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Effect of different levels of nano fertilizers and FYM on growth and yield attributes of Mustard (*Brassica juncea* L.)

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Abstract

A field experiment was conducted during the Rabi season 2024-25 at Research Farm, Department of Soil Science and Agricultural Chemistry, NAI, SHUATS, Prayagraj (UP) on sandy loam soil. The factors include 4 levels of Nano fertilizers (0%, 35%, 75% and 100%) and 3 levels of FYM (0 t ha⁻¹, 12.5 t ha⁻¹ and 25 t ha⁻¹). The experiment was laid out in randomized block design with twelve treatments which were replicated thrice. The maximum plant height 36.87, 84.30 and 183.45 cm and no. of branches 4.28, 6.83 and 11.53 at 30, 60 and 90 DAS respectively, no of siliqua plant⁻¹ 276.12, no. of seeds siliqua⁻¹ 20.12, test weight 5.70 g and the maximum seed yield 22.90 q ha⁻¹ were recorded in T₁₂ (Nano fertilizer @ 100% + FYM @ 25 t ha⁻¹). Results indicated that the application of different levels of Nano fertilizer and FYM significantly influenced crop growth and yield attributes.

Keywords: Nano fertilizer, FYM, mustard

Introduction

Mustard is the 2nd most important edible oilseed crop after groundnut in India ^[1]. It plays important role in Indian oilseed economy, 2nd largest grown oilseed crop in terms of area and production after groundnut. Mustard oil content varies from 37-49% ^[2]. The cultivated area of mustard is 8.06 Mha with the production of 11.75 Mt. and productivity of 1458 kg ha⁻¹ ^[3].

Repeated and intensive farming with improper nutrient management results plant nutrients deficiency in soil hence reduced yield ^[4]. Conventional fertilizers have very low NUE viz. nitrogen (N) 30–35%, phosphorus (P) 18–20%, potassium (K) 35–40% ^[5]. Nano fertilizers have high NUE e.g., Nano urea (>80%), Nano DAP (>90%). Due to ultra-small size when sprayed on the leaves, Nano fertilizer gets easily absorbed, provide higher bioavailability and release nutrients in controlled manner hence enhance crop yield ^[6] and in addition to these it also prevents from leaching and runoff losses ^[7].

FYM is the organic source of different nutrients (macro and micro nutrients), improves soil physico-chemical properties and enhances soil microbial population which brings nutrients in available form for the crops and hence enhance crop yield ^[4, 8]. Keeping the facts in view the experiment was conducted on entitled “Effect of different levels of Nano fertilizers and FYM on growth and yield attributes of mustard (*Brassica juncea* L.)”.

Materials and Methodology

The experiment was performed at Research Farm, Department of Soil Science and Agricultural Chemistry, SHUATS, Prayagraj during the Rabi season 2024-25 on sandy loam soil to investigate the effect of different levels of Nano fertilizers and FYM on growth and yield attributes of mustard.

The factors include 4 levels of Nano fertilizers (0%, 35%, 75% and 100%) and 3 levels of FYM (0 t ha⁻¹, 12.5 t ha⁻¹ and 25 t ha⁻¹). The experiment was laid out in RBD with twelve treatments viz. T₁. Absolute control, T₂. Nano fertilizer @ 0% + FYM @ 12.5 t ha⁻¹, T₃. Nano fertilizer @ 0% + FYM @ 25 t ha⁻¹, T₄. Nano fertilizer @ 35% + FYM @ 0 t ha⁻¹, T₅. Nano fertilizer @ 35% + FYM @ 12.5 t ha⁻¹, T₆. Nano fertilizer @ 35% + FYM @ 25 t ha⁻¹, T₇. Nano fertilizer @ 75% + FYM @ 0 t ha⁻¹, T₈. Nano fertilizer @ 75% + FYM @ 12.5 t ha⁻¹, T₉. Nano fertilizer @ 75% +

FYM @ 25 t ha⁻¹, T₁₀. Nano fertilizer @100% + FYM @ 0 t ha⁻¹, T₁₁. Nano fertilizer @ 100% + FYM @ 12.5 t ha⁻¹ and T₁₂. Nano fertilizer @ 100% + FYM @ 25 t ha⁻¹ replicated thrice. The mustard variety Varuna-T₅9 was sown on 25th of October 2024 at a spacing of 30×10 cm, with a plot size of 2 ×2 m². Observed parameters were plant height (cm), no. of branch plant⁻¹, no. of silique plant⁻¹, no. of seeds silique⁻¹, test weight (g) and seed yield (q ha⁻¹).

The recorded data were subjected to statistical analysis using the method of Fisher, 1925^[9] to test the significance of different treatments. The statistical differences were tested by F value and Critical Difference (CD) at 5% level of significance.

Results and Discussion

Growth parameters

The results of experiment presented in table 1. depicts the plant height of mustard crop significantly influenced by different levels of Nano fertilizers and FYM. The maximum plant height 36.87, 84.30 and 183.45 cm at 30, 60, and 90 DAS respectively were recorded in T₁₂ (Nano fertilizer @ 100% + FYM @ 25 t ha⁻¹) and minimum 19.27, 62.00 and 139.97 cm were observed in T₁ (Absolute control).

Similarly the maximum number of branch 4.28, 6.83 and 11.53 plant⁻¹, at 30, 60 and 90 DAS respectively were noted in T₁₂ [Nano fertilizer @ 100% + FYM @ 25 t ha⁻¹] and minimum no. of branch 1.44, 3.82 and 6.27 plant⁻¹ were recorded in T₁ [Absolute control].

Similar observations were reported by Acharya *et al.*, 2025^[10], Pandey *et al.*, 2020^[2] and Pandav *et al.*, (2022)^[11].

The increased in height and number branches might be due to synthesis of auxin which promotes cell division and elongation, enhance chlorophyll formation, photosynthesis rate of the crop which is the function of nutrients which were efficiently absorbed by the crop provided through Nano fertilizers and FYM^[12, 13, 14].

Yield Parameters

The results of experiment presented in table 2 depicts the number of silique plant⁻¹, number of seeds silique⁻¹ and test weight (g) significantly influenced by at different levels of Nano fertilizers and FYM.

The maximum no. of silique plant⁻¹ (276.12) was recorded in T₁₂ [Nano fertilizer @ 100% + FYM @ 25 t ha⁻¹] while the minimum no. of silique plant⁻¹ (166.22) was observed in T₁ [Absolute control]. Similar observation was recorded by Prasad *et al.*, 2021^[15] and Kumar *et al.*, 2018^[16].

The maximum no. of seeds silique⁻¹ (20.12) was recorded in T₁₂ [Nano fertilizer @ 100% + FYM @ 25 t ha⁻¹] while the minimum no. of seeds silique⁻¹ (11.20) was observed in T₁ [Absolute control]. Similar observation was recorded by Ekta *et al.*, 2024^[17] and Kumar *et al.*, 2017^[18].

The highest test weight (5.70 g) was recorded in T₁₂ [Nano fertilizer @ 100% + FYM @ 25 t ha⁻¹] while the minimum test weight (3.57g) was observed in T₁ [Absolute control]. Similar observations were reported by Ekta *et al.*, 2024^[17] and Kumar *et al.*, 2018^[16].

The increase in silique plant⁻¹, no. of seeds silique⁻¹ and test weight (g) might be due to efficient absorption of nutrients required for the crop growth applied through Nano fertilizers and FYM^[14].

Seed Yield

The results of experiment presented in table 2. depicts the seed yield (q ha⁻¹) of mustard significantly influenced by different

levels of Nano fertilizers and FYM. The maximum yield (22.90 q ha⁻¹) was recorded in T₁₂ [Nano fertilizer @ 100% + FYM @ 25 t ha⁻¹] while the minimum seed yield (11.37 q ha⁻¹) was observed in T₁ [Absolute control]. Similar observations were reported by Singh *et al.*, 2013^[19] and Kumar *et al.*, 2018^[16].

The increase in seed yield might be due efficient utilization of nutrients by the crop applied through Nano fertilizers which release the nutrients in controlled way and the FYM which is the source of both macro and micro nutrients, improves soil environment hence better absorption of moisture and nutrients which enhanced overall growth and yield attributes and ultimately increased the seed yield of mustard^[6, 20, 21].

Table 1: Effect of different levels of Nano fertilizers and FYM on plant height and no. of branch plant⁻¹ of Mustard

Treatment	Plant height (cm)			No. of branch plant ⁻¹		
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS
T ₁	19.27	62.00	139.97	1.44	3.82	6.27
T ₂	20.60	63.60	142.20	1.79	3.94	6.86
T ₃	21.70	65.33	144.33	2.00	4.10	7.37
T ₄	23.97	67.50	145.60	2.23	4.32	7.74
T ₅	24.97	68.33	147.27	2.50	4.82	8.05
T ₆	26.37	70.17	148.57	2.85	5.07	8.58
T ₇	27.70	71.73	155.50	3.17	5.38	8.94
T ₈	29.20	74.80	158.25	3.55	5.70	9.45
T ₉	30.23	77.83	166.20	3.68	5.94	9.78
T ₁₀	32.77	80.43	171.67	3.93	6.18	10.44
T ₁₁	34.67	82.57	176.24	4.10	6.62	10.98
T ₁₂	36.87	84.30	183.45	4.28	6.83	11.53
F-Test	S	S	S	S	S	S
S.Ed.	0.51	0.86	2.71	0.15	0.12	0.18
C.D at 5%	1.06	1.79	5.63	0.30	0.25	0.36

Table 2: Effect of different levels of Nano fertilizers and FYM on the silique plant⁻¹, no. of seeds silique⁻¹, test weight (g) and yield (q ha⁻¹) of mustard

Treatment	No. of silique plant ⁻¹	No. of seeds silique ⁻¹	Test weight (g)	Seed yield (q ha ⁻¹)
T ₁	166.22	11.20	3.57	11.37
T ₂	175.46	12.24	3.55	16.43
T ₃	185.45	12.89	3.70	17.51
T ₄	197.27	13.78	3.84	19.37
T ₅	205.40	14.21	4.07	19.70
T ₆	216.54	14.83	4.26	20.58
T ₇	227.52	15.30	4.46	21.40
T ₈	236.29	15.76	4.75	21.60
T ₉	246.38	16.45	4.85	21.97
T ₁₀	253.18	17.60	5.26	21.90
T ₁₁	266.01	18.45	5.53	22.82
T ₁₂	276.12	20.12	5.70	22.90
F-Test	S	S	S	S
S.Ed.	4.84	0.05	0.15	0.61
C.D at 5%	10.04	0.10	0.30	1.27

Conclusion

The results revealed that, the effect of different levels of Nano fertilizers and FYM significantly influenced the crop growth and yield attributes. Treatment T₁₂ (Nano fertilizer @100% + FYM @ 25 t ha⁻¹) recorded the best results among the other treatments.

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