Plant Archives Vol. 14 No. 2, 2014 pp. 855-858 *ISSN 0972-5210*

RESPONSE OF INDIAN MUSTARD (*BRASSICA JUNCEA* L.) AS INFLUENCED BY DIFFERENT DOSES AND SOURCES OF SULPHUR

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Abstract

The study was carried out to determine the response of Indian mustard (*Brassica juncea* L.) as influenced by different doses and sources of sulphur. Results showed that the most of the yield attributes were significantly influenced by different doses of sulphur. These all attributes were estimated in whole experiment from sowing to maturity and to at harvest. The yield and yield contributing characters were increased with the increasing levels of sulphur fertilizer up to 45kg sulphur per hectare. All yield components, such as number of siliqua per plant, seeds per siliqua, 1000-seed weight and seed yield per plant were found maximum from the treatment with 45kg sulphur per hectare. Similarly increase sulphur dose up to 45kg per hectare significantly improved seed and Stover yield of mustard. Sulphur application enhanced seed oil content and oil yield up to 45kg sulphur per hectare. Application of sulphur brought about significant increase in sulphur contents and their uptake by seed, Stover as well as biological yield.

Keywords : Mustard, sulphur, yields parameters**.**

Introduction

Oilseeds constitute the second largest agricultural commodity in India after cereals accounting for nearly 5 percent of gross national product and 10 per cent of the value of all agricultural products. Despite the fact that India is one of the leading oilseed producing countries in the world, it is not able to meet the edible oil requirement for its vast population. Among the oilseeds, rapeseed-mustard group of crops occupies prominent position in the country during winter season contributing nearly 21.6% and 23.1% to the total oilseed cropped area and production, respectively (Anonymous, 2007). According to Tandon (1991) widespread sulphur deficiency has been observed in crops and soils in 120 districts of India irrespective of soil texture and cropping pattern, including Varanasi and Mirzapur districts of eastern Uttar Pradesh. Sulphur is the fourth most important nutrient after nitrogen, phosphorus and zinc for Indian agriculture. Sulphur is best known for its role in the synthesis of proteins, oils, vitamins and flavoring compounds in plants. Three amino acids *viz.* Methionine (21%S), Cysteine (26%S), and Cystine (27%S) contain S which are the building blocks of proteins. About 90% of sulphur is present in these amino acids.

Coarse textured soils, which have low sulphur retentive capacity, application of 20-50 kg S ha^{-1} is recommended (Tandon, 1990). Sulphur fertilization in deficient soils is known to increase seed yield of irrigated mustard by 12 to 48 percent (Aulakh and Pasricha, 1988). The substantial increase in mustard yield due to sulphur application (Sharma, 1994; Chauhan, 1996; Joggi, 1998 and Singh *et al*., 2000). Hence, the present investigation was undertaken to find out the "Response of Indian mustard [*Brassica juncea* (L.) Czern. and Cosson] as influenced by different doses and sources of sulphur" on yield attributes.

Materials and Methods

The experiment was carried out during Rabi season of 2012-13 at campus research farm of Rajiv Gandhi South Campus, Department of Soil and Water Conservation, Institute of Agricultural sciences, B.H.U.

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The study comprised three doses and sources of sulphur (fertility levels-15, 30, 45) (Elemental sulphur, Gypsum, Single superphosphate). This experiment was conducted by mustard variety Parasmani 8. It was released for cultivation from Haryana University. Plants are longer and bushy in nature. It matures in 90 -95 days. The variety is recommended for both rain fed and irrigated conditions in which it gives average seed yield of 10-12 q ha^{-1} and 15-20 q ha^{-1}, respectively. The average oil content is 38-41%. The grains are larger in their size. The experiment was conducted in randomized block design having different treatment with 3 replication. The treatment comprised three level of elemental sulphur, three level of Gypsum, and three level of single superphosphate *i.e.* 15, 30, 45 used as sources of sulphur in experiment. There was one control plot in each replication. Full dose of P_2O_5 in the form of Diammonium phosphate and single super phosphate and full dose of K_2O through Murate of potash @45 kg ha^{-1} with full dose of sulphur (50% through SSP and 50% through elemental sulphur) were applied as per treatment as basal application (before sowing). Few doses of gypsum also applied in the field according to the treatments. Half of the amount of Nitrogen (as per treatment) was applied through Diammonium phosphate and urea. The half dose of nitrogen was top dressed after first irrigation. The crop was sown by keeping the seed rate of 5kg/ha with sowing the seed 2-3 cm deep in furrows keeping 45cm row to row distance. The plant to plant distance was kept 15 cm by thinning out the extra plants after 22 days of sowing. One spray of 100 gram Detergent + 50 ml Carosin oil which were dissolved in 15 liters of water. The spray was done in each plot at the time of Aphid infestation which occurred at the last stage of experimentation during crop growth period. The characters like yield attributes were recorded Siliqua per plant, Siliqua length, Seeds Siliqua per plant, Test weight, Seed yield, Harvest index (%).

Results and Discussion

The yield and yield attributing characters are presented in Tables 1 and 2. It is clearly indicated that siliquae per plant, siliquae length, seeds siliquae per plant, test weight, seed yield, harvest index (%) increased with increasing the fertilizer levels.

Data pertaining to number of siliquae as affected by sulphur rates and sources have been presented in table 1. In general, the number of siliquae increased significantly with increasing levels of sulphur upto 30.0 kg ha^{-1}. The number of siliquae of mustard crop was significantly influenced due to different treatments of sulphur. Due to the application of elemental sulphur significantly increased the number of siliquae of mustard up to 30.0 kg S ha^{-1}. Further increase in the amount of applied sulphur (45.0 kg ha^{-1}) significantly reduced the number of siliquae but exhibited significant superiority over 15.0 kg S ha^{-1} and control. Similar result was also obtained with the application sulphur through gypsum and single superphosphate. The applied sulphur through gypsum exhibited significant superiority over others. It is evident from the data pertaining to length of siliquae as affected by sulphur levels and sources presented in table 1 revealed that the length of siliquae increased significantly with increasing levels of sulphur upto 30.0 kg ha^{-1}. The length of siliquae of mustard crop was significantly influenced due to different treatments of sulphur. Due to the application of elemental sulphur significantly increased the length of siliquae of the experimental crop upto 30.0 kg S ha^{-1}. Further increase in the amount of applied sulphur (45.0 kg ha^{-1}) significantly reduced the length of siliquae but exhibited significant superiority over 15.0 kg S ha^{-1} and control. Similar result was also obtained with the application sulphur through gypsum and single superphosphate. The applied sulphur through gypsum exhibited significant superiority over others. It is apparent from the data table 1. that sulphur application brought about significant effect on number of seeds per siliquae. The highest seeds per siliquae were recorded at 30.0 kg sulphur per hectare provided by all the sources of sulphur. Further increasing rates of sulphur significantly reduces the number of seeds per siliquae. Among the sources of sulphur, applied sulphur through gypsum gave significant superiority over others. It is clear from the data shown in table 1 that highest test weight was obtained due to application of 30.0 kg sulphur per hectare provided by all the sources *viz.* Gypsum, single superphosphate and elemental sulphur. It remained at par when sulphur applied @ 45.0 kg ha^{-1} but was significantly superior over 15 kg sulphur per hectare and control. The data on yield of mustard apparent from the table 2 that increasing sulphur doses brought about significant increase in seed yield as compared to control. The application of sulphur through gypsum produced highest seed yield as compared with the elemental sulphur and single supper phosphate. Increasing sulphur dose up to 45.0 kg sulphur per hectare resulted highest yield through all the sources. However, the difference amongst the sources of sulphur does not reach the level of significance. It is evident from the data given in the table 2 that the sulphur application enhanced Stover yield significantly over control. The highest Stover yield was obtained at 45 kg sulphur per hectare provided by Gypsum, and Elemental sulphur. However, it was highest @ 30.0 kg S ha^{-1} applied through single

Table 1 : Effect of Sulphur doses and sources on yield attributes.

S. no.	Treatments	Siliquae per plant (No.)	Siliquae length (cm)	Seeds per siliquae (No.)	Test weight (g)
1.	T1 (control)	105.60	4.18	12.47	4.62
2.	T2 (Es-15)	122.67	4.23	13.08	4.80
3.	T3 (Es-30)	145.86	5.17	13.37	5.36
4.	T4 (Es-45)	162.74	5.36	15.07	5.54
5.	T5 (GY-15)	154.18	5.36	13.10	5.14
6.	T6 (GY-30)	170.53	5.44	14.19	5.74
7.	T7 (GY-45)	184.30	5.62	16.16	6.02
8.	T8 (SSP-15)	138.46	5.29	14.33	5.50
9.	T9 (SSP-30)	169.67	5.38	14.21	5.50
10.	T10 (SSP-45)	173.72	5.55	15.41	5.90
	SEm (±)	7.266	0.166	0.403	0.156
	CD (p=0.05)	21.588	0.492	1.198	0.464

Table 2 : Effect of doses and sources of sulphur on seed and stover yields and harvest index of mustard.

S. no.	Treatment	Seed yield (q ha^{-1})	Stover yield (q ha^{-1})	Harvest index (%)
1.	T1 (control)	9.27	46.11	20.10
2.	T2 (Es-15)	11.54	50.62	22.79
3.	T3 (Es-30)	12.54	56.27	22.27
4.	T4 (Es-45)	12.66	57.72	21.93
5.	T5 (GY-15)	13.86	57.47	24.12
6.	T6 (GY-30)	14.04	59.75	23.36
7.	*T7 (GY-45)	14.21	60.84	24.50
8.	T8 (SSP-15)	13.10	54.09	21.50
9.	T9 (SSP-30)	13.30	57.56	22.75
10.	*T10 (SSP-45)	13.78	60.99	23.85
	SEm (±)	0.537	1.702	0.931
	CD (p=0.05)	1.595	5.057	2.765

superphosphate. The differences among the treatments, the application of sulphur through of gypsum does not reach upto the level of significance among themselves and all the treatments was noticed at par with each others; but exhibits significant superiority over control. However, elemental sulphur and single superphosphate significantly increased the up to 30.0 kg S ha^{-1}. The data on harvest index presented in the table 2 clearly indicated that harvest index of mustard crop exhibits significant superiority over control. However, effect of increasing levels of sulphur reduces the harvest index from 15.0 kg S ha^{-1} but does not reach up to the level of significance. Highest harvest index was obtained by the application of sulphur @ 15.0 kg ha^{-1}. The favorable effects of sulphur application on yield attributes *viz.* siliquae per plant, seed per siliquae, and test weight was finally reflected in to seed yield. As such seed yield increased significantly up to 45 kg sulphur per hectare influenced due to difference sources of sulphur.

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