ISSN Print: 2664-6064
ISSN Online: 2664-6072
NAAS Rating (2025): 4.69
IJAN 2025; 7(9): 25-28
www.agriculturejournal.net
Received: 07-07-2025
Accepted: 09-08-2025

Lokesh Kumar
Vivekanand Global University Jagatpura, Jaipur, Rajasthan, India

Corresponding Author:
Lokesh Kumar
Vivekanand Global University Jagatpura, Jaipur, Rajasthan, India

Response of mustard [*Brassica juncea* (L.) Czern & Coss.] varieties to integrated nutrient management

Lokesh Kumar

DOI: https://www.doi.org/10.33545/26646064.2025.v7.i9a.282

Abstract
The productivity of mustard (*Brassica juncea* L.) is significantly influenced by varietal potential and nutrient management practices, particularly under semi-arid conditions. A field experiment was conducted during Rabi 2024-25 at the Research Farm of Vivekananda Global University, Jaipur, to evaluate the effect of four mustard varieties (Varuna, Rohini, RH-725, and Giriraj) and four nutrient management levels (control, 50% NPS + 5 t/ha vermicompost, 75% NPS + 5 t/ha vermicompost, and 100% NPS + 5 t/ha vermicompost) on yield attributes, yield, and economics. The experiment was laid out in a factorial randomized block design (FRBD) with 16 treatment combinations replicated four times.

Results revealed that the variety Giriraj (V4) produced the highest number of siliquae per plant (155.75), seeds per siliqua (17.24), test weight (4.57 g), seed yield (1990 kg/ha), and net returns (Rs. 74,367/ha). Similarly, nutrient management with 100% NPS + 5 t/ha vermicompost (NM3) recorded maximum siliquae per plant (160.50), seed yield (2054 kg/ha), biological yield (6296 kg/ha), and net returns (Rs. 75,531/ha). The interaction effects were non-significant but indicated a synergistic trend. It can be concluded that Giriraj variety combined with 100% NPS + 5 t/ha vermicompost significantly improved yield and profitability of mustard under semi-arid conditions of Rajasthan. The findings highlight the importance of integrating varietal selection and nutrient management strategies to achieve higher productivity and sustainability.

Keywords: Mustard, vermicompost, nutrient management, yield attributes, economics, Rajasthan

Introduction

Mustard (*Brassica juncea* L.), also known as Indian mustard, is one of the most important oilseed crops in India, contributing nearly 28% to the total oilseed production. India is the second-largest producer of rapeseed-mustard after China, with Rajasthan as the leading state, contributing more than 40% to the national production [1]. The crop plays a crucial role in ensuring edible oil self-sufficiency, reducing import dependency, and providing income security to farmers in semi-arid regions.

Despite its importance, the productivity of mustard in India remains relatively low compared to its potential. The national average productivity is around 1300-1500 kg/ha, which is significantly lower than the global average [2]. The major reasons include sub-optimal varietal selection, imbalanced fertilization, low organic matter content in soils, and improper agronomic management practices.

Varietal improvement has significantly contributed to enhancing mustard productivity. Varieties such as Varuna, Rohini, RH-725, and Giriraj are widely cultivated across different agro-climatic zones due to their adaptability, earliness, and yield potential. However, their performance varies under different soil fertility and climatic conditions [3].

Nutrient management, particularly through integrated approaches, is equally critical. Nitrogen (N), phosphorus (P), and sulphur (S) are the key nutrients for mustard, influencing growth, yield, and oil content [4]. Sulphur, in particular, plays an important role in glucosinolate synthesis and oil quality. Organic manures like vermicompost improve soil health by enhancing microbial activity, organic carbon content, and nutrient use efficiency [5]. Integrating chemical fertilizers with organic manures has been reported to improve crop productivity while maintaining soil fertility sustainability [6, 7]. Given this background, the present investigation was undertaken to evaluate the combined effect of mustard varieties

and nutrient management practices on growth, yield, and economics under the semi-arid agro-ecological conditions of Jaipur, Rajasthan.

Materials and Methods

Experimental Site

The field experiment was conducted at the Research Farm of Vivekananda Global University, Jaipur, Rajasthan during Rabi season of 2024-25. The site is located at 26.91°N latitude and 75.79°E longitude with an altitude of 431 m above mean sea level. The region is characterized by a semi-arid climate with hot summers, cold winters, and annual rainfall of ~550 mm, mostly received during the monsoon season. The experimental field was sandy loam in texture, low in organic carbon (0.35%), low in available nitrogen (245 kg/ha), medium in available phosphorus (28.4 kg/ha), and medium in potassium (290 kg/ha). Available sulphur was 12.5 kg/ha, indicating sulphur deficiency typical of mustard-growing areas of Rajasthan.

Experimental Details

The details of the experimental layout are presented in Table 1 and Table 2.

Table 1: Treatments details with their symbols

Sr. No.	Treatments	Symbols
A.	**Varieties**	
1.	Varuna	V_1
2.	Rohini	V_2
3.	RH - 725	V_3
4.	Giriraj (DRMRIJ 31)	V_4
B.	**Nutrient management**	
1.	Control	NM_0
2.	50% NPS + 5 t/ha Vermicompost	NM_1
3.	75% NPS + 5 t/ha Vermicompost	NM_2
4.	100% NPS + 5 t/ha Vermicompost	NM_3

Table 2: Details of the experiment are as follows:

	Season	Rabi, 2024-25
1.	Total number of treatments	16
2.	No. of replications	4
3.	Total number of plots	4 x 4 = 48
4.	Experimental design	Factorial Randomized Block Design
5.	Plot size Gross	3.0 m x 5.0 m = 15.0 m^2
6.	Net	2.4 x 5 m = 12.00 m^2
7.	Variety	As per treatments
8.	Spacing	30 x 10 cm
9.	Seed rate	4.0 kg ha^{-1}
10.	Location	Research Farm, VGU, Jaipur

Crop Management

The field was prepared by two ploughings followed by harrowing. Seeds were sown manually in rows at 30 × 10 cm spacing on 12th October 2024. Recommended seed treatment with thiram @ 3 g/kg seed was followed. Vermicompost was applied as per treatments during field preparation. NPS fertilizers (urea, single super phosphate, and elemental sulphur) were applied in respective quantities. The crop was irrigated at critical growth stages (vegetative, flowering, and siliqua development). Plant protection measures were adopted as per standard recommendations.

Observations Recorded

The following parameters were recorded from five randomly selected plants per plot:

Yield attributes: Number of siliquae per plant, number of seeds per siliqua, test weight (1000-seed weight in g).

Yield: Seed yield (kg/ha), straw yield (kg/ha), biological yield (kg/ha), and harvest index (%).

Economics: Gross returns, net returns, and benefit-cost (B:C) ratio based on prevailing market prices.

Statistical Analysis

The data were analyzed using Analysis of Variance (ANOVA) as per the method described by Panse and Sukhatme [8]. Treatment means were compared at a 5% level of significance (P = 0.05)

Results and Discussion

Yield Attributes

Table 3 shows the effect of varieties and nutrient management on yield attributes of mustard.

Among varieties, Giriraj (V4) recorded the highest number of siliquae/plant (155.75), seeds/siliqua (17.24), and test weight (4.57 g), followed by RH-725 (V3). The superiority of Giriraj may be attributed to its better genetic potential, higher assimilate partitioning, and improved sink strength. Similar results were reported by Singh *et al.* [9], who observed significant variation in siliqua number and test weight among mustard varieties.

Among nutrient management practices, NM3 (100% NPS + 5 t/ha vermicompost) recorded significantly higher siliquae/plant (160.50), seeds/siliqua (17.29), and test weight (4.37 g), compared to control. The increase may be due to balanced nutrient supply, improved root proliferation, and higher nutrient uptake. Vermicompost improves soil microbial activity and nutrient availability [10].

This indicates that combining full NPS fertilization with vermicompost enhances reproductive efficiency in mustard.

Table 3: Effect of varieties and nutrient management on Yield attributes of mustard

		Yield attributes	
Treatments	**No. of siliqua / plant**	**No. of seeds / siliqua**	**Test weight (g)**
Varieties			
Varuna	132.95	14.61	3.96
ROHINI	139.01	15.11	4.07

RH - 725	153.28	16.94	4.54
Giriraj	155.75	17.24	4.57
SEm ±	3.68	0.38	0.11
CD (P=0.05)	10.63	1.10	NS
Nutrient management			
Control	116.81	13.84	4.16
50% NPS + 5 t/ha VC	142.49	15.66	4.27
75% NPS + 5 t/ha VC	155.19	17.12	4.34
100% NPS + 5 t/ha VC	160.50	17.29	4.37
SEm ±	3.68	0.38	0.11
CD (P=0.05)	10.63	1.10	NS

Yield Performance

Table 4 presents the effect of treatments on seed yield, straw yield, biological yield, and harvest index.

Varieties: The variety Giriraj (V4) produced the highest seed yield (1990 kg/ha), straw yield (4150 kg/ha), and biological yield (6141 kg/ha). RH-725 (V3) was the second best, while Varuna (V1) recorded the lowest yield (1722 kg/ha). The higher productivity of Giriraj is linked to its superior yield attributes. Similar varietal differences in yield were also observed by [11]. Nutrient Management: The highest seed yield (2054 kg/ha) and biological yield (6296 kg/ha) were obtained with NM3 (100% NPS + 5 t/ha vermicompost), followed by NM2 (75% NPS + 5 t/ha vermicompost). Control plots (NM0) produced the lowest seed yield (1400 kg/ha). The positive impact of integrated nutrient management may be attributed to sustained nutrient availability and improved soil fertility [12]. Harvest Index: Differences in harvest index among varieties and nutrient management were statistically non-significant. This is consistent with earlier findings [13], where nutrient management improved biomass but not partitioning efficiency.

Table 4: Effect of varieties and nutrient management on yields and harvest index of mustard

Treatments	Yield (kg/ha)			Harvest Index (%)
	Seed	Straw	Biological	
Varieties				
Varuna	1722	3546	5268	32.80
ROHINI	1787	3667	5454	32.81
RH - 725	1963	4041	6004	32.73
Giriraj	1990	4150	6141	32.39
SEm ±	55	106	140	0.67
CD (P=0.05)	159	306	404	NS
Nutrient management				
Control	1400	3036	4832	33.02
50% NPS + 5 t/ha VC	1820	3780	5600	32.58
75% NPS + 5 t/ha VC	1992	4146	6138	32.47
100% NPS + 5 t/ha VC	2054	4242	6296	32.65
SEm ±	55	106	140	0.67
CD (P=0.05)	159	306	404	NS

Economics

Table 5 shows the economics of mustard production.

Varieties: Maximum net returns (Rs.74,367/ha) and B\:C ratio (2.53) were recorded with Giriraj (V4), followed by RH-725 (Rs.72,885/ha; 2.48). Varuna recorded the lowest net returns (Rs. 60,334/ha). The higher economic returns of Giriraj are due to its superior yield potential. Nutrient Management: Among nutrient practices, NM3 gave the maximum net returns (Rs. 75,531/ha) and B:C ratio (2.41), followed by NM2. Control (NM0) resulted in the lowest returns (Rs.56,430/ha). The profitability under integrated nutrient management has also been reported by Singh *et al*. [14].

Thus, adopting Giriraj variety with NM3 proved economically most viable.

Table 5: Effect of varieties and nutrient management on economics of mustard

Treatments	Economics	
	Net returns (₹ /ha)	B: C ratio
Varieties		
Varuna	60334	2.05
ROHINI	63702	2.17
RH - 725	72885	2.48
Giriraj	74367	2.53
SEm ±	2808	0.10
CD (P=0.05)	8110	0.28
Nutrient management		

Control	56430	2.12
50% NPS + 5 t/ha VC	65772	2.27
75% NPS + 5 t/ha VC	73555	2.44
100% NPS + 5 t/ha VC	75531	2.41
SEm ±	2808	0.10
CD (P=0.05)	8110	0.28

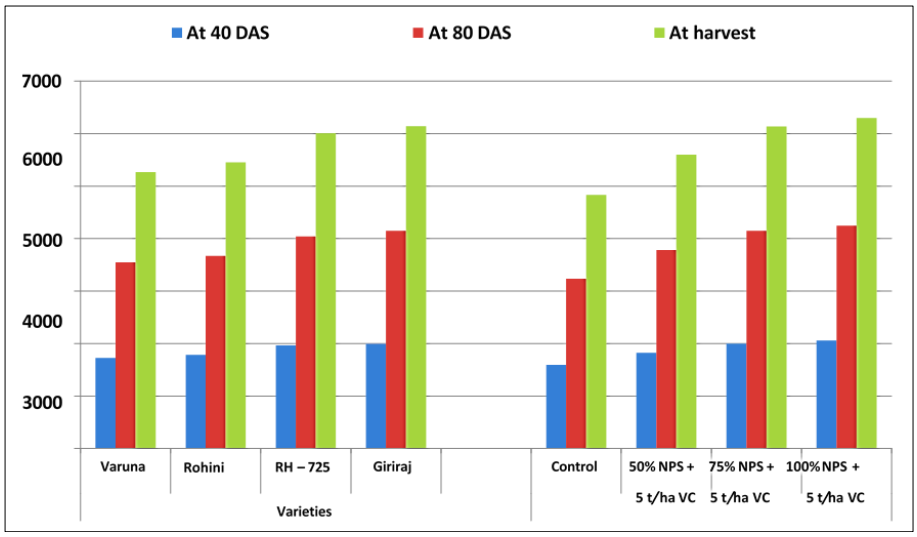

Fig 1: Effect of varieties and nutrient management on yields of mustard

Conclusion

The present study demonstrated that both varietal choice and nutrient management significantly influenced mustard productivity under semi-arid conditions of Rajasthan. The Giriraj variety (V4) outperformed others in terms of yield attributes, seed yield, and net returns. Similarly, the integrated nutrient management practice of 100% NPS + 5 t/ha vermicompost (NM3) resulted in maximum yield and profitability.

Therefore, for achieving higher productivity and economic returns, farmers in Rajasthan may be recommended to cultivate Giriraj variety with 100% NPS + 5 t/ha vermicompost. Such integrated approaches not only enhance yield but also improve soil fertility and ensure sustainability of mustard-based farming systems.

References

1. Directorate of Rapeseed-Mustard Research (DRMR). Vision 2050. ICAR-DRMR, Bharatpur, Rajasthan; 2017.
2. Food and Agriculture Organization of the United Nations (FAO). FAOSTAT statistical database. FAO, Rome; 2023.
3. Kumar A, Singh S, Singh D. Genetic variability and heritability studies in Indian mustard (*Brassica juncea* L.). Journal of Oilseed Brassica. 2017;8(1):71-75.
4. Yadav R, Yadav DS, Yadav LR. Response of mustard to nitrogen and sulphur fertilization. Indian Journal of Agronomy. 2018;63(3):368-372.
5. Pathak RK, Shukla A. Effect of organic manures and chemical fertilizers on growth, yield and quality of mustard. International Journal of Current Microbiology and Applied Sciences. 2019;8(2):315-322.
6. Sharma RP, Choudhary R. Integrated nutrient management in mustard: A review. Journal of Pharmacognosy and Phytochemistry. 2020;9(2):1580-1585.
7. Choudhary KK, Meena MK. Role of vermicompost in crop productivity and soil health. Journal of Pharmacognosy and Phytochemistry. 2021;10(5):231-236.
8. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. 4th ed. Indian Council of Agricultural Research (ICAR), New Delhi; 1985.
9. Singh B, Singh S, Rani A. Influence of varieties and nutrient management on yield attributes of mustard. Annals of Plant and Soil Research. 2019;21(3):236-239.
10. Gupta A, Meena RS. Effect of vermicompost and fertilizers on productivity of Indian mustard. Journal of Oilseeds Research. 2018;35(2):145-150.
11. Meena BL, Singh P, Choudhary GL. Varietal performance of mustard under different fertility levels. Indian Journal of Fertilisers. 2020;16(7):734-739.
12. Rathore SS, Shekhawat K. Integrated nutrient management in oilseed crops. Indian Journal of Agronomy. 2017;62(3):345-352.
13. Singh RK, Kumar V, Kumar R. Effect of integrated nutrient management on growth and yield of mustard. Journal of Pharmacognosy and Phytochemistry. 2022;11(1):1832-1836.
14. Singh D, Sharma S, Meena RS. Economics of mustard cultivation under different nutrient management practices. International Journal of Current Microbiology and Applied Sciences. 2020;9(9):2291-2298.