The Pharma Innovation Journal 2022; 11(4): 1251-1254

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(4): 1251-1254

www.thepharmajournal.com
Received: 07-01-2022
Accepted: 15-02-2022

Mentham Sasidhar Reddy
M.Sc. Scholar, Department of Agronomy, SHUATS, Prayagraj, Uttar Pradesh, India

Biswarup Mehera
Associate Professor, Department of Agronomy, SHUATS, Prayagraj, Uttar Pradesh, India

Corresponding Author:
Mentham Sasidhar Reddy
M.Sc. Scholar, Department of Agronomy, SHUATS, Prayagraj, Uttar Pradesh, India

Effect of organic manures and micronutrients (Zn & B) on growth, yield and economics of Indian mustard (*Brassica juncea* L.)

Mentham Sasidhar Reddy and Biswarup Mehera

Abstract
A field experiment was conducted during *Rabi* season of 2021 at Crop Research Farm (CRF). Department of Agronomy, SHUATS, Prayagraj (UP) on soil with sandy loam in texture to investigate the effect of organic manures and micronutrients (Zn & B) on growth and yield of Indian mustard. The treatments consists of three organic manures *viz*., Poultry manure, Farm Yard manure and Vermicompost and micronutrients Zinc (0.5%), Boron (1ppm), and Zinc+ Boron (0.5%+1ppm respectively) whose effect is observed on Indian mustard (var. VARUNA T-59). The experiment was laid out in Randomized Block Design with Nine treatments replicated thrice. The treatment with application of Vermicompost (4t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B) recorded significantly higher plant height (179.6cm), number of Branches per plant (11.0) and plant dry weight (35.3 g), number of siliquae per plant (296.9), number of seeds per siliqua (14.2), test weight (5.32g), seed yield (2.12 t/ha) and Stover yield (3.84 t/ha) compared to other treatment combinations.

Keywords: Indian mustard, organic manures, micronutrients, growth, yield, economics

Introduction
The rapeseed-mustard group of crops (Brassica spp. Family Brassicaceae) includes Indian rape (toria), Indian mustard, and other oilseed crops cultivated in India (raya). rapeseed oil (gobhi sarson) In terms of acreage and output, Ethiopian mustard (African sarson), yellow sarson, brown sarson, and taramira are next to soybean. India comes in second in terms of area after China and third in terms of production after Canada and China, accounting for 17.9% of total land and 11.2 percent of total rapeseed-mustard production worldwide (DRMR 2013). Under various agro-ecological conditions, these crops account for around 22.4 percent of total cultivated area under oilseeds (26.4 m ha) and contribute 22.6 percent of total oilseed production (30.0 m t) in the country (Anonymous 2012). Indian mustard (Brassica juncea) is a type of mustard that grows in India. Considering the acute shortage of vegetable oil in the country, as well as stiff competition from other more lucrative crops (cereals), there is a need to boost oilseed crop productivity by producing higher yielding cultivars and lowering prices through improved resource use efficiency.

Excess fertiliser can cause nutrient loss, surface and groundwater contamination, soil acidity or basification, losses in beneficial microbial communities, and increased sensitivity to destructive insects. Organic manures have a variety of advantages, including a balanced supply of nutrients, higher soil nutrient availability due to increased soil microbial activity, the decomposition of hazardous substances, improved soil structure and root development, and greater soil water availability.

Zinc is an essential micronutrient and plays a key role as a structural constituent or regulatory cofactor of a wide range of different enzymes and proteins in many important biochemical pathways like carbohydrate metabolism, photosynthesis, conversion of sugars to starch, protein metabolism, auxin (growth regulator) metabolism, pollen formation, integrity of biological membranes and resistance to infection by certain pathogens (Alloway 2008) [2]. Boron is an essential micronutrient indispensable for the normal growth and development of plants. It plays an important role in flowering and fertilization process, boosting yield and quality of crop produce (Kanwar and Randhawa, 1974) [7]. As a result, this study focused on the use of both organic and inorganic nutrient sources to ensure the long-term viability of Indian mustard production.

Materials and Methods

A field experiment was conducted during *Rabi* season of 2021 at Crop Research Farm (CRF), Department of Agronomy, SHUATS, Prayagraj (UP). The soil of the experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.4), medium in organic carbon (0.48%), medium in available Nitrogen (278.93 kg/ha), low in available Phosphorous (19.03 kg/ha) and medium in available Potash (238.1 kg/ha). The treatments consist of three organic manures *viz*., Poultry manure, Farmyard manure and Vermicompost and micronutrients Zinc (0.5%), Boron (1ppm), and Zinc+ Boron (0.5%+1ppm respectively) whose effect is observed on Indian mustard (var. VARUNA T-59). The experiment was laid out in Randomized Block Design with nine treatments replicated thrice. The experiment comprising nine treatment possible combination of above factor, *viz.*, T_1: FYM (8t/ha) + 50% RDF+ Zinc (0.5%ZnSO4) T_2: FYM (8t/ha) + 50% RDF+ Boron (1.0 ppm), T_3: FYM (8t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B), T_4: Vermicompost (4t/ha) + 50% RDF+ Zinc (0.5%ZnSO4), T_5: Vermicompost (4t/ha) + 50% RDF+ Boron (1.0 ppm), T_6: Vermicompost (4t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B), T_7: Poultry manure(3t/ha) + 50% RDF+ Zinc (0.5%ZnSO4), T_8: Poultry manure(3t/ha) + 50% RDF+ Boron (1.0 ppm), T_9: Poultry manure(3t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B), observations regarding growth and yield attributes was recorded during the field experiment.

Result and Discussion

Growth

According to the recorded and tabulated data pertaining to growth parameters, the significantly higher plant height (176.6 cm), maximum number of Branches per plant (11.0) and higher plant dry weight (35.3 g) was recorded in treatment with application of Vermicompost (4t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B).

Application of vermicompost in combination with inorganic fertilizers and micronutrients resulted significant increase in nutrient contents might be due to greater availability of N and P in soil supplied due to integrated application of vermicompost and inorganic fertilizer along with micronutrients. With balanced nutrient application, nutrient uptake increased as a function of biomass production and the nutrient content of that biomass. These results are in close conformity with findings of Bhagchand Kansotia *et al.* (2013) [9].

Yield attributes

According to the yield characteristics data that was collected and analysed at harvest, maximum number of siliquae per plant (296.9), maximum number of seeds per siliqua (14.2) and higher test weight (5.32g) was recorded in treatment with the application of Vermicompost (4t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B).

The higher performance of yield attributes might be due to the fact that, zinc is proved to increase pollen viability and significant effect on pollen formation and fertilization, hence higher grains number are direct index of pollen viability, whereas the prolong nutrient supplied by the inorganic and inorganic sources led to better translocation of photosynthates into form of grain resulting in better yield attributes. Similar findings were reported by Kannan *et al.* (2013) [6].

Yield

After evaluated the data recorded post harvesting of crop show that significantly higher seed yield (2.12 t/ha), higher Stover yield (3.84 t/ha) and harvest index (35.63%) was recorded in treatment with the application of Vermicompost (4t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B).

The judicious use of organic and inorganic source has beneficial effect on physiological process of plant metabolism *viz*. growth and yield there by leading to higher grain yield. Similar findings were reported by B.S. Manoj Gowda (2021) [10] who observed that Vermicompost in integration with inorganic fertilizers significantly increased grain yield of Finger millet.

Economics

The economic return of Indian mustard was analyzed after harvesting the crop based on market pricing, the result indicated a growing trend in with the increasing yield trend across treatment.

The maximum Gross returns (INR 1,60,311.7/ha), Net returns (INR 1,10,513.32/ha) and Benefit cost ratio (2.22) was evaluated in treatment with the application of Vermicompost (4t/ha) + 50% RDF + Zinc + Boron (0.5% ZnSO4& 1.0ppm B).

Table 1: Growth attributes of Indian mustard at harvest as influenced by Organic manures and Micronutrients (Zn & B).

Treatment	Growth attributes		
	Plant height (cm)	No. of Branches/plant	Plant dry Weight (g)
FYM (8t/ha) + 50% RDF+ Zinc (0.5%ZnSO4)	164.0	8.8	33.4
FYM (8t/ha) + 50% RDF+ Boron (1.0 ppm)	164.6	9.1	33.6
FYM (8t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B)	173.2	10.2	35.0
Vermicompost (4t/ha) + 50% RDF+ Zinc (0.5%ZnSO4)	168.8	9.1	33.5
Vermicompost (4t/ha) + 50% RDF+ Boron (1.0 ppm)	167.4	9.5	33.6
Vermicompost (4t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B)	179.6	11.0	35.3
Poultry manure(3t/ha) + 50% RDF+ Zinc (0.5%ZnSO4)	170.5	9.3	32.9
Poultry manure(3t/ha) + 50% RDF+ Boron (1.0 ppm)	171.2	9.4	33.4
Poultry manure(3t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B)	170.6	9.7	34.7
S.Em(±)	1.15	0.14	0.02
CD (p=0.05)	3.46	0.43	0.07

Table 2: Yield attributes of Indian mustard at harvest as influenced by Organic manures and Micronutrients (Zn & B).

Treatment	Yield attributes		
	No. of siliquae/plant	No. of seeds/siliqua	Test Weight (g)
FYM (8t/ha) + 50% RDF+ Zinc (0.5%ZnSO4)	260.7	13.3	4.46
FYM (8t/ha) + 50% RDF+ Boron (1.0 ppm)	256.6	13.1	4.49
FYM (8t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B)	275.4	13.8	5.06
Vermicompost (4t/ha) + 50% RDF+ Zinc (0.5%ZnSO4)	263.3	13.2	4.57
Vermicompost (4t/ha) + 50% RDF+ Boron (1.0 ppm)	265.5	13.3	4.49
Vermicompost (4t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B)	296.9	14.2	5.32
Poultry manure(3t/ha) + 50% RDF+ Zinc (0.5%ZnSO4)	256.1	13.4	4.46
Poultry manure(3t/ha) + 50% RDF+ Boron (1.0 ppm)	256.5	13.3	4.51
Poultry manure(3t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B)	267.3	13.6	4.73
S.Em(±)	0.46	0.08	0.05
CD (p=0.05)	1.39	0.25	0.15

Table 3: Yield of Indian mustard at harvest as influenced by Organic manures and Micronutrients (Zn & B).

Treatment	Grain Yield (t/ha)	Stover Yield (t/ha)	Harvest Index (%)
FYM (8t/ha) + 50% RDF+ Zinc (0.5%ZnSO4)	1.85	3.77	32.88
FYM (8t/ha) + 50% RDF+ Boron (1.0 ppm)	1.85	3.61	33.89
FYM (8t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B)	1.96	3.62	35.12
Vermicompost (4t/ha) + 50% RDF+ Zinc (0.5%ZnSO4)	1.85	3.68	33.51
Vermicompost (4t/ha) + 50% RDF+ Boron (1.0 ppm)	1.86	3.69	33.48
Vermicompost (4t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B)	2.12	3.84	35.63
Poultry manure(3t/ha) + 50% RDF+ Zinc (0.5%ZnSO4)	1.84	3.76	32.86
Poultry manure(3t/ha) + 50% RDF+ Boron (1.0 ppm)	1.84	3.79	32.67
Poultry manure(3t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B)	1.92	3.57	34.99
S.Em(±)	0.01	0.02	0.14
CD (p=0.05)	0.02	0.06	0.41

Table 4: Economics of Indian mustard at harvest as influenced by Organic manures and Micronutrients (Zn & B).

	Economics			
Treatments	Cost of Cultivation	Gross returns	Net Returns	B:C ratio
FYM (8t/ha) + 50% RDF+ Zinc (0.5%ZnSO4)	49,648.35	1,39,423.3	89,774.98	1.81
FYM (8t/ha) + 50% RDF+ Boron (1.0 ppm)	49,548.35	13,9,926.7	90,378.32	1.82
FYM (8t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B)	49,798.35	1,47,980.0	98,181.65	1.97
Vermicompost (4t/ha) + 50% RDF+ Zinc (0.5%ZnSO4)	49,648.35	1,39,926.7	90,278.32	1.82
Vermicompost (4t/ha) + 50% RDF+ Boron (1.0 ppm)	49,548.35	1,40,178.3	90,629.98	1.83
Vermicompost (4t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B)	49,798.35	1,60,311.7	1,10,513.32	2.22
Poultry manure(3t/ha) + 50% RDF+ Zinc (0.5%ZnSO4)	50,648.35	1,38,920	88,271.65	1.74
Poultry manure(3t/ha) + 50% RDF+ Boron (1.0 ppm)	50,548.35	1,38,668.3	88,119.98	1.74
Poultry manure(3t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B)	50,798.35	1,45,211.7	94,413.32	1.86

*Data was not subjected to statistical analysis.

Conclusion

Based on the above experimental findings, it is concluded that application of nutrients in combination of Vermicompost (4t/ha) + 50% RDF+ Zinc+ Boron (0.5%ZnSO4& 1.0ppm B) accomplished better growth parameters, yield attributes, higher seed yield, higher gross returns and net returns in mustard crop under eastern Uttar Pradesh conditions.

References

1. Ahmad A, Abraham G, Gandotra N, Abrol YP, Abdin MZ. Interactive effect of nitrogen and sulphur on growth, and yield of rapeseed-mustard [*Brassica juncia* (L.) Czern and Coss.) and B. Compestris (L.)] Genotypes. Journal of Agronomy and Crop Science. 2000;181(4):193-199.
2. Alloway BJ. Zinc in Soils and Crop Nutrition (Second Edition). IZA and IFA Publication, 2008.
3. Brown PH, Cakmak I, Zhang Q. Formand function of zinc plants. Zinc in soils and plants. Robson A.D. (Eds). Developments in Plant and Soil Sciences, Springer, Dordrecht, 1993, 55. https://doi.org/10.1007/978-94-011-0878-2_7
4. Chand S, Pabbi S. Organic Farming- a Rising Concept. Soverniour of the Agriculture Summit, on Reforms on Raising Farm Income. Jointly organized by Ministry of Agriculture, Govt. of India and Federation of Indian Chamber of commerce and Industry, Vigyan Bhavan New Delhi, 2005, 1-8.
5. Hussain MJ, Sarker MMR, Sarker MH, Ali M, Salim MMR. Effect of different levels of boron on the yield and yield attributes of mustard in Surma Kushiara Flood Plain Soil (AEZ 30). Journal of Soil and Nature. 2008;2(3):6-9.
6. Kannan RL, Dhivya M, Abinaya D, Krishna RL, Krishnakumar S. Effect of integrated nutrient management on soil fertility and productivity in maize. Bull. Envir. Pharm. Life Sci. 2013;2(8):61-67.
7. Kanwar JS, Randhawa NS. Micronutrient research in soils and plants in India: A review. ICAR. Technical Bulletin (Agric). 1974;50:1-60.
8. Karthikeyan K, Shukla LM. Effect of boron – sulphur interaction on their uptake and quality parameters of mustard (*Brassica juncea* L.) and sunflower (*Helianthus*

annuus L.). Journal of the Indian Society of Soil Science. 2008;56(2):225-230.
9. Kansotia Bhagchand, Meena Ram Swaroop, Meena Vijay Singh. Effect of vermicompost and inorganic fertilizers on Indian mustard (*Brassica juncea* L.). Asian J Soil Sci. 2013;8(1):136-139.
10. Manojgowda BS, Rajesh Singh, Wasim Khan. Effect of Different Spacing and Nutrient Sources on Growth and Yield of Zaid Finger Millet (*Eleusine coracana* (L.) Gaertn). Int. J Curr. Microbiol. App. Sci. 2021;10(02):2907-2912.
11. Meena MC, Patel KP, Rathod DD. Effect of Zn and Fe enriched FYM on yield and removal of nutrients under mustard-sorghum (fodder) cropping sequence in semi arid region of Gujarat. Indian Journal of Dryland Agricultural Research and Development. 2008;23(2):28-34.
12. Nanwal SRK. Productivity and quality of Indian mustard (*Brassica juncea*) as influenced by integrated nutrient management treatments in semi-arid environment. Environment and Ecology. 2007;25(4):956-958.
13. Pottar PS, Nadagouda VB, Salakinkop SR, Kannur VS, Gaddi AV. Effect of organic manure and fertilizer levels on nutrient uptake, soil nutrient status and yield of groundnut (*Arachis hypogaea* L.). Journal of Oilseeds Research. 1999;16(1):123-127.
14. Shireen F, Nawaz MA, Chen C, Zhang Q, Zheng Z, Sohail H, *et al*. Boron: Functions and approaches to enhance its availability in plants for sustainable agriculture. International Journal of Molecular Science. 2018;19:1856.
15. Thaneshwar, Vishram Singh, Jai Prakash, Manoj Kumar, Sateesh Kumar, Singh RK. Effect of Integrated Nutrient Management on Growth and Yield of Mustard (*Brassica juncea* L.) in Irrigated Condition of Upper Gangetic Plain Zone of India. Int. J Curr. Microbiol. App. Sci. 2017;6(1):922-932.
16. Verma H, Dawson J. Yield and economics of mustard (*Brassica compestris* L.) as influenced by sowing methods and levels of sulphur and boron. International Journal of Current Microbiology and Applied Sciences. 2018;7(1):380-386.