E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; 7(5): 350-352
Received: 04-03-2024
Accepted: 15-04-2024

Nengpichong Haokip
M.Sc. Scholar, Department of Agronomy Sam Higginbottom, University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Karishma Singh
Ph.D. Scholar, Department of Agronomy Sam Higginbottom, University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Joy Dawson
Professor and Head, Department of Agronomy Sam Higginbottom, University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Corresponding Author:
Nengpichong Haokip
M.Sc. Scholar, Department of Agronomy Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Effect of calcium and boron on growth and yield of groundnut (*Arachis hypogaea* L.)

Nengpichong Haokip, Karishma Singh and Joy Dawson

DOI: https://doi.org/10.33545/2618060X.2024.v7.i5e.696

Abstract
In 2023, a groundnut experiment was carried out at the Department of Agronomy's Crop Research Farm (CRF) during the *kharif* season. With ten treatments and three replications, the experiment was set up using a Randomized Block Design (RBD). As a baseline application and a control, the treatments included three levels of calcium (15, 20, and 25 kg/ha) and three levels of boron (1.0, 1.5, and 2.0 kg/ha) (20:60:40 kg N: P: K/ha). Following Treatment 9, which involved applying 25 kg of calcium per hectare and 2.0 kg of boron per hectare, the maximum plant dry weight (28.58 cm), number of pods per plant (21.99), number of kernel per pod (1.99 kg/ha), and highest test weight (219.21 g) and seed yield (3020.80 kg/ha) were all recorded. Additionally, the benefit cost ratio (2.41) was noted in the aforementioned.

Keywords: Groundnut, calcium, boron, growth, yield and economics

Introduction
The world grows groundnuts (*Arachis hypogaea* L.), a legume crop of the Fabaceae (or Leguminosae) family, mostly for their edible seeds and oil. It is also referred to as gobber or peanut. Originating in South America (Brazil), it thrives best in tropical and subtropical climates between 400 N and 400 S latitudes. The term "kernel" refers to the groundnut seed that is used to make peanut milk, protein, and confectionery nut flour. Groundnuts provide 46–52% seed oil, compared to 18–30% protein and carbs, respectively. While raw groundnut seed oil is used to make detergent, pure groundnut seed oil is primarily used in cooking, salad dressing, and margarine. Groundnuts, like other legumes, have According to Kalamkar *et al.* (2006) [4], there were 26.4 million hectares of groundnuts produced year on an average of 1.4 t/ha, with a total production of 37.1 million metric tons.

Ghanaian soils lack calcium, one of the essential nutrients. A large percentage of abandoned seeds (empty pods, or "pops") and incorrectly filled pods are caused by a calcium deficit. Moreover, it causes shriveled or aborted fruit, such as discolored plumules and seedless pods (Singh and Oswalt, 1995) [9]. A sufficient amount of calcium should be in the soil from the beginning of crop production to provide optimal yields of high-quality groundnut pods. The peanut plant needs calcium from the moment pegs start to show up in fruit production until the pods are fully developed. One of the essential micronutrients for plant growth and development is boron. It is well known that peanuts require slightly more boron than other crops that are legumes. In peanut plants, boron has the capacity to boost enzymatic and photosynthetic activities. It also contributes to the metabolism of nucleic acids and proteins. According to Ismail and Volkar (1997) [3], boron preserves the structural integrity of the plant and shields the plasma membrane from outside harm. Plants need boron, an essential element, for growth and development. In addition to boosting photosynthetic and enzymatic activity, boron enhances pollen grain viability, pollen tube growth, and germination (Prusty *et al.*, 2020) [7]. Since optimal fertiliser rates have a beneficial effect on groundnut performance, sustainable groundnut production depends on proper variety selection, fertiliser management, and other management practises (Nyuma *et al.*, 2019) [6].

Materials and Methods

In *Kharif* 2023, a field experiment was carried out at the Crop Research Farm (CRF), which is part of the Department of Agronomy at SHUATS, Prayagraj (U.P.), India. The experiment plot's soil was discovered to have a neutral pH and a sandy loam texture. A Randomized Block Design (RBD) was used to set up the experiment, which had ten treatments and three replicates. In addition to a control (20:60:40 kg N:P:K/ha), the treatment included three levels of soil application: calcium (15, 20, and 25 kg/ha) and boron (1.0, 1.5, and 2.0 kg/ha). By using the analysis of variance method (ANOVA), the data were gathered and statistically analyzed. A 5% level of significance (p=0.05) is applied to the results.

Results and Discussion

Plant dry weight (g)

At 60 DAS, significantly highest plant dry weight (28.58 g), were recorded in T_9 with calcium at 25 kg/ha + boron at 2.0 kg/ha (soil application). Application of higher amount of calcium fertilizer generally increased total dry weight. Increased availability and uptake of macro and micronutrients, as well as improved soil conditions for water and nutrient supply necessary for better plant growth and dry matter accumulation, may be the cause of the highest growth of groundnuts observed in the increase in dry weight following the application of gypsum. 2021 saw Abhigna *et al*. 2021 [1]. Together, the administration of micronutrients enhanced the supply of micronutrients required for fetus growth and development. This led to an increase in the accumulation of dry matter in the reproductive organs and the creation of expanded sink capacities.

Number of pods per plant

Treatment with calcium at 25kg/ha + boron at 2.0 kg/ha (soil application) recorded significantly highest no of pods per plant (21.99) however, treatment with calcium at 25 kg/ha + boron at 1.5 kg/ha (soil application) and treatment calcium at 20 kg/ha + boron at 2.0 kg/ha (soil application) were statistically at par with the treatment calcium at 25 kg/ha + boron at 2.0 kg/ha (soil application). The gypsum's sulfur, which is essential for energy transformation and storage, carbohydrate metabolism, and enzyme activation, may be the cause of the increase in pod production per plant. This would also boost the plant's capacity for photosynthetic activity. These data support the conclusions made by Banu *et al.* (2017) [2].

Number of kernels per pod

Treatment with calcium at 25 kg/ha boron at 2.0 kg/ha (soil application) was recorded significantly highest number of kernel per pods (1.99). However, treatment with calcium at 25 kg/ha + boron at 1.5 kg/ha (soil application) and treatment calcium at 25 kg/ha + boron at 1.0 kg/ha (soil application) was recorded statistically at par with the treatment calcium at 25 kg/ha + boron at 2.0 kg/ha (soil application). Increased photosynthate and their subsequent translocation to a storage organ may be the cause of the increased number of kernels per pod, which improved production fill-up. Shamsuddin *et al.* (1991) [8] also noted similar results.

Test weight (g)

Treatment with calcium at 25 kg/ha + boron at 2.0 kg/ha (soil application) was recorded significantly highest test (219.21g) however, treatment calcium at 25 kg/ha + boron at 1.5 kg/ha (soil application) and treatment calcium at 25 kg/ha + boron at 1.0 kg/ha (soil application) was recorded statistically at par with the treatment calcium at 25 kg/ha + boron at 2.0 kg/ha (soil application). According to Li *et al.* (1997) [5], the timely application of boron may have contributed to the rise in test weight and had a substantial impact on cell metabolism, pod development, and pod filling capacity.

Seed yield (kg/ha)

Treatment with calcium at 25 kg/ha + boron at 2.0 kg/ha (soil application) was recorded significantly highest seed yield (3020.80 kg/ha). However, Treatment with calcium at 20 kg/ha + Boron at 2.0 kg/ha (soil application) and treatment with calcium at 25 kg/ha + boron at 1.0 kg/ha (soil application) were recorded statistically at par with the treatment calcium at 25 kg/ha + boron 2.0 kg/ha (soil application). The favorable effects of these elements on other yield parameters, such as plant height and branch count, may be responsible for the rise in calcium seed output. Increasing levels of any element led to an increase in stover yield. In order to maximize the pod output, calcium is essential for the groundnut crop's reproductive growth. The outcomes align with the research conducted by Sreelatha *et al.* (2004) [10].

Economics

In treatment 9, the highest benefit cost ratio (2.41) were observed.

Table 1: Effects of calcium and boron on groundnut growth and productivity.

S. No	Treatment Combination	plant dry weight (g) at 60DAS	No. of pods/plant	No. of kernel/pod	Test weight (g)	Seed Yield (kg/ha)	B:C ratio
1	boron 1.0 kg/ha + calcium 15 kg/ha	23.01	17.40	1.67	210.45	2038.41	1.34
2	boron 1.5 kg/ha + calcium 15 kg/ha	21.72	17.64	1.34	210.85	2243.86	1.57
3	boron 2.0 kg/ha + calcium 15 kg/ha	21.78	16.93	1.87	213.27	2250.64	1.56
4	boron 1.0 kg/ha + calcium 20 kg/ha	24.23	16.80	1.87	215.39	2255.56	1.58
5	boron 1.5 kg/ha + calcium 20 kg/ha	24.02	16.12	1.89	215.29	2186.39	1.50
6	boron 2.0 kg/ha + calcium 20 kg/ha	24.95	21.57	1.76	214.20	2710.57	2.08
7	boron 1.0 kg/ha + calcium 25 kg/ha	23.58	17.51	1.87	217.58	2374.79	1.71
8	boron 1.5 kg/ha + calcium 25 kg/ha	26.18	18.12	1.67	218.78	2206.79	1.52
9	boron 2.0 kg/ha + calcium 25 kg/ha	28.58	21.99	1.99	219.21	3020.80	2.41
10	(20-60-40 kg/ha) N-P-K (control)	23.25	18.22	1.78	214.51	2329.77	1.70
	S.Em(±)	0.31	1.26	0.22	1.02	43.62	-
	CD (p=0.05)	0.91	3.73	0.71	3.02	129.59	-

Conclusion

In groundnut, the maximum yield and benefit-cost ratio were observed with the application of 25 kg/ha of calcium and 2.0 kg/ha of boron (T_9).

References

1. Abhigna D, Lakshman K, Sree Rekha, Latha M. Growth, yield and economics of groundnut (*Arachis hypogaea* L.) as influenced by micronutrient fertilization on coastal sandy soils of Andhra Pradesh. The Pharma Innovation Journal. 2021;10(9):312-315.
2. Banu JC, Shrof SN, Shah. Effect of sources of sulphur and biofertilizers on growth, yield and quality of summer groundnut. International Journal of Agriculture Science. 2017;13(6):67-70.
3. Ismail C, Volkar R. boron nutrition of crop in relation to yield and quality- a review. Plant and Soil. 1997;193:71-83.
4. Kalamkar SS. Prospects of Contract Farming in India in the Context of Globalisation. Indian Journal of Agricultural Marketing. 2006;20(3):25.
5. Li C, Yuan H, Zhang Y, Zhang F. Growth of lateral buds versus changes of endogenous indoleacitic acid and Zeatin/zeatin riboside content in pea plants grown under boron deficiency. In: Boron in soils and plants. 1997. p. 179-182.
6. Nyuma HT, Rweyemamu CL, Fayiah JS. Effect of fertilizer and genotype on crop quality and profitability of groundnut in Morogoro, Tanzania. International Journal of Advanced Research and Publications (IJARP). 2019;3(11):1-5.
7. Prusty M, Alim MA, Swain D, Panda D, Ray M. Effect of sources and doses of Sulphur and Boron application on Yield, nutrient content and nutrient uptake of Groundnut (*Arachis hypogea* L.). International Journal for Innovative Engineering and Management Research. 2020;9(12):495-505.
8. Shamshuddin ZH, Syed Omar SR, Zuraidah JY, Wynne JC, Elkan GH. Use of lime/gypsum and their combination to improve nodulation and yield of groundnut in an acidic soil. Developments in Plant and Soil Sciences. 1991;45:275-280.
9. Singh F, Oswalt DL. Groundnut Production Practices. Skill Development series Number 3. ICRSAT Training and Fellowship Program International Crops Institute for the Semi-Arid Tropics, Patancheru, Andhra Pradesh 502 324, India; c1995.
10. Sreelatha N, Seshaiah BV, Sankara Rao V. Effect of phosphorus and sulphur nutrition on nutrient composition oil content and yield of groundnut. The Andhra Agricultural Journal. 2004;15(3,4):380-383.