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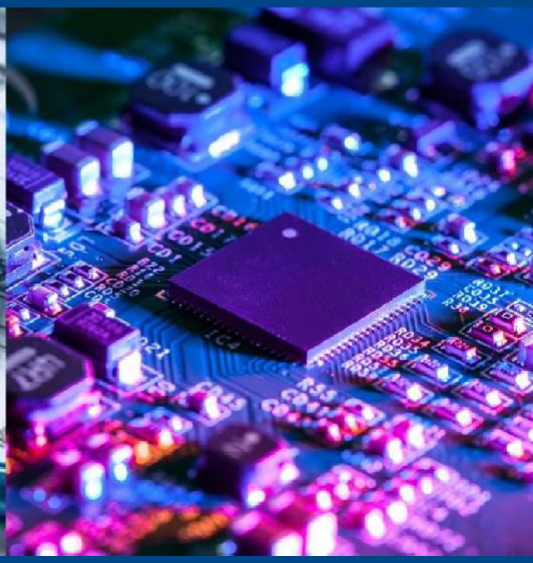

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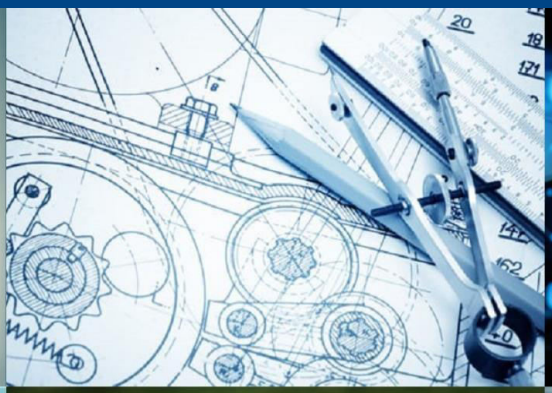

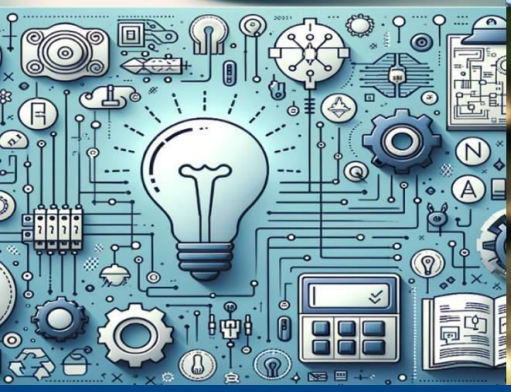

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Effect of Nitrogen and Sulphur on Growth, Yield and Quality of Taramira (Eruca sativa Mill.)

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ABSTRACT: A field experiment was conducted during the Rabi season of 2024–25 at Vivekananda Global University, Jaipur, to evaluate the effect of nitrogen and sulphur fertilization on the performance of taramira (Eruca sativa Mill.). The study employed 16 treatment combinations comprising four nitrogen levels (0, 20, 40, 60 kg/ha) and four sulphur levels (0, 20, 40, 60 kg/ha) arranged in a factorial randomized block design with three replications. Results demonstrated that nitrogen at 60 kg/ha and sulphur at 60 kg/ha significantly enhanced plant height, dry matter accumulation, yield components (siliquae per plant, seeds per siliqua, 1000-seed weight), seed and stover yield, oil content, and nutrient uptake. The treatment N_3S_3 (60 kg N + 60 kg S/ha) recorded the highest economic return and benefit-cost ratio. The findings suggest that balanced application of nitrogen and sulphur can significantly improve the productivity and quality of taramira in semi-arid agro-ecosystems.

I. INTRODUCTION

Taramira, an underutilized oilseed crop of the Brassicaceae family, is well-adapted to the arid and semi-arid zones of northwestern India. Despite its drought resilience and suitability to marginal lands, taramira productivity remains low due to inadequate nutrient management. Nitrogen, a key macronutrient, influences vegetative growth, protein synthesis, and yield. However, excessive application can lower oil content and increase environmental burden. Sulphur plays a vital role in oil synthesis and protein metabolism and is increasingly becoming deficient in Indian soils. Thus, balanced fertilization is critical to maximizing yield and quality. This study was undertaken to assess the impact of varying nitrogen and sulphur levels on growth, yield, and quality attributes of taramira under field conditions.

II. MATERIALS AND METHODS

The experiment was carried out at the Research Farm of Vivekananda Global University, Jaipur (26°51′N latitude, 75°47′E longitude; altitude 390 m) during Rabi 2024–25. The

soil was loamy sand, alkaline (pH 8.1), low in nitrogen (139.2 kg/ha), medium in phosphorus and potassium, and poor in organic carbon (0.24%).
Experimental Design: Factorial Randomized Block Design
Treatments: 4 Nitrogen levels (0, 20, 40, 60 kg/ha) × 4 Sulphur levels (0, 20, 40, 60 kg/ha) = 16 treatments
Replication: 3
Crop: Taramira variety RTM-1355 Plot Size: Net plot – 13.5 m² Sowing Date: 15 October 2024
Irrigation: Two irrigations via sprinkler system (flowering and pod development stage) Harvesting Date: 5 February 2025

Table 1. Nitrogen and Sulphur Levels Applied

Nitrogen Levels (kg/ha)	Sulphur Levels (kg/ha)
0 (N0)	0 (S0)
20 (N1)	20 (S1)
40 (N2)	40 (S2)
60 (N3)	60 (S3)

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III. RESULTS AND DISCUSSION

Growth Attributes

Application of nitrogen and sulphur significantly improved plant height and dry matter production at both 40 DAS and maturity. The highest plant height (92.76 cm) and dry matter accumulation (43.64 g/plant) were recorded with 60 kg N/ha and 60 kg S/ha, respectively. These results indicate a positive interaction between nitrogen and sulphur in promoting vegetative growth.

Table 2. Effect of Nitrogen and Sulphur on Plant Height and Dry Matter of Taramira

Treatment	Plant Height (cm) at 40 DAS	Plant Height (cm) at Maturity	Dry Matter (g/plant) at 40 DAS	Dry Matter (g/plant) at Maturity
Control	37.85	80.64	9.36	36.79
20 kg N	41.70	85.07	10.68	39.39
40 kg N	43.97	89.30	11.23	41.85
60 kg N	45.92	92.76	11.53	43.64

Yield Components and Yield

Table 4.2 Effect of nitrogen and sulphur on yield attributes of taramira

Treatments				
Nitrogen levels (kg/ha)	**No. of branches per plant**	**No. of siliquae per plant**	**No. of seeds per siliquae**	**Test weight (g)**
Control	8.33	130.79	13.05	3.48
20	9.74	177.28	17.71	3.61
40	10.04	200.18	19.99	3.67
60	11.35	224.56	22.39	3.87
SEm+	0.29	5.98	0.60	0.06
CD (P = 0.05)	0.84	17.27	1.72	0.19
Sulphur levels (kg/ha)				
Control	7.96	141.09	14.09	3.46
20	9.59	185.33	18.51	3.61
40	11.18	195.98	19.53	3.77
60	11.73	210.40	21.02	3.84
SEm+	0.29	5.98	0.60	0.06
CD (P = 0.05)	0.84	17.27	1.72	0.19

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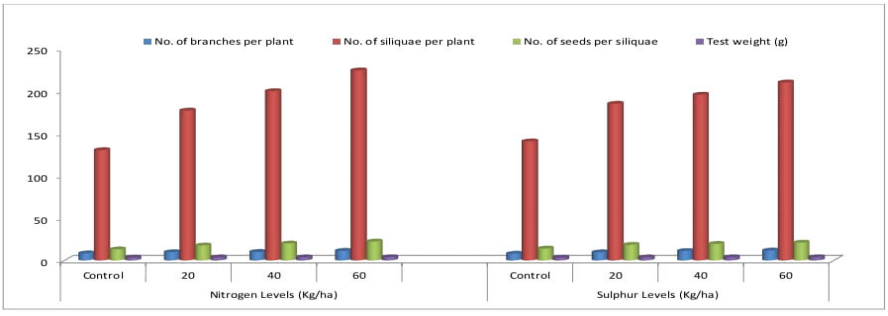

Fig: 4.2 Effect of nitrogen and sulphur on yield attributes of taramira

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1. Grain (Seed) Yield
Nitrogen:
Maximum yield: 1034 kg/ha with 60 kg N/ha.
This was significantly superior to 20 kg (840 kg/ha) and 40 kg N/ha (935 kg/ha).
Lowest yield in control (658 kg/ha).

Sulphur:
Highest yield: 986 kg/ha with 60 kg S/ha, significantly better than control.
At par with 40 kg S/ha (922 kg/ha).
Control yield: 692 kg/ha.

2. Straw Yield
Nitrogen:
Highest straw yield: 2546 kg/ha at 60 kg N/ha.
Significantly superior to 40 kg (2302 kg/ha), 20 kg (2073 kg/ha), and control (1608 kg/ha).

Sulphur:
Maximum yield: 2404 kg/ha with 60 kg S/ha, significantly better than control.
At par with 40 kg S/ha (2260 kg/ha).
Control: 1711 kg/ha.

3. Biological Yield (Seed + Straw)
Nitrogen:
Highest: 3580 kg/ha with 60 kg N/ha.
Significantly superior to 20 kg N/ha (2913 kg/ha).
At par with 40 kg N/ha (3237 kg/ha).
Control: 2266 kg/ha.

Sulphur:
Highest: 3390 kg/ha at 60 kg S/ha, at par with 40 kg (3182 kg/ha).
Control: 2403 kg/ha.

4. Harvest Index (%)
Ranged between 28.73% and 29.08% for all treatments.
No significant difference due to nitrogen or sulphur levels (NS).

Nutrient Uptake and Quality Parameters
Combined application of N and S increased nitrogen and sulphur content in seed and straw. Maximum oil content (38.9%) and oil yield (732.3 kg/ha) were observed in the N_3S_3 treatment.

Economics
N_3S_3 treatment recorded the highest net return of ₹48,760/ha and a benefit-cost ratio of 2.95, indicating its profitability and economic viability.

IV. CONCLUSION

The field study conducted during Rabi 2024–25 showed that the combined application of 60 kg N/ha and 60 kg S/ha significantly enhanced the growth, yield attributes, nutrient uptake, oil content, and economic returns of Taramira (Eruca sativa). Nitrogen notably improved plant height, dry matter, and seed yield, while sulphur was vital for better nutrient uptake and oil quality. The best treatment combination not only achieved maximum biological performance but also highest net return and benefit-cost ratio, proving that balanced and optimal fertilization with nitrogen and sulphur is essential for maximizing productivity and profitability in taramira cultivation under semi-arid conditions.

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