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Effect of various levels of potassium on yield of Linseed (*Linum usitatissimum*) in swell-shrink soils of Maharashtra

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Abstract

A field experiment was conducted to study the effect of potassium levels on yield of linseed in swell shrink soils at the Agril. Technical School, Buldhana on NL-371 variety during rabi season of 2025-26. The field experiment was laid out in Randomized Block Design consisting of six treatments viz., absolute control (T₁), 60:30:00 kg NPK ha⁻¹ (T₂), 60:30:20 kg NPK ha⁻¹ (T₃), 60:30:30 kg NPK ha⁻¹ (T₄), 60:30:40 kg NPK ha⁻¹ (T₅), 60:30:50 kg NPK ha⁻¹ (T₆) replicated four times. The results of the present experiment revealed that the highest seed and straw yield of linseed was recorded with the application of 60:30:50 kg NPK ha⁻¹ which was statistically at par with application of 60:30:40 kg NPK ha⁻¹ and 60:30:30 kg NPK ha⁻¹. The lowest yield was observed under the absolute control.

Keywords: Linseed, Potassium levels, Yield, Vertisol

Introduction

Linseed is an annual oilseed crop belongs to the genus *linum* and the family Linaceae. One of the oldest species which is cultivated for oil and fibre is *Linum usitatissimum* L. (Lay and Dybing, 1989)^[8]. Linseed which are grown mainly for oil purpose which contains small seeded type are originated in south western Asia comprising, India, Afghanistan and Turkey. Another one consists, linseed which are grown for fibre purposes are believed to be originated in the mediterranean region including Asia minor, Egypt, Algeria, Spain, Italy and Greece. In India Linseed is cultivated for oil and for globally it is used as a Flax. (Wakjira *et al.*, 2004)^[12]. Linseed producing country, India ranks 4th position in the world followed by Kazakhstan, Russia and Canada. The area under linseed cultivation consists about 320 thousand hectares producing annual production of 174 thousand tonnes, and productivity of 543.80 kg/ha ranking India 5th in world. (FAOSTAT, 2020)^[3]. Seed composition includes 20-25% protein, 35 to 40% oil, carbohydrate of 15-29%, crude fibre of 5-9% and ash content of 2-4%.

Among the major nutrient elements Potassium (K) is usually the most, abundant in soils. In Indian agriculture the demand of potassium is growing as crop shows positive response to potassium fertilization. Total potassium content which occurs in soil may vary from one soil to another. In Indian soils, potassium status is generally medium to high, but insufficient supply of potassium combined with depletion in soil potassium which leads to yield decline (Regmi *et al.*, 2002 and Panaullah *et al.*, 2006)^[11, 9].

In soil the importance of potassium (K) is highly significant. Agronomic crops require and absorb large quantities of potassium from the root zone which lead to its classification as a macronutrient. Potassium is the only major element and it is distinctive because plants can accumulate it in greater amount without any toxicity symptoms. Potassium at high level enhances overall quality traits, longer shelf life of crops, disease resistance which are essential for human consumption and improves nutritional value of grain and forage crops. Contributing up to 6% of plant dry weight potassium is recognized as one of the major macronutrients which is called as a "quality nutrient" (Hartz *et al.*, 1999)^[5]. Several physical characteristics such as taste, shelf life, size, colour, shape

is affected by potassium. Potassium is essential for transport of water, nutrients and carbohydrates in plants, supports early plant growth, increase protein levels, improves how efficiently plants use water, plants resist disease and insect attacks whole maintaining lifespan. With the view of above, the present investigation was carried out to study the effect of different K levels on yield of linseed in swell-shrink soil of Maharashtra.

2. Materials and Methods

The field experiment was conducted during rabi 2025-26 at the Agril. Technical School, Buldhana, Maharashtra, India. Geographically, Buldhana is the western most district of the Vidharbha and lies between north latitude 19.51° to 21.17° and east longitude 75.75° to 76.59°. Buldhana experiences a climate that varies from semi-arid to tropical, with three well-defined seasons. They are a hot, dry summer from March to May, a warm, rainy monsoon from June to October, and a mild, cold winter from November to February. The soil of the experimental site was deep, clayey black soil taxonomically classified as very fine, smectitic, calcareous, hyperthermic family of Typic Haplusters. The experiment comprised six treatments, viz., Absolute control (T₁), 60:30:00 kg NPK ha⁻¹ (T₂), 60:30:20 kg NPK ha⁻¹ (T₃), 60:30:30 kg NPK ha⁻¹ (T₄), 60:30:40 kg NPK ha⁻¹ (T₅), 60:30:50 kg NPK ha⁻¹ (T₆). The treatments were replicated four times in a Randomized Block Design (RBD). Linseed variety NL-371 at a spacing of 30 × 10 cm (row × plant). The recommended dose of fertilizer (RDF) for linseed was 60:30:00 kg N, P₂O₅, and K₂O per hectare. Half dose of N and full dose of P and K was applied at the time of sowing. The remaining half quantity of N was applied after 30 DAS as top dressing.

The recorded data on yield was statistically analysed using analysis of variance (ANOVA) for a Randomized Block Design, as described by Gomez and Gomez (1984) [4]. Treatment means were compared using the critical difference (CD) at the 5 percent level of significance.

Results and Discussion

Seed yield of linseed

The data pertaining to the seed yield of linseed as influenced by different levels of potassium fertilizers are presented in table 1. The results revealed that Seed and straw yield of linseed varied significantly with different levels of potassium fertilizers combined with the recommended dose of N and P fertilizers. Among the various treatment, significantly higher seed yield (14.34 q ha⁻¹) was observed with the higher levels of potassium along with the recommended dose of N and P (60:30:50 kg NPK ha⁻¹:T₆) followed by application of 60:30:40 kg NPK ha⁻¹ i.e. T₅ (14.05 q ha⁻¹) and 60:30:30 kg NPK ha⁻¹ i.e. T₄ (13.56 q ha⁻¹) which were at par with each other. The treatment T₆, T₅ and T₄ had increased the seed yield by 42.4, 39.5 and 34.7% higher compared to absolute control. The increasing levels of potassium from 0 kg to 50 kg ha⁻¹ along with recommended dose of N and P yielded linear increment in seed yield of linseed from 11.30 to 14.34 q ha⁻¹. The lowest seed yield (10.07 q ha⁻¹) was recorded in absolute control (T₁) where no fertilizers were applied. The enhancements in seed yield of linseed might be attributed to the fact that potassium is essential for processes like photosynthesis, water interaction, protein synthesis and at least 60 different enzyme systems within the plant (Bahuguna *et al.*, 2025) [2].

The results are in support with Jyoti *et al.* (2017), Atkari *et al.* (2022) [1], Pranav *et al.* (2024) [10] who also observed that increasing levels of potassium significantly increased the seed yield.

Table 1: Effect of different potassium levels on seed and straw yield of linseed

Treatments	Yield (q ha ⁻¹)	
	Seed yield	Straw yield
T ₁ – Absolute control	10.07	16.10
T ₂ – 60:30:00 kg NPK ha ⁻¹	11.30	18.31
T ₃ – 60:30:20 kg NPK ha ⁻¹	12.80	20.99
T ₄ – 60:30:30 kg NPK ha ⁻¹	13.56	22.78
T ₅ – 60:30:40 kg NPK ha ⁻¹	14.05	23.89
T ₆ – 60:30:50 kg NPK ha ⁻¹	14.34	24.65
SE(m) ±	0.63	1.13
CD at 5%	1.89	3.40

Straw yield of linseed

The effect of different levels of potassium with recommended dose of N and P was found significant on straw yield of linseed (Table 1). The increasing levels of potassium from 0 to 50 kg ha⁻¹ enhanced linear increment in the straw yield from 18.31 to 24.65 q ha⁻¹. The application of 50 kg potassium along with recommended dose of NP (30:60) produced significantly higher straw yield of linseed (24.65 q ha⁻¹) which was statistically at par with the application of 60:30:40 kg NPK ha⁻¹ (23.89 q ha⁻¹) and 60:30:30 kg NPK ha⁻¹ (22.78 q ha⁻¹). The treatment receiving 50, 40 and 30 kg potassium along with recommended NP i.e. T₆, T₅ and T₄ produced the 53.11, 48.39 and 41.49% higher straw yield of linseed over the absolute control. On the contrast, the lowest straw yield (16.10 q ha⁻¹) was recorded in absolute control.

The results were in conformity with the findings reported by Atkari *et al.* (2022) [1] and Pranav *et al.* (2024) [10] who asserted that increasing levels of potassium significantly increased the straw yield of linseed.

Conclusion

The present investigation results clearly indicated that the application of potassium levels significantly impacted the seed and straw yield of linseed in Vertisols. Hence, it can be concluded that application of potassium @ 50 kg ha⁻¹ and 40 kg ha⁻¹ was found equally effective for producing significantly higher seed and straw yield of linseed in swell-shrink soils of Maharashtra.

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