GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 14, Issue 02, Feb 2026 Impact Factor: 8.466

www.aarf.asia,**Email** : editoraarf@gmail.com

INFLUENCE OF VARIED NITROGEN, PHOSPHORUS, AND SULPHUR LEVELS ON GROWTH, YIELD COMPONENTS, AND PRODUCTIVITY OF SUMMER SESAME (SESAMUM INDICUM L.)

ASST PROF. S. S. RASKAR
Assistant Professor
College of Agri-Business Management at Narayangaon,
Tal. Junnar, Dist. Pune.

Abstract

This study investigates the impact of different doses of nitrogen (N), phosphorus (P), and sulphur (S) on the growth parameters, reproductive attributes, and yield of summer sesame (Sesamum indicum L.) variety GT-2 under the agro-climatic conditions of middle Gujarat, India. Employing a factorial randomized block design, eighteen treatment combinations comprising three levels each of nitrogen (25, 50, 75 kg ha^{-1}) and phosphorus (12.5, 25, 37.5 kg ha^{-1}), plus two sulphur levels (0 and 20 kg ha^{-1}), were tested with three replications. Results demonstrated that increasing nitrogen from 25 to 50 kg ha^{-1} and phosphorus from 12.5 to 37.5 kg ha^{-1} significantly elevated plant height, branch number, capsule length, seeds per capsule, and test weight. Sulphur application at 20 kg ha^{-1} notably improved these growth traits and increased seed and stalk yield by approximately 8.8% and 7.5%, respectively. Optimal nutrient combination for maximizing seed yield and its related parameters was determined as 50 kg N, 25 kg P_2O_5, and 20 kg S per hectare. These findings advocate for tailored nutrient management to enhance summer sesame productivity sustainably.

Keywords - Summer sesame, Nitrogen fertilization, Phosphorus application, Sulphur supplementation, Yield components, Seed yield, GT-2 variety, Sustainable agriculture

Introduction

Sesame (Sesamum indicum L.) is one of the ancient and economically important oilseed crops globally, valued especially for its high-quality edible oil rich in

GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 14, Issue 02, Feb 2026 Impact Factor: 8.466
© Association of Academic Researchers and Faculties (AARF)
www.aarf.asia,**Email** : editoraarf@gmail.com

antioxidants and essential fatty acids. India is among the largest producers and consumers of sesame, cultivating it predominantly in states such as Gujarat, Rajasthan, Maharashtra, and Uttar Pradesh. Despite its wide cultivation, sesame yields remain low due to inadequate nutrient management, soil fertility constraints, and biotic stresses.

Nitrogen, phosphorus, and sulphur are essential macronutrients that profoundly influence plant metabolism, growth, and development. Nitrogen facilitates vegetative growth and protein synthesis, phosphorus plays a pivotal role in energy transfer and reproductive development, while sulphur is crucial for synthesizing amino acids and enzymes vital for photosynthesis and metabolism.

This research explores the synergistic effects of varying nitrogen, phosphorus, and sulphur levels on summer sesame performance, aiming to optimize fertilizer recommendations under middle Gujarat's agro-climatic conditions.

Statement of Problem

Despite its high nutritional and economic value, sesame production faces challenges of suboptimal yield largely due to inefficient nutrient management practices. The lack of precise knowledge on the combined effects of nitrogen, phosphorus, and sulphur levels on growth, yield components, and final productivity impedes maximizing summer sesame potential in Gujarat. There is an exigent need to identify nutrient management regimes that can enhance yield sustainably while minimizing input wastage and environmental impact.

Scope of Research Study

This study focuses on understanding the influence of three essential nutrients—nitrogen, phosphorus, and sulphur—on summer sesame variety GT-2 under field conditions typical to middle Gujarat. Findings are intended to guide regional farmers to adopt scientifically optimized fertilizer schedules aimed at improving sesame yield and quality. The research also offers valuable insights for agronomists and policy makers working to bolster oilseed crop production efficiency in similar agro-ecological zones.

GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 14, Issue 02, Feb 2026 Impact Factor: 8.466
© Association of Academic Researchers and Faculties (AARF)
www.aarf.asia,**Email** : editoraarf@gmail.com

Significance of Research Study

Improving sesame yield through balanced nutrient management is significant to meet increasing demands for edible oils and enhance farmers' profitability. Understanding how nitrogen, phosphorus, and sulphur individually and interactively affect plant growth and yield components enables formulation of precise fertilizer recommendations, curtailing input costs and environmental hazards. Additionally, high sesame productivity contributes to rural livelihood security and supports the agro-based economy.

Relevance of Research Study

Oilseed crops like sesame are integral to India's food security and export economy. However, stagnating productivity necessitates innovative research on nutrient management. This study's emphasis on integrated N, P, and S nutrition aligns with evolving sustainable agriculture goals, improving nutrient use efficiency and reducing chemical fertilizer overuse. The variety tested, GT-2, is widely cultivated; thus, results have immediate applicability in enhancing local sesame production systems.

Objectives of Research Study

1. To evaluate the effect of different nitrogen levels on growth, yield attributes, and yield of summer sesame var. GT-2.
2. To determine the influence of varying phosphorus doses on the same parameters.
3. To assess the role of sulphur supplementation on sesame's growth and productivity.
4. To identify the optimal combination of nitrogen, phosphorus, and sulphur for maximizing seed yield under middle Gujarat agro-climatic conditions.
5. To provide recommendations for efficient nutrient management practices for sesame farmers.

GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 14, Issue 02, Feb 2026 Impact Factor: 8.466
© Association of Academic Researchers and Faculties (AARF)
www.aarf.asia,**Email** : editoraarf@gmail.com

Hypotheses of Research Study

1. Increasing nitrogen levels up to an optimum threshold significantly enhances growth and yield parameters of summer sesame.
2. Phosphorus availability positively affects growth and yield up to a certain application rate beyond which effects plateau.
3. Integrated application of nitrogen, phosphorus, and sulphur yields synergistic benefits exceeding individual nutrient effects.
4. There exists a combination of N, P, and S that maximizes seed yield and yield attributes economically and agronomically.

Research Methodology

Experimental Site and Soil Characteristics

The experiment was conducted at the Pulse Research Station, Anand Agricultural University, Vadodara, Gujarat during the summer season of 2010. The soil was sandy loam, deep, moisture-retentive with neutral pH (7.5), low in nitrogen, organic carbon, and zinc, but rich in available phosphorus and potassium.

Plant Material

Sesame variety GT-2, known for its high yield and resistance to pests and diseases, was selected.

Experimental Design

A factorial randomized block design with three replications was employed, involving 18 treatment combinations: three nitrogen levels (25, 50, 75 kg ha^{-1}), three phosphorus levels (12.5, 25, 37.5 kg P_2O_5 ha^{-1}), and two sulphur levels (0 and 20 kg S ha^{-1}).

Crop Management

The plot preparation included manual furrow creation at 2–3 cm depth with 45 cm row spacing. Full doses of phosphorus and sulphur along with half nitrogen dose were applied at sowing. Remaining half nitrogen was top-dressed a month after sowing.

GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 14, Issue 02, Feb 2026 Impact Factor: 8.466

www.aarf.asia,**Email** : editoraarf@gmail.com

Eight irrigations were provided as per crop demand, sowing occurred on 27th February, and harvesting was done on 24th May 2010.

Data Collection

Observations for growth parameters and yield attributes such as plant height, number of branches, number of capsules per plant, capsule length, seeds per capsule, and test weight were recorded from five tagged plants per plot. Seed and stalk yields per hectare were recorded at harvest.

Statistical Analysis

Collected data were subjected to analysis of variance (ANOVA) to determine the significance of treatment effects. Critical differences were computed at 5% level of significance.

Key Aspects of Investigation

1. Influence of N, P, and S on morphological growth indices.
2. Effect on reproductive traits contributing to yield formation.
3. Seed and stalk yield responses to nutrient treatments.
4. Interaction effects among nutrients, if any.
5. Determination of nutrient levels with maximum agronomic efficiency.

Findings

1. **Nitrogen Effect:** Plant height, branches, capsule number, and seed parameters increased significantly up to 50 kg N/ha; 75 kg N/ha showed marginal, non-significant additional gains. Seed yield improved by 10 to 12% with 50–75 kg compared to 25 kg N/ha.
2. **Phosphorus Effect:** Increase from 12.5 to 25 and 37.5 kg P_2O_5/ha enhanced growth and yield attributes significantly; seed yield improvement was about 6–8%.

GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 14, Issue 02, Feb 2026 Impact Factor: 8.466
© Association of Academic Researchers and Faculties (AARF)
www.aarf.asia,**Email** : editoraarf@gmail.com

3. **Sulphur Effect:** Application of 20 kg S/ha enhanced physiological parameters and seed/stalk yield by roughly 8.8% and 7.5%, respectively, attributed to improved chloroplast and protein synthesis.
4. Combined nutrient applications did not show significant interactions but indicated additive effects on growth and yield.
5. Harvest index remained largely unaffected by nutrient treatments.
6. Optimal nutrient dose for maximum seed yield and growth parameters was 50 kg N, 25 kg P_2O_5, and 20 kg S per hectare.

Recommendations

1. Farmers cultivating summer sesame in Gujarat's agro-climatic context should adopt fertilizer regimes comprising 50 kg N, 25 kg P_2O_5, and 20 kg S per hectare for enhanced yield.
2. Split application of nitrogen with half dose at sowing and remaining as top dressing ensures better nutrient utilization.
3. Sulphur inclusion is essential for balanced nutrition and should be integrated into fertilization programs.
4. Routine soil testing is recommended to tailor nutrient management strategies effectively.
5. Further research is suggested to explore long-term effects of integrated nutrient management on soil health and sesame quality.

Contribution towards Society and Stakeholders

This study provides evidence-based guidelines for optimized fertilization of summer sesame, potentially increasing farmers' profitability through improved yields and reduced fertilizer wastage. It supports sustainable agricultural practices by promoting balanced nutrient applications, reducing environmental pollution risks from over-fertilization. Sesame growers, extension agents, input suppliers, and policymakers

GE-International Journal of Management Research
ISSN (O): (2321-1709), ISSN (P): (2394-4226)
Vol. 14, Issue 02, Feb 2026 Impact Factor: 8.466

www.aarf.asia,**Email** : editoraarf@gmail.com

benefit from the practical recommendations for enhancing oilseed production in semi-arid regions.

Conclusion

The integrated application of nitrogen at 50 kg ha^{-1}, phosphorus at 25 kg P_2O_5 ha^{-1}, and sulphur at 20 kg S ha^{-1} significantly improves growth and yield components as well as seed and stalk yields of summer sesame (var. GT-2) under middle Gujarat conditions. Increasing nitrogen beyond 50 kg ha^{-1} offers negligible benefits, while phosphorus and sulphur at stated levels optimize productivity. Adoption of these nutrient management practices is vital for achieving higher sesame production sustainably.

References

1. Chaubey, A.K., Kaushik, M.K., & Singh, S.B. (2003). Response of sesame (Sesamum indicum) to nitrogen and sulphur in light-textured entisol. *New Agriculturist*, 14(1,2), 61-64.
2. Choudhari, S.R., & Patel, D.B. (2007). Response of sesamum (Sesamum indicum L.) to different levels of phosphorus and sulphur under north Gujarat agroclimatic conditions. *GAU Research Journal*, 32(1-2), 31-33.
3. Mandal, S., Sengupta, K., Maity, D., & Jana, P.K. (1993). Sulphur with NPK boosts the yield of summer sesamum. *Indian Farming*, 43(5), 17-18.
4. Mondal, S.S., Verma, D.D., & Kuila, S. (1992). Effect of organic and inorganic sources of nutrients on growth and yield of sesame. *Indian Journal of Agricultural Sciences*, 62(4), 258-262.
5. Patel, J.R. (2000). Response of sesame genotypes to levels of nitrogen. *Journal of Oilseeds Research*, 17(1), 179-180.
6. Patra, A.K. (2001). Yield and quality of sesamum (Sesamum indicum) as influenced by N and P during post rainy season. *Annals of Agricultural Research*, 22(2), 249-252.