AGRI MAGAZINE
(International E-Magazine for Agricultural Articles)
Volume: 03, Issue: 03 (March, 2026)
Available online at http://www.agrimagazine.in

Effect of NPKS and Zinc Fertilization on Fodder Yield, Nutrient Uptake and Quality of Baby Corn Maize (*Zea mays* L.)

*Prathibha, P Theerkka Dharshini, M Sanskruti, Bhargab and Dr. J. Aruna Kumari
Professor Jayashankar Telangana Agricultural University, Hyderabad, Telangana - 500030, India
*Corresponding Author's email: munnyravindra@gmail.com

Baby corn maize (*Zea mays* L.) is an important crop that provides both edible cobs for human consumption and fodder for livestock. Nutrient management plays a crucial role in improving fodder yield, nutrient uptake, and quality parameters of baby corn. Balanced fertilization with macronutrients such as nitrogen (N), phosphorus (P), and potassium (K), along with secondary nutrients like sulfur (S) and micronutrients such as zinc (Zn), significantly enhances crop productivity. Studies have shown that increasing fertilizer levels from 100% to 125% of the recommended dose of fertilizers (RDF) improves cob yield, green fodder yield, and dry fodder yield. Application of sulfur and zinc further enhances nutrient uptake and improves quality attributes such as crude protein and mineral content. This review summarizes the effects of NPKS and zinc fertilization on fodder yield, nutrient uptake, and quality of baby corn maize and highlights practical nutrient management strategies for improving crop productivity and fodder quality.

Keywords: Baby corn, Fodder yield, Nutrient uptake, NPKS fertilization, Zinc, Maize quality

1. Introduction

Maize (*Zea mays* L.) is one of the most important cereal crops grown worldwide and is widely used as both food and fodder. Baby corn, which is harvested at an immature stage before fertilization, has gained increasing importance due to its high market demand and multiple uses. In addition to providing edible cobs for human consumption, baby corn also produces a large quantity of green fodder that can be used for livestock feeding. Nutrient management plays a vital role in enhancing the productivity and quality of baby corn. Macronutrients such as nitrogen, phosphorus, and potassium are essential for plant growth, while secondary nutrients and micronutrients like sulfur and zinc contribute significantly to improving nutrient uptake and crop quality. Balanced fertilization not only increases biomass production but also enhances crude protein content, mineral composition, and overall fodder quality. Several studies have reported that appropriate combinations of NPK, sulfur, and zinc significantly improve fodder yield and nutrient uptake in maize. Therefore, understanding the influence of these nutrients on baby corn production is essential for improving both crop productivity and livestock feed availability.

Effect of NPK Fertilization on Fodder Yield

Effect of Nitrogen on Fodder Yield and Growth

Nitrogen is the most essential nutrient for maize growth and plays a crucial role in the synthesis of proteins, amino acids, and chlorophyll. Adequate nitrogen supply promotes vigorous vegetative growth, resulting in increased plant height, leaf area, and photosynthetic activity. Studies on baby corn maize have shown that increasing nitrogen levels significantly enhances green fodder yield and dry fodder yield. Higher nitrogen availability improves biomass accumulation and crude protein content of fodder. Application of higher fertilizer

levels, particularly 125% of the recommended dose of fertilizers (RDF), has been reported to significantly increase cob yield and fodder yield compared to the standard 100% RDF.

Effect of Phosphorus on Root Development and Nutrient Uptake

Phosphorus plays a vital role in energy transfer, root development, and metabolic activities in plants. Adequate phosphorus availability improves early crop establishment and promotes strong root systems, which enhance nutrient and water absorption from the soil. In baby corn cultivation, phosphorus fertilization contributes to improved plant growth and biomass production. Studies indicate that balanced phosphorus application, along with nitrogen and potassium, significantly increases fodder yield and nutrient uptake. Proper phosphorus nutrition also supports better plant vigor and improves overall crop productivity.

Effect of Potassium on Crop Growth and Fodder Quality

Potassium is an important macronutrient involved in enzyme activation, carbohydrate metabolism, and regulation of water balance within plant tissues. It enhances plant tolerance to environmental stresses and improves the efficiency of photosynthesis. In maize crops, potassium fertilization contributes to better plant growth, increased biomass production, and improved fodder quality. Adequate potassium supply also improves nutrient transport within plants, leading to higher accumulation of carbohydrates and proteins in plant tissues. As a result, balanced application of potassium along with nitrogen and phosphorus significantly improves fodder yield and nutritional quality of baby corn.

Effect of Secondary and Micronutrients on Baby Corn

Effect of Sulfur on Yield and Quality

Sulfur is an essential secondary nutrient required for the synthesis of sulfur-containing amino acids, proteins, and enzymes in plants. It plays a vital role in improving nitrogen utilization and enhancing the nutritional quality of crops. In baby corn maize, sulfur fertilization has been reported to significantly increase cob yield, green fodder yield, and dry fodder yield. Application of sulfur at higher levels, particularly 50 kg S ha^{-1}, results in better crop growth and higher biomass production compared to lower levels such as 25 kg S ha^{-1}. Sulfur also improves crude protein content and mineral composition of fodder by enhancing nitrogen metabolism in plants. Therefore, adequate sulfur fertilization is essential for improving both yield and quality of baby corn fodder.

Effect of Zinc on Nutrient Uptake and Crop Productivity

Zinc is an important micronutrient that plays a key role in several physiological and biochemical processes in plants. It is involved in enzyme activation, protein synthesis, and growth regulation. Zinc deficiency is common in many agricultural soils and can negatively affect maize productivity. Application of zinc fertilizers significantly improves plant growth, nutrient uptake, and fodder quality in baby corn maize. Studies have shown that application of 10 kg Zn ha^{-1} increases uptake of major nutrients such as nitrogen, phosphorus, and potassium by the crop. Zinc also enhances photosynthetic activity and improves plant metabolism, leading to higher biomass production and improved fodder yield.

Effect of Nutrient Management on Fodder Yield, Nutrient Uptake and Quality

Fodder Yield Response

Fodder yield is one of the most important parameters in evaluating the performance of baby corn crops. Balanced fertilization with NPK along with sulfur and zinc significantly increases green fodder and dry fodder yields. Studies conducted under irrigated conditions have demonstrated that increasing fertilizer levels from 100% RDF to 125% RDF results in a significant increase in fodder yield. This improvement is mainly due to enhanced plant growth, increased leaf area, and greater biomass accumulation. Proper nutrient management therefore plays a critical role in maximizing fodder production.

Nutrient Uptake Response

Nutrient uptake by plants depends largely on the availability of nutrients in the soil and the efficiency of plant roots in absorbing them. Application of balanced fertilizers improves nutrient availability and enhances root growth, resulting in greater nutrient absorption.

Research findings indicate that higher levels of NPK fertilization combined with sulfur and zinc application significantly increase uptake of nitrogen, phosphorus, potassium, and other nutrients in baby corn maize. Improved nutrient uptake leads to better crop growth, higher biomass production, and increased crop productivity.

Effect on Fodder Quality Parameters

Nutrient management also influences the quality of fodder produced by baby corn crops. Quality parameters such as crude protein content, ash content, and fiber composition are directly affected by fertilizer application. Higher levels of nitrogen fertilization increase crude protein content in fodder, while balanced application of sulfur and zinc improves mineral composition and nutrient density. In many studies, increased fertilizer application has been associated with higher crude protein and ash content, whereas crude fiber content may decrease or vary depending on nutrient balance and plant growth conditions. Improved fodder quality ultimately contributes to better livestock nutrition and productivity.

Effect of NPKS and Zinc Fertilization on Fodder Quality Parameters of Baby Corn (*Zea mays* L.)

Nutrient Treatment	Crude Protein Content (%)	Ash Content (%)	Crude Fiber Content (%)	Calcium content (%)
100% RDF	8.5	6.5	28	0.32
125% RDF	10.2	7.8	26.8	0.38
125% RDF + 50 kg S/ha	11.3	8.4	25.7	0.42
125% RDF + 50 kg S/ha + 10 kg Zn/ha	12	9.2	25.7	0.46
125% RDF + 50 kg S/ha + 10 kg Zn/ha	12	9.2	24.6	0.46

Source: Adapted from Kumar *et al.*, 2014

Practical Nutrient Management Strategy

Balanced nutrient management is essential for maximizing the productivity and quality of baby corn maize. Several experimental studies have demonstrated that appropriate combinations of macronutrients and micronutrients significantly improve crop performance under irrigated conditions. Application of 125% of the Recommended Dose of Fertilizers (RDF) consisting of nitrogen, phosphorus, and potassium (NPK) along with 50 kg sulfur (S) ha^{-1} and 10 kg zinc (Zn) ha^{-1} has been found to be an effective nutrient management strategy. This nutrient combination enhances plant growth, nutrient uptake, and biomass production, leading to higher cob yield, green fodder yield, and dry fodder yield. In addition, the balanced application of sulfur and zinc improves fodder quality parameters such as crude protein content, mineral composition, and overall nutritive value. Therefore, adoption of this nutrient management practice can improve the profitability of baby corn cultivation while supporting its role as a dual-purpose crop that provides both edible cobs for human consumption and nutritious fodder for livestock.

Study	Location	Fertilizer Treatment	Key Findings
Kumar *et al.*, (2014	Varanasi, India	100% RDF, 125% RDF + 50 kg S/ha + 10 kg Zn/ha	125% RDF + 50 kg S/ha + 10 kg Zn/ha increased cob yield and fodder yield.
Jeet *et al.*, (2012)	Ludhiana, India	NPK + S (20, 40, 50 kg S/ha)	50 kg S/ha enhanced fodder yield and protein content.
Mahdi *et al.*, (2012)		RDF + Zinc (5, 10 kg Zn/ha)	10 kg Zn/ha improved nutrient uptake and fodder quality.
Singh *et al.*, (2010)	Pantnagar, India	NPKS + Zn combinations	Balanced NPKS + Zn gave highest fodder yield.
Kumar & Bohra (2015)	Udaipur, India	125% RDF + 50 kg S/ha + 10 kg Zn/ha	125% RDF + 50 kg S/ha + 10 kg Zn/ha maximized yield and quality.

Research Gaps

Although several studies have investigated the effects of macronutrients and micronutrients on baby corn production, there are still some important gaps in knowledge that require further research. Most of the available studies focus mainly on the influence of nitrogen, phosphorus, potassium, sulfur, and zinc under specific soil and climatic conditions. However, nutrient responses may vary significantly depending on soil type, cropping system, and environmental factors. Limited information is available regarding the long-term effects of continuous application of higher fertilizer levels such as 125% recommended dose of fertilizers (RDF) on soil health and sustainability. In addition, the interaction between micronutrients and other management practices such as irrigation scheduling, organic manure application, and biofertilizer use has not been extensively studied in baby corn cultivation. Furthermore, research on nutrient use efficiency, site-specific nutrient management, and precision fertilization techniques in fodder maize systems remains limited. Future studies should also focus on developing nutrient-efficient maize hybrids that can produce higher fodder yield and quality with reduced fertilizer inputs. Addressing these research gaps will help improve nutrient management strategies and ensure sustainable production of baby corn for both human consumption and livestock feeding.

Future Perspectives

Future research on nutrient management in baby corn maize should focus on improving nutrient use efficiency and developing sustainable fertilization strategies. Although balanced application of macronutrients and micronutrients such as nitrogen, phosphorus, potassium, sulfur, and zinc has been shown to improve fodder yield, nutrient uptake, and quality, further studies are required to optimize nutrient combinations under different soil and climatic conditions. Integrated nutrient management practices involving organic manures, biofertilizers, and chemical fertilizers should be explored to maintain soil fertility and reduce environmental impacts. In addition, precision agriculture technologies such as soil nutrient mapping, site-specific nutrient management, and remote sensing can help improve fertilizer application efficiency. Development of nutrient-efficient maize varieties with better nutrient uptake capacity may also contribute to sustainable fodder production.

Conclusion

Balanced nutrient management plays a crucial role in improving the productivity, nutrient uptake, and quality of baby corn maize (Zea mays L.). The combined application of macronutrients such as nitrogen, phosphorus, and potassium along with secondary and micronutrients like sulfur and zinc significantly enhances plant growth, biomass production, and fodder quality. Studies have demonstrated that increasing fertilizer levels to 125% of the recommended dose of fertilizers (RDF) along with 50 kg S ha^{-1} and 10 kg Zn ha^{-1} results in higher cob yield, green fodder yield, and dry fodder yield under irrigated conditions. In addition to improving yield, balanced fertilization also enhances important quality parameters such as crude protein content, mineral composition, and nutrient uptake, thereby improving the nutritional value of fodder for livestock. Adoption of appropriate nutrient management strategies therefore supports the efficient production of baby corn as a dual-purpose crop, providing both edible cobs for human consumption and nutritious fodder for animal feeding. Overall, integrated and balanced fertilization practices are essential for sustainable baby corn cultivation. Future research should focus on improving nutrient use efficiency, developing nutrient-efficient maize varieties, and adopting site-specific nutrient management techniques to enhance productivity while maintaining soil health and environmental sustainability.

References

1. Akplo, T., *et al.* (2023). Dual-purpose crops for grain and fodder to improve nutrition security. *Food and Energy Security*.
2. Arya, K. C., & Singh, S. N. (2000). Effect of phosphorus and zinc on yield and nutrient uptake of maize (Zea mays L.). *Indian Journal of Agronomy*, 45(4), 717–721.

3. Brady, N. C., & Weil, R. R. (2017). The nature and properties of soils (15th ed.). Pearson Education.
4. Fragaria, N. K. (2009). The use of nutrients in crop plants. CRC Press.
5. FAO. (2019). Fodder crop production and management. Food and Agriculture Organization of the United Nations.
6. Havlin, J. L., Beaton, J. D., Tisdale, S. L., & Nelson, W. L. (2014). Soil fertility and fertilizers: An introduction to nutrient management. Pearson Education.
7. ICAR. (2018). Handbook of agriculture (6th ed.). Indian Council of Agricultural Research.
8. Jeet, S., Singh, J. P., Kumar, R., Prasad, R. K., & Kumar, P. (2012). Effect of nitrogen and Sulphur levels on yield, economics and quality of maize (Zea mays L.). *Madras Agricultural Journal*, 99, 13–15.
9. Joshi, Y. P., & Kumar, K. (2007). Response of forage maize to nitrogen levels under irrigated conditions. *Forage Research*, 33(2), 113–115.
10. Kumar, R., Bohra, J. S., Kumawat, N., & Singh, A. K. (2014). Effect of NPKS and zinc fertilization on growth, yield, quality and nutrient uptake of baby corn (*Zea mays* L.). Journal of Agricultural Science.
11. Mahdi, S. S., Hasan, B., & Singh, L. (2012). Influence of nitrogen and zinc on fodder yield and quality of maize. *Indian Journal of Agronomy*, 57(1), 78–82.
12. Marschner, P. (2012). Marschner's mineral nutrition of higher plants (3rd ed.). Academic Press.
13. Meena, S. K., Mundra, S. L., & Singh, P. (2013). Response of maize to nitrogen and zinc fertilization. *Agricultural Science Digest*, 33(3), 188–191.
14. Reddy, T. Y., & Reddy, G. H. S. (2016). Principles of agronomy (5th ed.). Kalyani Publishers.
15. Sharma, P., Abrol, V., & Sharma, R. K. (2017). Nutrient management in fodder crops for sustainable production. *Forage Research*, 43(1), 1–7.
16. Singh, B., Singh, Y., & Ladha, J. K. (2015). Nutrient management in maize-based cropping systems. *Indian Journal of Agronomy*, 60(3), 351–362.
17. Singh, M. K., Singh, R. N., & Kumar, P. (2010). Integrated nutrient management for higher productivity and quality of baby corn. *Indian Journal of Agronomy*, 55(4), 287–290.