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Maximizing Mustard Crop Yield: Unveiling the Impact of Organic and Inorganic Fertilizers on *Brassica juncea* L. var. M-27

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A field experiment was carried out during the rabi season 2021- 2022 at Himalayan University, Itanagar, Arunchal Pradesh to assess the effect of organic and inorganic fertilizers on the yield of Mustard var.M-27. Yield attributing characters like fresh weight of silique, dry weight, number of silique per plot, length of silique per plant, and seed yield of mustard were found maximum in the application of vermicompost (T_2) with a dose of 100% vermicompost. From the results of the present study, it can be concluded that the application of vermicompost could be the best source of mustard as compared to other sources for enhancing the yield of mustard.

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Keywords: Vermicompost; inorganic fertilizers; mustard plants' intensive cropping.

1. INTRODUCTION

Mustard (*Brassica juncea* L.) is a herbaceous annual plant in the family Brassicaceae, with chromosome no.18 grown for their seeds which are as a spice. The yellow/ white mustard is indigenous to Southern Europe, whereas brown mustard is from China and was introduced to Northern India. Mustard plants are thin herbaceous herbs with yellow flowers. The leaves of the plant are toothed, and lobed, and occasionally have the largest terminal lobes. It contains antioxidants and other beneficial plant compounds to help protect our body against damage and disease. Mustard seeds contain 37-49% of oil and these oils are used as condemned in the preparation of pickles, curries, vegetables, hair oils, medicines, and the manufacture of glasses. The oil cake is used as a feed and manure. The leaves of young plants are used as green vegetables and stems and leaves are a good source of green fodder for cattle. In the tanning industry, mustard oil is used for softening leather.

Intensive cropping has made the soil deficient in macro as well as micronutrients. This has resulted in a decline in productivity and a deterioration in soil health and productivity. The success of any cropping system depends upon the appropriate management of resources including balanced use of manure and fertilizers. The use of organic manure may prove a viable option for sustaining the productivity [1]. Vermicompost application has been known to improve the physical, chemical, and biological properties of soil (Nagavallemma et al.2004). Although, there are numerous of research about the changes in soil properties after organic amendments (Chaney et al. 1992), there is not enough information about the main parameters to be monitored over time to assess the effect of vermicompost application on soil quality. India produced around 6.9mt of mustard next to China. In India, Uttar Pradesh is the second largest producer of mustard seed after Rajasthan. By 2050, India needs to produce 17.84mt of vegetable oils for its nutritional fat requirement of a projected 1685million population. Thus, enhancing productivity of oilseeds is imperative for self-reliance in India. In India, it is cultivated over an area of 307,000 hectares with annual production of 233,000 tonnes. India holds 11.3 % of the world's arable land and only 4% of the water resources to feed 16% of the human population and 18% of the animal population of the world. India's oilseed scenario recently presented a picture of virtual stagnation. Total Mustard Seed production reached 654,112 tonnes in 2019 in the world according to the Food and Agriculture Organisation Corporate Statistical Database (FAOSTAT).

2. MATERIALS AND METHODS

The field experiment was conducted in the field of Borum Village, Itanagar (Arunachal Pradesh) during the Rabi season of the year 2022.The total no.of plots was twenty-one .Individual plot sizes were 1m x 1m.Plot to plot distance were 15 cm.Row to row distance was 15 cm.Length and width of the plot were 8 m and 5m.The climatic condition of Borum is subtropical. The rainy season started in May, and it extended up to September and retreats from October onwards. The mean minimum and maximum temperature recorded during the cropping season was 12ºC and 22ºC, respectively. The average relative humidity in the morning hours was 19%-70% in the evening. The average sunshine hour was 8.3.

The organic and inorganic fertilizers were applied as 0%(control), 100% organic ,100% inorganic,75:25%, 65:35%, 50:50% and 25:75%, respectively in three replications. All the Vermicompost and NPK were incorporated into the soil during final land preparation. Five seeds were sown per hole at a depth of 3cm in the row, plant to plant distance was 15cm and row to row distance was 45cm. The seeds were covered with pulverized soil just after sowing and gently pressed with hand.

The number of siliques from 5 randomly selected plants was counted and their mean values were calculated. Green matured silique was harvested at a regular interval from each unit plot and their weight was recorded. As harvesting was done at different and the total silique was recorded in each unit plot and expressed in gram (g). Five randomly selected plants siliques were weighted and recorded (g).

Mustard variety M-27 was developed by Regional Research Station, Assam Agricultural University, Shillongani, Nagaon, Government of Assam. Seed size is 3.2 maturity period of M-27 is 90-95 days, oil content is 45%, special attribute in rain fed areas, plant height is 90-

100cm and its average yield is 1000-1200kg/ha. M-27 required cool and dry weather and a fair supply of soil moisture during the growing period and dry clear weather at the time of maturity. In India they are grown in Rabi season from September-October to February –March. Sandy and Loamy sand soils suitable for Mustard crops. A clean and well-pulverised seedbed of good tilt is needed for better germination. Soil having a neutral pH (7.0) is ideal for their proper growth and yield. It requires 15-20 tonnes/ hectare of FYM or Compost at the time of field preparation.

3. RESULTS AND DISCUSSION

3.1 Effect of Organic and Inorganic Fertilizers on Yield Attribute of Mustard Crop

Fresh weight of silique, Dry weight, Number of silique per plot, Length of silique per plant and seed yield of mustard differed significantly due to application of different organic and inorganic manures presented in Table 1. The maximum fresh weight of plant (2.31gm), Dry weight (1.60gm), Number of silique per plant ((22.33) , Length of silique per plant (3.30), seed yield (26.43g) were recorded from T_2 (100% organic), while the minimum of fresh weight of plant (0.63gm), Dry weight (0.25gm), Number of silique per plant (18.00), Length of silique per plant (3.00), seed yield (24.62g) were recorded from T_1 (control) respectively [2].

The data which was recorded at 30, 60, and 90 DAS gave us visible result as to help us determine which type of treatment produces the highest yield. Different treatment starting from T_1 to T_6 given in which T_2 proved to be treatment which gave the highest yield(26.43g) followed by T_3 (75% VC + 25% NPK) (25.27g) followed by T_4 (65% VC+35%NPK) (25.00g), T_5 (50% VC+ 50%NOK) (24.99g), T_6 (25% VC+75%NPK) (25.00g) and T_7 (100% inorganic) (24.67g). T_1 lowest yield (24.62g). In this, 100% vermicompost was applied on treatment T_2 which gave the highest yield of mustard seed because vermicompost increases the yield of the mustard crop because of high porosity, aeration, drainage, and water holding capacity (Edwards and Burrows 1988), presence of beneficial microflora (Tomati et al., 1987).

The positive influence of vermicompost was due to the adequate supply of nutrients in the root zone and plant system.The increased availability of nutrients in the root zone coupled with increased metabolic activity at cellular levels might have synthesized more nutrients and their accumulation in various plant parts.Thus crops supplied with higher doses of vermicompost had utilized more nutrients as compared to lower doses resulting in increased nitrogen, phosphorus, potassium, and sulphur content in seed and stover.The increased uptake of these nutrients seems to be because the uptake of nutrients is a product of biomass and nutrient content.These results are in agreement with those of Jat et al. [3].

The increasing levels of vermicompost significantly increased the yield of mustard.The combined application of vermicompost and nutrients improved the nutrient uptake mainly due to better growth and seed production.The balanced nutrition also enhanced the synergistic effect on the uptake of other plant nutrients [4].

The beneficial role of vermicompost in the mineralization of native as well as its nutrient content by creating favourable conditions for microbial as well as chemical activities which enhanced the available nutrient pool of the soil. All the available nutrients are not taken up by the

Table 1. Effect of organic and inorganic fertilizer on yield attributes in mustard

Treatments	Fresh weight of silique (g)	Dry weight of silique (g)	No. of Silique per plot	Length of silique per plot	Yield per plot (gm)
T_1	0.63	0.25	18.00	3.00	24.62
T_2	2.31	1.60	22.34	3.30	26.43
T_3	1.99	1.00	22.33	3.29	25.27
T_4	1.97	0.98	22.30	3.27	25.00
T_5	1.50	0.74	21.30	3.25	24.99
T_6	1.53	0.76	21.32	3.26	25.00
T_7	1.48	0.73	19.00	3.24	24.67
S.Ed±	**0.14**	**0.11**	**01.13**	**0.02**	**0.01**
CD at 5%	**0.31**	**0.25**	**0.85**	**0.05**	**0.16**

plant and the rest remains in the soil which improves the available nutrient status of the soil after the harvest of the crop.These results are in agreement with those of Sharma et al. [5].

4. CONCLUSION

From the foregoing discussion, it is clear that the application of T_2 which was 100% vermicompost had the maximum fresh weight, dry weight, number of silique per plot, length of silique per plant, and seed yield of mustard. This result was constant throughout the cropping season. The data was recorded at 30, 60, and 90 DAS. The highest result came in T_2 and the lowest in T_1. From the above result, it can be concluded that vermicompost is the best strategy for improving soil fertility for longer periods.Vermicompost will increase soil organic matter status, which acts as a reservoir for nutrients and hence, improves soil physicochemical attributes for yield and its attributes. The study also indicates that the application of vermicompost helps to increase crop productivity and improve soil fertility and soil quality. Present investigations will be useful to farmers, agronomists, pedologists, researchers, and environmentalists as they will provide information in maintaining long-term soil fertility, sustaining higher productivity of crops, and lessening the harm caused to the soil by the use of inorganic fertilizers.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Tejada M, Garcia AM, Martinez, Parrado J. Effect of a vermicompost composted with beet vinasse on soil properties, Soil Losses and Soil Restoration. Catena. 2009;99:238-247.
2. Pal PM. Effect of organic and inorganic fertilization on productivity and quality of Indian Mustard (*Brassica juncea*) in Indo-Gangetic plains of Uttar Pradesh, India. International Journal of Agriculture Science; 2019.
3. Jat G, Sharma KK, Jat NK. Effect of FYM and mineral nutrients on physiochemical properties of soil under mustard in western arid zone of India. Annals of Plant and Soil Research. 2012;14(2):167-170.
4. Sharma JK, Jat G, Meena RH, Purohit HS, Choudhary RS. Effect of vermicompost and nutrients application on soil properties, Yield, uptake and quality of Indian Mustard (*Brassica juncea*). Annals of Plant and Soil Research. 2017;19(1):17-22.
5. Sharma P, Majumdar SP, Sharma SR. Impact of vermicompost, potassium and iron on physic-chemical properties of typic ustipsamment. Environment and Ecology. 2013;31(4):1980-1983.

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