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# Economic feasibility of weed management practices in cumin

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## ABSTRACT

A field experiment was conducted to find out the economic feasibility of weed management practices in terms of weed dynamics, weed control efficiency and performance of cumin *(Cuminum cyminum*).The experiment comprised of nine treatments. The experiment was laid out in randomized block design with three replications. Major weed flora observed in the experimental field were *Plantago pumila, Chenopodium murale, Chenopodium album, Amaranthus viridis, Cyperus rotandus* and *Phalaris minor.* The results revealed that weed free treatments resulted in significantly maximum vegetative growth and seed yield (6.0 q $ha^{-1}$) of cumin followed by pre emergence application of oxadiargyl @ 75 g $ha^{-1}$ + one hand weeding at 45 DAS. Among the weed management practices, weed free treatment was most effective in reducing the dry weight of weeds and recorded the highest weed control efficiency (85.94%) followed by preemergence application of oxadiargyl @ 75 g $ha^{-1}$ + one hand weeding at 45 DAS (78.31%). However, the maximum net returns (46,364.80 Rs.$ha^{-1}$) and highest benefit: cost ratio of 3.48:1 was obtained in pre-emergence application of oxadiargyl @75 g $ha^{-1}$ + one hand weeding at 45 DAS among all the treatments including weed free treatment. Thus pre emergence application of oxadiargyl @75 g/ha. + one hand weeding at 45 DAS was found as the best economically feasible practice to keep weed infestation at minimum level and to ensure higher economic yield (5.91 q $ha^{-1}$) in cumin.

**Key words:** *Cuminum cyminum* L, weed management, herbicide, yield**.**

## INTRODUCTION

Cumin (*Cuminum cyminum* L) is an important seed spice crop mainly grown in winter season in North India. It is an aromatic annual herb belonging to family Apiaceae. It is grown for its aromatic and fragrant seeds. The cumin seeds have an aromatic fragrance due to an alcohol, cuminol. Cumin seeds are used as a spice for their distinctive aroma. The productivity of cumin (380 kg $ha^{-1}$) is very low compared to other seed spices like fennel (1279 kg $ha^{-1}$) and fenugreek (1245 kg $ha^{-1}$).Weeds are an important factor lowering yield of cumin, which is responsible for reducing crop growth by two mechanisms. First by giving competition for resources such as space, light, water, nutrients etc. The second is allellopathy, which involves releasing of toxin into the environment (Bansal, 4).The initial growth of crop is slow; thereby it is more susceptible to weed crop competition in the earlier growth period of the crop. If weed problem is not managed properly, there is a strong chance of crop failure. Herbicides are the most effective and economic weed control measures. In view of the above facts, study on weed management practices was carried out for identifying effective and economically viable weed control method for harvesting higher yield of cumin.

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## MATERIALS AND METHODS

The experiment was carried out at National Research Centre on Seed Spices, Ajmer (Raj.) during winter season of 2006-07 and 2007-08.The experiment comprised of nine treatments *viz*. weedy check control ($T_1$), hand weeding at 45 DAS ($T_2$), pendimethalin @ 1.0 kg $ha^{-1}$ as pre emergence ($T_3$), oxadiargyl @ 75 g $ha^{-1}$ pre emergence ($T_4$) , fluchloralin 1 kg $ha^{-1}$ pre-plant incorporation($T_5$), pendimethalin @ 1.0 kg $ha^{-1}$ pre - emergence + hand weeding at 45 DAS ($T_6$), oxadiargyl @ 75 g $ha^{-1}$ pre emergence+hand weeding at 45 DAS ($T_7$), fluchloralin @1.0 kg $ha^{-1}$ pre-plant incorporation + hand weeding at 45 DAS ($T_8$) and weed -free ($T_9$).The experiment was laid out in randomized block design with three replications. The soil of the experimental site was sandy loam with a pH of 8.92 and having 0.21 per cent organic carbon , 76.0, 33.4, and 234.1 kg $ha^{-1}$ available N, $P_2O_5$ and $K_2O$, respectively. The weed control practices were applied as per treatments under study.

The irrigation and other cultural practices were adopted as per recommendation. The observations on growth, yield attributing characters, yield and economics of cumin were taken during the course of study. Net

returns and B: C ratio was also worked out. Weed control efficiency (WCE) was calculated as per the formula suggested by (Patil and Patil, 9)

$$WCE (\%) = [(DMC-DMT)/DMC] \times 100$$

Where, DMC is the dry matter weight of weeds in the control plots and *DMT* is the dry matter weight of weeds in treated plots.

The weed index was calculated as per formula suggested by (Gill and Kumar, 6)

WI (%) = [(X-Y)/X] x 100; Where X is the yield from weed free plots and Y is the yield from treated plots.

## RESULTS AND DISCUSSION

The most important weed species in the experimental field through-out the growing period were *Plantago pumila ,Chenopodium murale*, *Chenopodium album*, *Amaranthus virdis*, *Cyperus rotundus*, *Phalaris minor*, *Cynadon dactylon* and *Anagallis arvensis*, respectively. The highest dry weight of weeds (92.58 q $ha^{-1}$) was found in the unweeded treatment (control plot), which was significantly higher than that in other treatments (Table 1). Similar results were also reported by Ahmed *et al.* (1) ; Dhama *et al,(*5) and Bajpai and Singh (3).Weed free treatment recorded the lowest weed density and dry weight of weeds at harvest. The pre emergence application of oxadiargyl @ 75g $ha^{-1}$ + one hand weeding at 45 days after sowing resulted significantly minimum weed density and dry weight of weeds (3.97q $ha^{-1}$) than that in other treatments except weed free condition. Fluchloralin applied as pre plant incorporation @ 1 kg $ha^{-1}$ was found less effective in reducing dry weight of weeds (10.09 q $ha^{-1}$) and resulted lower weed control efficiency.

Highest weed control efficiency was observed in weed free treatment (85.94%) due to continuous removal of weeds up to 90 days after sowing. Among all the weed management practices, maximum weed control efficiency was recorded in pre emergence application of oxadiargyl @ 75 g $ha^{-1}$ + one hand weeding at 45 DAS (78.31%) followed by pre emergence application of pendimethalin 1 kg $ha^{-1}$ + one hand weeding at 45 DAS (75.33%). The lowest weed control efficiency was recorded in pre-plant incorporation of fluchloralin @ 1 kg $ha^{-1}$ (70.70%). Alam *et al.* (2) and Singh *et al. (*12) have also reported the similar results.

In general, crop with better growth was found in the plots having weed control treatments than unweeded treatment (Table 1). It might be due to severe cumin weed competition in unweeded (control) treatment compared to weed control treatments throughout the growing period.

The pre emergence application of oxadiargyl @ 75g $ha^{-1}$ + one hand weeding at 45 days after sowing significantly increased plant growth parameters over weedy check (control). A perusal of data (Table 1) revealed that significantly highest plant height and other growth attributes were obtained with the pre emergence application of oxadiargyl @75 g $ha^{-1}$+hand weeding at 45 DAS followed by pre emergence application of

**Table 1.** Crop growth parameters, dry weight of weeds, weed index & weed control efficiency as affected by weed management practices in cumin.

| Treatment | No. of branches $plant^{-1}$ | Dry weight of weeds at harvestq $ha^{-1}$ | Weed control efficiency(%) | Weed index (%) |
|---|---|---|---|---|
| Weed check control | 3.30 | 92.58 | 0.00 (4.05)* | 77.94 |
| Hand weeding at 45 DAS | 3.88 | 12.21 | 86.38 (68.51)* | 65.33 |
| Pendimethalin 1 kg $ha^{-1}$ PE | 4.95 | 7.39 | 91.57 (73.61)* | 17.08 |
| Oxadiargyl 75 g $ha^{-1}$ PE | 5.52 | 5.14 | 94.28 (76.33)* | 12.93 |
| Fluchloralin 1 kg $ha^{-1}$ PE | 4.51 | 10.09 | 88.57 (70.70)* | 33.66 |
| Pendimethalin 1 kg $ha^{-1}$ PE + Hand weeding at 45 DAS | 5.57 | 6.03 | 93.08 (75.33)* | 3.98 |
| Oxadiargyl 75 g $ha^{-1}$PE + Hand weeding at 45 DAS | 5.74 | 3.97 | 95.48 (78.31)* | 1.99 |
| Fluchloralin 1 kg $ha^{-1}$ PE + Hand weeding at 45 DAS | 4.98 | 8.99 | 89.87(71.87)* | 21.55 |
| Weed free | 5.76 | 0.00 | 100.0 (85.94)* | 0.00 |
| LSD (P = 0.05) | 0.603 | 3.831 | 4.063 | - |

* ( ) Parenthesis are Arc Sin transformed values; DAS=Days after sowing, PE= Pre emergence

pendimethalin 1 kg ha$^{-1}$ + one hand weeding at 45 DAS. The lowest plant growth attributing characters were obtained in weedy check. This result supports the study by Mehta *et al* ( 7) and Meena and Chaudhary (8).

All the weed management practices significantly influenced the yield attributes and yield of cumin over unweeded treatment (Table 2). Significantly highest yield components and seed yield were obtained with weed free treatment over all the other treatments (Table 2). Among all other weed management practices, significantly higher umbels per plant, umbellets per umbel and seeds per umbellate were obtained with the pre emergence application of oxadiargyl @ 75 g ha$^{-1}$ + one hand weeding at 45 DAS followed by pre emergence application of pendimethalin 1 kg ha$^{-1}$+ hand weeding at 45 DAS. The lowest yield contributing characters and seed yield were obtained in weedy check.

Further perusal of data (Table 2) indicated that, pre emergence application of oxadiargyl @ 75 g ha$^{-1}$ + one hand weeding at 45 DAS has produced significantly higher, test weight (4.60g) essential oil content in seed (4.09%) and seed yield (5.91 q ha$^{-1}$) followed by pre emergence application of pendimethalin @ 1 kg ha$^{-1}$ + hand weeding at 45 DAS over rest of the treatments under study. The lowest seed yield (1.33 q ha$^{-1}$) was recorded in weedy check during both the years, which indicated the extent of loss caused by the presence of

**Table 2.** Yield components and yield as affected by weed management practices in cumin.

| Treatment | No. of umbels plant$^{-1}$ | Test weight (g.) | Essential oil(%) | Seed yieldq ha$^{-1}$ |
|---|---|---|---|---|
| Weed check control | 6.75 | 3.50 | 3.47 | 1.33 |
| Hand weeding at 45 DAS | 9.36 | 3.95 | 3.57 | 2.09 |
| Pendimethalin 1 kg ha$^{-1}$ PE | 13.22 | 4.41 | 4.05 | 5.00 |
| Oxadiargyl 75 g ha$^{-1}$ PE | 14.47 | 4.50 | 4.03 | 5.25 |
| Fluchloralin 1 kg ha$^{-1}$ PE | 12.09 | 4.16 | 3.88 | 4.00 |
| Pendimethalin 1 kg ha$^{-1}$ PE + Hand weeding at 45 DAS | 15.79 | 4.53 | 4.02 | 5.79 |
| Oxadiargyl 75 g ha $^{-1}$PE + Hand weeding at 45 DAS | 16.04 | 4.60 | 4.09 | 5.91 |
| Fluchloralin 1 kg ha$^{-1}$ PE + Hand weeding at 45 DAS | 14.32 | 4.45 | 3.85 | 4.73 |
| Weed free | 15.84 | 4.57 | 4.07 | 6.03 |
| LSD ($P$ = 0.05) | 0.333 | 0.006 | 0.027 | 0.021 |

**Table 3.** Economics of various weed management practices in cumin.

| Treatment | Seed yield (q ha$^{-1}$) | Gross returns (Rs. ha$^{-1}$) | Cost of cultivation (Rs. ha$^{-1}$) | Net returns (Rs. ha$^{-1}$) | B:C ratio |
|---|---|---|---|---|---|
| Weed check control | 1.33 | 14,630 | 15,775 | -1145 | 0.92 |
| Hand weeding at 45 DAS | 2.09 | 22,990 | 17,775 | 5,215 | 1.29 |
| Pendimethalin 1 kg ha$^{-1}$ PE | 5.00 | 55,000 | 18,187 | 36,813 | 3.02 |
| Oxadiargyl 75 g ha$^{-1}$ PE | 5.25 | 57,750 | 16,645 | 41,105 | 3.46 |
| Fluchloralin 1 kg ha$^{-1}$ PE | 4.00 | 44,000 | 17,166 | 26,834 | 2.56 |
| Pendimethalin 1 kg ha$^{-1}$ PE + Hand weeding at 45 DAS | 5.79 | 63,690 | 20,186 | 43,503 | 3.15 |
| Oxadiargyl 75 g ha $^{-1}$PE + Hand weeding at 45 DAS | 5.91 | 65,010 | 18,645 | 46,365 | 3.48 |
| Fluchloralin 1 kg ha$^{-1}$ PE + Hand weeding at 45 DAS | 4.73 | 52,030 | 19,166 | 32,864 | 2.71 |
| Weed free | 6.03 | 66,330 | 23,775 | 42,555 | 2.78 |
| LSD ($P$ = 0.05) | 0.021 | — | — | — | — |

* Selling Prices Seed Rs. 11,000/- ha$^{-1}$

the weeds in cumin, if unchecked. This was in agreement with the findings of Sharma and Chauhan (11). The application of oxadiargyl helps in controlling weed problem, which in turn, reduce weed crop competition for space, light, nutrients and soil moisture. Hence, it results in higher growth and yield attributes, which ultimately lead to higher seed yield of cumin. Similar results were obtained by Meena and Chaudhary (8), who reported that application of oxadiargyl gave higher seed yield of cumin due to better weed control efficiency. Similarly, Rathore *et al*.(10) found that pre- emergence application of pendimethalin @ 1.0 kg $ha^{-1}$ resulted highest seed yield of cumin over rest of the treatments. The maximum seed yield obtained under the application of oxadiargyl may be attributed to its better weed control efficiency.

The maximum net returns Rs. 46364.80 $ha^{-1}$ and highest benefit: cost ratio of 3.48:1 was obtained with pre emergence application of oxadiargyl @75 g $ha^{-1}$ + one hand weeding at 45DAS among all the treatments including weed free treatments followed by pre emergence application of pendimethalin @1 kg $ha^{-1}$ + one hand weeding at 45 DAS (Table 3).

Thus, it can be concluded that pre emergence application of oxadiargyl @75 g $ha^{-1}$ + one hand weeding at 45 DAS is safe and economical; to control weed effectively and obtaining highest benefit: cost ratio in cumin.

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