



Effect of Sulphur Fertilization on Yield, Sulphur Uptake and Oil Content in Indian Mustard under Sandy Loam Soil of Eastern Uttar Pradesh

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ABSTRACT

Field experiments were conducted at the farm of Krishi Vigyan Kendra Jaunpur, Uttar Pradesh during rabi season of 2014-15 and 2015-16 in randomized block design with mustard variety NDR-8501 with six treatments. The treatments consisted of commercial grade of sulphur fertilizer viz. sulphur 90% DP @ 25kg/ha at sowing time as basal (S1), Sulphur 80% WP @ 5kg/ha at 45 DAS with urea topdressing/broadcasting (S2), Sulphur 80% WP 1.50kg/ha as foliar sprayed at 75 DAS (S3), sulphur 90% DP @ 25 kg/ha + sulphur 80% WP @ 5 kg/ha applied with urea broadcasting at 45DAS (S4), sulphur basal 90% DP + sulphur 80% WP @ 1.25 kg/ha foliar sprayed at 75 DAS (S5), no use of sulphur (Farmer practice) as (S6). The application of sulphur had significant influence on yield attributes, grain yield, sulphur uptake and oil percent in mustard. The maximum average value of plant height (158.75cm), seed per siliqua 13.45, test weight (4.863 gm), grain yield (21.86 q/ha) and oil content (33.73%) were recorded with dual application basal along with 80% WP @ 1.25kg/ha foliar sprayed at 75%DAS closely followed by application of sulfur basal + 80%WP @ 5kg/ha applied with urea broadcasting at 45DAS and minimum value was recorded under treatment (S6) farmer practices. Therefore, application of sulfur 90% WP @ 25kg/ha +sulfur 80WP @1.25kg/ha foliar sprayed at 75% DAS were recommended for improving yield, yield attributes, oil percent and sulphur uptake of Indian mustard.

Key words: Mustard, Oil content, Sulphur, sulphur uptake and yield.

INTRODUCTION

Mustard (*Brassica juncea* L.) is the second most important edible oil seed crop. Mustard oil is used as cooking oil and also condiments, medicine and industrial purposes. Rapeseed-mustard ranks 2nd in terms of production, after soybean, however due to more oil content (35- 45%) it ranks 1st in terms of oil yield among all oilseeds crops. In Uttar Pradesh, area covered 639 lakh ha with production 726 lakh tonnes and productivity of 1136 kg/ha, which is very low as compared to national productivity of India. The main causes for low production are large acreage under marginal land, which is deficient in major nutrients and imbalanced nutrient management. Sulphur fertilization significantly improves various quality parameters within plant system. Application of S in combination with balanced amounts of other

nutrients significantly increased the oil content of Brassica spp. (5-6%) and also the protein content. Therefore, present investigation was undertaken to study the effect of sulphur fertilization on yield, sulphur uptake and oil content in Indian mustard.

MATERIALS AND METHODS

Field experiment was conducted at farm of Krishi Vigyan Kendra, Jaunpur during two consecutive Rabi seasons of 2014-15 and 2015-16 in randomized block design with six treatments and three replications. The treatments mainly consisted of commercial grade sulphur containing fertilizers available in the marketed as under:

Seeds of Indian mustard cv. NDR-8501 were sown @ 5 kg/ha on 13th October, 2014 and 16th October, 2015 at 40 cm × 20 cm spacing with a

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Table 1. Treatment details.

Symbol	Treatment	Quantity kg/ha	Time of application	Method of application
S1	Sulphur 90% DP	25	Just before sowing	Basal application
S2	Sulphur 80% WP	5	45 DAS	Broad cast with urea
S3	Sulphur 80% WP	1.5	60 DAS	Foliar Application
S4	Sulphur 90% DP + Sulphur 80% WP	25.0+5.00	Just before sowing + 45 DAS	Basal application + Broad cast with urea
S5	Sulphur 90% DP + Sulphur 80% WP	25.00 + 1.50	Just before sowing + 60 DAS	Basal application + Foliar Application
S6	Farmer practice (0 kg sulphur)	--	--	--

pre-sowing irrigation. Other cultural practices including recommended fertilizer levels (100:40:30 kg N:P:K/ha) were kept the same for all treatments during both the years. For plant control measures Metasystox @0.2% was sprayed thrice at 10 days interval during pod development stage to protect the crop from aphids. Weeding was done at 25 to 28 days after sowing before irrigation. Oil content (%) was determined by taking a sample of seeds of each plot of all the replications following the standard method (AOAC, 1960). Grain yield was recorded at harvest for all the treatments. The data were analysed using statistical methods.

RESULTS AND DISCUSSION

Growth characters were influenced significantly due to application of different sulphur containing

fertilizers. On an average maximum plant height (158.75cm) was record with application of 25 kg/ha 90 % DP sulphur as basal supplemented with 1.25 kg/ ha 80% WP sulphur as foliar application at 75 DAS of plant growth followed by (153.95 cm) basal application of 25 kg/ ha 90 % DP sulphur along with broad casting of 5 kg 80 % WP with urea at 45 days of sulphur and both were significantly more as compared to control treatment (Table 2). Application of 25 kg/ ha 90 % DP sulphur as basal supplemented with 1.25 kg/ ha 80% WP sulphur as foliar application at 75 DAS produced maximum primary and secondary branches on an average (4.33 and 11.54) which was at par with S4 and S1 treatments, but significantly higher than treatment S2, S3 and control.

Table 2. Effect of sulphur on growth and yield attributes at harvest.

Treatment	Plant height (cm)		No of primary branches/plant		No of secondary branches/plant		No of siliqua/plant		No of seeds/siliqua	
	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
S1	146.2	146.8	4.10	4.13	10.84	10.90	282.16	284.25	12.94	12.92
S2	147.3	148.1	3.85	3.84	9.62	9.73	264.31	265.81	12.14	12.18
S3	144.5	145.3	3.67	3.69	8.49	8.61	241.52	243.54	11.56	11.57
S4	153.5	154.6	4.21	4.25	11.08	11.06	301.42	305.42	13.25	13.25
S5	158.6	158.9	4.29	4.37	11.57	11.52	308.29	310.58	13.46	13.45
S6	139.2	138.7	3.46	3.43	7.43	7.44	212.57	217.82	10.24	10.30
S.Em. ±	1.95	1.91	0.10	0.09	0.28	0.26	7.43	7.89	0.21	0.20
C.D. (P=0.05)	5.26	5.22	0.26	0.25	0.67	0.65	20.82	21.07	0.57	0.56

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Table 3. Effect of sulphur on yield, oil content and sulphur uptake of mustard.

Treatment	Seed yield (q/ha)		Straw yield (q/ha)		Test weight (g)		Oil content (%)		Sulphur uptake in seed (kg/ha)	
	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
S1	20.52	20.68	44.52	44.90	4.626	4.630	36.83	36.82	15.84	15.80
S2	19.74	20.04	42.89	43.01	4.452	4.455	36.21	36.32	14.52	14.54
S3	18.40	18.45	40.28	40.51	4.421	4.427	35.64	35.59	14.22	14.23
S4	21.36	21.32	47.10	46.88	4.820	4.843	37.49	37.60	16.23	16.30
S5	21.82	21.90	47.62	47.90	4.864	4.862	37.65	37.70	16.42	16.48
S6	17.26	17.51	39.25	39.72	4.210	4.208	33.80	33.67	12.13	12.11
S.Em. ±	0.31	0.29	0.43	0.44	0.006	0.006	0.52	0.54	0.21	0.20
C.D. (P=0.05)	0.89	0.87	1.05	1.09	0.021	0.023	1.07	1.10	0.57	0.58

The highest number of siliqua per plat was recorded 308.29 in 2014-15 and 310.58 in 2015-16 with dual applied sulphur fertilizers compared to single dose of fertilizer. Maximum number of seeds (13.46 and 13.45) per siliqua was recorded with S4 and S5 followed by broad cast of 5 kg sulphur 80 % WP with urea at 45 DAS and there were significantly high as compared to other treatments and control (Table 3). Increase in these parameters could be also ascribed to overall improvement in plant growth and vigour with sulphur fertilization that favoured both the grain formation and grain development which resulted into increase in test weight of mustard seed (Ray *et al*, 2015).

The seed yield had significant effect of sulphur levels at crop harvest. The yield increased progressively and significantly with each successive doses of sulphur application. In treatment S6, seed yield was 17.26 and 17.51 kg/ha as against 21.86, 21.34, 18.37, 19.89 and 20.60q/ha recorded in treatments S5, S4, S3, S2, and S1, respectively. Thus, the difference in yield resulting from S application was significant. Similar results have been reported by Yadav *et al* (2010).

Double fertilization @ 25 kg/ ha 90 % DP sulphur as basal supplemented with 1.25 kg/ ha 80% WP sulphur as foliar application at 75 DAS was increased oil content (33.80% and 33.67%) and sulphur uptake (16.42 kg/ha and 16.46 kg/ha)

in seed than single fertilization of sulphur. Earlier studies also showed that successive increase in S-levels on mustard led to increased S uptake (Sharma *et al*, 2009) as well as oil content (Kumar and Trivedi, 2012).

CONCLUSION

Sulphur 90% DP @ 25 kg/ha + Sulphur 80% WP @ 1.5 kg/ha treatment combination was the best treatment as compared to others.

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