut (*Arachis hypogaea* L.). *The Bioscan* 15 (4) : 535—540.