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Effect of Weed Management Practices on Yield and Economics of Linseed (*Linum usitatissimum* L.) in *Vertisols* of Chhattisgarh

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A B S T R A C T

The field experiment entitled "Effect of weed management practices on yield and economics of linseed (*Linum usitatissimum* L.) in *Vertisols* of Chhattisgarh" was carried out during *rabi* season of 2020-21; at the Instructional Cum Research Farm, DKS College of Agriculture and Research Station, Bhatapara. The experiment was laid out in Randomized Block Design with 3 replication and 12 treatments *viz.*T_1 - Weedy check, T_2 -1 hand weeding at 20 DAS, T_3- 1 hand hoeing at 20 DAS + 1 hand weeding at 40 DAS, T_4 - pendimethalin @ 0.90 kg a.i.ha^{-1}(PE), T_5 -pendimethalin @ 0.90 kg a.i. ha^{-1} (PE)+1 hand weeding at 40 DAS, T_6- pendimethalin @ 0.90 kg a.i. ha^{-1} (PE)+ imazathypr @ 100g a.i. ha^{-1}(PoE), T_7- pendimethalin @ 0.90 kg a.i. ha^{-1}(PE) + isoproturon @ 1kg a.i. ha^{-1} (PoE), T_8- pendimethalin @ 0.90 kg a.i. ha^{-1} (PE) + metsulfuron methyl @ 4g a.i. ha^{-1} (PoE), T_9 - metsulfuron methyl @ 4g a.i. ha^{-1} (PoE), T_{10}- imazathypr @ 100 g a.i. ha^{-1}(PoE), T_{11} - isoproturon @ 1 kg a.i. ha^{-1} (PoE) and T_{12} - weed free. Linseed variety *Indira alsi-32* (RLC-81) was sown on 09th November, 2020 at 30 × 10 cm spacing using 20 kg seed ha^{-1} with recommended level of nutrients 60, 30 and 30 kg N, P_2O_5 & K_2O ha^{-1} respectively. Crop was harvested on 24th February, 2021. The result showed that the weed free (T_8) recorded highest yield, which was statistically at par with 1 hand hoeing at 20 DAS + 1hand weeding at 40 DAS (T_3). Highest benefit: cost ratio was recorded in pendimethalin @ 0.90 kg a.i. ha^{-1} (PE) + metsulfuron methyl @ 4g a.i. ha^{-1} (PoE) (T_8) followed by metsulfuron methyl @ 4g a.i. ha^{-1} (PoE) (T_9). Weedy check (T_1) was the most inferior treatment which recorded 875 kg ha^{-1} and 1326 kg ha^{-1} grain and straw yield respectively.

Introduction

Linseed (*Linum usitatissimum* L.) is a major oilseed crop in India, it is primarily cultivated during the *rabi* season. It has high oil value with large amount of fibre, carbohydrates and fat. The productivity of linseed is very low in India as well as in Chhattisgarh due to various agronomic reasons; weed infestation is one of the major limiting factors in production. Weed species infesting in linseed vary according to the agro-ecosystem of the growing region.

Weeds compete with the linseed crop during early growing stage resulting reduction yield, initial growth period of 20-45 days is very critical for weed control. Season long weed competition has been found to reduce linseed yield to the extent of 30-40% during *rabi season* (Mahere *et al.,* 2000). Physical or mechanical methods of weed management are conventional methods of weed control in linseed. Many times 2-3 manual weedings are required to keep the crop weeds free. Hand weeding is expensive because it is not only time consuming but labour intensive also. However, the extra benefit of giving more aeration and soil moisture conservation may not be overlooked. But, with a rising labour shortage the discovery of the possibility of herbicide weed control in linseed needs recognition. Identifying of a selective and cost effective herbicide can be a good alternative to giving a weed free environment for such an important during early growth period of crop.

Materials and Methods

The field experiment was conducted at the Research-cum-Instructional Farm, Dau Kalyan Singh College of Agriculture and Research Station, Bhatapara, Chhattisgarh during *rabi* season of 2020-21.

Experimental site is located in South Eastern region of Chhattisgarh at 21°43′ N latitude and 81°59′ E longitude with an attitude of 273 m above mean sea level (MSL), Experimental site have clay texture (*Vertisols*) soil with pH of 7.7, organic carbon content of 0.30% and available N, P_2O_5 and K_2O content of 112.7, 12.73 and 384.0 kg ha^{-1} respectively. The total rainfall received during the crop growth period was 30.2 mm, relative humidity ranged between 59.7% in 45th standard week to 51.2% in 9th standard week, with the mean of weekly maximum and minimum temperature 27.2 to 35.2°C and 9.2 to 18.0°C respectively. The treatment consist & of 12 weed management practices *viz.* T_1 - Weedy check, T_2 -1 hand weeding at 20 DAS, T_3 - 1 hand hoeing at 20 DAS + 1 hand weeding at 40 DAS, T_4 - pendimethalin @ 0.90 kg a.i.ha^{-1} (PE) T_5 -pendimethalin @ 0.90 kg a.i. ha^{-1} (PE) +1 hand weeding at 40 DAS, T_6pendimethalin @ 0.90 kg a.i. ha^{-1} (PE)+ imazathypr @ 100g a.i. ha^{-1} (PoE), T_7 - pendimethalin @ 0.90 kg a.i. ha^{-1} (PE) + isoproturon @ 1kg a.i. ha^{-1} (PoE), T_8- pendimethalin @ 0.90 kg a.i. ha^{-1} (PE) + metsulfuron methyl @ 4g a.i. ha^{-1} (PoE), T_9 - metsulfuron methyl @ 4g a.i. ha^{-1} (PoE), T_{10}- imazathypr @ 100 g a.i. ha^{-1} (PoE), T_{11} - isoproturon @ 1 kg a.i. ha^{-1} (PoE), and T_{12} - weed free.

Experiment was laid out in Randomized Block Design with three replications. *Indira alsi-32* variety was sown on 9th November, with inter and row spacing of 30 and 10cm respectively. The field was fertilized with N, P_2O_5, K_2O@ 60, 30 and 30 kg ha^{-1}respectively. Half of N (30 kg), full of P_2O_5 and K_2O were applied during final land preparation before sowing. Remaining of N (30 kg) was applied as first top dressing at 30 DAS.

All the herbicides were applied as per the protocol of application time using knapsack sprayer. The observation on seed yield, stover yield and biological yield was recorded from the net plot and converted to kg ha^{-1}.

Harvest index was determined using the formulas economic yield (kg ha^{-1}) / biological yield (kg ha^{-1}) × 100 as suggested by Donald (1962). Cost of cultivation was calculated based on prevailing labour wages at farm and price of inputs and operations.

For the calculation of gross returns, minimum support price was taken for grain and local market price was used for stover. The Benefit : Cost ratio was worked out on the basis of net returns per unit cost of cultivation.

Results and Discussion

Effect of weed management practices on yield of linseed crop

The linseed yield was significantly influenced by weed management practices (Table 1). Weed free (T_{12}) treatment recorded highest grain yield, stover yield and biological yield of 1175 kg ha^{-1}, 2027.10 kg ha^{-1} and 3202.1 kg ha^{-1} followed by 1 hand hoeing at 20 DAS + 1hand weeding at 40 DAS (T_3) of 1144.6 kg ha^{-1}, 1955 kg ha^{-1} and 3082 kg ha^{-1} respectively. The lowest yield recorded with weedy check (T_1) of 451.6 kg ha^{-1}, 874.5 kg ha^{-1} and 1326.2 kg ha^{-1} in grain yield, stover yield and biological yield respectively. Drastic reductions of Linseed yield due to higher competition of weeds with crop for growth factors (moisture, light, nutrients and space) in weedy check have also been reported by Jain and Jain (2016). Harvest index of the crop were also significantly influence by weed management practices (Table 1).

Highest values (38.49%) for harvest index were recorded with post emergence application of Metsulfuron methyl@ 4g a.i. (T_8). Weedy check (T_1) recorded the lowest harvest index (34.05%).

Table.1 Yield (kg ha^{-1}) and harvest index (%) of linseed as influenced by different methods of weed management

Treatment	Seed yield (kgha^{1})	Stover yield (kg ha^{-1})	Biological yield (kg ha^{-1})	harvest index (%)
T_1 - Weedy check	452	875	1326	34.05
T_2 - 1 hand weeding at 20 DAS	797	1387	2184	36.50
T_3 - 1 hand hoeing at 20 DAS + 1 hand weeding at 40 DAS	1127	1955	3082	36.58
T_4 - Pendimethalin @ 0.90 kg a.i. ha^{-1} (PE)	836	1454	2290	36.50
T_5 - Pendimethalin @ 0.90 kg a.i. ha^{-1} (PE)+1 hand weeding at 40 DAS	903	1572	2475	36.50
T_6 - Pendimethalin @ 0.90 kg a.i. ha^{-1} (PE)+ imazathypr @ 100g a.i. ha^{-1} (PoE)	936	1629	2566	36.50
T_7 - Pendimethalin @ 0.90 kg a.i.ha^{-1} (PE)+Isoproturon @ 1kg a.i. ha^{-1} (PoE)	904	1572	2476	36.50
T_8 - Pendimethalin @ 0.90 kg a.i. ha^{-1} (PE) + Metsulfuron methyl @ 4g a.i.ha^{-1}(PoE)	1053	1883	2936	35.87
T_9 - Metsulfuron methyl@ 4g a.i. ha^{-1}(PoE)	942	1505	2446	38.49
T_{10}-Imazathypr@ 100g a.i.ha^{-1} (PoE)	855	1488	2344	36.50
T_{11}-Isoproturon@ 1kg a.i.ha^{-1} (PoE)	803	1398	2201	36.50
T_{12} - Weed free	1175	2027	3202	36.69
SEm±	17.71	27.09	42.22	0.427
CD (*P*=0.05)	50.61	77.43	120.69	1.222

*PE- Pre emergence, PoE- Post emergence

Table.2 Cost of cultivation, gross return, net return and benefit: cost ratio as influenced by different methods of weed management.

Treatment	Cost of cultivation (Rs ha^{-1})	Gross returns (Rs ha^{-1})	Net returns (Rs ha^{-1})	B:C Ratio
T_1 - Weedy check	14825	21200	6375	0.43
T_2 - 1 hand weeding at 20 DAS	18875	37252	18377	0.97
T_3 - 1 hand hoeing at 20 DAS + 1 hand weeding at 40 DAS	22925	53464	30539	1.33
T_4 - Pendimethalin @ 0.90 kg a.i. ha^{-1} (PE)	16112	39059	22947	1.42
T_5 - Pendimethalin @ 0.90 kg a.i. ha^{-1}(PE)+ 1 hand weeding at 40 DAS	20162	42222	22060	1.09
T_6- Pendimethalin @ 0.90 kg a.i. ha^{-1}(PE) + imazathypr @ 100g a.i. ha^{-1} (PoE)	17501	43764	26263	1.50
T_7 - Pendimethalin @ 0.90 kg a.i. ha^{-1}(PE)+ Isoproturon @ 1kg a.i. ha^{-1}(PoE)	17581	42237	24656	1.40
T_8 -Pendimethalin @ 0.90 kg a.i. ha^{-1}(PE)+ Metsulfuron methyl @ 4g a.i. ha^{-1} (PoE)	16399	49268	32869	2.00
T_9 - Metsulfuron methyl @ 4g a.i. ha^{-1}(PoE)	15112	43880	28768	1.90
T_{10}- Imazathypr @ 100 g a.i. ha^{-1} (PoE)	16215	39978	23763	1.47
T_{11}- Isoproturon @ 1 kg a.i. ha^{-1} (PoE)	16294	37548	21254	1.30
T_{12} - Weed free	26975	54902	27927	1.04
SEm±	_	818.80	818.80	0.046
CD (*P*=0.05)	_	2340.24	2340.24	0.133

*PE- Pre emergence, PoE- Post emergence

Effect of weed management practices on economics of linseed crop

Data on the economics of linseed as influenced by weed management practices are shown in table 2. Among the weed management practices, weed free (T_{12}) is recorded maximum cost of cultivation and gross returns of 26975.0 Rs ha^{-1} and 54902 Rs ha^{-1} respectively, which was statistically at par with 1 hand hoeing at 20 DAS + 1 hand weeding at 40 DAS (T_3). This might be due to higher price of labour charge by weeding which involved more number of labour for manual weeding to create weed free condition. Weedy check (T_1) incurred minimum cost of cultivation (14825 Rs. ha^{-1}) though gave lowest gross returns of 54902 Rs ha^{-1}. Similar findings also reported by Dwivedi and puhup (2019).

Post emergence application of pendimethalin @ 0.90 kg a.i. ha^{-1} + metsulfuron methyl @ 4g a.i. ha^{-1} (T_8) being at par with 1 hand hoeing at 20 DAS + 1hand weeding at 40 DAS (T_3) fetched highest net returns (32869 Rs ha^{-1}). Weedy check (T_1) recorded lowest net returns (6375 kg ha^{-1}). Similar findings noted by Dwivedi and Puhup (2019). Benefit: cost ratio was noted significantly higher (2.0) with pre-emergence application of pendimethalin @ 0.90 kg a.i. ha^{-1} followed by application of metsulfuron methyl @ 4g a.i. ha^{-1}as post emergence, although this treatment was statistically at par with metsulfuron methyl @ 4g a.i. ha^{-1} (PoE) (T_9). Thus it can be

concluded that application of pendimethalin @ 0.90 kg a.i. ha^{-1} (PE)+ metsulfuron methyl @ 4g a.i. ha^{-1} (PoE) (T_8) and metsulfuron methyl @ 4g a.i. ha^{-1} (PoE) (T_9) was found the promising treatment in term of higher seed yield and B:C ratio for enhancing the productivity and profitability of linseed.

Weed free (T_{12}) treatment produced the highest seed yield of linseed (1175 kg ha^{-1}) followed by 1 hand hoeing at 20 DAS +1hand weeding at 40 DAS (T_3) (1144kg ha^{-1}) and pendimethalin @ 0.90 kg a.i. ha^{-1} (PE) + metsulfuron methyl @ 4g a.i. ha^{-1} (PoE) (T_8) (1053 kg ha^{-1}). Weedy check (T_1) treatment produced the lowest grain yield of (451 kg ha^{-1}). Increased grain and straw yields were primarily due to maintenance of weed free environment, especially during critical growth stages of crop, which reduce crop weed competition allowed for better growth and development of linseed crop resulting in higher seed yield.

References

Acharya, S. S., Nirala, R. B. P., Roychowdhury, A., Ghosh, M. and Haque, M. 2017. Bio-efficacy of herbicides against complex weed flora in linseed Indo-gangetic plain of Bihar. *Research on crops* 18(1): 49–56.

Donald, 1962. In search of yield. *Journal of Australian Agricultural Science* 28: 171–178.

Dwivedi, S. K. and Puhup, C. S. 2019. Weed dynamics, growth pattern, yield and economics of linseed under different weed management practices. *Indian Journal of Weed Science* 51(1): 36–39.

Jain, D. N. and Jain, V. 2016. Weed management with pre and post emergence herbicides in liseed (*Linum usitatissimum* L.). *World Weeds* 5(1-2): 41–45.

Mahere, J., Yadav, P. K. and Sharma, R. S. 2000. Chemical weed control in linseed withspecial reference to Cuscuta. *Indian journal of weed science* 32: 216–17.

Mishra, J. S., Singh, V. P. and Yaduraju, N. T. 2003. Bio-efficacy and economics of herbicidal weed control in irrigated linseed (*Linum usitatissimum* L.). *Indian Journal of Weed Science* 35(1&2): 154–155.

Vavilov, N. I. 1951. The origin, variation, immunity and breeding of cultivated plants, 1– 366.

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