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 T_6 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

The family Brassicaceae includes Taramira which is an important oilseed crop during the winter season, and Taramira has desirable characteristics particularly its resistance to powdery mildew which can be transferred to both important crops namely Brassica campestris and Brassica juncea. With an efficient and fast penetrating root system that allows for the extrusion of soil water from deep soil layers there is not much need for preparatory tillage A resilient crop like this can be cultivated successfully in dry land areas and poor sandy soils through the conservation of moisture during years of severe drought along with late Rabi rains; making it the only available option for planting on soil with limited water supply. The oil content in taramira is affected by manuring and irrigation along with disease status. Additionally, a popular way to make mustard oil more pungent is by adding taramira oil. Moreover, the usage of taramira cake as manure not only improves the physical condition and fertility of the soil but also provides nutritional feed for animals (Yadav et al).2017) Selecting organic manure is a sustainable option because it enhances the water-holding capacity of the soil while improving its texture and structure.The presence of a large number of bacteria along with actinomycetes and fungi can be observed in organic manure, which fosters an increase in microbiological activity. This promotes the mineralization process for organic nitrogen, thereby making nutrients readily available for plants.The most important nutrient among several functions is Nitrogen which determines the growth of the mustard crop as well as increases protein content and yield. Additionally, phosphorus and potash are efficiently utilized in the presence of nitrogen. It plays a significant role in encouraging flowering while also contributing to the setting of siliquae as well as bolstering both size of siliqua and overall crop yield (Singh and Meena 2004)

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 in *rabi* season 2021-22. The maximum temperature of the location ranges between 46^0C-48^0C and seldom falls below 4^0C-5^0C. 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 plant height, number of branches plant^{-1}, number of siliqua plant^{-1}, siliqua length, number of grains siliqua $^{-1}$, 100 seed weight, oil content, grain yield, straw yield, bio1ogical yield, harvest index.

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 T_6 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 T_1 (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 a1*., 2013 and Noor *et a1*.,2020).**

Number of branches plant^{-1}

Mamimum number of branches plant^{-1} were found significantly in treatment T_6 was 2.47, 6.69 and 11.60 respectively. While the minimum values of the result were found in treatment T_1 (control) 1.83, 5.10 and 8.80 respectively.

Number of siliquae plant^{-1}

The number of siliquae-1 was found significantly higher in T_6 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 T_1 *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.

Length of Siliqua (cm)

The length of taramira detailed results was in shown in table 3. as influenced by T_6 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 T_1 *i.e.*, 0.9 cm.

Number of seeds per siliqua

The number of seeds per siliqua of 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.

Test Weight (g)

The treatment T_6 in both the years of trails *i.e.*,3.5 g in 2 both 2021 and 2022, while minimum test weight was found in T_1 *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 (t ha^{-1})

Among different treatments, an appraisal of data shows significantly supreme grain yield of 1.65 and 1.67 t ha^{-1} in treatment T_6 *i.e.*, in comparison over control T_1 *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 T_6 *i.e.*, 36.96 and 36.26 % in 2021 and 2022 respectively while minimum oil content was recorder in T_1 *i.e.*, 30.77 and 30.78 %.

Stover yield (t ha $^{-1}$)

The maximum stover yield of taramira was recorded with the treatment T_6 *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 t ha $^{-1}$) in 2021 and 2022 respectively.

Biological yield (t ha^{-1})

The treatment T_6 *i.e.* found significant in achieving higher biological yield of 4.83 and 4.94 t ha^{-1}, in comparison with treatment T_1 *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 T_6 *i.e.,* 2 and 176.8 g m^{-1} while minimum dry matter accumulation of Taramira was recorded in T_1 *i.e.,* 142.0 and 143.6 g m^{-1} in 2021 and 2022 respectively.

Harvest index (%)

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.

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 a1.*, 2013 and Noor *et al.*, (2020).**

Conclusion

The trial revealed that using farm yard manure and vermicompost, along with inorganic fertilizers in treatment T6, resulted in the highest increase in growth and yield of taramira. The production was enhanced by increasing the doses of the treatment combination. Considering that the results rely on an experiment conducted for one season, it is necessary to conduct further trials to confirm the outcome.

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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}

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 harvest	30 DAS	60 DAS	90 DAS	At harvest	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
T6	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**	**1.03997**	**1.19766**	**1.92605**	**0.10131**	**0.92541**	**1.33248**	**1.51898**	**0.02847**	**0.09098**	**0.15882**	**0.03017**	**0.07512**	**0.17154**
C. D. @ 5 %	**1.36066**	**3.13063**	**3.6053**	**5.79799**	**0.93714**	**2.78577**	**4.0116**	**4.57257**	**0.08569**	**0.27387**	**0.4781**	**0.09082**	**0.22613**	**0.51639**

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 accumulatio (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
T9	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**