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Effect of organic and inorganic sources of nutrients on growth attributes of linseed

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Abstract

The field experiment was conducted at R.B.S. College, Bichpuri, Agra to evaluate the effect of organic and inorganic sources of nutrients on growth attributes of linseed in alluvial soils of the Agra region.The experiment was layout in randomized block design with nine treatments of T1 - 100 % RDF, T2 - 75 % RDF + Sulphur, T3 - 75 % RDF + zinc, T4 - 75 % RDF + vermicompost, T5 - 75 % RDF + Sulphur + zinc + vermicompost, T6 - 50 % RDF + Sulphur, T7 - 50 % RDF + zinc, T8 - 50 % RDF + vermicompost and T9 - 50 % RDF + Sulphur + zinc + vermicompost withfour replications. The results found that the application of T5 @ (75% RDF + Sulphur + zinc + vermicompost), recorded significantly maximum higher number of plant population, no. of branch plant^{-1}, plant height, no. of capsules plant^{-1}, no. of seed capsules^{-1}, seed weight plant^{-1} and test weight of linseed crop compared to T6 @ (50 % RDF + sulphur) respectively.

Key words: INM, growth, yield, linseed

Introduction

Linseed crop cultivated mainly as a Rabi crop during the winter season. The crop thrives best under temperate and cool climates, with optimal temperatures ranging between 10°C and 38°C. Sowing is generally done in October to November, depending on soil moisture availability. Early sowing helps the crop escape major diseases and pests such as rust, bud fly and powdery mildew. Drought and high temperatures during the early growth and seed-filling stages can severely affect yield and oil quality. Integrated Nutrient Management (INM), which combines inorganic fertilizers such as NPK, Zn, and S with organic sources like vermicompost, is considered a promising approach. This strategy ensures balanced nutrition, enhances soil fertility, and sustains crop productivity. For linseed, which has relatively high nutrient requirements but is less studied compared to other oilseed crops, evaluating the combined effect of these nutrient sources is crucial to optimize growth, yield, and oil quality.

Materials and Methods

The field experiments were conducted at the Agricultural Research farm of R.B.S. College Bichpuri, Agra located in semi arid or gray steppe arid region of South-Western Uttar Pradesh during two consecutive kharif seasons of 2023-24 and 2024-25 on sandy loam soil. The soil had EC 0.28 dSm^{-1}, pH 8.2, organic carbon 4.4 g kg^{-1}, available N 190.6, P 13.8 and K 218.6 kg ha^{-1}. The soil had $CaCl_2$ extractable sulphur content of 14.2 kg ha^{-1} and DTPA extractable zinc 0.59 mg kg^{-1}. The experiment was laid out in randomized block design with four replications. The treatments were comprised of T1 - 100 % RDF, T2 - 75 % RDF + Sulphur, T3 - 75 % RDF + Zinc, T4 - 75 % RDF + Vermicompost, T5 - 75 % RDF + Sulphur + Zinc + Vermicompost, T6 -

50 % RDF + Sulphur, T7 - 50 % RDF + Zinc, T8 - 50 % RDF + Vermicompost and T9 - 50 % RDF + Sulphur + Zinc + Vermicompost. The treatment was applied at the time of sowing and linseed was sown in second week of October. The crop was harvested at physiological maturity and yield data were recorded. The yield attributes of linseed crop were recorded at harvest. The data were statistically analysed using standard procedures of ANOVA at 5% level of significance.

Results and Discussion

Plant population

The results presented in Tables-1 reveal that number of plant population of the linseed was significantly affected by various treatments. Application of T5 @ (75% RDF + sulphur + zinc + vermicompost), recorded significantly maximum higher number of plant population (136) compared to T6 @ (50 % RDF + sulphur) (107) respectively. The percent increase in number of plant population with: (T_7), (T_8), (T_2), (T_3), (T_4), (T_1), (T_9) and (T_5) levels of organic and inorganic sources of nutrient management treatmentswere 4.1, 8.2, 10.1, 13.8, 17.4, 20.7, 23.9 and 27.0% compared to (T_6) respectively. The present findings are in close agreement with those reported by Keivanrad and Zandi (2012), Yadav et al. (2018) and Kumar et al. (2018).

Branch plant^{-1}

The data presented in Tables-1 reveal that the maximum number of branches plant^{-1} was significantly increased with the application of T5 @ (75% RDF + sulphur + zinc + vermicompost) (8.78) compared to T6 @ (50 % RDF + sulphur) (6.79) respectively. The percent increase in number of branches plant^{-1}with: (T_7), (T_8), (T_2), (T_3), (T_4), (T_1), (T_9) and (T_5) levels of organic and inorganic sources of nutrient management treatments were 5.2, 9.4, 12.5, 16.2, 19.5, 23.3, 26.6 and 29.2% compared to (T_6) respectively. The present findings are in close agreement with those reported by Keivanrad and Zandi (2012), Patel et al. (2025b) and Kumawat et al. (2014).

Plant height

Among the treatments, application of T5 @ (75% RDF + sulphur + zinc + vermicompost), recorded significantly maximum higher plant height of linseed (97.6 cm) compared to T6 @ (50 % RDF + sulphur) (74.6 cm) respectively. The percent increase in plant height with: (T_7), (T_8), (T_2), (T_3), (T_4), (T_1), (T_9) and (T_5) levels of organic and inorganic sources of nutrient management

Table 1: Effect of organic and inorganic sources of nutrients on plant population, no. of branch plant^{-1}, plant height, no. of capsules plant^{-1}, no. of seed capsules^{-1}, seed weight plant^{-1} and test weight of linseed

Treatments	Plant population (M^2)	No. of branch plant^{-1}	Plant height (cm)	No. of capsules plant^{-1}	No. of seed capsules^{-1}	Seed weight plant^{-1}(gm)	Test weight (gm)
T1	129	8.38	91.2	81.3	8.71	5.54	8.72
T2	118	7.64	83.1	74.6	7.99	4.82	8.10
T3	122	7.89	85.7	77.0	8.26	5.02	8.33
T4	125	8.11	88.5	79.1	8.50	5.26	8.52
T5	136	8.78	97.6	86.2	9.20	6.11	9.24
T6	107	6.79	74.6	66.4	7.23	4.10	7.35
T7	111	7.14	77.8	70.5	7.51	4.40	7.62
T8	116	7.43	81.0	72.8	7.79	4.65	7.81
T9	132	8.60	94.6	83.6	8.95	5.81	9.01
SEm±	2.86	0.36	3.19	2.84	0.34	0.23	0.33
CD @ 5%	5.90	0.74	6.58	5.86	0.71	0.47	0.69

treatments were 4.2, 8.6, 11.4, 14.9, 18.6, 22.1, 26.7, 30.8% compared to (T_6) respectively (Tables 1). These results are in agreement with the opinion of Keivanrad and Zandi (2012), Lal et al. (2016), Kumari et al. (2024), Kumawat et al. (2014) and Kumar et al. (2018).

Number of capsules plant^{-1}

Application of T5 @ (75% RDF + sulphur + zinc + vermicompost), recorded significantly maximum higher number of capsules plant^{-1}of linseed (86.2) compared to T6 @ (50 % RDF + sulphur) (66.4) respectively. The percent increase in number of capsules plant^{-1}with: (T_7), (T_8),(T_2), (T_3), (T_4), (T_1), (T_9) and (T_5) levels of organic and inorganic sources of nutrient management treatments were 6.1, 9.7, 12.4, 16.0, 19.2, 22.4, 26.0 and 29.9% compared to (T_6) respectively (Tables-1). These results are in agreement with the opinion of Keivanrad and Zandi (2012), Yadav et al. (2018) and Kumar et al. (2018).

Number of seed capsules^{-1}

Application of T5 @ (75% RDF + sulphur + zinc + vermicompost), recorded significantly maximum higher number of seed capsules^{-1} (9.20) compared to T6 @ (50 % RDF + sulphur) (7.23) respectively. The percent increase in number of seed capsules^{-1} with: (T_7), (T_8), (T_2), (T_3), (T_4), (T_1), (T_9) and (T_5) levels of organic and inorganic sources of nutrient management treatments were 3.9, 7.7, 10.4, 14.3, 17.5, 20.4, 23.8 and 27.2% compared to (T_6) respectively (Tables-1). These results are in agreement with the opinion of Yadav et al. (2018), Kumar et al. (2018) and Tripathi et al. (2011).

Seed weight plant^{-1}

Application of T5 @ (75% RDF + sulphur + zinc + vermicompost), recorded significantly maximum higher weight of seed plant^{-1} of linseed crop (6.11 gm) compared to T6 @ (50 % RDF + sulphur) (4.10 gm) respectively. The percent increase in weight of seed plant^{-1}with: (T_7), (T_8), (T_2), (T_3), (T_4), (T_1), (T_9) and (T_5) levels of organic and inorganic sources of nutrient management treatments were 7.1, 13.3, 17.5, 22.3, 28.1, 34.9, 41.6 and 48.8% compared to (T_6) respectively (Tables 1). These results are in agreement with the opinion of Singh et al. (2024), Patel et al. (2025a) and Kumar et al. (2018).

Test weight

Application of T5 @ (75% RDF + sulphur + zinc + vermicompost), recorded significantly maximum higher test weight (9.24 gm) compared to T6 @ (50 % RDF + sulphur) (7.35 gm) respectively. The percent increase in test weight with: (T_7), (T_8), (T_2), (T_3), (T_4), (T_1), (T_9) and (T_5) levels of organic and inorganic sources of nutrient management treatments were 3.7, 6.3, 10.2, 13.3, 16.0, 18.7, 22.6 and 25.7% compared to (T_6) respectively (Tables-1). These results are in agreement with the opinion of Keivanrad and Zandi (2012), Kumar et al. (2018) and Tripathi et al. (2011).

Conclusion

The present study that integrated nutrient management practices, particularly the combination of 75% RDF + sulphur + zinc + vermicompost, significantly enhance plant growth and productivity. The synergistic effect of inorganic fertilizers with vermicompost and micronutrients leads to better nutrient uptake, improved physiological performance, and sustainable yield gains.

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