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Organic source based nutrient management practices on growth and yield of Indian mustard

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ABSTRACT

The field experiment was conducted during the Rabi season of 2020-21 at student instructional farm (SIF), A. N. D. University of Agriculture & Technology, Kumarganj, Ayodhya (U.P.), to see the effect of different organic manure on growth, yield attributes and yield of Indian mustard. The experiment was laid out in randomized block design, comprised of thre replications and eight treatments. A significantly (P<0.05) higher crop growth viz., plant height and number of branches were noted with 50 % FYM + 50 % VC + natural liquid manure, Jeevamrit. Different yield attributes (number of silique/plant, number of seed /silique and 1000- grain weight and yield parameters viz., seed yield (17.95 qha^{-1}), stover yield (47.92 qha^{-1}), harvest index (27.2%) and grain: straw ratio (37.5) of Indian mustard grown under 50 % FYM+ 50 % VC + natural liquid manure, Jeevamrit (P<0.05) were significantly higher.

Keywords: Jeevamrit, natural liquid manure, organic manure, seed yield

INTRODUCTION

Mustard is important oil seed crop in India and plays a significant role in the daily diet after groundnut and accounts for 27.8% of the country's oilseed industry (Beenish *et al.* 2018). It occupied 6.67 Mha of acreage, production 7.12 Mt and productivity 1150 kgha^{-1} (Economic survey, 2019). Despite these successes, the production potential and actual demand is still unmatched and the yield of mustard in India is comparatively lower than other mustard producing countries. There are various roadblocks in enhancing the productivity of mustard such as, the changeable climate, incompetent irrigation water and fertilizer management and poor physical conditions of soil. The main threat to Indian agriculture is the deterioration of soil health, which is made worse by the excessive use of fertilizers in agricultural fields with less responsive soils having little organic matter content (Gora *et al.* 2022). The improper application of chemical fertilizers and pesticides not only reduce soil fertility but also harms the consumers' health (Mandal, 2009). Organic farming is an environment friendly farming system that can maintain soil fertility and productivity. Organic manures, including animal waste (poultry manure, sheep manure etc.), residues of field crops, green manures and composts, generally improve soil physical and biological properties while improving soil moisture holding capacity, resulting in increased crop productivity (Murali *et al.* 2018). Recycling of bio-waste resources in the form of compost can be a means of meeting the demands for organic manures while also helping to clean up environmental pollution (Kumar, 2005). Keeping this in view, the present study was undertaken in order to assess the effect of different organic manures on various growth and yield parameters of Indian mustard.

MATERIALS AND METHODS

The field experiment was conducted during *Rabi* season of 2020–2021 at the students instructional farm of the A. N. D. University of Agriculture & Technology in Kumarganj, Ayodhya (U.P.). The soil of the experimental site was silty loam, low in organic carbon (0.40%) and available N (187 kgha^{-1}), medium in available P (20.4 kgha^{-1}) and K (218.0 kgha^{-1}), and low in available S (8.78 kgha^{-1}). The experiment was conducted in randomized block design (RBD) with 3 replications, comprised of 8 treatments, viz. Control (T1); 100% VC (T2); 100% FYM (T3); 100% PM (T4); 50% FYM + 50 % VC + natural liquid manure (Jeevamrit) (T5); 50% FYM + 50% PM + natural liquid manure

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(Jeevamrit) (T6); 50% FYM+ 25%VC + 25% PM (T7) and 25% FYM + 50%VC+ 25%PM (T8). Three different types of organic manures viz. farm yard manure (FYM), poultry manure (PM), and vermicompost (VC) along with natural liquid manure, Jeevamrit were used in the study as per the treatment. The crop field without any manure treatment was taken as control. The Varuna variety of mustard seeds with 6 kg ha^{-1} was sown manually. The soil of the plots was treated with different organic manures before sowing of seeds. Prior to sowing in the plots, the seeds were treated with Beejamrit by soaking them in prepared Beejamrit solution overnight, followed by drying on polythene sheets under shade. Two irrigations (5 cm each) were applied during crop season at rosette stage (25 DAS) and at siliqua formation stage (55 DAS) of the crop. The crop was treated with Jeevamrit twice, half as basal and remaining half was applied as top-dressing.

RESULTS AND DISCUSSION

Growth and development

The observations for the plant height in response to the organic manure-based treatments are presented in Table 1. The highest plant height (25.6 cm at 30 DAS, 101.3 cm at 60 DAS, 183.1 cm at 90 DAS, and 189.6 cm at harvest) was observed in the plots treated with (50% FYM + 50% VC + natural liquid manure) T5, which was at par with T6 (50% FYM + 50% PM + natural liquid manure) and significantly higher over rest of the treatments. The untreated plot (control) exhibited shorter plant height from 30 DAS (15.35 cm) up to the maturity of crop (118.7 cm). It is pertinent that treatments T5 recorded higher plant height due to application of Jeevamrit as it solubilizes the fixed soil nutrients in available form (Nitin and Purohit, 2020). The number of primary, secondary, and tertiary branches per plants is presented in Table 1. The minimum (5.1) number of primary, secondary and tertiary branches/plants were noted under T1 while maximum number of primary, secondary and tertiary branches/plants were recorded under plants grown in plots treated with (50% FYM + 50% VC + natural liquid manure) T5. The number of primary branches compared to other, may be increased due to application of vermicompost along with Jeevamrit. The combination might be helpful for uptake of nutrients in the early stage of growth in comparison to other manures. The above results are in accordance to those already reported by Kashved *et al.* (2010), Tripathi *et al.* (2010), Rundala *et al.* (2013), Kumawat *et al.* (2014).

Table 1: Effect of integrated nutrient management practices on growth and development of Indian mustard

Treatments	Plant height (cm)			Harvest	Number of branches		
	30 DAS	60 DAS	90 DAS		Primary	Secondary	Tertiary
T_1	15.3	60.6	109.7	118.7	5.1	11.3	14.1
T_2	22.9	90.4	163.5	169.4	7.3	16.2	20.2
T_3	21.2	83.9	151.7	157.2	6.8	15.0	18.7
T_4	20.0	79.2	143.2	148.3	6.4	14.2	17.7
T_5	25.6	101.3	183.1	189.6	8.2	18.1	22.6
T_6	24.1	95.2	172.1	178.3	7.7	17.1	21.3
T_7	18.2	71.9	130.0	134.6	5.8	12.9	16.0
T_8	17.0	67.3	121.7	126.1	5.5	12.1	15.1
SEm±	1.10	2.10	2.47	3.71	0.44	0.82	1.02
LSD(P≤0.05)	3.31	6.38	7.52	11.27	1.33	2.48	3.09

Yield parameters and yield of Indian mustard

The data presented under Table 2 suggest that every organic manures based treatment to the soil increased the yield contributing traits, viz.,the highest number of siliquae plants^{-1} (297), number of siliqua production (289 siliqua plant^{-1}), were observed in the plants cultivated in T5 (50% FYM + 50% VC + natural liquid manure) treated soil. The maximum number of seeds/siliqua (12.6) was also found in treatment T5 (50% FYM + 50% VC + natural liquid manures), which was at par with T6 and T2 treatments. It might be due to higher fertility level of the treated plots. Significantly maximum test weight (4.19 g) was

recorded in T5 treated plots followed closely by T6 (4.05 g) while the minimum (3.15 g) was recorded in T1 (untreated plots). These data are in agreement with previous reports published by Kasved *et al.* (2010) and Tripathi *et al.* (2010).

Table 2: Effect of integrated nutrient management practices on yield parameter and yield of Indian mustard

Treatments	Number of silique/plant	Number of seeds/slique	1000-grain weight (g)	Seed yield (qha^{-1})	Stover yield (q/ha)	Harvest index (%)
T_1	190	8.6	3.15	13.55	37.95	26.3
T_2	265	11.3	3.80	16.28	46.45	26.0
T_3	246	10.5	3.56	15.40	42.96	26.4
T_4	232	10.0	3.50	15.10	42.21	26.3
T_5	297	12.6	4.19	17.95	47.92	27.2
T_6	289	12.2	4.05	17.35	46.86	27.0
T_7	216	9.2	3.45	14.97	41.99	26.3
T_8	206	9.0	3.52	15.15	42.24	26.4
SEm±	8.2	0.30	0.11	0.67	1.43	0.06
LSD (P≤0.05)	24.8	0.80	0.34	2.04	4.33	0.19

Data pertaining to yield attributing characters and yield of Indian mustard has been given in Table 2. The results revealed that significantly highest seed yield (17.95 qha^{-1}), stover yield (47.92 qha^{-1}), harvest index (27.2 %) and seed:stover ratio with 37.5 value (Fig.1) were recorded with T5 (50% FYM + 50% VC + natural liquid manures), which was at par with T6 (50% FYM + 50% PM + natural liquid manure) and significantly higher while minimum was recorded under control. The yield increased because of increased plant height, number of branches, number of silique/plants, number of seed/siliques, 1000-grain weight in same treatments. Similar findings had been reported by Abraham *et al.* (2008) and Maheshbabu *et al.* (2008).

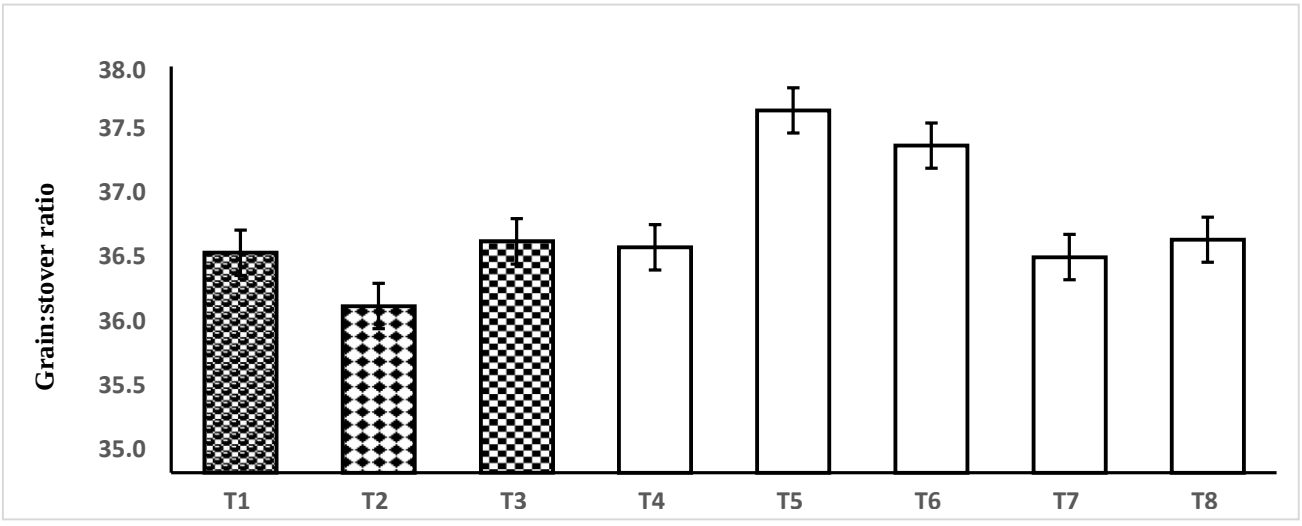

Fig1.Effect of organic source based nutrient management options on seed:stover ratio of Indian mustard.

It is concluded that the treatment T5 (50% FYM + 50% VC + natural liquid manure) was superior among the organic manure-based combinations for growth and yield of Indian mustard. This combination may further be recommended for better nutrient management in Indian mustard under organic nutrient-based management practices for higher productivity and profitability.

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