

Original Research Article

Response of organic manures and rice residues on Yield attributes of Taramira (*Eruca sativa* Mill.)

ABSTRACT

The trial carried for the two repeated years, start from *rabi* seasons of the years 2021-22 at research farm, department of soil science and agricultural chemistry, [NAI], SHUATS, Prayagraj. The excavated soil sample from experimental site before conducting research operation, mentioned that, the land topography range was nearly levelled with 1-3% slope, among nine treatments, during field experimentation, the conjunctive use of NPK and different organic manures (FYM, vermicompost and jeevamrutha) levels, together come with best results significantly. However, the growth factors including pre-harvest parameters *i.e.* height of plant 122.2 cm, and number of siliquae plant⁻¹ 78.5 opined significantly highest in treatment T₆ registering [NPK @ 100 % + VC @ 100 % + @ R @ 100 % + Zn @ 100 %], which in turn influenced in achieving highest mean of number of seed siliquae⁻¹ 5.61, oil content 36.96 % and weight of 100 grains 3.5 g, which eventually gave the highest increasing mean of grain yield 1.65 t ha⁻¹, straw yield 3.18 t ha⁻¹, biological yield 4.83 t ha⁻¹, harvest index 34.18 %, net returns of 88,133.00 and 88,638.00.50 Rs ha⁻¹, wider C:B ratio 1:1.46 and 1:1.47 as compared to rest of treatments.

Key word: FYM; vermicompost, jeevamrutha, growth, yield parameters, *etc.*

Introduction

Taramira (*Eruca sativa* Mill.) is an important winter season oilseed crop of the family Brassicaceae. Taramira has desirable traits particularly resistance to powdery mildew that can be transferred to *Brassica campestris* and *Brassica juncea* both of which are important crops.

It does not require much preparatory tillage due to efficient and fast penetrating root system permitting extrusion of soil water from deep soil layers. It is a hardy crop that can be successfully grown in dry land areas and poor sandy soils with conserved moisture during the years of severe drought coupled with late Rabi rains, it is the only alternative available for sowing on soils having limited moisture supply. The oil content in taramira ranges from 31.6 - 41.31%, which is affected by manuring, irrigation and disease status. Taramira oil is mainly used in adulteration of mustard oil to increase pungency. The cake of taramira is used as manures for improving the soil physical condition and soil fertility and it can also be used nutritional feed for animals (Yadav *et al.* 2017). Organic manure is the sustainable option as it increases water-holding capacity of soil; improves soil texture and structure. Organic manure contains a very high population of bacteria, actinomycetes and fungi so that microbiological activity get increased that resulted into increased mineralization of organic nitrogen and thus nutrients become available to the plants. Among several functions, Nitrogen is the most important nutrient, which determines the growth of the mustard crop and increases the amount of protein and yield. Phosphorus and potash are known to be efficiently utilized in the presence of nitrogen. It promotes flowering, setting of siliquae and increase the size of siliqua and yield (Singh and Meena 2004).

Comment [MS1]: Need more information for soil and organic matter condition

Methodology

The field experiment which was carried out at the research farm of soil science and agricultural chemistry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during *inrabi* season 2021-22. The maximum temperature of the location ranges between 46°C-48°C and seldom falls below 4°C-5°C. The relative humidity ranges between 20-94%. The average rainfall of this area is around 1100mm annually. The experiment was laid out in Randomized Block Design (RBD) with 9 treatments. The treatments have been replicated three times. The different treatments were employed randomly in each replication. The details of the treatment combinations are given below table.1 and observation were recorded plantheight, numberofbranches plant⁻¹, number of siliqua plant⁻¹,siliqualength, numberofgrains siliqua⁻¹,100seedweight, oil content, grainyield, strawyield, biologicalyield, harvestindex.

Results and discussions

The combined response of organic manures, macro nutrients and zinc with different levels on plant height of taramira at different growth intervals was observed at 30, 60 and 90 DAS, during the experimental year 2021-22 and 2022-23.

Plant height (cm)

The maximum plant height was recorded as 31.1 cm, 60.7 cm and 103.9 cm in T₆ at 30 DAS, 60 DAS and 90 DAS respectively and the minimum plant height was recorded as 21.5 cm, 46.10 cm and 76.5 cm in T₁ (control) at 30 DAS, 60 DAS and 90 DAS respectively. Increase in plant height is due to increase in FYM, vermicompost, jeevamrit and inorganic fertilizers (Yadav *et al.*, 2013 and Noor *et al.*, 2020).

Number of branches plant⁻¹

Maximum number of branches plant⁻¹ were found significantly in treatment T₆ was 2.47, 6.69 and 11.60 respectively. While the minimum values of the result were found in treatment T₁ (control) 1.83, 5.10 and 8.80 respectively.

Comment [MS2]: The author need to discuss for results

Number of siliquae plant⁻¹

The number of siliquae-1 was found significantly higher in T₆ in both the years of trails *i.e.*, 78.5 and 82.2 in 2021 and 2022 respectively. The lowest number of siliquae plant⁻¹ was found in T₁ *i.e.*, 68.8. It was also observed that the number of siliquae plant-1 of soil was gradually increased with increasing the doses of NPK, zinc, vermicompost, and rice residue.

Comment [MS3]: The author need to discuss for results

Length of Siliqua (cm)

The length of taramira detailed results was shown in table 3. as influenced by T₆ in both the years of trails *i.e.*, 2.0 and 2.0 cm in 2021 and 2022 respectively while minimum length was found in T₁ *i.e.*, 0.9 cm.

Comment [MS4]: The author need more discussion

Number of seeds per siliqua

The number of seeds per siliqua was found significantly higher in in both the years of trails *i.e.*, 1.3 and 1.40 in 2021 and 2022 respectively while minimum number of seeds per siliqua was found in *i.e.*, 0.70 and 0.70 in 2021 and 2022 respectively.

Comment [MS5]: Need concrete discussion

Test Weight (g)

The treatment T₆ in both the years of trials *i.e.*, 3.5 g in 2 both 2021 and 2022, while minimum test weight was found in T₁*i.e.*, 2.8 and 2.9 in 2021 and 2022 respectively. It was also observed that the test weight(g) of soil was gradually increased with increasing the doses of NPK, zinc, vermicompost, and rice residue due to increase in supply of nutrients to the crop.

Grain yield (tha⁻¹)

Among different treatments, an appraisal of data shows significantly supreme grain yield of 1.65 and 1.67 t ha⁻¹ in treatment T₆*i.e.*, in comparison over control T₁*i.e.*, 0.47 and 0.60 t ha⁻¹.

Oil content (%)

The data shows that maximum oil content of taramira was recorded with the treatment T₆*i.e.*, 36.96 and 36.26 % in 2021 and 2022 respectively while minimum oil content was recorder in T₁*i.e.*, 30.77 and 30.78 %.

Stover yield (t ha⁻¹)

The maximum stover yield of taramira was recorded with the treatment T₆*i.e.* with 3.18 and 3.27 t ha⁻¹ while minimum stover yield was recorded in *i.e.*, 1.77 and 1.94 tha⁻¹) in 2021 and 2022 respectively.

Biological yield (t ha⁻¹)

The treatment T₆*i.e.* found significant in achieving higher biological yield of 4.83 and 4.94 ha⁻¹, in comparison with treatment T₁*i.e.* 2.20 and 2.54 t ha⁻¹. Improved physical and chemical properties of the soil through the application of different levels of plant nutrients might be the other possible reason for getting higher yield and higher productivity, successively.

Dry Matter Accumulation

The maximum dry matter accumulation of taramira was recorded with the treatment T₆*i.e.*, 2 and 176.8 g m⁻¹ while minimum dry matter accumulation of Taramira was recorded in T₁*i.e.*, 142.0 and 143.6 g m⁻¹ in 2021 and 2022 respectively.

Harvest index (%)

Comment [MS6]: Need more discussion

The result of data depicted showed that harvest index was found maximum in T_6 i.e., as 34.18 % during 2021 and 33.83 % during 2022 while the minimum values of the result were found T_1 which was 21.02 % during 2021 and 23.21 % during 2022, respectively.

Comment [MS7]: Discussion

Benefit Cost Ratio

The maximum cost to benefit ratio was achieved in treatment T_6 i.e., 01:01.5 and 01:01.5 during 2022 and 2023, respectively. The minimal cost to benefit ratio was obtained in control treatment T_1 i.e., 01:1.20 and 01:1.21 during 2022 and 2023 respectively (Yadav *et al.*, 2013 and Noor *et al.*, (2020).

Conclusion

It revealed from the trial that application of farm yard manure and vermicompost with inorganic fertilizers in treatment T_6 was found best in increasing growth and yield of taramira. The increase in doses of the treatment combination enhanced the production. Since the results is based on one season experiment, further trail is needed to substantiate the result.

Comment [MS8]: Need to improve

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Table 1. Treatment combination of Taramira

TREATMENT	TREATMENT COMBINATION
T ₁	[NPK @ 25 % + FYM @ 25 % + @ R @ 25 % + Zn @ 25 %]
T ₂	[NPK @ 50 % + FYM @ 50 % + @ R @ 50 % + Zn @ 50 %]
T ₃	[NPK @ 100 % + FYM @ 100 % + @ R @ 100 % + Zn @ 100 %]
T ₄	[NPK @ 25 % + VC @ 25 % + @ R @ 25 % + Zn @ 25 %]
T ₅	[NPK @ 50 % + VC @ 50 % + @ R @ 50 % + Zn @ 50 %]
T ₆	[NPK @ 100 % + VC @ 100 % + @ R @ 100 % + Zn @ 100 %]
T ₇	[NPK @ 25 % + JM @ 25 % + @ R @ 25 % + Zn @ 25 %]
T ₈	[NPK @ 50 % + JM @ 50 % + @ R @ 50 % + Zn @ 50 %]
T ₉	[NPK @ 100 % + JM @ 100 % + @ R @ 100 % + Zn @ 100 %]

Note: RDF, FYM, vermicompost (VC), rice residue (R), and jeevamrutha(JM)

NPK 100% (40:20:20 + Zn 25 kg ha⁻¹)

FYM 10 t ha⁻¹ VC 4 t ha⁻¹

R 5 t ha⁻¹

JM 500 ltr ha⁻¹

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Table 2. Effect of organic manure and rice residue on taramira at different observations 30, 60, and 90 DAS

S. No.	Plant height (cm) 2021-22				Plant height (cm) 2022-23				Number of branches plant ⁻¹ 2021-22			Number of branches plant ⁻¹ 2022-23		
	30 DAS	60 DAS	90 DAS	At harves t	30 DAS	60 DAS	90 DAS	At harves t	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS
T ₁	21.5	46.1	71.70	88.9	22.90	43.55	79.50	92.44	01.67	05.10	08.83	1.83	5.97	08.80
T ₂	28.4	56.5	96.10	104.3	26.76	57.51	93.23	103.00	01.90	05.93	09.10	2.27	6.07	09.23
T ₃	27.9	58.7	99.00	108.4	28.57	59.28	98.29	109.30	02.13	06.33	10.67	2.27	6.43	10.40
T ₄	29.0	60.1	102.6	115.6	30.87	60.13	102.98	119.13	02.43	06.63	11.37	2.67	6.73	11.20
T ₅	25.6	58.6	98.30	112.0	27.84	60.22	97.62	110.67	01.83	06.53	10.90	2.00	6.63	10.87
T ₆	28.5	60.7	103.9	122.2	31.10	61.20	106.19	120.83	02.20	06.93	11.53	2.47	6.97	11.60
T ₇	31.6	60.4	100.60	117.0	30.32	61.61	102.62	116.53	02.03	06.77	11.77	2.07	6.77	11.73
T ₈	26.5	54.9	89.60	100.6	23.49	56.19	91.33	101.60	02.10	06.07	09.33	2.03	6.10	09.37
T ₆	27.6	57.8	92.70	101.3	24.79	57.44	93.48	103.23	02.13	06.20	10.30	2.27	6.43	10.63
F- test	S	S	S	S	S	S	S	S	S	S	S	S	S	S
S.Em. (±)	0.452	1.0399	1.1976	1.9260	0.1013	0.9254	1.3324	1.5189	0.0284	0.0909	0.1588	0.0301	0.0751	0.1715
C. D. @ 5 %	1.3606	3.1306	3.6053	5.7979	0.9371	2.7857	4.0116	4.5725	0.0856	0.2738	0.4781	0.0908	0.2261	0.5163
	6	3		9	4	7		7	9	7		2	3	9

Table 3: Treatment Efficacy Of Different Parameters In Two Consecutive Year.

S. No.	Number of siliquae plant ⁻¹		Length of siliqua (cm)		Number of seed siliqua ⁻¹		Test weight (g)		Grain yield (t ha ⁻¹)		Stover yield (t ha ⁻¹)		Biological yield (t ha ⁻¹)		Oil content		Harvest Index (%)		Dry matter accumulation (g m ⁻¹)	
	2021-2022	2022-2023	2021-2022	2022-2023	2021-2022	2022-2023	2021-2022	2022-2023	2021-2022	2022-2023	2021-2022	2022-2023	2021-2022	2022-2023	2021-2022	2022-2023	2021-2022	2022-2023	2021-2022	2022-2023
T ₁	68.8	70.4	0.9	0.9	0.70	0.70	2.8	2.9	0.47	0.6	1.77	1.94	2.2	2.54	30.77	30.78	21.02	23.21	142.0	143.6
T ₂	70.6	74.5	1.7	1.7	0.90	0.90	3.0	3.0	1.26	1.31	2.81	2.85	4.07	4.16	31.96	31.97	30.95	31.43	170.4	172.7
T ₃	74.5	78.2	1.9	1.9	1.10	1.10	3.2	3.2	1.4	1.43	2.85	2.89	4.25	4.31	33.47	33.56	32.89	33.07	172.6	173.5
T ₄	72.2	75.8	1.9	1.9	1.10	1.20	3.2	3.3	1.62	1.64	2.91	2.96	4.53	4.6	33.32	33.41	35.17	35.7	175.6	176.9
T ₅	73.2	76.8	1.9	1.9	1.0	1.00	3.2	3.2	1.27	1.3	2.83	2.91	4.11	4.21	33.9	33.91	30.6	30.95	172.3	173.3
T ₆	78.5	82.2	2.0	2.0	1.30	1.40	3.5	3.5	1.65	1.67	3.18	3.27	4.83	4.94	36.96	36.26	34.18	33.83	176.2	176.8
T ₇	70.6	71.9	1.9	1.8	1.20	1.20	3.3	3.4	1.38	1.42	3.08	3.14	4.46	4.56	35.73	35.53	31.01	31.16	173.9	174.3
T ₈	71.4	74.1	1.8	1.9	0.80	0.80	3.1	3.1	1.12	1.14	2.79	2.84	3.91	3.98	31.73	31.72	28.64	28.58	168.8	170.0
T ₉	75.3	77.7	1.9	1.9	0.90	1.00	3.1	3.2	1.15	1.16	2.83	2.89	3.98	4.05	32.54	32.59	28.96	28.62	169.6	171.3
F- test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
S.Em. (±)	1.1450	1.291	0.019	0.012	0.012	0.015	0.048	0.054	0.016	0.026	0.033	0.039	0.064	0.058	0.485	0.4588	0.522	0.481	1.953	1.867
C.D. @ 5 %	3.447	3.887	0.060	0.036	0.060	0.048	0.144	0.163	0.049	0.081	0.113	0.118	0.193	0.176	1.460	1.3785	1.571	1.450	5.881	5.620