



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; 9(6): 1162-1164
Received: 19-03-2026
Accepted: 23-04-2026

Debesh Singh
Department of Agricultural
Chemistry & Soil Science, R.B.S.
College, Bichpuri, Dr. Bhim Rao
Ambedkar University, Agra, Uttar
Pradesh, India

Yogesh Singh
Department of Agricultural
Chemistry & Soil Science, R.B.S.
College, Bichpuri, Dr. Bhim Rao
Ambedkar University, Agra, Uttar
Pradesh, India

Corresponding Author:
Debesh Singh
Department of Agricultural
Chemistry & Soil Science, R.B.S.
College, Bichpuri, Dr. Bhim Rao
Ambedkar University, Agra, Uttar
Pradesh, India

Nitrogen and sulphur uptake by mustard as affected by foliar application of thio urea in different nutrient levels under various irrigation schedules

Debesh Singh and Yogesh Singh

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i6o.5841>

Abstract

Field experiments was conducted at R.B.S. College, Bichpuri, Dr. Bhim Rao Ambedkar University, Agra during two rabi season of 2021-22 and 2022-23 in split plot design with twelve treatment and three replication in which three irrigation schedules in the main plots and four nutrient levels in sub-plots. The findings revealed that the irrigated treatments show significantly higher seed and stover yield and nitrogen and sulphur uptake as compared to no irrigation treatment. Application of nutrients at higher levels (100%) significantly increased the uptake of by seed and stover over lower levels (50%). The crop sown with two irrigations at 35 and 60 DAS and 100% NPKS produced significantly maximum total N uptake (94.51 kg ha⁻¹) and S uptake (31.12 kg ha⁻¹) over rest of the other treatment combinations except treatment combination of two irrigations at 35 and 60 DAS and 75% NPKS + 1% foliar spray of thio urea at flowering stage.

Keywords: Irrigation schedules, nutrient levels, nitrogen and sulphur uptake, thio urea.

Introduction

Indian mustard [*Brassica juncea* (L.) Czern & Coss.] is an important *rabi* oilseed crop with 2nd ranking in area and 3rd in productivity, contributing 27.8% to its oilseed as industry despite an average yield of 12.58 q ha⁻¹, below the global 19.96 q ha⁻¹. (Indian Ecological Society, 2023) [3]. Mustard crop needs approx 200 to 400 mm of water through irrigation as well as rainfall. At critical periods, the crop is extremely vulnerable to the water stress. The most critical stages of irrigation in mustard farm are the as pre-flowering stage and also at siliquae formation stage which needs about 15% soil moisture by volume in the root zone. Irrigation at maximum branching and pod development stages has given yield gains of 24 - 60%. Among these two, another i.e. pod development stage was found most critical and irrigation at this stage gives higher yields (Chouhan *et al*; 2002) [1]. After irrigation, fertilizers are the second most important input for crop growth and development. There are many reports that fertilizers enhances water productivity (Pandey *et al.*, 2001) [9] but the efficacy of fertilizers depends on the availability of soil moisture. Nutrient management is crucial for optimizing growth and yield, with the nitrogen significantly enhancing plant height and the dry matter accumulation. Potassium aids in photosynthesis and stress resistance, phosphorus supports metabolic functions and flowering, while sulphur boosts the amino acid and chlorophyll synthesis. Mustard belonged to Cruciferae family which containing high amounts of glucosinolates and have a high sulfur demand due to very rich in oil content. Thiourea, a sulphahydral compound, is known to improve oilseeds productivity and its role as a drought ameliorant is well established under the sub-tropical regions. Its application in rapeseed-mustard affects oil, protein and glucosinolate concentration (Ghosh *et al.*, 2000) [2]. Keeping in view the present study was carried out.

Materials and Methods

The field experiment was conducted at the Instructional Farm, *Raja Balwant Singh College*, Bichpuri, Agra, India (27° 17' 46" N, 77° 00' 33"E) during two rabi season of 2021-2022 and 2022-23. The soil texture of experimental field was sandy clay loam that having low status of organic carbon and available – N and sulphur but medium in available phosphoru and potassium.

The experiment was laid out in split plot design consisting of twelve treatments in which three irrigation schedules as main plot and four nutrient management as sub plot treatment which replicated in three times. Mustard (Var. RH-725) was sown in the 40 cm row spacing in last week of October and harvested on second week of March. Recommended doses of fertilizers were 80 kg N, 40 kg P₂O₅, 20 kg K₂O and 30 kg S per ha. Full dose of Phosphorus, potassium & sulphur and half dose of nitrogen were applied at basal dose. Remaining half dose of nitrogen was top dressed after 1st irrigation. Nitrogen and sulphur content in mustard seed and stover were determined as per standard methods and nutrient uptake was calculated as per conversion factor

$$\text{Nutrient uptake (kg/ha)} = \frac{\text{Nutrient Content (\%)} \times \text{Yield (kg/ha)}}{100}$$

Results and Discussion

Effect of irrigation scheduling and nutrient management on seed and stover yield

It is clear from Table 1 that under each irrigation schedule, application of 100% NPKS resulted higher seed yield over 50% NPKS + 1% foliar spray of thio urea and control treatments but was statistically at par with 75% NPKS + 1% foliar spray of thio urea at flowering stage. Similarly in each nutrient management

practice, two irrigations at 35 and 60 DAS produced higher seed yield as compared to other irrigation schedule. This is attributed to improved nutritional environment in the rhizosphere as well as in the plant system leading to higher nutrients translocation in plant parts along with irrigation water so that availability of moisture in rhizosphere which solubilized the nutrients and ultimately the plants exploited more nutrients from soil through their root proliferation and finally the yield parameters. (Lakpale *et al.* 2007)^[6].

The crop sown with two irrigations at 35 and 60 DAS and 100% NPKS produced significantly maximum seed (2191.7 kg ha⁻¹) and stover (5136.7 kg ha⁻¹) yield over rest of the other treatment combinations except treatment combination of two irrigations at 35 and 60 DAS and 75% NPKS + 1% foliar spray of thio urea at flowering stage. The higher yield with 100% NPKS or 75% NPKS + thio urea with two irrigations. Increase in yield parameters due to increasing of NPKS may be due to adequate nutrients which are turns help in vigorous vegetative growth of plants and subsequently increase the plant height through cell elongation cell division photosynthesis and turbidity of plant cell. Similar results have also been recorded by Tripathi *et al.*, (2011)^[11]. Increase in seed and stover yield with an increase in the rate of NPKS application has also been reported by Paliwal and Singh (2014)^[8] and Meena *et al.* (2024)^[7].

Table 1: Effect of irrigation scheduling and nutrient management on seed and stover yield of mustard

Nutrient management	Irrigation scheduling (I)			
	I ₀ : No irrigation	I ₁ : One irrigation at 35 DAS	I ₂ : Two irrigations at 35 & 60 DAS	F- Mean
	Seed yield (kg ha ⁻¹)			
F ₁ : Control	927.2	1326.7	1476.7	1243.5
F ₂ : 50% NPKS + Thio urea (1%)	1160.8	1646.7	1831.7	1546.4
F ₃ : 75% NPKS + Thio urea (1%)	1214.2	1752.5	2110.0	1692.2
F ₄ : 100% NPKS	1246.7	1801.7	2191.7	1746.7
I - Mean	1137.2	1631.9	1902.5	
	F within I (F x I)		I within F (I x F)	
C. D. (5%)	95.75		111.51	
	Stover yield (kg ha ⁻¹)			
F ₁ : Control	3239.5	3887.5	3959.7	3695.6
F ₂ : 50% NPKS + Thio urea (1%)	3766.7	4543.7	4488.4	4266.3
F ₃ : 75% NPKS + Thio urea (1%)	3839.2	4876.0	4983.3	4566.2
F ₄ : 100% NPKS	4083.3	4745.8	5136.7	4655.3
I - Mean	3732.2	4513.3	4642.0	
	F within I (F x I)		I within F (I x F)	
C. D. (5%)	194.25		228.10	

Effect of irrigation scheduling and nutrient management on total nitrogen and sulphur uptake

Nitrogen and sulphur uptake by mustard seed and stover were significantly higher with irrigation (Table-2). Crop sown with two irrigations resulted in significantly higher uptake over one irrigation and no irrigation treatments. under each irrigation schedule, application of 100% NPKS resulted higher total N and S uptake over 50% NPKS + 1% foliar spray of thio urea and control treatments but was statistically at par with 75% NPKS + 1% foliar spray of thio urea in one or two irrigation treatments. Nutrient uptake was computed by multiplying yield with nutrient content thus it is evident that both the parameters affect the uptake values which have been reflected in Irrigated plots (I₁ & I₂) as there was higher nutrients uptake as compared to no irrigation plots. The higher nutrient uptake with increasing levels of irrigation may be attributed to better water and nutrient availability, which gave rise to better plant growth and yield and congenial atmosphere for nutrients uptake. Similar findings have been reported in mustard by Yadav *et al.* (2010)^[12] and Kumar *et*

al. (2005)^[5].

Application of nutrients at higher levels (100%) significantly increased the uptake of by seed and stover over lower levels (50%). Enhanced uptake of nutrient with its application was also been reported by Katiyar *et al.* (2011)^[4]. The crop sown with two irrigations at 35 and 60 DAS and 100% NPKS produced significantly maximum total N uptake (94.51 kg ha⁻¹) and S uptake (31.12 kg ha⁻¹) over rest of the other treatment combinations except treatment combination of two irrigations at 35 and 60 DAS and 75% NPKS + 1% foliar spray of thio urea at flowering stage. It is because uptake was positively correlated with seed yield. This may be attributed to proportionate increase in dry matter production and increase in total seed and stover yield with the respective treatments. The favourable effect of thio-urea on growth of plants might be due to improved photosynthetic efficiency. Application of thio- urea also creates lighter microbial population in soil which is responsible for mobilizing essential nutrients. Similar reports were found by Singh and Pal (2011)^[10].

Table 2: Effect of irrigation scheduling and nutrient management on total nitrogen and sulphur uptake (kg ha⁻¹) by mustard

Nutrient management	Irrigation scheduling (I)			
	I ₀ : No irrigation	I ₁ : One irrigation at 35 DAS	I ₂ : Two irrigations at 35 & 60 DAS	F- Mean
	N - Uptake			
F ₁ : Control	42.60	57.41	62.88	54.30
F ₂ : 50% NPKS + Thio urea (1%)	53.12	73.45	78.30	68.29
F ₃ : 75% NPKS + Thio urea (1%)	55.41	79.17	90.74	75.10
F ₄ : 100% NPKS	58.11	80.25	94.51	77.63
I - Mean	52.31	72.57	81.61	
	F within I (F x I)			I within F (I x F)
C. D. (5%)	3.51			4.03
	S - Uptake			
F ₁ : Control	13.16	18.27	20.31	17.24
F ₂ : 50% NPKS + Thio urea (1%)	16.56	23.64	25.41	21.87
F ₃ : 75% NPKS + Thio urea (1%)	17.32	25.47	29.94	24.24
F ₄ : 100% NPKS	18.11	25.85	31.12	25.03
I - Mean	16.29	23.30	26.70	
	F within I (F x I)			I within F (I x F)
C. D. (5%)	1.29			1.48

Conclusion

From the results obtained under present study indicate that irrigated treatments show significantly higher seed and stover yield and nitrogen and sulphur uptake as compared to no irrigation treatment. Application of 100% NPKS alone or 75% NPKS with foliar spray of thio urea recorded significantly higher seed and stover yield and nitrogen and sulphur uptake as compared to control and lower NPK levels. Thus the crop sown with two irrigations at 35 and 60 DAS with either 100% NPKS or 75% NPKS + 1% foliar spray of thio urea at flowering stage noticed higher N and S uptake by mustard which produced qualitative seed yield in alluvial soil of agra district of uttar pradesh.

References

1. Chauhan DR, Manget R, Singh I. Response of Indian mustard to irrigation and fertilization with various sources and levels of sulphur. *Indian Journal of Agronomy*. 2002;47(3):422-426.
2. Ghosh PK, Hati KM, Mandal KG, Misra AK, Chaudhary RS, Bandyopadhyay KK. Sulfur nutrition in oilseeds and oilseed-based cropping systems. *Fertilizer News*. 2000;45(8):51-52.
3. Indian Ecological Society. Mustard production statistics in India 2023. Indian Ecological Society; 2023. <https://www.ecologicalsociety.in>
4. Katiyar NK, Rarawat S, Pathak RK, Kumar A. Effect of Azotobacter and nitrogen levels on yield and quality of wheat. *Annals of Plant and Soil Research*. 2011;13(2):152-155.
5. Kumar A, Thakur KS, Sharma S. Integrated nutrient management in maize (*Zea mays*)-Gobhi sarson (*Brassica napus*) cropping system under rainfed conditions. *Indian Journal of Agronomy*. 2005;50(4):274-277.
6. Lakpale R, Shrivastava GK, Tripathi RS. Effect of irrigation schedule on growth, yield and economics of spice crops. *Indian Journal of Agricultural Sciences*. 2007;77(3):170-173.
7. Meena S, Shivran AC, Dhaker DL, Rayapati K, Meena BR. Effect of irrigation scheduling and thiourea on productivity of Indian mustard [*Brassica juncea* (L.) Czern. & Coss.]. *Journal of Oilseeds Research*. 2024;41(3-4):161-167.
8. Paliwal A, Singh JP. Response of mustard (*Brassica juncea* L. Czern. & Coss.) to potassium with other nutrients on yield and quality. *The Bioscan*. 2014;9(2):649-652.
9. Panday PK, Sounda S, Tripathi SK. Effect of irrigation and sulphur on yield, nutrient uptake and quality of mustard. *Journal of Oilseeds Research*. 2001;17(1):122-126.
10. Singh SP, Pal MS. Effect of integrated nutrient management on productivity, quality, nutrient uptake and economics of mustard (*Brassica juncea*). *Indian Journal of Agronomy*. 2011;56(4):381-387.
11. Tripathi MK, Chaturvedi S, Shukla DK, Saini SK. Influence of integrated nutrient management on growth, yield and quality of Indian mustard (*Brassica juncea* L.) in tarai region of northern India. *Journal of Crop and Weed*. 2011;7(2):104-107.
12. Yadav RP, Tripathi ML, Trivedi SK. Yield and quality of Indian mustard (*Brassica juncea*) as influenced by irrigation and nutrient levels. *Indian Journal of Agronomy*. 2010;55(1):56-59.