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Study the effect of nitrogen and sulphur levels on yield attributes, yield and quality of Indian mustard [*Brassica juncea* (L.) Czern & Coss.]

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Abstract
A field experiment were conducted to "Study the effect of nitrogen and sulphur levels on yield attributes, yield and quality of Indian mustard [*Brassica juncea* (L.) Czern & Coss.]. during 2006-07 and 2007-08 at instructional farm of N.D. University of Agriculture & Technology, Kumarganj, Faizabad. The experiment comprised of four nitrogen levels (0, 40, 80 and 120 kg ha^{-1}) and four sulphur levels (0, 20, 40 and 60 kg ha^{-1}) tested in Randomized Block Design. Application of nitrogen increased all the yield attributes significantly viz; number of siliquae $plant^{-1}$, length of siliqua (cm), number of seeds $siliqua^{-1}$ and test weight up to 120 kg N ha^{-1}. All the above yield attributes gave maximum response at 60 kg S ha^{-1}. The highest protein content of 21.61% and 21.52 were obtained with 120 kg N ha^{-1} during 2006-07 and 2006-07. Maximum protein content was 20.94% and 20.89% were at 60 kg sulphur ha^{-1} during respective years. The maximum seed yield (19.20 & 18.39q ha^{-1}) and stover yield (59.49& 57.21 q ha^{-1}) were recorded at 120 kg N, which was at par with 80 kg N ha^{-1} in respective years. In case of sulphur application the maximum seed yield (18.89& 18.08 q ha^{-1}) and stover yield (58.38& 55.16 q ha^{-1}) were recorded at 60 kg S ha^{-1} in respective years which was at par with 40 kg S ha^{-1}. The protein yield (415.16 & 395.88kg ha^{-1}.) and oil yield (7.3 & 7.06 q ha^{-1}) was obtained maximum at 120 kg N ha^{-1} in respective years, which was at par with 80 kg N ha^{-1} significantly superior over the control and 80 kgNha^{-1}. The application of 60 kg sulphur gave the maximum protein yield (396.56 & 380.08 kg ha^{-1}) and oil yield (7.66 &7.36 kg ha^{-1}) in respective years, which was at par with 40 kg S ha^{-1}.

Keywords: Nitrogen, sulphur levels, Indian mustard

Introduction
Indian mustard is an important winter season oil seed crop but its productivity in the eastern Uttar Pradesh is very low. One of the important factors responsible for its low yield is inadequate use of plant nutrient particularly nitrogen and sulphur. The importance of nitrogen fertilization to achieve the higher production potential in mustard is well recognized it is the basic constituent of plant life. It tends to encourage vegetative growth and governs a considerable degree the utilization of other nutrients. Sulphur is involved in various metabolic process on the plants. It is indispensable for synthesis of essential amino acids like–cysteine, cystine and methonine; the SH-Sulphydry linkages provide the source of pungency in oils; It involves in the formation of glycosides or glucosinolates, which on hydrolysis increase the oil content of mustard; and improve the quantity and quality of oilseeds. It is also constituent of glutathione, a compound supposed to be associated with plant respiration and in the synthesis of essential oils, flavored compound in crucifers and improved marketing quality of many crops. It play a vital role in chlorophyll formation. Keeping the above view a study was undertaken to "Study the effect of nitrogen and sulphur levels on yield attributes, yield and quality of Indian mustard [*Brassica juncea* (L.) Czern & Coss.].''

Materials and methods
A field experiment were carried out to "Study the effect of nitrogen and sulphur levels on yield attributes, yield and quality of Indian mustard [*Brassica juncea* (L.) Czern & Coss.]." during rabi season at instructional farm of N.D. University of Agriculture & Technology, Kumarganj, Faizabad. The soil of experimental field was silty loam in texture, and having pH (1:2.5)8.69, EC 0.35 dS/m, organic carbon 0.33%, available nitrogen 197.25 kg/ha, available phosphorus 10.30 kg/ha., available potash 162.20 kg/ha and available sulphur 8.10 kg/ha The experiment comprised of four nitrogen levels (0, 40, 80 and 120 kg ha^{-1}) and four sulphur levels (0, 20, 40

and 60 kg ha^{-1}) tested in Randomized Block Design with three replications. Nitrogen and sulphur was supplied through urea and gypsum respectively. As per treatment half dose of nitrogen and full dose sulphur was applied as basal dressing. The remaining half dose of nitrogen was applied after first irrigation. Full dose of P and K was applied at the time of sowing. The crop was sown in row 45 cm apart. The yield attributes and yield were recorded at maturity. Protein content was estimated on the basis of nitrogen content in mustard grain and oil percent was estimated by Soxhlet (1879) [15] method.

Results and discussion

Yield attributes

Application of nitrogen increased all the yield attributes significantly upto 120 kgha^{-1}. Yield attributes value were maximum at 120 kg ha^{-1} *viz*., number of siliquae plant^{-1}(319.5& 317.5), length of siliqua (6.17 & 6.12 cm), number of seeds siliqua^{-1} (12.74 &12.71) and 1000-seed weight (5.24 &5.21) in respective years and at par with 80 kg N ha^{-1} in both the years. This might be due to the fact that plant receiving more nitrogen increased the leaf area vis-à-vis photosynthesis and allowed higher lateral differentiation producing greater number of flowers which in turn developed more seeds siliqua^{-1}. Under higher levels of nitrogen the translocation of photosynthates from sources to sink is increased which resulted increase in number and size of seed siliqua^{-1}. Similar findings was also reported by Bhari *et al.* (2000) [1], Kumar *et al.* (2001) [6, 10], Kumar *et al.* (2002) [7], Kumar and Yadav. (2007) [8] and Tomar and Singh (2007) [16] Application of sulphur increased all the attributes significantly and recorded maximum value at 60 kg S ha^{-1} *viz*., number of silique plant^{-1}(319 & 317.75), length of siliqua (6.11 & 6.04cm), number of seeds siliqua^{-1} (13.31 & 13.25) and test weight (5.25 & 5.22) in both the years and at par with 40 kg S ha^{-1} in both the years. This might be due to fact that sulphur may be greatly influenced the compatibility of the pollen grain. The maximum numbers of seeds per siliqua were observed at 60 kg S ha^{-1}, while minimum in control during the two cropping season. Sulphur increased the supply of photosynthates to flowering initiation which might have increased the number of seeds per siliqua. These results obtained are in close conformity with the finding of Chauhan *et al.* (2002) [3], Kumar and Yadav (2007) [8] and Dongarker *et al.* (2005) [4]

Yield

The maximum grain yield of 19.20 & 18.39 q/ha^{-1} were recorded at 120 kg N ha.$^{-1}$ in two consecutive years, which were at par (18.89 &18.08 q ha^{-1})with 80 kg N ha.$^{-1}$ in both the years. Heighest mustard gain yield (18.89 & 18.08 q ha^{-1}) were obtained significantly at 60 kg S ha.$^{-1}$, which were at par (18.26 & 17.48 q ha^{-1}) with 40 kg S ha.$^{-1}$ in both the years. Minimum seed yield was recorded in control treatments of nitrogen (13.85q ha^{-1} & 13.05 q ha^{-1}) and sulphur (14.58 q ha^{-1} &13.78q ha^{-1}) in both the years respectively. The increase in seed yield was associated with increase all the yield contributing characters *viz*., siliqua plant^{-1}, length of siliqua, seeds siliqua^{-1} and test weight. Adequate supply of nitrogen facilitated better growth and development of crop plant, enhanced nutrient uptake which resulted significant increase in yield attributes. Similar results have also been reported by Sharma (2008) [13], Kumar *et al.* (2006) [9]. The stover yield was also influenced by nitrogen and sulphur levels and has been presented in Table-1. Increasing levels of nitrogen increased stover yield significantly up to 120 kg N ha^{-1} and were recorded (59.49 & 57.21 q ha^{-1}), which was significant over the control (44.72 & 39.94 q ha^{-1}) and 40 kg N ha^{-1} (50.62 & 48.48 q ha^{-1}) and at par with the 80 kg N ha^{-1} (58.78 & 55.91 q ha^{-1}) in respective years. Stover yield increased with increasing levels of sulphur. The maximum stover yield (58.38 q ha^{-1}) and (55.16 q ha^{-1}) was obtained significant at 60 kg S ha^{-1} during 2006-07 and 2007-08 respectively. The minimum stover yield was recorded under control treatment (45.64 and 44.08 q ha^{-1}). This might be due to the fact that nitrogen application increased all the growth contributing characters *viz*., plant height, branches plant^{-1}, and leaf area which enhanced the stover production. The beneficial effect of nitrogen fertilization on stover yield of mustard has also been reported by Kumar *et al.* (2001) [6, 10]

Quality

The highest protein content (21.61% & 21.52%) was obtained with 120 kg N ha^{-1}, which were at par (21.16 & 21.03%) with 80 kg N ha^{-1} in respective years. The increasing protein content was mainly due to the increase in nitrogen uptake by the crop. It may be stated that higher availability of nitrogen in plant, the synthesized carbohydrate may be converted more rapidly into protein than fat which in turn enhanced the protein content in seed. Similar results also recorded by Dubey and Khan (1993) [5], Meena and Sumeriya (2003) [11]. Sulphur level @ 60 kg ha^{-1} recorded highest protein content (20.94% & 20.89%)in both the years. It may be noted that sulphur is an integral part of mustard oil and therefore, it played a significant role in the synthesis of oil. Sulphur supply seems to be involved in an increased conversion of primary fatty acid metabolites to end product of fatty acid. Similar results were also reported by Sharma (2008) [13], Singh and Meena (2003) [11] and Chandel *et al.* (2002) [2]. The oil content in mustard seed decreased with increasing levels of nitrogen application upto 120 kg N ha^{-1} (38.35 & 38.33%) in both the years. These findings are supported by Premi and Kumar (2004) [12]. But the oil yield increased significantly with increasing levels of nitrogen from 0 to 80 kg ha^{-1} respective years. The increase in oil yield is due to increase in seed yield with increasing levels of nitrogen. Increasing in oil yield with increasing dose of nitrogen was also reported by Kumar *et al.* (2006) [9], Tomar and Singh (2007) [16] and Chandel *et al.* (2002) [2]. Maximum oil yield (7.66 & 7.36 q ha^{-1}) was recorded with 60 kg S ha^{-1} which was significantly higher than rest of the sulphur levels. Increase in oil content due to application of sulphur has also been reported by Chandel *et al.* (2002) [2] and Tomar and Singh (2007) [16].

Table 1: Yield attributing characters and yield of mustard as influenced by nitrogen and sulphur levels

Treatments	Number of siliqua per plant		Length of siliqua (cm)		Number of seeds per siliqua		Test weight (g)		Seed yield (q/ha)		Stoevr yield (q/ha)	
	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
Levels of nitrogen												
N_0	194.50	191.75	5.15	5.09	10.63	10.55	4.26	4.22	13.85	13.05	44.72	39.94
N_{40}	262.25	260.00	5.50	5.46	11.65	11.59	4.56	4.56	16.85	15.65	50.62	48.48

N_{80}	310.25	307.75	5.94	5.87	12.46	12.43	5.08	5.06	18.63	17.84	58.75	55.91
N_{120}	319.5	317.50	6.17	6.12	12.74	12.71	5.24	5.21	19.20	18.39	59.49	57.21
SEm±	5.31	5.04	0.12	0.11	0.25	0.24	0.10	0.08	0.25	0.25	1.21	1.06
CD (P=0.05)	15.32	15.30	0.33	0.30	0.73	0.70	0.29	0.23	0.72	0.73	3.50	3.05
Levels of sulphur												
S_0	217.75	215.25	5.04	5.01	10.18	10.11	4.30	4.29	14.58	13.78	45.64	44.08
S_{20}	244.75	241.50	5.58	5.54	11.03	10.98	4.58	4.55	16.40	15.60	52.06	48.45
S_{40}	305.00	302.50	6.04	5.96	12.96	12.93	5.00	5.00	18.26	17.48	57.50	53.85
S_{60}	319.00	317.75	6.11	6.04	13.31	13.25	5.25	5.22	18.89	18.08	58.38	55.16
SEm±	5.31	5.04	0.12	0.11	0.25	0.24	0.10	0.08	0.25	0.25	1.21	1.06
CD (P=0.05)	15.32	15.30	0.33	0.30	0.73	0.70	0.29	0.23	0.72	0.73	3.50	3.05

Table 2: Effect of nitrogen and sulphur levels on protein and oil content and yield of protein and oil

Treatments	Protein content in seed (%)		Protein yield (kg/ha)		Oil content in seed (%)		Oil yield (q/ha)	
	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
Levels of nitrogen								
N_0	19.60	19.55	271.76	257.01	40.14	40.10	5.58	5.39
N_{40}	20.58	20.50	338.76	321.16	39.71	39.68	6.55	6.23
N_{80}	21.16	21.03	394.32	375.39	38.93	38.90	7.26	6.95
N_{120}	21.61	21.52	415.16	395.88	38.35	38.33	7.38	7.06
SEm±	0.40	0.42	7.86	6.83	0.58	0.62	0.14	0.12
CD (P=0.05)	1.16	1.21	22.69	20.50	NS	NS	0.40	0.34
Levels of sulphur								
S_0	20.50	20.38	301.00	282.75	38.03	37.98	5.52	5.21
S_{20}	20.69	20.60	340.87	322.81	38.81	38.79	6.35	6.04
S_{40}	20.82	20.74	381.57	363.80	39.70	39.66	7.24	6.92
S_{60}	20.94	20.89	396.56	380.08	40.59	40.58	7.66	7.36
SEm±	0.40	0.42	7.86	6.83	0.58	0.62	0.14	0.12
CD (P=0.05)	NS	NS	22.69	20.50	1.67	1.78	0.40	0.34

Reference

1. Bhari NR, Singh RK, Mann PS. Response of Indian mustard (*Brassica juncea* L.) to nitrogen and phosphorus on jonipramments of North Western Rajasthan. Indian J Agron. 2000; 45(4):741-757.
2. Chandel RS, Sudhakar PC, Singh Kalyan. Direct and residual effect of sulphur on Indian mustard (*Brassica junceai* L.) in rice (*Oryza sativa*) Indian mustard cropping system. Indian J Agril. Sci. 2002; 72(4):230-232.
3. Chauhan DR, Ram M, Singh I. Response of Indian mustard (*B. juncea* L.) to irrigation and fertilization with various sources of sulphur. Indian J Agron. 2002; 47(3):422-426.
4. Dongarkar KP, Pawar WS, Khawal VS, Khutate NG, Gudadhe NN. Effect of nitrogen and sulphur on growth and yield of mustard (*Brassica juncea* L.). J. Soils Crops, 2005; 15(1):163-167.
5. Dubey OP, Khan RA. Effect of nitrogen and sulphur on dry matter production, grain yield and nitrogen content of different growth stages of mustard under irrigated vertisol. Indian J Agron. 1993; 38(2):270-276.
6. Kumar A, Singh DP, Singh B, Pal V. Effect of nitrogen application on pertaining of biomass of Brassica Juncea L., Indian J Agron. 2001; 46(1):162-167.
7. Kumar A, Shivmangal P, Singh SB. Effect of nitrogen levels and varieties on production potential of yellow sarson (*Brassica campestries var.* yellow sarson). Indian J. Agron. 2002; 47(1):105-108.
8. Kumar H, Yadav DS. Effect of phosphorus and sulphur levels on growth, yield and quality of Indian mustard (*Brassica juncea* L.) cultivars. Indian J Agron. 2007; 52(3):154-157.
9. Kumar N, Singh S, Singh V. Effect of iron and sulphur levels on yield, oil content and their uptake of Indian mustard (*Brassica juncea* L.). Indian J Agron. 2006; 5(1):63-64.
10. Kumar S, Singh B, Rajpoot AL. Response of Indian mustard to source and level of sulphur under rainfed condition. Indian J Agron. 2001; 46(3):528-532.
11. Meena BS, Sumeriya HKA. Influence of nitrogen levels irrigation and intercultural on the oil and protein content soil moisture studies and interaction effects of mustard [*Brassica juncea* (L.) *Czern & Coss.*]. Crop Res. Hissar. 2003; 26(3):404-413.
12. Premi OP, Kumar M. Response of Indian mustard to different levels of N and P under irrigation. Indian J Agron. Res. 2004; 38(3):51-53.
13. Sharma YK. Effect of phosphorus and sulphur on yield and uptake of nutrient by mustard. Ann. Pl. Soil Res., 2008; 10(2):195-196.
14. Singh A, Meena NL. Effect of nitrogen and sulphur levels on the oil and protein yield of mustard (*Brassica juncea* L.). Ann. Agril. Res. 2003; 24(2):368-371.
15. Soxlet F. Die gewichts analytiche Bestimmung Des Milchfettes. Dingler's Polytecniches Journal (in German). 1879; 232:461-465.
16. Tomar SK, Singh K. Response of Indian mustard (*Brassica juncea* L.) to nitrogen and sulphur fertilization under rainfed condition of diara land. International J Agril. Sci. 2007; 3(2):5-9.