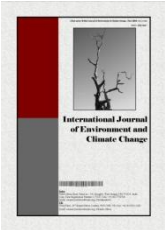

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Evaluation of Organic Manure and Bio-Fertilizer on Yield and Economics of Yellow Mustard (*Sinapis alba L.*)

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

A field experiment was conducted during *Rabi* 2021 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P). The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.1). The experiment was laid out in Randomized Block Design with nine treatments each replicated thrice on the basis of one year experimentation. It was consisting of combination of three level of bio-fertilizer VAM, Azotobacter, Azosprillium 10ml/kg seed each and used organic manure FYM 5.0t/h, Vermicompost and Neem cake 1.0t/h each. The results showed that application of Vermicompost 1.0 t/ha + *Azospirillum* 10ml/kg seed was recorded significantly higher siliquae/plant (159.32), seeds/siliquae (40.57), days to maturity (88.95), test weight (3.14 g), seed yield (1.71 t/ha) and oil content (42.38 %), gross returns (Rs.102800.00/ha), net return (Rs.72240.00/ha) and benefit cost ratio (2.36) as compared to other treatments.

Keywords: FYM; neem cake; vermicompost; VAM; Azospirillum, Azotobacter.

1. INTRODUCTION

"Yellow mustard (*Sinapis alba* (L.) Czern. and coss.) belongs to the family Cruciferae. India is one of the largest mustard growing countries in the world, occupying the first position in area and third in production after China and Canada. It is most important winter (Rabi) oil seed crop in northern India. Among the seven edible oilseed crop cultivated in India, rapeseed-mustard

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(Brassica spp.) contributed about 25% in the total production of oil seed crops. In India, mustard was cultivated over an area of about 6.23 million hectare with production and productivity of 9.34 million tonnes and 1499 kg/ha respectively" (India starts 2019-2020). "Oil seeds play an important role in Indian Agriculture and industries. Besides, immense value in our diet, oils and fats are used in cosmetics, soaps, lubricants, paints and varnish industries and their medicinal and therapeutic value. The requirement of vegetable oils and fats will be much higher in coming years in view of ever-increasing population" [1].

"Yellow mustard is predominantly cultivated in the states of Rajasthan, Uttar Pradesh, Haryana, Madhya Pradesh and Gujarat. Rajasthan ranks first in area and production of rapeseed and mustard with 2.50 million ha area and 3.71 million tonnes production. Mustard oil is used as condiment in pickles, flavouring curries and vegetables, preparation of hair oils, medicines, soap making and in the tanning industry for softening of leather. The mustard cake is used mostly for cattle feed and manure" [2].

Bio-fertilizers offer an economically attractive and ecologically sound means of reducing external inputs and improving quality and yield of crop. they contain microorganisms which are capable of "mobilizing nutrient elements from unavailable form to available form through different biological processes" [3]. **"**Azotobacter inoculants when applied to many non-leguminous crop plants, promote seed germination and initial vigour of plants by producing growth promoting substance" [4].

"Despite many fold advantages of organic farming and organic foods, organic inputs do not respond immediately particularly in the soil with wide C: N ratio. It entails the use of compost, FYM, vermicompost, crop residues, green manures, green leaf manuring in crop rotation and biofertilizers to enrich the soil organic carbon, supply all essentially required plant nutrients and improve soil properties. Nutrient management through organics plays a major role in maintaining soil health due to build-up of soil organic matter, beneficial microbes and enzymes. Long-term addition of organic materials to soil results an increase in organic matter, crop productivity and soil biological activity" [5].

1.1 Objective

To study the effect of organic manure and biofertilizer on growth, yield and quality of yellow mustard.

To evaluate the economics of treatment combination.

2. MATERIALS AND METHODS

The present examination was carried out during *Rabi* 2021 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj, UP, which is located at 25.28^{o}N latitude, 81.54^{o}E longitude and 98 m altitude above the mean sea level. The experiment laid out in Randomized Block Design consisting with three replications and nine treatment, three level of biofertilizer VAM (342 spores /50 g of soil) was observerd in the rhizosphere of mustard, Gigaspora, Glomus, sclerocystis and acaulospora four genera of VAM are present there, Azotobactor and Azosprillum was applied 10ml/kg seed each.The colony count of Azotobacter and Azosprillium 2.4 **×**10^{7} and 2.1 **×** 10^{8} cfu/ml.During the period from germination to harvest, many plant growth parameters were recorded and after harvest, many yield parameters were recorded. Test weight (g) and seed were recorded and statistical analysis was performed using ANOVA analysis applied to random block design.

3. RESULTS AND DISCUSSION

3.1 Yield

3.1.1 Number of Siliquae/ plants

Significantly maximum number of siliquae/plant (159.32) was recorded with the treatment of application of Vermicompost 1.0 t/ha + *Azospirillum* 10 ml/kg seed over all the treatments. However, the treatments Vermicompost 1.0 t/ha + *Azotobacter* 10ml/kg seed (158.44) and Neem cake 1.0 t/ha + *Azospirillum* 10 ml/kg seed (156.84) which were found to be statistically at par with Vermicompost 1.0 t/ha + *Azospirillum* 10 ml/kg seed.

3.1.2 Number of Seeds/Siliquae

Significantly maximum number of seeds/siliquae (40.57) was recorded with the treatment of application of Vermicompost 1.0 t/ha + *Azospirillum* 10 ml/kg seed over all the treatments. However, the treatments

Vermicompost 1.0 t/ha + *Azotobacter* 10 ml/kg seed (40.02) and Neem cake 1.0 t/ha + *Azospirillum* 10 ml/kg seed (39.17) which were found to be statistically at par with Vermicompost 1.0 t/ha + *Azospirillum* 10 ml/kg seed.

"The greater photosynthesis production of metabolites and enzymatic activities due to the vermicompost application might have influenced into increased and extensive root system and the greater production of metabolites and their translocation to various sinks especially the productive structures (Siliqua and seeds) could have helped to increase into the number of Siliqua per plant besides increasing the overall growth". The results were found to be similar with Bana et al. [6].

3.1.3 Test weight (g)

Significantly highest Test weight (3.14 g) was recorded with the treatment of application of Vermicompost 1.0 t/ha + *Azospirillum* 10ml/kg seed over all the treatments. However, the treatments Vermicompost 1.0 t/ha + *Azotobacter* 10ml/kg seed (3.05 g) and Neem cake 1.0 t/ha + *Azospirillum* 10ml/kg seed (2.94 g) were found to be statistically at par with Vermicompost 1.0 t/ha + *Azospirillum* 10ml/kg seed.

3.1.4 Seed yield (t/ha)

Significantly highest Seed yield (1.71 t/ha) was recorded with the treatment application of Vermicompost 1.0 t/ha + *Azospirillum* 10ml/kg seed over all the treatments. However, seed production (1.68 t / ha) is due to vermicompost 1.0 t / ha + Azotobacter 10 ml / kg. The above treatment was found to be statistically correct with 1,0 t / ha + Azopurilum 10 ml / kg seed.

"The increase in the yield has been reported to be associated with the release of macro and micro nutrients during the course of microbial decomposition. Organic matter also functions as source of energy for soil micro flora which brings about the transformation of other nutrients held in soil or applied through other means, in a form that is readily utilized by growing plants which helped in increase of seed yield" Bana et al. [6].

3.2 Economics

Economics viz. cost of application, gross return, net return and benefit cost ratio of yellow mustard under the level of organic manure (FYM, Vermicompost, Neem cake) and three level of bio-fertilizer (VAM, Azotobacter, Azosprillium). Returns were calculated from the market price of seeds 200.00 (Rs/ha) and the variable cost was calculating from the level of organic manure and bio-fertilizer [7].

Among the treatment t_4 (vermicompost 1.0t/ha + VAM 10 ml/g seed) with line sowing maximum total cost of cultivation (30660.00 INR/ha) whereas t_5 (vermicompost 1.0 t/ha + Azosprilium 10 ml/kg seed) were recorded higher gross return, net return (72240.00 INR/ha) and B:c ratio (2.36) with line sowing. The economic parameter due to level of organic manure and biofertilizer was changes due to seed yield of the crop with successive increase in organic manure and level of bio-fertilizer and also varies due to relative cost of input in relation to output [8].

The application of vermicompost 1.0t/ha + Azosprillium 1.0t/ha significantly increased the seed yield. Since the findings based on the research done in one season, the experiment may be repeated to confirm findings [9,10].

Table 1. Evaluation of organic manure and bio-fertilizer on yield attributes and yield of mustard

Treatments	Siliquae/ plant	Seeds/ siliquae	Test weight (g)	Seed yield (t/ha)
1. FYM 5.0 t/ha + VAM 10 ml/kg seed	150.62	34.25	2.40	1.13
2. FYM 5.0 t/ha + *Azospirillum* 10 ml/kg seed	153.74	36.43	2.60	1.34
3. FYM 5.0 t/ha + *Azotobacter* 10 ml/kg seed	151.74	35.00	2.44	1.20
4. Vermicompost 1.0 t/ha + VAM 10 ml/kg seed	154.64	37.44	2.68	1.42
5. Vermicompost 1.0 t/ha + *Azospirillum* 10 ml/kg seed	159.32	40.57	3.14	1.71
6. Vermicompost 1.0 t/ha + *Azotobacter* 10ml/kg seed	158.44	40.02	3.05	1.68
7. Neem cake 1.0 t/ha + VAM 10ml/kg seed	152.44	35.85	2.51	1.28
8. Neem cake 1.0 t/ha + *Azospirillum* 10 ml/kg seed	156.84	39.17	2.94	1.54
9. Neem cake 1.0 t/ha + *Azotobacter* 10 ml/kg seed	155.86	38.29	2.83	1.47
F test	**S**	**S**	**S**	**S**
S. EM (±)	0.95	0.57	0.08	0.07
CD (P = 0.05)	2.85	1.72	0.24	0.22

Table 2. Evaluation of organic manure and bio-fertilizer on economics of yellow mustard

Treatments	Cost of cultivation	Gross returns	Net returns	B:C Ratio
1. FYM 5.0 t/ha + VAM 10 ml/kg seed	30460.00	67800.00	37340.00	1.23
2. FYM 5.0 t/ha + *Azospirillum* 10ml/kg seed	30360.00	80600.00	50240.00	1.65
3. FYM 5.0 t/ha + *Azotobacter* 10ml/kg seed	30300.00	72200.00	41900.00	1.38
4. Vermicompost 1.0 t/ha + VAM 10ml/kg seed	30660.00	85200.00	54540.00	1.78
5. Vermicompost 1.0 t/ha + *Azospirillum* 10ml/kg seed	30560.00	102800.00	72240.00	2.36
6. Vermicompost 1.0 t/ha + *Azotobacter* 10ml/kg seed	30500.00	100600.00	70100.00	2.30
7. Neem cake 1.0 t/ha + VAM 10 ml/kg seed	30560.00	77000.00	46440.00	1.52
8. Neem cake 1.0 t/ha + *Azospirillum* 10 ml/kg seed	30460.00	92600.00	62140.00	2.04
9. Neem cake 1.0 t/ha + *Azotobacter* 10 ml/kg seed	30400.00	88200.00	57800.00	1.90

4. CONCLUSION

On the basis of one season experimentation, it can be concluded that with the application of vermicompost 1.0 + Azosprillium 10ml/kg was found significantly superior in Siliquae /plant (159.32), Seeds/Siliquae (40.57), Test weight (3.14 g), Seed yield (1.71 t/ha), ++and economically viable (2.36) so this treatment is viable for farmers.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Kumar A, Kumar A, Kumar P, Yogesh LK, Yadav, Rajesh Kumar. Effect of Organic Management Practices on Growth, Yield Attributes and Grain Yield in Mustard (*Brassica juncea* (L.) Czern. and Coss.). Int. J. Curr. Microbiol. App. Sci. 2018;7 (09):3585-3590.
2. Potdar DS, Purohit HS, Meena RH, Kaushik MK, Jain HK, Ameta KD. Effect of integrated phosphorus management on growth, yield and quality of mustard (*Brassica juncea* L.). Journal of Pharmacognosy and Phytochemist. 2019;8(4):1700-1704.
3. Hadiyal JG, Kachhadiya SP, Ichcchuda PK, Kalsaria RN. Response of Indian mustard (*Brassica juncea* L.) to different levels of organic manures and bio-fertilizers. Journal of Pharmacognosy and Phytochemistry. 2017;6(4):873-875.
4. Kalita N, Bhuyan S, Maibangs S, Saud RK. Effect of Biofertilizer seed treatment on Growth, yield and economics of toria (*Brassica campestris* L.) under rainfed condition in hill zone of Assam. Current Agriculture Research Journal. 2019;7(3) :332-336.
5. Collins HP, Rasmussen PE, Douglas CL. Crop rotation residue management effect of soil carbon and microbial biomass dynamics. Soil.Soc. Am. J. 1992;56:783-788.
6. Ban PR, Ransing SS, Jadhav GN. Effect of liquid biofertilizer on growth and yield of summer groundnut (*Arachis hypogea* L). International Journal of Chemical Studies. 2018;6(5):1061-1064.
7. Aglawe BN, Waghmare YM, Ajinath B. Effect of biofertilizer on growth, yield and economics of sesame (*Sesamum indicum* L.). The Pharma Innovation Journal. 2021;10(10):437-439.
8. Dutta S, Singh MS. Effect of Azotobacter on yield and oil content of rapeseed mustard varieties under Manipur condition. Indian Journal of Hill Farming. 2002; 15(2):44-46.
9. Fazily T, Hanshul CS. Effect of Organic Manures on Yield and Economics of Late Sown Wheat (*Triticum aestivum*). International Journal of Research & Review. 2019;6(1):168-171.
10. Gudadhe NN, Pankar PS, Khawale VS, Dongarkar KP. Effect of Bio

fertilizers on growth and yield of mustard (*Brassica juncea* L.). Journal of Soils and Crops. 2005;15(1):160-162.

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