International Journal of Engineering Research & Management Technology
ISSN: 2348-4039
September-2014 Volume-1, Issue-5
Email: editor@ijermt.org www.ijermt.org

A Study of Nitrogen and Sulphur levels on yield attributes, yield and quality of Indian Mustard [Brassica juncea (L.) Czern & Coss.]

Nirmal Chaudhary
Research Scholar
Department of Botany
Sainath University,Ormanjhi. Ranchi, Jharkhand.

Dr. S.H.A. Kazmi
Associate Prof.
Shia P.G.College, Department of Botany, Lucknow.

ABSTRACT

The data presented in table indicated that the dry matter accumulation per plant increased with advancement of crop age irrespective of the treatments. The rate of increase was higher between 30 and 60 days and between 90 days and harvest stages. Varieties exhibited significant variation in dry matter accumulation per plant. Variety RH 30 recorded the highest dry matter accumulation per plant and it was significantly superior to other varieties at all the stages of crop growth during both the years except at 30 and 90 days stages during 2018-19, where the differences between RH 30 and Vardan were non-significant. Nitrogen application had significant effect on the dry matter accumulation per plant which showed an increasing trend with increasing levels of nitrogen application upto 100 kg ha^{-1}. The increase beyond 50 kg N ha^{-1} was significant at 30 and 60 days and at harvest stages during 2017-18 and only at harvest during 2018-19. Sulphur application also had remarkable effect on dry matter accumulation per plant at all the crop growth stages during both the years. Each successive increment in sulphur application upto 50 kg S ha^{-1} led to significant increase in dry matter accumulation per plant at harvest during both the years. The differences between 0 and 25 kg S ha^{-1} at 60 days stage during both the years and at 90 days stage between 25 and 50 kg S ha^{-1} during 2018-19 at 30 and 90 days stages were non-significant.

Keywords: *Nitrogen, sulphur levels, Indian mustard*

1.1 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.].''

1.2 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.

1.3 RESULTS AND DISCUSSION

Varieties differed significantly in respect of number of siliquae per plant (Table-9). Variety Vardan bore significantly more number of siliquae per plant than Bio 902 and RH 30. Differences between Bio 902 and RH 30 were found to be non-significant though the former had higher number of siliquae per plant. The same trend was observed during both the years.

Nitrogen levels affected the number of siliquae per plant significantly during both the years. Each successive increment in nitrogen application led to significant increase in number of siliquae per plant.

Like nitrogen sulphur levels had also influenced significantly the number of siliquae per plant which tended to increase remarkably with each successive increment in sulphur application upto 50 kg S ha^{-1}.

The length of siliqua varied significantly among the varieties (Table-9). Variety Vardan had the siliquae having significantly highest average length. Bio 902 and RH 30 did not differ significantly in respect of siliqua length though the former exhibited more length.

Nitrogen application had significant effect on length of siliqua which tended to improve with increasing levels of nitrogen. An application of 100 kg

N ha^{-1} resulted in significantly more length of siliqua than no nitrogen application. The crop fertilized with 50 kg N ha^{-1} did not differ significantly from those given 0 or 100 kg N ha^{-1}. The same trend was observed during both the years.

Sulphur levels did not have significant effect on length of siliqua in any of the years, though, the length was noted to increase with increasing doses of sulphur application.

Varieties, in general, exhibited significant variation in number of seeds per siliqua (Table-9) during both the years. Variety Vardan contained significantly highest number of seeds per siliqua. The lowest number of seeds per siliqua was recorded in variety RH 30, though it was at par with Bio 902.

Varying levels of nitrogen led to significant variations in average number of seeds per siliqua. Crop fertilized with 100 kg N ha^{-1}remaining at par with that given 50 kg N ha^{-1}, which in turn, was at par with that grown with no nitrogen application. Differences, however, between 100 kg and 0 kg N ha^{-1} application were significant. The similar trend was observed during both the years.

Sulphur application failed to have marked effect on number of seeds per siliqua, though, it exhibited an increasing trend with increasing dose of sulphur fertilization.

Table-1.1

Yield attributes as influenced by varieties, N and S levels of fertilization during 2017-18 and 2018-19.

Treatment	No. of siliquae per plant	Length of siliqua (cm)	No. of grains per siliqua	No. of siliquae per plant	Length of siliqua (cm)	No. of grains per siliqua
	2017-18			2018-19		
Varieties						
Vardan	233.5	4.08	12.9	216.7	4.05	12.8
Bio 902	182.6	3.76	10.1	173.3	3.71	10.0
RH 30	160.3	3.47	9.6	155.5	3.46	9.6
SEM ±	7.6	0.13	0.4	6.4	0.14	0.4
CD (P = 0.05)	22.6	0.40	1.1	19.3	0.43	1.2
Nitrogen (kg ha^{-1})						
0	160.7	3.50	9.9	146.9	3.49	9.7
50	186.7	3.78	10.7	177.7	3.77	10.8
100	228.6	4.03	11.6	220.9	3.96	11.9
SEM ±	7.6	0.13	0.4	6.4	0.14	0.4
CD (P = 0.05)	22.6	0.40	1.1	19.3	0.43	1.2
Sulphur (kg ha^{-1})						
0	175.8	3.27	10.3	149.7	3.25	10.1
25	186.7	3.95	10.5	190.9	3.93	10.8
50	213.7	4.09	11.8	204.9	4.04	11.5
SEM ±	3.4	0.06	0.2	3.5	0.06	0.27
CD (P = 0.05)	9.8	N.S.	N.S.	10.0	N.S.	N.S.

Seed weight per plant (Table-11) differed significantly among the varieties. Variety Vardan produced significantly higher seed weight per plant than Bio 902 and RH 30. Bio 902 also exhibited superiority over RH 30. The same trend was observed during both the years.

Nitrogen application had significant effect on seed weight per plant which tended to increase markedly with each successive increment of nitrogen during both the years. The percentage increase in seed weight from 0 to 50 and 50 to 100 kg N ha^{-1} was noted to be 46.94 and 17.92 per cent, respectively, during 2017-18. The corresponding increase during 2018-19 were 47.40 and 19.32 per cent, respectively.

Levels of sulphur application resulted in significant variation in seed weight per plant. Increasing levels of sulphur upto 50 kg S ha^{-1} led to remarkable increase in seed weight per plant. The increase being 25.82 and 18.06 per cent, when sulphur dose were raised from 0 to 25 and 25 to 50 kg S ha^{-1} during 2017-18. Corresponding increase during 2018-19 was 31.15 and 6.53 per cent.

The data presented in Table-12 showed that nitrogen and sulphur levels interacted significantly in respect of seed weight per plant, during both the years. The interaction was more obvious during 2018-19, where the significant response to sulphur application beyond 25 kg S ha^{-1} was associated with high levels of nitrogen fertilization (50 kg N ha^{-1}). During 2017-18, the increase in seed weight per plant beyond 25 kg S ha^{-1} was significant at all the levels of nitrogen though the magnitude was more at higher levels. Response to nitrogen application was also better under high levels of sulphur

Varieties registered significant differences in 1000-grain weight (Table-11) only during 2017-18. Variety RH 30 had significantly boldest grains followed by Bio 902 and Vardan. Differences between Bio 902 and Vardan were not significant, though the former had bolder grains.

Nitrogen application affected significantly 1000-grain weight of mustard crop. During 2018-19, the 1000-grain weight tended to increase with each successive increment in nitrogen application upto 100 kg N ha^{-1}. Almost similar trend was observed during 2017-18 except that the increase beyond 50 kg N ha^{-1} did not reach the level of significance.

1000-grain weight was noted to improve significantly with each successive increment in sulphur application upto 50 kg S ha^{-1}. The same trend was observed during both the years.

Table-1.2

Yield attributes as influenced by varieties and N and S levels of fertilization during 2017-18 and 2018-19.

Treatment	2017-18		2018-19	
	Weight of grains (g/plant)	1000-grain weight (g)	Weight of grains (g/plant)	1000 grain weight (g)
Varieties				
Vardan	8.40	3.91	8.29	4.02
Bio 902	6.72	4.01	6.61	4.10
RH 30	5.47	4.41	5.46	4.27
SEM ±	0.21	0.11	0.18	
CD (P = 0.05)	0.62	0.32	0.55	N.S.
Nitrogen (kg ha^{-1})				
0	4.90	3.01	4.81	3.05
50	7.20	4.51	7.09	4.20
100	8.49	4.81	8.46	5.14
SEM ±	0.21	0.11	0.18	0.13
CD (P = 0.05)	0.62	0.32	0.55	0.40
Sulphur (kg ha^{-1})				
0	5.50	3.21	5.49	3.30
25	6.92	4.41	7.20	4.38
50	8.17	4.71	7.67	4.71
SEM ±	0.11	0.06	0.10	0.06
CD (P = 0.05)	0.31	0.17	0.28	0.19

Yield attributes

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

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

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] Ravindra Kumar Rajput, Somendra Nath, YK Sharma et al. (2018).

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.
17. Ravindra Kumar Rajput, Somendra Nath, YK Sharma et al. (2018). Study the effect of nitrogen and sulphur levels on yield attributes, yield and quality of Indian mustard [Brassica juncea (L.) Czern & Coss.], The Pharma Innovation Journal 2018; 7(3): 632-634.