Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(2): 1093-1096
Received: 08-01-2018
Accepted: 09-02-2018

Pushpendra Kumar
Department of Soil Science and Agril. Chemistry, C.S.A. University of Agriculture and Technology, Kanpur, Utter Pradesh, India

S Dimree
Department of Soil Science and Agril. Chemistry, CSA, University of Agriculture and Technology, Kanpur, Utter Pradesh, India

Ashok Kumar
Department of Soil Science and Agril. Chemistry, CSA, University of Agriculture and Technology, Kanpur, Utter Pradesh, India

DD Yadav
Department of Agronomy, CSA, University of Agriculture and Technology, Kanpur, Utter Pradesh, India

Correspondence
Pushpendra Kumar
Department of Soil Science and Agril. Chemistry, CSA, University of Agriculture and Technology, Kanpur, Utter Pradesh, India

Effect of sulphur, zinc and FYM on yield attributes and yield on mustard (*Brassica juncea* (L.) Czern and Coss)

Pushpendra Kumar, S Dimree, Ashok Kumar and DD Yadav

Abstract
A field experiment was conducted in pot-culture of Department of Soil Science and Agril. Chemistry, CSAUA&T, Kanpur (U.P.), during *Rabi* season 2016-17 to study the Effect of zinc and sulphur on yield, nutrient uptake and quality characteristics of mustard cv. Varuna. The 7 treatments consisted of T_1: Control, T_2: 100% RDF (80:60:40) + S 40 Kg, T_3: 100% RDF+Zn 5kg, T_4: 100% RDF+Zn 5kg+S 40kg, T_5:100% RDF + FYM5 ton + Zn 5kg, T_6: 100% RDF + FYM 5 ton + S40kg T_7: 100% RDF + FYM 5 ton + Zn 5 kg + S 40kg. The content of all nutrients increased with integration of FYM, in comparison to control. It was observed that the plant height, No. of primary branches, No. of secondary branches, number of siliqua plant^{-1}, number of seed siliqua^{-1}, and test weight (gm) increased with integration of FYM. The maximum plant hight (cm) No. of Primary branches, No. of secondary branches No. of siliqua/plant No. of seed/siliqua and test weight (gm) treatment combination were recorded on T_7 100% RDF +5 ton FYM+ S 40 kg+Zn 5 kg (156.5, 6.25, 13.75, 267.25, 14.75 and 4.70) followed by T_6: 100% RDF + FYM 5 ton + S40kg (154.25, 5.50, 13.50, 262.25, 14.00 and 4.59) and T_5:100% RDF + FYM5 ton + Zn 5kg, (151.25, 5.47, 12.75, 258.50, 13.50 and 4.46) respectively. The maximum seed and stover yields increased with integration of Farm Yard Manure i.e. T_7 100% RDF +5 ton FYM + Zn 5 kg + S 40 kg 21.21 q ha^{-1} and 47.87q ha^{-1}, Followed by T_6: 100% RDF + FYM 5 ton + S40kg (18.91 and 43.67 q ha^{-1}) and T_5:100% RDF + FYM5 ton + Zn 5kg, (18.51 and 42.51 q ha^{-1}) respectively computed 57.22% and 36.12 % higher than control. The maximum economic benefits of gross realization, net realization along with highest BCR of 2.60:1.

Keywords: FYM, mustard, sulphar, zinc

Introduction

Mustard (*Brassica juncea* (L.) Czern and Coss) is important *Rabi* oilseed crop which belongs to family "Cruciferae". In India, first rank in area and third in production after China and Canada. On the world map, Indian rapeseed and mustard occupies about 6.18 million hectare area with a production of 7.36 mt and average productivity of 1190 kg/ha. In India Rajasthan ranks first both in area in production Gujarat state has the highest productivity of rapeseed and mustard, Whereas in UP rapeseed and mustard is grown on 6.58 lakh.ha area with production of 0.76 mt and productivity of 1155kg/ha (Anonymous 2015).

In India consumption of oil and fats is continuously increasing due to increase in population at an annual growth rate of 2.1 per cent and improved standards of living due to accelerated economic development in the base scenario of per capita growing by 4.0 per cent annually, an average Indian's yearly edible oil requirement is fated to rise from 9.81 kg in 1999-2000 to 16 kg by 2015 (Hegde, 2004).

For oil seeds sulphur and zinc are most vital nutrients for growth and development. Sulphur is considered to be the fourth important essential nutrient after nitrogen, phosphorus and potassium for the plant growth. Sulphur performs many physiological functions like synthesis of cysteine, methionine, chlorophyll and oil content of oil seed crops. It is also responsible for synthesis of certain vitamins (B, Biotin and Thiamine), metabolism of carbohydrates, proteins and oil formation of flavor compounds in crucifers.

Keeping this in view, the present investigation was carried out to study the effect of sulphur, zinc and FYM on growth, yield attributes, seed yield, gross income, net profit and B:C ratio in irrigated Indian mustard.

In recent years, sulphur deficiency has been aggravated in the soil due to continuous removal by crops and use of high analysis sulphur devoid fertilizers coupled with intensive cropping with high yielding varieties and reduction in use of organic manure and sulphur containing fungicides and insecticides resulted in sulphur deficiency in soils (Pasricha *et al.*, 1972).

Sulphur deficiency is as high as 81 per cent in the light textured soils of North and North West zone of Gujarat (Sadasania, 1992) [9]. They reported that sulphur deficiency tends to affect adversely on growth and which reduces the crop yield to the extent of 10-30 per cent.

The available zinc in Gujarat soils ranges between 0.25 to 2.58 mg kg-1 (Dangarwala *et al*., 1983) [7]. As nearly half of the Indian soil are Zn deficient and 24 per cent soils of Gujarat state are Zn deficient and 58 per cent soils of North and North Gujarat found deficient to medium in available zinc status. Soils of India had multiple nutrient deficiencies, mainly of N, P, K, S and Zn and their use have become essential to obtain optimum crop yield.

FYM helps in maintaining soil sustainability in terms of nutrients supply capacity of soil. The increase in productivity of the crops might be attributed due to its essential role of all nutrients present in FYM for plant growth through its effect as a good source of soil organic matter which improves the physico-chemical and biological properties of soil. Application of FYM also increases cation exchange capacity and helps in keeping soil micro nutrients in available form through its chelating action as well as microbial activity in soil besides supplying macro and micro plant nutrients.

At present generally our soils are become sick due to deficit of organic matter in soil, so there is urgent need to apply FYM to overcome the problem.

Materials and Methods

The experiment was conducted at Experimental Farm Department of Soil Science and Agril Chemistry, C.S. Azad University of Agriculture and Technology Kanpur U.P. (India) under Randomized Block Design with 7 treatments (T_1: Control, T_2: 100% RDF (80:60:40) + S 40 Kg, T_3: 100% RDF+Zn 5kg, T_4: 100% RDF+Zn 5kg+S 40kg, T_5:100% RDF + FYM5 ton + Zn 5kg, T_6: 100% RDF + FYM 5 ton + S40kg T_7: 100% RDF + FYM 5 ton + Zn 5 kg + S 40kg) during the year 2016-17. Laboratory studies were conducted in the Deptt. of Soil Science and Agril. Chemistry of the University. Soils of experimental field were sandy loam and deficient in organic carbon, nitrogen, phosphorus, sulphur and zinc. Mustard variety Varuna was sown on dated 8 Nov 2016 and harvested on 14 March 2017. Different aspects embodied in the investigation were growth attributes e.g. plant height, primary branches/plant, secondary branches, siliqua/plant, seed /siliqua and test weight (weight of 1000 seeds in gram). At maturity seed and straw yields were recorded. Soils were analyzed before and after the crop for N, P, K, S and Zn to see the dynamics of these nutrients in soil and plant.

Observation Recorded

Plant Height

Five plants were selected randomly from each plot and tagged. The height was measured at the time of harvest, in cm with the help of meter scale from the base of the plant to top of the the plant and mean value was computed.

Number of primary and secondary branches

Five selected tagged plants were also used for counting of primary and secondary branches at harvest. Total number of primary and secondary branches were counted separately and mean value have been computed for primary and secondary branches plant$^{-1.}$

Number of siliqua plant^{-1}

The siliqua of five randomly selected plants were separated and counted. The average value was reported as number of siliqua plant^{-1}.

Number of seeds siliqua^{-1}

Twenty randomly selected siliqua, taken from respective five plants, were threshed and seeds were counted. The average number of seeds was reported as number of seeds per siliqua.

Test Weight

Sample of seeds was drawn from the produce of each net plot and one thousand seeds were counted from each treatment. The counted seeds were weighed and recorded as test weight.

Seed Yield

Each net plot was threshed separately. The weight of seeds was recorded and finally converted into q ha^{-1}.

Stover Yield

Stover yield was computed by deducting the seed yield from the total biological yield and converted into q ha^{-1}.

Result and Discussion

Effect of different treatments on growth, yield and yield attributing character of mustard

This study included plant height, no. of primary branches/plant, no. of secondary branches/plant, siliqua/plant, seed/siliqua and test weight.

Plant Height

Plant height was recorded at maturity of crop. It ranged from 143.75- 156.50 cm respectively attained in treatments T_1 and T_7. The results were significant and pace of increase was linear with increase in fertility level. The latter was best treatment in plant height resulted in increase of 9% over control. FYM is a multi-nutrient organic source played a significant role in increasing plant height. Further, since the soils were deficient in zinc and sulphur albeit they had key role in the plant vegetative growth and their supply provided a balanced nutrition on this parameter. The main reason for such results is because of the key role of these nutrients in plant growth and metabolism. The results of present study are in conformity with the reports of above workers.

Number of primary branches

The number of primary branches was found 4.25 and 6.25 in treatments T_1 and T_7 during the year 2016-17. There was about 2 to 3 times increase in no. of primary branches/plant. It was evident that addition of FYM+S+Zn had significant increasing effect on no. of primary branches. Branching is a major yield contributory character. There were about 2 to 3 times increase in no. of primary branches

The present study and the results thereof corroborated by findings of several workers. Singh and Singh (2005) [5] revealed that application of nitrogen and sulphur increased primary branches per plant.

Secondary Branches

The number of secondary branches was found 10.25 and 13.75 in treatments T_1 and T_7. It was evident that addition of FYM+S+Zn had significant increasing effect on the number of secondary branches. In our study the treatments receiving sulphur with NPK gave better branching pattern and the results was superior over control treatment.

No of siliqua per plant

Since the seeds are formed in siliqua, number of siliqua is a direct indication of seed yield. All the treatments were significantly superior to control. It was found 243.25 siliqua in T_1 and 267.25 in T_7 treatment. All the treatments gave significant value over control. Prasad and Singh (2004) [2] reported that the sulphur application influenced the number of siliqua per plant significantly.

No of seed per siliqua

Number of seed per siliqua increased linearly with increase in fertility level. It was found 10.25 and 14.75 seed per siliqua in T_1 and T_7 treatments. T_7 gave the highest value which was significantly over control treatment. It was clear that treatments having FYM, FYM+S, and FYM+S+Zn were better in respect of this character. Aga (2004) reported in an experiment that the number of seed /siliqua increased significantly with the increasing levels of sulphur.

Seed Test Weight

Seed test weight expressed as weight of 1000 grains in gram is a measure of seed plumpness i.e. seed health. It was observed that test weight 4.32 gm and 4.70 gm in treatment T_1 and T_7. Aga (2004) reported that the test weight increased significantly with increasing levels of sulphur. Similar results also observed by Prasad and Singh (2004) [2].

Seed and Stover yield

The seed yield varied from 13.49 to 21.21 q/ha whereas stover yield ranges from 36.92 to 47.87 q/ha in present investigation. The trends of variation in stover yield is more or less. All the treatments are significantly superior to control. Addition of FYM, S and Zn increases the seed yield in a significant manner. There are so many scientist on this aspect and they concluded that FYM increases the nutrient uptake value and ultimately seed yield automatically increases. Our results are similar to T_7 (100% RDF+FYM+ S+Zn) Singh and Pal (2011) [4], Mohd and Bhat (2005) [5]. The results are in agreement with those of above workers.

Table 1: Effect of different treatment on yield attributing character

Treatment	Plant height (cm)	No. of primary branches	No. of secondary branches	No. of siliqua/plant	No. of seed/siliqua	Test weight (gm)
T_1-Control	143.75	4.25	10.25	243.25	10.25	4.32
T_2-100% RDF+S 40 kg	145.5	4.50	10.50	248.50	10.75	4.52
T_3-100% RDF+Zn 5 kg	147.25	4.75	11.00	249.75	11.50	4.62
T_4-100 % RDF +S 40 kg+Zn 5 kg	148.5	5.25	11.50	253.25	12.25	4.36
T_5-100 % RDF+FYM 5 ton+Zn 5 kg	151.25	5.47	12.75	258.50	13.50	4.46
T_6-100 % RDF +FYM 5 ton +S 40 kg	154.25	5.50	13.50	262.25	14.00	4.59
T_7- 100 % RDF+ FYM 5 ton + Zn 5 kg +S 40 kg	156.50	6.25	13.75	267.25	14.75	4.70
CD (5%)	4.7	3.63	4.30	14.54	4.84	0.31
SEm (+)	1.57	1.23	1.46	4.8	1.65	0.11

Table 2: Effect of different treatments on seed yield, stover yield, cost cultivation, gross income, net profit and B:C ratio

Treatments	Seed yield (q ha^{-1})	Stover yield (q ha^{-1})	Cost of cultivation	Gross income	Net profit	B:C ratio
T_1-Control	12.20	36.92	22728	38446	15718	1.69:1
T_2-100% RDF+S 40 kg	15.60	37.70	23394	48685	25291	2.08:1
T_3-100% RDF+Zn 5 kg	16.47	38.48	23178	51334	28156	2.21:1
T_4-100 % RDF +S 40 kg+Zn 5 kg	16.84	40.83	23844	52562	28718	2.20:1
T_5-100 % RDF+FYM 5 ton+Zn 5 kg	18.51	42.51	24678	57655	32977	2.33:1
T_6-100 % RDF +FYM 5 ton +S 40 kg	18.91	43.67	24894	58913	34019	2.36:1
T_7- 100 % RDF+ FYM 5 ton + Zn 5 kg +S 40 kg	21.21	47.87	25344	66023	40679	2.60:1
CD (5%)	3.04	6.48	-	-	-	-
SEm (+)	1.01	2.16	-	-	-	-

Conclusion

Application of 100% RDF, Sulphur @ 40 kg ha^{-1} in conjunction with zinc @ 5.0 kg ha^{-1} helped in increasing the productivity of mustard. Further, integrated application of 100 % RDF sulphur @ 40 kg ha-1 in conjunction with zinc @ 5.0 kg ha-1 in the presence of FYM @ 5 t ha^{-1} to mustard can be followed for getting the maximum economic benefit in terms of gross realization and net return along with sustaining soil health.

References

1. Anonymous. Agricultural Statistics at a glance, Directorate of Ministry of Agriculture (GOI), New Delhi, 2013.
2. Prasad D, Singh MM. Response of Indian mustard to nitrogen and sulphur. Ann. PL. Res. 2004; 6:84-85.
3. Singh H, Chaudhary R, Lal M. Effect of nitrogen, sulphur and Azotobacter on growth, yield and uptake of nutrients by mustard. Ann.PL. Soil Res. 2005; 7:72-74.
4. Singh SP, Pal MS. Effect of integrated nutrient management on productivity, quality, nutrient uptake and economics of mustard. Indian J Agron. 2011; 56(4):381-387.
5. Mohd, Auyoub, Bhat Room Singh. Productivity of Indian mustard (*Brassica juncea* L.) as influenced by the integrated nutrient management on an inceptisol. Crop Research (Hissar). 2005; 30(1):131-134.

6. Wani MA, Aga FA. Response of mustard to levels and sources of sulphur. Ann. Pl. Soil Res. 2004; 6:88-89.
7. Dangarwala RT, Trivedi BS, Patel MS, Mehta PM. Ed. Micronutrient Research in Gujarat-Gujarat Agriculture University Anand, Gujarat, India, 1983.
8. Hedge DM. The Hindu Survey of Indian Agriculture, 2004.
9. Sadasania RM. Studies on sulphur avaibility in soil of North West Gujarat. M.Sc. Thesis, GAU, Sardarkrushinagar, 1992.