



INTEGRATED NUTRIENT MANAGEMENT THROUGH ORGANIC AND INORGANIC SOURCES IN INDIAN MUSTARD (*Brassica juncea* L.)

Harshita Sharma, Prabhat Kumar Chaturvedi and Ram Pyare¹

Dept. of Agronomy, National Post Graduate College, Barahalganj, Gorakhpur-273402 (U.P.), India

Dept. of Agronomy, C.S.A.U.A. & T., Kanpur (U.P.), India

Email: harshitasharma@gmail.com

ABSTRACT

A field experiment was conducted during the winter (Rabi) season of 2015-16 at National Post Graduate College, Barahalganj, Gorakhpur on silty-loam soil to study the effect of integrated nutrient management on growth and yield of Indian mustard (*Brassica juncea*) under four levels of vermicompost and three levels of recommended dose of fertilizers (RDF). It was combination of 12 treatments viz. (1) 50% RDF (2) 75% RDF (3) 100% RDF (4) 50% RDF+2t/ha vermicompost (5) 75% RDF+2t/ha vermicompost (6) 100% RDF+2t/ha vermicompost (7) 50% RDF+4t/ha vermicompost (8) 75% RDF+4t/ha vermicompost (9) 100% RDF+4t/ha vermicompost (10) 50% RDF+6t/ha vermicompost (11) 75% RDF+6t/ha vermicompost (12) 100% RDF+6t/ha vermicompost. Result revealed that the growth attributes of mustard significantly observed at 6t/ha vermicompost over control and rest treatments, respectively. Yield attributes of mustard were influenced significantly by levels of vermicompost of 6t/ha compared to 0, 2 & 4 t/ha, respectively. The seed yield and Stover yield of mustard were recorded maximum 17.45q/ha and 45.42q/ha at 6t/ha vermicompost, which was at par 4 t/ha, respectively. Calculated gross income (Rs. 41824/ha) was obtained at 6t/ha vermicompost over other remaining treatments, respectively but net profit (Rs. 18677/ha) was obtained at 4t/ha vermicompost, which was at par 2t/ha vermicompost, respectively. Almost, all growth characters and yield attributes of mustard under study were maximum at 100% RDF clearly followed by 75% and 50% RDF, respectively. Seed yield and Stover yield of mustard increased statistically with increased level of fertility. It was highest 16.55 q/ha and 41.80q/ha at 100% RDF. Gross income (Rs. 39196/ha) and net returns (Rs. 18835/ha) due to sale of seed yield was higher at 100% RDF, which was at par 75% . RDF fertility levels, respectively. Therefore, obtaining maximum net profit for mustard crop (Mahyco Bold Plus) was fertilizer @2t/ha vermicompost alongwith 75% . RDF in the year of study.

Keywords: Mustard, Vermicompost, Fertility Levels

Oil seed crops have been the backbone of agricultural economy of Indian from time immemorial. Mustard is the second most important oil seed in India after soya been. In the world, it is grown over an area of 703.119 million ha, Production of 68000 tones and consumption of 71000 tones during 2016-17. It accounts for nearly 25% of the total oilseed production in India. India is the third largest mustard producing country in the world after China and Canada. India accounts for nearly 12% of world production. As per COOTI's (central organization for Oil Industry and Trade)

estimates, in Uttar Pradesh about 8.40 lakh tones of is estimate to be produce in the year 2015-16 while in previous year the state had produced only 6.75 lakh tones of Mustard. Uttar Pradesh is the second largest mustard producing state in India after Rajasthan and Madhya Pradesh (Anonymous, 2017). Continuous and sole applications of artificial or inorganic fertilizer induce the soil sickness and disturb the soil environment to result in low productivity and un sustainability. On other hand Organic sources are eco-friendly, improve productivity and sustainability. Nitrogen, Phosphorus and Potash is

an important constituent for plant. This nitrogen help in formation of a largest frame on which more flowers and eventually more pods can develop. Phosphorus fertilization improves growth of mustard crops. The role of Potash in mustard is to activate a wide range of enzyme system. It also controls others physiological functions. vermicompost is a good Organic source of plant nutrient supply. It is a rich source of N (1.6%), P (0.54%), K (0.80%), Ca, Mg, S, Z, Fe, vitamins and other growth hormone. In contrary to synthetic fertilizers, vermicompost reduce soil toxicity by buffering action prevents soil degradation and enhances soil fertility status.

MATERIALS AND METHODS

A field experiment was carried out during 2015-16 at crop research farm of N.P.G College, Barahalaganj, Gorakhpur. Experimental soil was silty loam having 245.80 kg/ha N, 0.20% Organic Carbon with 8.5 soil pH. Mohyco Bold plus was grow in Rabi season which was supplied with four dose of vermicompost viz. 0, 2, 4 & 6 t/ha and three levels of fertilizers viz; 50% RDF, 75% RDF and 100% RDF. Recommended fertilizer level was 120kg N + 40kg P + 40 kg K/ha. After Rice harvest field was prepared and sown of mustard variety Mohyco Bold Plus was done on 18.11.2015 using 5kg seed/ha by bullock drawn seed drill. As per treatment fertilizers and vermicompost dose was applied in mustard. Mustard crop was harvested on 15.03.2016. residual effect of organic and fertilizers applied in mustard was evaluated on growth, yield and economics insucceeding mustard crop. The present study was therefore, carried out compare vermicompost and fertility levels and to find out suitable dose of organic and inorganic fertilizers

dose on growth, yield and economic aspects of mustard in eastern Uttar Pradesh

RESULTS AND DISCUSSION

Growth attributes of mustard:

Plant height at harvest increased significantly at 2, 4 and 6t/ha applied vermicompost over control, whereas 4 and 6t/ha were not show significant response over 2t/ha. Number of functional leaves significantly increased with increasing applied vermicompost upto 6t/ha over control. However, the maximum functional leaves was also observed at 6t/ha vermicompost (54.42) and minimum functional leave at control of vermicompost (46.80) compared to other combinations in the year of study. The number of primary bunches was increase significantly at 2 and 4 t/ha vermicompost over control but at par response between 4 and 6 t/ha vermicompost doses. The maximum number of primary bunches of mustard was recorded at 6t/ha applied vermicompost. The number of secondary branches of mustard was significantly increased at 4 and 6t/ha applied vermicompost over control treatment, respectively whereas, significantly response only applied 6 t/ha vermicompost doses over 2 t/ha vermicompost treatment and equal response at between at 4 and 6 t/ha and at 2 and 4 t/ha applied vermicompost doses to each others. The vermicompost at increasing rates exerted a positive effect on production of dry matter accumulation/ plant upto 6t/ha dose in the present trial and 2, 4 and 6t/ha applied vermicompost dose with percentage increments of 12.07% , 17.91% and 21.91% over control in the year of study, respectively. There effects may be explained that vermicompost increased the availability of plant

nutrients in general and higher dose (4 and 6 t/ha) in particular which improve the growth characters of mustard plants in all ways. Superiority of vermicompost in mustard crop has also rich in N content and contains C:N ratio much lower dose that central. The results corroborate the findings of Patel and Shelke (2000).

The plant height was significantly increased at 75% RDF and 100% RDF over control fertility levels whereas, mustard crop almost equal height of plant at 75% and 100% RDF were noted. It was maximum of 208.76cm at 100%RDF in the present experimentation. The fertility levels produced marked variation on functional leaves when it increased significantly upto 100% RDF over control and 75% RDF treatments, respectively. Primary branches/ plant was significantly increased with increased levels of fertility upto 100% RDF over 50 and 75%. RDF treatment whereas, secondary branches/plant was significant influence of fertility levels observed at 75%RDF over 50%RDF and at par response of 75% and 100%RDF to each other. Dry matter production was significantly higher produce upto 75% RDF treatment over 50%RDF fertility levels. The maximum dry matter production of 66.19g was weight at 100% RDF treatment. Mustard is a heavy feeder oil seed crop of plant nutrient require higher amount of nutrients which were available more at 100% RDF, thus crop responded well to higher dose of fertilizer application. In case of growth attributes of mustard with increasing fertilizer dose upto 100% RDF has also been reported by Gujar and Chauhan (1997).

Yield attributes of mustard:

The application of vermicompost at 6 t/ha was significant produce more number of siliqua/plot (370.57) over control and dose of 2 and 4 t/ha vermicompost, respectively but 2t/ha vermicompost treatment did not show any significant influence over control treatment. The length of siliqua/plot was significantly increased upto 6 t/ha applied vermicompost than control, 2 t/ha and 4 t/ha vermicompost treatment, respectively. The percentage increments of 6 t/ha dose over no vermicompost, 2 t/ha and 4 t/ha vermicompost were 28.85, 17.54 and 10.87 in the present experimentation. The number of seeds siliqua were increased significantly with increased levels of vermicompost upto highest dose of 6 t/ha, it enhanced number of seeds/ siliqua in used of vermicompost at 2, 4 and 6 t/ha doses over no vermicompost treatment, respectively. The test weight of mustard were significantly increased with increased levels of vermicompost upto 6 t/ha. The increments of 5.65%, 11.52% and 19.34% in the used of 2, 4 and 6 t/ha over control, respectively. The application of vermicompost may improve the physical environment of soil which allowed the plant root for more elongation and development in general and height dose in particular treatment such higher root length, root density and root volume has been responsible for finally more uptake of plant nutrients from the soil which caused significant improvement in yield attributes of mustard. There results are in dose conformity to those of Dhaka and Satish (2003) and Thanki *et al.* (2004).

The number of siliqua/plant was significantly increased at 75% and 100% RDF over

50% RDF. Maximum siliqua/plant were recorded (363.75) at 100% RDF. The difference between 75 and 100% RDF fertility levels was not significant in present study. The length of siliqua increased significantly at 75% RDF over 50% RDF. Length of siliqua increased by 0.26 cm (6.68%) and 0.35 cm (8.99%) at 75% and 100% RDF over 50% RDF, respectively. The number of seeds/siliqua were increased significantly at 75% and 100% RDF over applied fertility level of 50% RDF. Maximum seeds/siliqua were recorded (14.52) at 100% RDF treatment. Due to influence of fertility levels on 1000 seeds weight was increased significantly at 75% RDF over used 50% RDF, beyond this dose the numerical increased was observed. The difference between 75 and 100% RDF fertility levels was equal in this study. Almost yield attributes of mustard under study were maximum at 100% RDF clearly followed by 75% RDF and reduced with 50% RDF dose. Mustard is a heavy feeder oil seed crop which were available more at 100% RDF. So, crop responded well due to reasons higher dose of fertilizer applications. The result in respect of yield attributes of mustard is the conformity with the findings of Gujar and Chauhan (1997).

Yields of mustard and its economics:

The seed and stover yield of mustard were significantly increased with increased levels of vermicompost up to 4 t/ha in seed yield and 6 t/ha in stover yield and numerically improve upto 6 t/ha in seed yield only. Application of 2, 4 and 6 t/ha vermicompost increased the seed and stover yield to the tune of 1.81/q (13.66%) & 4.17 q (10.11%), 3.33q (25.13%) & 8.87 q (24.27%) & 4.20 q (31.69%) & 12.21 q (37.01%) per hectore over

control, respectively. In general vermicompost affected the harvest index of the crop but it was statistically similar at each levels of vermicompost. The vermicompost at increasing rates expeted a significantly effect on grass income. The maximum gross income (Rs 41824/ha) was obtained at 6t/ha vermicompost and minimum gross income (Rs. 31956/ha) at control treatment. The vermicompost at increasing rates exerted a positive effect on net income which significant response was noted only upto 2 t/ha used fertility level but clearly reduced net returns (Rs. 1754q/ha) with 6t/ha applied vermicompost due to regions, cost of cultivation is higher. The maximum net income was recorded with 4 t/ha vermicompost in the present investigation. Better performance of vermicompost might be due to the reason it is rich in nitrogen and C:N ratio much lower than control which resulting heavy branching. There results may be supported by Satya jeet and Nanwal (2007) and Ramesh *et. al.* (2009).

The seed yield of mustard was significantly higher obtained with 75% RDF over 50% RDF applied fertility levels but beyond used fertility level of 100% RDF it was at par to 75% RDF. The stover yield of mustard was significantly increased with increased levels of fertility upto 100% RDF it gave more stover yield by a margin of 6.12 q/ha (17.15%) and 2.12 q/ha (5.34%) than 50% and 75% RDF fertility levels, respectively such higher yield may be supported well by improvement in growth and yield parameters. These effects may be supported by the findings of Singh *et. al* 2009. The fertility levels have no significant effect on harvest index. The increasing rate of fertility levels exerted positive effect on gross and net income only upto 75% RDF which was

significantly more than lower doses of fertilizer (50% RDF) in the present field trial. The difference between 75 and 100% RDF treatments were not significant in both observations.

Rabi season of 2015-16 for obtaining maximum profit in mustard crop (Mayco Bold Plus) may be fertilized @2t/ha vermicompost alongwith 75% recommended dose of fertilizer.

Conclusion:

On the basis of experimentation conducted on silty loam soil of eastern Uttar Pradesh during

Table-1: Effect of vermicompost and fertility levels on growth attributes of mustard crop.

Treatments	Plant height (cm)	Functional leaves	Primary branches/plot	Secondary branches/plot	Dry matter production/plot (g)
Vermicompost					
Control	196.86	46.80	6.50	14.84	54.00
2 t/ha	203.97	48.58	7.32	15.39	60.52
4 t/ha	206.75	50.79	8.12	16.16	63.67
6 t/ha	209.53	54.42	8.43	18.09	65.83
S.E. (d)	3.15	0.74	0.30	0.51	1.15
C.D. at 5%	6.40	1.52	0.61	1.04	2.34
Fertility levels					
50% RDF	190.62	46.61	6.29	15.03	54.57
75% RDF	208.62	50.99	7.87	16.38	62.25
100% RDF	208.76	52.84	8.61	16.94	66.19
S.E. (d)	2.72	0.64	0.26	0.44	0.99
C.D. at 5%	5.54	1.31	0.53	0.89	2.02

Table-2: Effect of vermicompost and fertility levels on yield attributes of mustard crop.

Treatment	Silqua/plant	Length of silqua	Seed/ silqua	Test weight (g)
Vermicompost				
control	331.82	3.64	12.19	4.60
2t/ha	340.29	3.99	13.35	4.86
4t/ha	354.90	4.23	14.15	5.13
6t/ha	370.57	4.69	15.05	5.49
S.E. (d.)	7.38	0.15	0.25	0.13
C.D. at 5%	15.02	0.33	0.50	0.27
Fertility levels				
50% RDF	331.31	3.89	12.55	4.74
75% RDF	354.62	4.15	13.99	5.10
100% RDF	363.75	4.24	14.52	5.22
S.E (d.)	5.39	0.09	0.21	0.11
C.D at 5%	12.03	0.24	0.43	0.23

Table-3: Effect of vermicompost and fertility levels on yield and economics of mustard crop.

Treatment	Seed yield(q/ha)	Stover yield (q/ha)	Harvest index (%)	Gross income (Rs./ha)	Net return (Rs./ha)
Vermicompost					
control	13.25	32.99	28.67	31956.00	16591.00
2t/ha	15.06	36.55	29.19	36312.00	18037.00
4t/ha	16.58	41.25	28.65	39952.00	18677.00
6t/ha	17.45	45.42	27.94	41824.00	17549.00
S.E (d.)	0.44	0.93	0.32	593.91	428.68
C.D at 5%	0.90	1.90	0.65	1208.31	872.17
Fertility levels					
50%	14.34	35.68	28.71	34896.00	15697.00
75%	15.91	39.68	28.63	38376.00	18601.00
100%	16.51	41.80	28.49	39196.00	18835.00
S.E(d)	0.38	0.81	0.27	514.34	371.25
C.D at 5%	0.78	1.65	N.S	1146.43	755.31

References:

Anonymous (2017). Ministry of Agriculture, Govt. of India, Internet.

Dhaka AK and Kumar Satish (2003). Response of fertility levels and organic sources on late planted raya. *Annals of biology*, 19(2): 129-133.

Gurjar B S and Chauhan D V S (1997). Yield attributes and seed yield of Indian mustard as influenced by fertility levels and spacing. *Indian Journal of Agronomy*, 42(1): 143-144.

Patel J R and Shelke VB (2000). Effect of organic and inorganic fertilizers on yield of mustard. *Journal of Maharashtra Agricultural Universities*, 25(1): 70-71.

Ramesh P, Panwar NR, Singh AB and Ramana S (2009). Effect of organic nutrient management practices on the production potential, nutrient uptake, soil quality, input use efficiency and economics of mustard (*Brassica juncea*). *Indian Journal of Agronomy*, 79(1): 40-44.

Satyajeet and Nanwal RK (2007). Productivity and quality of Indian mustard (*Brassica juncea*) as influenced by integrated nutrient management treatments in semi arid environment. *Environment and Ecology*, 25(4): 956-958.

Singh PK, Immuksungba, Kanaujia SP (2009). Effect of integrated nutrient management on growth yield, its attributes and nutrient uptake of mustard crop in acidic soils of Nagland. *Environment and Ecology*. 27(3): 1036-1039.

Thanki JD, Patel AM and Patel AK (2004). Effect of nitrogen, phosphorus and farm yard manure on growth, yield, quality and nutrient uptake of Indian mustard (*Brassica juncea*). *Journal of Oilseeds Research*, 21(2): 296-298.