The Pharma Innovation Journal 2022; 11(6): 1939-1942

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(6): 1939-1942
© 2022 TPI
www.thepharmajournal.com
Received: 12-02-2022
Accepted: 21-05-2022

Deepsikha
M.Sc. Scholar, Department of Agronomy, ITM University, Gwalior, Madhya Pradesh, India

Tomar SS
Professor, Department of Agronomy, ITM University, Gwalior, Madhya Pradesh, India

Varsha H Perli
M.Sc. Scholar, Department of Agronomy, ITM University, Gwalior, Madhya Pradesh, India

Kasi R Gummadala
M.Sc. Scholar, Department of Agronomy, ITM University, Gwalior, Madhya Pradesh, India

Corresponding Author:
Deepsikha
M.Sc. Scholar, Department of Agronomy, ITM University, Gwalior, Madhya Pradesh, India

Comparative analysis of growth and yield traits of different mustard (*Brassica juncea* L.) varieties under sulphur fertilization

Deepsikha, Tomar SS, Varsha H Perli and Kasi R Gummadala

Abstract
Comparative analysis of different growth and yield traits of three mustard varieties were conducted at Crop Research Centre (CRC), School of Agriculture, ITM University Gwalior, Madhya Pradesh during *Rabi* season of 2021-22. Data indicated that variety 'NRCHB-101' performed better in comparison to 'RVM-2' and 'Varuna' as it shows higher physiological growth (CGR, RGR and AGR) at most of the stages and produce more number of siliquae, per plant. Other parameters such as test weight, seed yield, oil content and B:C ratio were also higher in NRCHB-101 variety. Application of 30 and 45 kg S ha-1 depicted statistically par results of physiological growth at most of the stages and also gave comparable seed yield and oil content in both the levels but 30 kg S ha-1 the net returns are higher and B:C ratio when compared to other sulphur concentrations.

Keywords: Mustard, physiological growth, sulphur level and oil content

Introduction
Rapeseed mustard (*Brassica juncea* L.) is the most widely grown edible oilseed crop in India, accounting for 28.6% of total oilseed output, comparably with other seven oil seed crops. Rapeseed mustard is the second-most important oilseed crop in India, next only to soybean, with almost one-fourth share in both area and production (Jat *et al*., 2019) [1]. It is cultivated in an area of 7.58 million hectares with a production of 10.1 million tonnes yielding 1324 kg/ ha (ICAR-DRMR, 2021). There exists a huge gap between the global productivity (20.47 q/ ha) and India's productivity (13.24 q/ ha) which need to be bridged with the expansion of area under high yielding varieties (hybrids) due to their improved genetic potential (Kiran *et al*., 2019) [5]. After nitrogen, phosphorus, and zinc, sulphur is the fourth most important nutrient in Indian agriculture. Sulphur insufficiency is becoming more common in many sections of the nation, owing to higher crop yields, intensive agriculture, and a transition from low-analysis fertilizers to high-analysis fertilizers, which contain little or no sulphur. Mustard is nutrient-dense, with an oil content ranging from 37 to 49 percent. It belongs to the Cruciferae family, which has a high sulphur need due to its high glucosinolate content. It is critical to increase oilseed output in order to fulfil the expanding demand. Due to crop competition, boosting productivity via increasing area is nearly impossible. As a result, adopting high-yielding cultivars and inputs can enhance productivity per unit area. Mustard is responsive to sulphur in comparison to other crops. Sulphur fertilization has also been shown to increase the oil content in seeds of rapeseed-mustard (Rajesh *et al*., 2010) [7]. Keeping in views the present study was carried out.

Materials and Methods
During the years 2021-22, a field experiment was undertaken at the Agriculture Research Farm, School of Agriculture, ITM University, Gwalior, (M.P.). Few soil samples of the surface soil up to 15 cm, depth was taken randomly before sowing and a composite sample made after mixing all these, was analysed in the laboratory for mechanical and chemical composition the soil in the experiment had a sandy clay loam texture, was normal to reactivity, and had a low organic carbon content (0.43 percent). N, P, K, and S were found to be 216.8, 12.3, 228.6, and 23.64 kg ha-1, respectively. The research farm is located at latitude of 26°14' N and longitude of 78° 14' E with an elevation of 206 m above the mean sea level.

In a split-plot design with three replications, twelve treatments were used, with three varieties (Varuna, NRCHB-101, and RVM-2) in the main plot and four sulphur levels (0, 15, 30, and 45 kg ha-1) in the subplots. On October 27, 2021, mustard types were sowed in rows 40 cm apart using 05 kg seed ha-1. At the time of seeding, half of the necessary nitrogen dose was administered, along with plenty of phosphate and potassium. After the initial watering, the remaining half dosage of N was administered. Sulphur was sprayed according to the treatment plan using bentonite sulphur at the basal. All agronomic procedures were kept regular and consistent for all treatments except those under study. Plant height, the number of branches, the number of siliqua, the number of seeds, test weight, seed yield, oil content, and other yield characteristics were tracked from germination through harvest. B: C ratios, CGR, RGR, AGR. Dry matter accumulation was used to calculate growth parameters. Using Radford's (1967) method, the values for crop growth rate (CGR; g m–2 day–1), relative growth rate (RGR; mg g–1 day–1), and absolute growth rate (AGR; g day–1) were computed. Analysis of variance was used to examine the data collected in each observation, and significant differences between treatment means were assessed using the least significant difference (LSD) test with a 5% probability.

Results and Discussion

Growth and yield attributes

Plant height

Plant height was 198.40 cm compared to other treatments and 201.38 cm compared to other sulphur levels in NRCHB-101 with a sulphur level of 45 kg/ha. Varuna was taller than RVM-2. However, statistically, it was par to a sulphur level of 30 kg/ha (S2). The minimal height was recorded in the control plot. The mustard plant height was increased by using sulphur treatments. These findings support those of (Mehndi *et al*., 2007) [2].

Number of Branches

NRCHB -101 with a sulphur level of 45 kg/ha had the most branches, with 19.05 compared to other varieties and 19.26 compared to other sulphur levels. RMV-2 has a greater number of branching than Varuna. However, statistically, it was comparable to a sulphur level of 30 kg/ha. The application of sulphur, which fundamentally enlarged the quality of important branches, is most likely the cause of the increased number of branches. These findings support those of (Rajesh *et al*., 2010) [7], (Rakesh *et al.*, 2016) [8].

Number of siliqua

NRCHB-101 generated the most Siliqua with a sulphur level of 45 kg/ha (203.05 compared to other varieties) and 202.85 per plant (202.85 compared to other sulphur levels). RVM-2 produced much more Siliqua than Varuna. However, statistically, it was par with the 30 kg/ha applied sulphur amount. The application of sulphur, which promoted the siliqua per plant in mustard, is most likely to blame for the rise in the number of siliqua. These findings support those of (Ram pyare *et al*., 2008) [4].

Number of seeds

In sulphur levels of 45 kg/ha, the number of seeds per siliqua was highest in NRCHB-101, at 12.66 per siliqua when compared to other varieties and 12.43 when compared to sulphur levels. In comparison to Varuna, RVM-2 generated more seeds. These findings support those of (Mehndi *et al*., 2007) [2] and (Ram pyare *et al*., 2008) [4].

Test weight

The greatest test weight was found in NRCHB-101 at 45 kg/ha sulphur, which was 4.23 when compared to other varieties and 4.27 when compared to sulphur levels. However, statistically, it was par with the applied sulphur level of 30 kg/ha. These findings support those of (Satybhan *et al*. 2017) [9].

Seed yield

NRCHB-101 had the highest seed production per hectare with a sulphur level of 45 kg/ha, which was 1936.9 kg/ha when compared to other varieties and 1908.3 kg/ha when compared to sulphur levels. However, statistically, it was par with the applied sulphur level of 30 kg/ha. RVM-2 generated a much larger seed output than Varuna.

The probable reason for the increase in yield is might be due to the favourable reaction to sulphur which might have enhanced sulphur absorption from the soil, which improves the reproductive structure of the sink, boosting the generation of assimilates to fill the seed, and ultimately the seed yield. The results back up those of (Sarangthem *et al*., 2008) [6]. As the development stage progressed, each unit of current dry matter decreased. (Rajesh *et al*., 2010) [7] Have backed up this claim. In comparison to other mustard varieties, (Rajesh *et al*., 2010) [7] found that NRCHB-101 produced the greatest seed yield per hectare.

Oil content

NRCHB-101 had the maximum oil content with a sulphur level of 45 kg/ha, which was 39.52 when compared to other varieties and 39.67 when compared to different sulphur levels. It was, nevertheless, statistically equivalent to the applied sulphur level of 30 kg/ha.

The rise in oil content might be attributed to the synthesis of more glycosides, which raised the oil content, or it could be linked to the increasing oil content with the use of sulphur (Ray *et al*., 2015) [10]. These findings support those of (Ram Pyare *et al*., 2008) [5].

Physiological parameters

CGR

NRCHB-101 had the highest crop growth rate, which was greater than Varuna but comparable to RVM-2. Except for control, CGR was comparable from 0-90 DAS for all sulphur levels. However, from 90 DAS through maturity, CGR peaked at 45 kg/ha sulphur. These findings support those of (Mehndi *et al*., 2007) [2] and (Piri *et al*., 2007) [3].

AGR

NRCHB-101 had the greatest AGR, which was greater than the other two kinds varieties from 0-30 DAS range but was par in the 60-90 DAS range. At maturity, the variants had no discernible impact.

From 90 DAS to maturity stage, AGR was maximum at 45kg/ha sulphur level, which was on par with the preceding two sulphur levels. In the control, the minimum AGR was recorded. These findings support those of (Mehndi *et al*., 2007) [2] and (Piri *et al*., 2007) [3].

RGR

NRCHB-101 had the greatest RGR, which was statistically par with RVM-2 and Varuna from 0-90 DAS. Varuna had the highest RGR of the three kinds at 90 DAS – maturity. RGR was greatest at 45kg/ha, but it was similarly in par with the other two preceding sulphur levels except for control until 90 DAS. These findings support those of (Mehndi *et al*., 2007) [2] and (Piri *et al*., 2007) [3].

Economics

B:C ratio

When compared to varieties, NRCHB-101 had the highest B: C ratio of 3.84 in sulphur levels of 30 kg/ha, and its Net and Gross income was Rs. 118599/ha and Rs. 87689/ha, respectively. These findings support those of (Rajesh kumar *et al*., 2010) [7], (Ram Pyare *et al*., 2008) [4].

Table 1: Yield attributes, yield, oil and economics of mustard as influenced by varieties and sulphur levels.

Treatments	Plant height (cm)	No. of branches Plant^{-1}	Number of siliquae plant^{-1}	Seeds siliqua $^{-1}$	1000 seed weight (g)
Varieties (V)					
V1: Varuna	192.07	17.32	178.26	11.12	3.88
V2: NRCHB-101	198.40	19.05	202.85	12.66	4.23
V3: RVM-2	191.90	18.54	193.59	12.25	4.16
S.E m.±	1.70	0.22	3.34	0.13	0.05
C.D. (5%)	NS	0.85	13.11	0.52	0.18
Sulphur Levels (S)					
S0: Control	185.46	16.77	172.26	11.26	3.86
S1: 15 kg S ha^{-1}	192.93	18.08	191.63	12.04	4.06
S2: 30 kg S ha^{-1}	196.71	19.10	199.33	12.30	4.17
S3: 45 kg S ha^{-1}	201.38	19.26	203.05	12.43	4.27
S.Em.±	2.04	0.21	1.96	0.19	0.05
C.D. (5%)	6.06	0.62	5.83	0.56	0.16
Interaction (V x S)	NS	NS	NS	NS	NS

Table 2: Yield attributes, yield, oil and economics of mustard as influenced by varieties and sulphur levels.

Treatments	Seed Yield (kg ha^{-1})	Harvest index (%)	Oil content (%)	Net Return (Rs. ha$^{-1)}$	B:C ratio
Varieties (V)					
V1: Varuna	1675.8	29.15	38.18	72476	3.36
V2: NRCHB-101	1936.9	30.35	39.52	87689	3.84
V3: RVM-2	1831.5	30.13	39.21	81449	3.64
S.E m.±	21.7	0.19	0.23	-	-
C.D. (5%)	85.2	0.76	0.90	-	-
Sulphur levels (S)					
S0: Control	1636.5	29.22	37.86	70464	3.33
S1: 15 kg S ha^{-1}	1812.4	29.54	38.73	80353	3.59
S2: 30 kg S ha^{-1}	1901.6	30.16	39.62	84719	3.66
S3: 45 kg S ha^{-1}	1908.3	30.58	39.67	84136	3.58
S.E m.±	17.2	0.22	0.20	-	-
C.D. (5%)	51.2	0.65	0.61	-	-
Interaction (V x S)	NS	NS	NS	-	-

Table 3: Physiological parameters of mustard as influenced by varieties and sulphur levels

Treatments	CGR (mg g^{-1} day^{-1})				RGR (mg g^{-1}day^{-1})				AGR(m g g^{-1} day^{-1})			
	0-30 DAS	30-60 DAS	60-90 DAS	90-At maturity	30 DAS	60 DAS	90 DAS	At maturity	0-30 DAS	30-60 DAS	60-90 DAS	90-At maturity
Varieties (V)												
V1: Varuna	2.33	8.25	7.27	1.97	14.86	21.93	7.54	1.44	0.093	0.330	0.491	0.079
V2: NRCHB-101	2.37	9.03	8.83	1.74	15.07	22.78	8.30	1.15	0.095	0.361	0.553	0.070
V3: RVM-2	2.32	8.70	8.24	1.99	14.76	22.61	8.07	1.35	0.093	0.348	0.530	0.080
S.E m.±	0.06	0.13	0.40	0.22	0.40	0.42	0.34	0.16	0.002	0.005	0.036	0.009
C.D. (5%)	NS	0.50	NS	NS	NS	NS	NS	NS	NS	020	NS	NS
Sulphur levels (S)												
S0: Control	2.14	8.25	6.97	1.66	13.53	23.00	7.41	1.27	0.086	0.330	0.479	0.066
S1: 15 kg S ha^{-1}	2.38	8.61	8.22	1.86	15.19	22.14	8.08	1.28	0.095	0.344	0.529	0.074
S2: 30 kg S ha^{-1}	2.39	9.12	8.68	1.91	15.21	22.77	8.13	1.26	0.096	0.365	0.547	0.076
S3: 45 kg S ha^{-1}	2.46	8.67	8.59	2.17	15.66	21.85	8.26	1.45	0.098	0.347	0.544	0.087
S.Em.±	0.07	0.18	0.28	0.23	0.45	0.55	0.25	0.15	0.003	0.007	0.031	0.009
C.D. (5%)	0.20	0.54	0.83	NS	1.35	NS	NS	NS	0.008	022	0.093	NS
Interaction (V x S)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Conclusion

Based on the data analysis, it is possible to infer that NRCHB-101 is a superior mustard variety for increasing productivity and profitability and that the crop should be produced with 30 kg S ha-1 in the agro-climatic conditions of Madhya Pradesh's Gwalior area.

References

1. Jat RS, Singh VV, Sharma P, Rai PK. Oilseed brassica in India; Demand, supply, policy perspective and future potential. 2019;26:8. doi:10.1051/ocl/2019005
2. Mehdi SS, Singh OP. Effect of various levels of sulfur fertilization on growth and yield of Indian mustard (*Brassica juncea* L.) under subtropical conditions. Environment and Ecology. 2007;25(2):241-243.
3. Piri Issa, Sharma S. Physiological analysis of growth and yield of Indian mustard as affected by irrigation and sulphur. Indian Journal of Plant Physiology. 2006;11(3):253-260.
4. Pyare Ram, Prasad Kedar, Dixit Vivek, Khan Naushad, Sonker TC. Effect of row spacings and sulphur on growth, yield attributes, yield and economics of mustard (*Brassica juncea* L.) Czern & Coss. Plant Archives. 2008;8(2):633-635.
5. Rana Kiran, Singh Jitendra Pratap, Parihar Manoj. Manifestation of improved cultivars, irrigation and sulphur in mustard growth, productivity, quality and profitability: A review. Journal of Pharmacognosy and Phytochemistry. 2019;8(3):2778-2782.
6. Sarangthem Indira, Singh LS, Singh NG, Sarkar AK. Response of rapeseed on nitrogen and sulphur Journal of the Indian Society of Soil Science. 2008;56:222-224.
7. Singh Kumar Rajesh, Singh Y, Singh AK, Kumar Rakesh, Singh VK, Kumar Anjani, *et al*. Response of Fertility Level on Growth, Yield and Economics of Indian Mustard (*Brassica juncea* L.) Czern and Coss. Varieties Under Late Sown Condition, International Journal of Tropical Agriculture. 2010;(3):379-383.
8. Rakesh S, Chandra Ganesh B. Effect of sulphur levels on growth, yield and quality of mustard in Terai regions of West Bengal Annals of Plant and Soil Research. 2016;18(2):152-155.
9. Singh Satybhan, Thenua OVS, Singh Virendra. Effects of Irrigation schedules and Nutrient levels of Mustard (*Brassica juncea* L.) International journal of recent advances in multidisciplinary Research. 2017, 3056-3059.
10. Ray K, Sengupta K, Pal AK, Banerjee H. Effects of sulphur fertilization on yield, S uptake and quality of Indian mustard under varied irrigation regimes. Plant science Environment. 2015;61(1):6-10.