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EFFECT OF INTEGRATED WEED MANAGEMENT ON OIL PARAMETERS IN LINSEED (*Linum usitatissimum* L.) CROP UNDER GUJARAT

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ABSTRACT

A Conducted experiment at college farm of the N. M. College of Agriculture, NAU, Navsari, to determine how integrated weed control affects the oil parameters of linseed (Linum usitatissimum L.) during the rabi season of 2016-2017. When labour is readily accessible, keeping the crop weed-free during the crop's growth period can boost output potential, increase profit, and effectively manage weeds while also improving the quality of the oil in the linseed. Pendimethalin was equally effective in the absence of labour at 0.75 kg/ha PE fb 2,4-D and 0.50 kg/ha PoE, 40 DAS.

(Key words–Linseed, Weed management, Economics, Pendimethalin, Isoproturon, 2,4-D, Oil quality)

INTRODUCTION

Linseed (*Linum usitatissimum* L.), commonly known as flax, is one of the oldest cultivated oilseed and fibre crops belonging to the family Linaceae. It is valued for its seeds, which contain 33–47% oil rich in omega-3 fatty acids (alpha-linolenic acid), protein, dietary fibre, and essential minerals. (Anonymous.2013) Linseed is widely used as a health-promoting food due to its benefits in reducing the risk of heart disease, arthritis, inflammation, and certain cancers. Besides edible uses, its oil is extensively utilized in industries for manufacturing paints, varnishes, inks, linoleum, and other products, while the oil cake serves as nutritious animal feed and organic manure.

Weed infestation is one of the major constraints in linseed production because the crop grows slowly during its early stages and cannot compete effectively with weeds. Weeds compete for water, nutrients, sunlight, and space, causing 20–45% yield losses or even complete crop failure under severe infestation. The critical period of weed competition is 20–25 days after sowing, making timely and effective weed management essential for improving seed yield, oil content, and overall productivity of linseed.

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MATERIALS AND METHODS

A field experiment was conducted during the Rabi season of 2016–17 at Plot B-12, College Farm, N. M. College of Agriculture, Navsari Agricultural University (NAU), Navsari. The experimental site is located at 20°57′ N latitude and 72°54′ E longitude, with an altitude of 10 m above mean sea level.

The experiment consisted of 12 weed management treatments arranged in a Randomized Block Design (RBD) with three replications. The treatments were: **T_1:** Weed-free, **T_2:** One hand weeding at 20 DAS, **T_3:** Two hand weedings at 20 and 40 DAS, **T_4:** Pendimethalin @ 1.0 kg/ha as pre-emergence (PE), **T_5:** Isoproturon @ 1.0 kg/ha as post-emergence (PoE) at 20 DAS, **T_6:** 2,4-D @ 0.5 kg/ha as PoE at 20 DAS, **T_7:** Pendimethalin @ 0.75 kg/ha (PE) followed by Isoproturon @ 0.75 kg/ha (PoE) at 40 DAS, **T_8:** Pendimethalin @ 0.75 kg/ha (PE) followed by 2,4-D @ 0.5 kg/ha (PoE) at 40 DAS, **T_9:** Pendimethalin @ 0.75 kg/ha (PE) followed by one hand weeding at 40 DAS, **T_{10}:** Isoproturon @ 0.75 kg/ha (PoE) at 20 DAS followed by one hand weeding at 40 DAS, **T_{11}:** 2,4-D @ 0.5 kg/ha (PoE) at 20 DAS followed by one hand weeding at 40 DAS, **T_{12}:** Weedy check (control)

The experimental soil was clayey in texture, with low available nitrogen (254.01 kg/ha), medium available phosphorus (32.67 kg/ha), and high available potassium (430.08 kg/ha). The soil was slightly alkaline (pH 7.64) and had good moisture-holding capacity. A local variety of linseed was sown in November and harvested in March. The recommended fertilizer dose of 60 kg nitrogen (N) and 30 kg phosphorus (P_2O_5) per hectare was applied to the crop. Observations were recorded on seed yield, stover yield, oil content, oil yield, and economics to evaluate the performance of different weed management treatments.

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RESULTS AND DISCUSSION

Effect on yield and yield attributes

The data presented in Table 1 indicated that different weed management practices had a significant effect on seed yield and stover yield, whereas test weight was not significantly influenced by the treatments.

Among all the treatments, the weed-free treatment (T_1) recorded the highest seed yield (1420 kg/ha) and stover yield (2962 kg/ha). This treatment was statistically at par with T_8 (Pendimethalin @ 0.75 kg/ha as pre-emergence followed by 2,4-D @ 0.5 kg/ha as post-emergence at 40 DAS), T_3 (two hand weedings at 20 and 40 DAS), T_9, and T_7. Compared with the weedy check (T_{12}), the seed yield increased by 56.2% under the weed-free treatment (T_1), followed by 56.1% under T_8, 53.4% under T_9, and 52.0% under T_7. Similarly, the highest stover yield was also recorded under the weed-free treatment, showing a 71.3% increase over the weedy check. The corresponding increase in stover yield under T_8, T_3, and T_9 was 70.4%, 68.6%, and 66.7%, respectively.

The higher seed and stover yields obtained under these treatments may be attributed to effective weed control during the critical crop–weed competition period, which minimized competition for moisture, nutrients, sunlight, and space. Improved weed control enhanced crop growth and facilitated greater accumulation of photosynthates, resulting in better yield attributes and higher productivity. The study also indicated that weed management during the 25–30 DAS period, either through herbicide application, hand weeding, or their combination, effectively reduced yield losses caused by weed competition.

The improved plant growth, including greater plant height, more branches, and higher dry matter accumulation under effective weed management treatments, contributed to the increased seed and stover yields. Similar results were also reported by Angiras *et al.* (1991), Giriyapla *et al.* (2016) and Jain and Jain (2016).

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Effect on Oil quality and Oil yield

The results showed that different weed management treatments did not significantly affect the oil content of linseed. However, numerically, the weed-free treatment (T_1) recorded the highest oil content (39.93%), while the weedy check (T_{12}) recorded the lowest oil content (34.63%). The higher oil content under the weed-free treatment may be due to the genetic characteristics of the crop, as oil content is largely controlled by heredity and is less influenced by agronomic practices. Similar results were also reported by Kumar *et al.* (2012) and Husain *et al.* (2015).The data on quality in terms of content (%) and yield (kg/ha) of oil are presented in Table 1.

The effect of weed management treatments on oil yield was significant. The weed-free treatment (T_1) produced the highest oil yield (567.3 kg/ha), which was statistically at par with T_8 (533.9 kg/ha), T_3 (505.1 kg/ha), T_9 (499.8 kg/ha), and T_7 (480.6 kg/ha). The weedy check (T_{12}) recorded the lowest oil yield (214.1 kg/ha). The higher oil yield obtained under the weed-free treatment was mainly due to its higher seed yield. In contrast, severe weed competition in the weedy check reduced seed production, resulting in a lower oil yield. Similar findings were reported by Husain *et al.* (2015) and Mane *et al.* (2017), who observed that effective weed control improved crop growth and nutrient uptake, leading to higher oil yield.

CONCLUSION

The findings of the present investigation revealed that effective weed management plays a vital role in improving the productivity and profitability of linseed. The weed-free treatment maintained through hand weeding recorded the highest seed yield, oil yield, and net returns. Therefore, it is recommended wherever sufficient labour is available. In situations where manual labour is scarce or expensive, Pendimethalin @ 0.75 kg/ha (PE) followed by 2,4-D @ 0.5 kg/ha (PoE) at 40 DAS may be adopted as an efficient and economical weed management practice.

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Table 1- Oil parameters influenced by various weed management treatments.

Treatments		Seed yield (kg/ha)	Stover yield (kg/ha)	Oil content (%)	Oil yield (kg/ha)
T_1	Weed free	1420	2962	39.9	567
T_2	One HW at 20 DAS	0955	1646	35.3	336
T_3	Two HW at 20 and 40 DAS	1321	2708	38.1	505
T_4	Pendimethalin 1.0 kg/ha PE	1181	2337	36.1	428
T_5	Isoproturon 1.0 kg/ha PoE, 20 DAS	0979	1958	36.0	353
T_6	2,4-D 0.5 kg/ha, PoE, 20 DAS	0969	1864	39.1	378
T_7	Pendimethalin 0.75 kg/ha PE *fb* Isoproturon 0.75 kg/ha PoE, 40 DAS	1297	2465	37.1	480
T_8	Pendimethalin 0.75 kg/ha *fb* 2,4-D 0.5 kg/ha PoE, 40 DAS	1417	2872	37.9	533
T_9	Pendimethalin 0.75 kg/ha + One HW at 40 DAS	1334	2576	37.5	499
T_{10}	Isoproturon 0.75 kg/ha PoE, 20 DAS + One HW at 40 DAS	1045	2090	36.2	378
T_{11}	2,4-D 0.5 kg/ha PoE, 20 DAS + One HW at 40 DAS	1021	1997	37.6	384
T_{12}	Weedy check	622	851	34.6	214
	S.Em. ±	74.43	146.5	1.79	33.7
	C.D at 5 %	232	456	NS	105
	C.V. %	11.41	11.57	8.37	13.8

Note: HW: Hand weeding, DAS: Days after sowing

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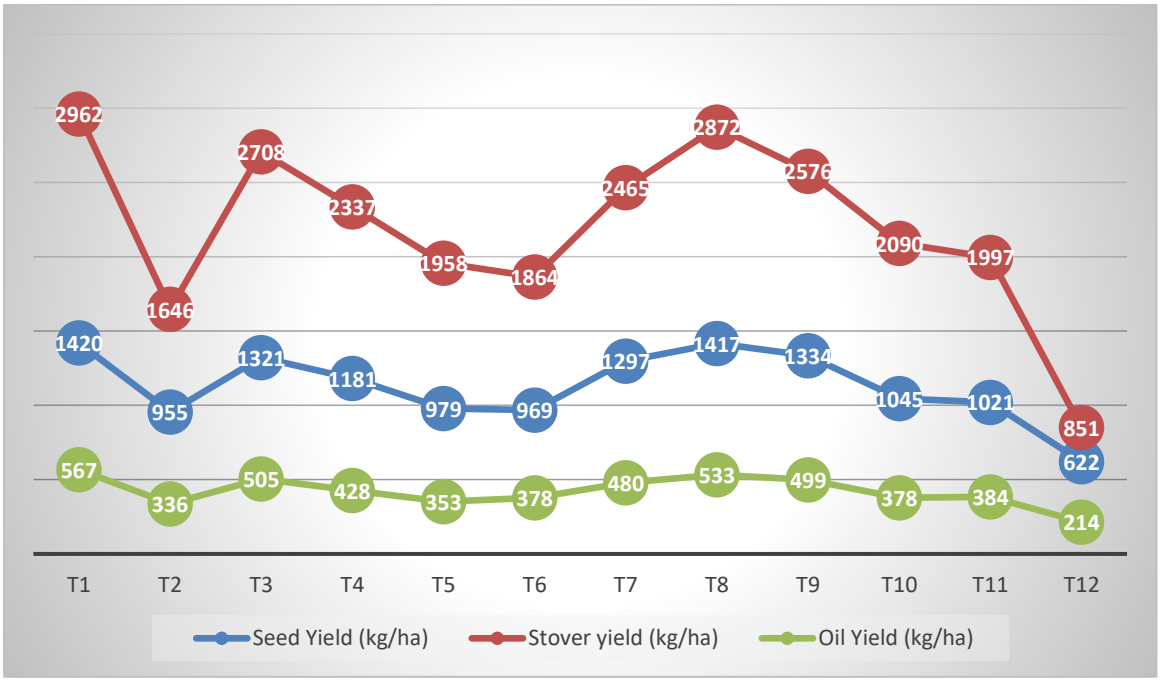
Fig.1 Oil parameters influenced by various weed management treatments.



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