



Effect of Sulphur and Zinc on Growth and Yield of Baby Corn (*Zea mays* L.)

**Chilka Vandhana Varsha^{a++*}, Rajesh Singh^{b#}
and Thakur Indu^{at}**

^a Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj, Uttar Pradesh, India.

^b Naini Agricultural Institute, SHUATS, Prayagraj, 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: 10.9734/JEAI/2024/v46i52412

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/115166>

Original Research Article

Received: 29/01/2024

Accepted: 03/04/2024

Published: 06/04/2024

ABSTRACT

A field study was conducted at Crop Research Farm Department of Agronomy SHUATS Prayagraj, (U.P). During *zaid* season 2023 with the objective of influence of sulphur and zinc on growth and yield of baby corn. Data on growth and yield components of the crop were recorded. The experiment was laid out in Randomized Block Design with 10 treatments and replicated thrice. The Treatments consisted of 3 levels of Sulphur (15, 30, 45 kg/ha) and zinc (10, 20, 30 kg/ha) With Baby corn var SYNGENTA (G-5414). The results reported that the application of Sulphur 45 kg/ha along zinc 30 kg/ha recorded maximum plant height (108.7cm), Maximum plant dry weight (49.08 g/plant), Number of cobs per plant (2.07), cob yield with husk (10.06 t/ha), cob yield without husk (3.91 t/ha), green fodder yield (28.43 t/ha). Maximum gross return (92,087.17 INR/ha), net return (61,352 INR/ha) and B:C ratio (2.00) were recorded in (treatment-9) that is with 45 kg of Sulphur+30 kg Zinc. With application sulphur and zinc morphological characters increased which

⁺⁺M.Sc. Scholar;

[#]Associate Professor;

[†] Ph.D. Scholar

^{*}Corresponding author: E-mail: varshavandhana452@gmail.com;

might be attributed to a stronger role of zinc in cell division, cell expansion, and enlargement which ultimately lead to the improved vegetative growth. The interaction effect between sulphur and Zinc was found significant in respect of green and dry matter yield.

Keywords: Sulphur; zinc; growth; yield.

1. INTRODUCTION

Maize is popularly called as “Queen of cereals” as well as “miracle crop” because it has a greater yield potential. “Maize is third most important cereal crop, next to rice and wheat. The novelty of maize is cultivating it predominantly for vegetable purpose as “baby corn”. Baby corn is typically a maize ear (*Zea mays* L.) produced from regular corn plants which is harvested earlier, particularly when the silks have the size of 1-3 cm” (Thavaprakash et al., 2005). “Baby corn, a novel utilization of maize, is used as a vegetable in many Asian countries. It is used as an ingredient in the preparation of many food items [1,2]. It refers to whole, entirely edible corn of immature cob harvested just before fertilization at the silk emergence stage” (Galinat, 1985). “It is dehusked young ear of the female inflorescence of maize plant, harvested at silk emergence before fertilization” (Kapoor, 2002).

Sulphur nutrition plays an important role in improving the growth and productivity of maize. Sulphur is an essential constituent of amino acids, viz. cysteine which involved in Krebs’s cycle, cystine and methionine Used in the formation of Anthocyanin, chlorophyll, lignin and pectin of cell membrane [3-7]. Sulphur content in plants depends on the growth stage, plant part and crop species. Its concentration is high in grains as higher than in straw at maturity. Plant tissues should have the required concentration of sulphur to produce biomass, carbohydrates, proteins to the full potential (Text book of plant nutrient management by ISA-Indian Society of Agronomy) [8-12].

Zinc is one of the essential micronutrient required for optimum plant growth and plays a vital role in metabolism. Zinc plays a role in plant resistance against diseases, photosynthesis, cell membrane integrity, protein synthesis and chlorophyll within the plant tissues [13-16]. It plays an important role in basic cellular functions in all group of organisms and different enzyme catalyzing many metabolic activities in plants. Zinc is essential for plant functions, production of auxins, an essential growth hormone. It is necessary for starch

formation, proper development, chlorophyll and carbohydrates. Plays an important role in stabilization of protein (Komal et al., 2018).

2. MATERIALS AND METHODS

The experiment was conducted during *Zaid* season of 2023 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P). The soil of the experimental field was sandy loam in texture, nearly neutral in soil reaction (pH -7.6), organic carbon (0.870%), available N (219 kg/ha), available P (41.8 kg/ha) and available K (261.2 kg/ha). The treatment consists of T₁: Sulphur 15 kg/ha + Zinc 10 kg/ha, T₂: Sulphur 15 kg/ha + Zinc 20 kg/ha, T₃: Sulphur 15 kg/ha + Zinc 30 kg/ha, T₄: Sulphur 30 kg/ha + Zinc 10 kg/ha, T₅: Sulphur 30 kg/ha + Zinc 20 kg/ha, T₆: Sulphur 30 kg/ha + Zinc 30 kg/ha, T₇: Sulphur 45 kg/ha + Zinc 10 kg/ha, T₈: Sulphur 45 kg/ha + Zinc 20 kg/ha, T₉: Sulphur 45 kg/ha + Zinc 30 kg/ha, T₁₀: Control (RDF- N-P-K- 60-60-40 kg/ha).

The experiment was laid out in Randomized Block Design, with 10 treatments replicated thrice. The observations were recorded for plant height, plant dry weight, No. of cobs per plant, Cob yield (t/ha) a) With husk (t/ha) b) Without husk(t/ha), Green fodder yield (t/ha). The collected data was subjected to statistical analysis by analysis of variance method. Baby corn, variety (G-5414(Syngenta) were selected for sowing. Seeds are sowed of spacing (45x10 cm).

3. RESULTS AND DISCUSSION

3.1 Growth Parameters

3.1.1 Plant height (cm)

The data revealed that significantly higher plant height (108.79 cm) was recorded with application of 45 kg/ha Sulphur along with 30 kg/ha Zinc. However, treatment (T8) was found to be statistically at par with highest “Plant increased height with application of sulphur and zinc it due to the vital role of nutrients in cellular growth, differentiation and metabolism which results in

vigorous growth of plants and extensive root system leading to increased growth parameters like plant height” Mohsin (2014).

3.1.2 Plant dry weight (g/plant)

Significantly highest plant dry weight (49.08 g) was recorded with application of (45 kg/ha Sulphur + 30 kg/ha Zinc). However, treatment T8 was found to be statistically at par with highest.

Application of 45 kg/ha Sulphur and 30 kg/ha Zinc had given that higher dry weight this might be due to adequate Sulphur being an energy bond compound and its major role is transformation of energy essential for almost all metabolic processes viz., photosynthesis, respiration, cell elongation and cell division, activation of amino acids for synthesis of protein and carbohydrate metabolism. Stated by Kumar et al., [17]. “The possible reason for this might be due to the fact that the favorable increase in dry weight of Baby corn might be due to Zinc involvement in auxin synthesis which played a major role in photosynthetic activity of the crop (as in other C4 plants)” Amutham et al., [18]. “The interaction effect between Sulphur and Zinc was found significant in respect of green and dry matter yield” [19].

3.2 Yield Parameter

3.2.1 Number of Cobs/Plant

Application of (45 kg/ha Sulphur + 30 kg/ha Zinc) was recorded significantly higher number of cobs per plant (2.07) However, treatment T8 was found to be statistically at par with the highest.

3.2.2 Cob yield with husk (t/ha)

Treatment-9 (45 kg/ha Sulphur + 30 kg/ha Zinc) was recorded significantly maximum Corn yield with husk (10.06 t/ha). However, treatment T8 was found to be statistically at par with highest.

3.2.3 Cob yield without husk (t/ha)

Treatment-9 (45 kg/ha Sulphur + 30 kg/ha Zinc) was recorded significantly maximum Corn yield without husk (3.91t/ha) which was superior over all other treatments.

However, treatment T8 was found to be statistically at par with highest.

Increase in corn yield with fertilization might be due to the role of Sulphur and zinc play a vital role in increasing corn yield because Sulphur and zinc takes place in many physiological processes of plant such as chlorophyll formation, stomatal regulation, starch utilization which enhance corn yield. The continuous filling of grains due to sufficient photosynthesis might have resulted in increased length and size of the corn Gnanasundari et al., [20].

3.2.4 Green Fodder (t/ha)

Treatment-9 (45 kg/ha Sulphur along with 30 kg/ha Zinc) was recorded significantly maximum Green Fodder (28.43 t/ha) which was superior over all other treatments. However, treatments t8 was found to be statistically at par with Treatment-9(45 kg/ha Sulphur + 30 kg/ha Zinc).

Table 1. Effect of Sulphur and Zinc on growth attributes of baby corn

SI No.	Treatments	40 DAS	
		Plant height (cm)	Dry weight (g/plant)
1	Sulphur 15 kg/ha + Zinc 10 kg/ha	104.46	40.67
2	Sulphur 15 kg/ha + Zinc 20 kg/ha	104.73	41.25
3	Sulphur 15 kg/ha + Zinc 30 kg/ha	104.96	42.17
4	Sulphur 30 kg/ha + Zinc 10 kg/ha	105.47	42.20
5	Sulphur 30 kg/ha + Zinc 20 kg/ha	106.98	43.94
6	Sulphur 30 kg/ha + Zinc 30 kg/ha	106.98	44.94
7	Sulphur 45 kg/ha + Zinc 10 kg/ha	107.15	46.68
8	Sulphur 45 kg/ha + Zinc 20 kg/ha	107.79	47.32
9	Sulphur 45 kg/ha + Zinc 30 kg/ha	108.79	49.08
10	Control : (60-60-40 N-P-K kg/ ha)	105.28	41.82
	SEm(±)	0.930	1.72
	CD (P=0.05)	2.77	5.11

Table 2. Effect of Sulphur and Zinc on yield attributes on Babycorn

SI No	Treatments	Number of cobs/plant	Cob yield with husk (t/ha)	Cob yield without husk (t/ha)	Green fodder yield (t/ha)
1	Sulphur 15 kg/ha + Zinc 10 kg/ha	1.20	7.42	2.16	21.10
2	Sulphur 15 kg/ha + Zinc 20 kg/ha	1.33	7.66	2.42	21.85
3	Sulphur 15 kg/ha + Zinc 30 kg/ha	1.40	8.05	2.55	22.83
4	Sulphur 30 kg/ha + Zinc 10 kg/ha	1.50	8.23	2.73	24.15
5	Sulphur 30 kg/ha + Zinc 20 kg/ha	1.50	8.24	2.74	24.22
6	Sulphur 30 kg/ha + Zinc 30 kg/ha	1.56	8.24	2.78	25.12
7	Sulphur 45 kg/ha + Zinc 10 kg/ha	1.83	9.55	3.34	26.64
8	Sulphur 45 kg/ha + Zinc 20 kg/ha	2.03	9.79	3.52	27.90
9	Sulphur 45 kg/ha + Zinc 30 kg/ha	2.06	10.06	3.91	28.43
10	Control : (60-60-40 N-P-K kg/ ha)	1.46	8.12	2.62	23.54
	SEm(±)	0.11	0.370	0.420	1.40
	CD (P=0.05)	0.32	1.10	-	3.19

“Increase in a green fodder yield might be due to the enhanced translocation of Sulphur with applied Zinc, which resulted in a higher production of green fodder in a respective level of nutrient. Similar results of significantly higher fodder yield with Zn application” was also reported by Mehdi et al., [21].

4. CONCLUSION

It can be concluded that application of Sulphur 45 kg/ha along with Zinc 30 kg/ha as performed better in growth parameters and yield attributes

ACKNOWLEDGEMENT

I express my gratitude to my advisor Dr. RAJESH SINGH for constant support, guidance and for his valuable suggestions for improving the quality of this research work and also to all the faculty members of the Department of Agronomy, SHUATS, Prayagraj, Uttar Pradesh (U.P). for providing all necessary facilities, for their cooperation, encouragement, and support.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Kumar R, Bohra S. Effect of NPKS and Zn application on growth. Yield, economics and quality of baby corn. *Archives of Agronomy and Soil Science*. 2014; 60(9):1193-1206.
2. Amutham GT, Karthikeyan R, Thavaprakash N, Bharathi C. Agronomic Bifortification with zinc and growth and

yield of baby corn (*Zea mays* L) under irrigated conditions, *Journal of Pharmacognosy and Phytochemistry*. 2019;8(3):434-437.

3. Ammisetty Sai Sravan, Dhanush Reddy, Pavan Ganesh and Joy Dawson. Effect of Potassium and Zinc on Growth and Yield of Baby Corn (*Zea mays* L.). *Int. J. Curr. Microbiol. App. Sci*. 2021;10(01):1723-1729
4. Gnanasundari R, Sellamuthu KM, Malathi P. Effect of sulphur and zinc on growth and yield and NPK uptake of Hybrid Maize in Black Calcareous Soil. *Madras Agriculture Journal*. 2018;2018.
5. Mehdi SS, Hussain B, Singh L. Influence of seed rate, nitrogen and zinc on fodder maize (*Zea mays* L.) in temperate conditions of western Himalayas. *Indian Journal of Agronomy*. 2012;57(1):85-88.
6. Arab GM, Dina A Ghazi, El-Ghamry AM. Effect of zinc application on maize grown on alluvial soils. *Journal Soil Science and Agriculture Engineering, Mansoura Univ*. 2018;9(9):419-426.
7. Azeem Tariq, Shakeel A Anjum, Mahmood A Randhawa, Ehsan Ullah, Muhammad Naeem, Rafi Qamar, Umair Ashraf, Mubashar Nadeem. Influence of zinc nutrition on growth and yield behaviour of maize (*Zea mays* L.) hybrids. *American Journal of Plant Sciences*. 2014;5:2646-2654.
8. Bharathi C, Poongothai S. Direct and residual effect of sulphur on growth, nutrient uptake, yield and its use efficiency in maize. *Research Journal of Agriculture and Biological Sciences*. 2008;4(5): 368–72.

9. Dwivedi SK, Singh RS, Diwivedi KN. Effect of Sulphur and zinc nutrition on yield and quality of maize in typicustochrept soil of Kanpur. *Journal India of Soil Science*. 2002;50(1):70- 74.
10. Dadarwal RS, Jain NK, Singh D. Integrated nutrient management in babycorn (*Zea mays* L.). *Indian Journal of Agricultural Sciences*. 2009;79(12):1023–10.
11. Kumar R, Bhora JS, Amithesh kumar singh, Narendra Kumawat. Productivity, Profitability and nutrient -use efficiency of baby corn (*Zea mays*). As influenced of varying fertility levels. *Indian Journal of Agronomy*. 2015;60(2):285-290.
12. Meena SK, Mundra SL, Singh P. Response of maize (*Zea mays* L.) to nitrogen and zinc fertilization. *Indian Journal of Agronomy*. 2013;58(1):127–28.
13. Moshin AU, Ahmad AUH, Farooq M, Ullah S. Influence of zinc application through seed treatment and foliar spray on growth , productivity and grain quality of hybrid maize. *The journal of Animal &plant sciences*. 2014;24(5):14941503.
14. Mahapatra AK, Barik, Mishra GC. Integrated Nutrient Management on Baby Corn (*Zea mays* L) *International Journal of Bio-resource and Stress Management*. 2018;9(1):044-048.
15. Mehta YK, Shaktawat MS, Singhi MS. Influence of sulphur, phosphorous and farm yard manure on yield attributes and yield of maize (*Zea mays*) in southern Rajasthan condition. *Indian Journal of Agronomy* 2005;50:203-205.
16. Rakesh, Kumar, Bohra JS. Effect of NPKS and Zn application on growth, yield, economics and quality of baby corn. *Archives of Agronomy and Soil science*. 2014;60(9):1193-1206.
17. Sabha Jeet, Singh JP, Rakesh Kumar, Hari Om. Response of nitrogen and sulphur levels on productivity and profitability of QPM hybrid (*Zea mays*) under dryland condition of Eastern Uttar Pradesh. *Indian Journal of Agricultural Sciences* 2014;84(5):589- 594.
18. Singh MK, Singh RN, Singh SP, Yadav MK, Singh VK. Integrated nutrient management for higher yield, quality and profitability of baby corn (*Zea mays* L.). *Indian Journal of Agronomy*. 2010;55(2): 100–04.
19. Sobhana V, Kumar A, Idnani LK, Singh I, Shiva Dhar. Plant population and nutrient requirement for baby corn hybrids (*Zea mays*). *Indian Journal of Agronomy*. 2012; 57(3):294–96.
20. Thripathi I, Sagar GEV, Devi KS, Sharma SHK. Effect of nitrogen and sulphur levels on growth and yield of maize (*Zea mays*). *International Journal of Agriculture Sciences*. 2016;12(2):181-18.
21. Thavaprakash N, Velayudham K, Muthukumar VB. Effect of crop geometry, intercropping system and integrated nutrient management practices on productivity of baby corn (*Zea mays* L.) Based Intercropping Systems. *Research Journal of Agricultural and Biological Sciences*.

© Copyright (2024): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<https://www.sdiarticle5.com/review-history/115166>