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**Short communication**

# Integrated weed management in cumin

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Cumin (*Cuminum cyminum* L) locally known as 'zeera' is an important seed spice crop of western India particularly of Rajashthan, Gujarat and some parts of Madhya Pradesh. Its seed have pleasant aromatic odour and also has medicinal value. India is a major producer, consumer and exporter of spices in the world. Among seed spices cumin occupies first position in term of value and second in terms of production. It is cultivated in an area of 594 thousand hectare with the production of 394 thousand Mt and productivity of 0.7 t/ha in India (NHB 2013).

Being a short stature crop with slow initial growth, the crop is more susceptible to weed competition during the earlier growth period. Herbicides are the most effective and economic measure of weed control. Generally, cumin farmers control weed manually, which is labour intensive and costly. Therefore, the present study was conducted to find out the effective and economical weeding practice in cumin.

An experiment was conducted in winter *(Rabi)* season of 2013-14 at Research Farm, College of Horticulture, Mandsaur (Madhya Pradesh) to find out the effective and economically viable weed management practices for obtaining higher yield of cumin. The soil of experimental field was light black loamy in texture with pH 7.2, EC 0.35 dS/m, low in available nitrogen (243.2 kg/ha), medium in available phosphorus (19.8 kg/ha) and high in available potassium (448.0 kg/ha). The experiment was laid out in randomized block design with 12 treatments using three replications. The cultivar *'GC4'* was used for sowing on 30 October 2013. The crop was sown at a spacing of 30 x 10 cm using recommended dose of fertilizer and cultural practices. Cumin crop was harvested on different dates as per maturity. The data recorded were subjected to statistical analysis using RBD and ANOVA technique suggested by Panse and Sukhatme (1985).

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**Effect on growth and yield**

Application of herbicides and weed management treatments significantly increased the growth and yield of cumin. Application of oxadiargyl 0.06 kg/ha as pre-emergence *fb* two hand weeding at 40 and 60 DAS significantly improved the plant height at different growth stages, number of branches and reduced the duration of 50% flowering of cumin. Besides weed free treatment, the highest number of umbels/plant (14.4), number of umbellates/plant (84.3), 1000- seed test weight (4.10 g), seed yield (595 kg/ha) and straw yield (900 kg/ha) were recorded with application of oxadiargyl 0.060 kg/ha as *fb* two hand weeding at 40 and 60 DAS. The early flowering (4-7 days) was also observed under oxadiargyl 0.060 kg/ha as PE *fb* 2 hand weeding at 40 and 60 DAS. Higher yield attributes, seed and straw yield under these treatments might be due to effective control of weeds, which in turn reduced crop-weed competition significantly and consequently resulting in better congenial condition for growth and development of the crop. Similar improvement in seed yield, straw yield and harvest index were also recorded by Yadav *et al.*(2005), Mehriya *et al.*(2007), Meena *et al.*(2009) and Yadav *et al.*(2012) in cumin crop.

**Effect on weeds**

Weed management practices significantly reduced the number of weeds and dry matter of weeds recorded at different growth stages. The dominant weed flora in the experimental field consisted of *Chenopodium album*, *Chenopodium murale*, *Cynodon dactylon*, *Cyperus rotundus*, *Melilotus alba*, *Argemone mexcicana*, *Asphodelus tenuifolius*, *Plantago pumila*, *Rumex dentatus* and *Launea asplenifonifolia*. Application of oxadiargyl 0.06 kg/ha *fb* two hand weeding at 40 and 60 DAS was found more effective in reducing the weed population (6.2/$m^2$) and resulted in less dry weight of weeds (12.40 g/$m^2$). Application of oxadiargyl 0.075

**Table 1. Growth and yield attributes of cumin under different weed management methods in cumin**

| Treatment | Plant height (cm.) | | Number of branches /plant | | Days to 50 % flowering | Number of umbels / plant | 1000-seed test weight (g) | Seed yield per plant (g) | Seed yield (kg/ha) | Straw yield (kg/ha) | Harvest index (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 DAS | At harvest | 60 DAS | 90 DAS | | | | | | | |
| Pendimethalin 1.0 kg/ha as PE | 15.4 | 21.5 | 4.5 | 4.8 | 59.0 | 11.5 | 3.60 | 1.29 | 430 | 783 | 35.44 |
| Pendimethalin 1.2 kg/ha as PE *fb* 1 HW at 40 DAS | 16.2 | 22.6 | 5.0 | 5.4 | 56.0 | 13.5 | 3.90 | 1.53 | 500 | 850 | 37.03 |
| Pendimethalin 1.0 kg/ha as PE *fb* 2 HW at 40 and 60 DAS | 16.5 | 22.8 | 5.3 | 5.7 | 55.0 | 14.0 | 4.00 | 1.62 | 520 | 880 | 37.14 |
| Oxyfluorfen.0.15 kg/ha as PE | 14.3 | 20.8 | 4.1 | 4.4 | 59.0 | 11.0 | 3.50 | 1.05 | 360 | 730 | 33.05 |
| Oxyfluorfen 0.30 kg/ha as PE *fb* 1 HW at 40 DAS | 14.9 | 21.1 | 4.3 | 4.6 | 59.0 | 11.3 | 3.55 | 1.38 | 460 | 810 | 36.22 |
| Oxyfluorfen at 0.15 kg/ha as PE *fb* 2 HW at 40 and 60 DAS | 15.8 | 22.3 | 4.8 | 5.2 | 58.0 | 12.5 | 3.80 | 1.42 | 475 | 830 | 36.39 |
| Oxadiargyl at 0.06 kg/ha as PE | 15.6 | 21.8 | 4.5 | 4.9 | 58.0 | 12.3 | 3.75 | 1.35 | 450 | 800 | 36.00 |
| Oxadiargyl at 0.075 kg/ha as PE *fb* 1 HW at 40 DAS | 16.3 | 22.7 | 5.1 | 5.6 | 57.0 | 13.9 | 3.95 | 1.62 | 520 | 880 | 37.14 |
| Oxadiargyl at 0.06 kg/ha as PE *fb* 2 HW at 40 and 60 DAS | 17.9 | 22.9 | 5.8 | 6.3 | 55.0 | 14.4 | 4.10 | 1.71 | 595 | 900 | 39.79 |
| Weed check (control) | 11.5 | 17.4 | 3.2 | 3.4 | 62.0 | 6.2 | 3.00 | 0.45 | 230 | 510 | 31.08 |
| Hand weeding (40 DAS) | 13.4 | 19.2 | 4.0 | 4.3 | 60.0 | 9.5 | 3.40 | 0.87 | 310 | 730 | 30.23 |
| Weed free | 19.8 | 24.7 | 6.4 | 7.3 | 53.0 | 15.5 | 4.83 | 1.87 | 600 | 930 | 39.21 |
| LSD (P=0.05) | 1.9 | 1.8 | 0.6 | 0.9 | 2.7 | 1.0 | 0.61 | 0.23 | 73 | 133 | 5.18 |

**Table 2. Economics of cumin and weeds under different weed management methods in cumin**

| Treatment | Economics of treatments | | | Weed dry matter g/m$^2$ | | | | Weed population/m$^2$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gross returns (x10$^3$ `/ha) | Net returns (x10$^3$ `/ha) | Benefit : cost ratio | 30 DAS | 60 DAS | 90 DAS | At harvest | 30 DAS | 60 DAS | 90 DAS | At harvest |
| Pendimethalin 1.0 kg/ha as PE | 51.60 | 29.80 | 1.36 | 8.7 | 20.6 | 40.4 | 60.0 | 15.6 | 20.8 | 21.3 | 21.6 |
| Pendimethalin 1.2 kg/ha as PE *fb* 1 HW at 40 DAS | 60.00 | 35.81 | 1.48 | 7.4 | 10.0 | 22.3 | 35.2 | 13.2 | 10.4 | 11.2 | 11.3 |
| Pendimethalin 1.0 kg/ha as PE *fb* 2 HW at 40 and 60 DAS | 62.40 | 36.60 | 1.41 | 8.8 | 10.3 | 10.0 | 20.6 | 15.8 | 10.6 | 8.2 | 8.3 |
| Oxyfluorfen.0.15 kg/ha as PE | 43.20 | 22.00 | 1.03 | 12.6 | 30.1 | 62.6 | 90.5 | 22.5 | 28.2 | 29.0 | 29.5 |
| Oxyfluorfen 0.30 kg/ha as PE *fb* 1 HW at 40 DAS | 55.20 | 30.65 | 1.24 | 11.9 | 10.3 | 36.3 | 57.6 | 21.2 | 18.3 | 19.2 | 19.5 |
| Oxyfluorfen at 0.15 kg/ha as PE *fb* 2 HW at 40 and 60 DAS | 57.00 | 31.80 | 1.26 | 12.5 | 11.2 | 11.0 | 25.0 | 22.3 | 18.5 | 15.1 | 15.3 |
| Oxadiargyl at 0.06 kg/ha as PE | 54.00 | 33.20 | 1.59 | 7.2 | 18.0 | 36.1 | 54.3 | 12.8 | 17.7 | 18.1 | 18.3 |
| Oxadiargyl at 0.075 kg/ha as PE *fb* 1 HW at 40 DAS | 62.40 | 39.55 | 1.71 | 6.3 | 8.5 | 16.2 | 27.0 | 11.2 | 8.0 | 9.0 | 9.5 |
| Oxadiargyl at 0.06 kg/ha as PE *fb* 2 HW at 40 and 60 DAS | 71.40 | 46.55 | 1.87 | 7.1 | 8.1 | 8.5 | 12.4 | 12.6 | 8.4 | 6.0 | 6.2 |
| Weed check (control) | 27.60 | 7.75 | 0.39 | 62.3 | 140.1 | 220.0 | 280.0 | 110.5 | 130.3 | 135.8 | 140.1 |
| Hand weeding (40 DAS) | 37.20 | 15.35 | 0.70 | 60.5 | 70.2 | 120.8 | 180.0 | 108.2 | 60.3 | 63.2 | 64.5 |
| Weed free | 72.00 | 39.15 | 1.31 | 1.0 | 1.2 | 1.0 | 1.4 | 3.0 | 3.0 | 2.0 | 1.0 |
| LSD(P=0.05) | 8.70 | 9.12 | 0.38 | 2.08 | 3.0 | 5.1 | 6.6 | 3.5 | 3.4 | 2.4 | 2.9 |

kg/ha *fb* one hand weeding at 40 DAS was found equally effective in this respect (Table 1). The highest weed population at harvest was recorded in unweeded control (140.1/m$^2$). The combined effect of herbicide and hand weeding gave less dry weight of weeds which was responsible for higher weed control efficiency. Further, weeds were effectively controlled under weed free and oxadiargyl 0.06 kg/ha *fb* two hand weeding at 40 and 60 DAS, hence there was no severe competition by weeds for moisture and nutrients which resulted into induced growth and yield of cumin. The findings are in agreement with the results reported by Kumar (2001), Yadav *et al* (2005), Mehriya *et al*(2007), Meena *et al* (2009) and Yadav *et al* (2012).

## Economics

Among the different weed management methods, maximum net return (₹ 46550) and benefit : cost ratio of 1.87 were obtained with an application of oxadiargyl 0.06 kg/ha *fb* two hand weeding at 40 and 60 DAS while the minimum net return and benefit :

**Table 3. Correlation coefficients and regression lines showing relationship between independent variable (x) and dependent variable (y) under different weed management methods in cumin**

| Dependent variable (x) in cumin | Independent variable (y) | Correlation coefficient (r) | Regression line (y = a + by (x)) |
|---|---|---|---|
| Branches/plant (60 DAS) | Plant height at harvest (cm) | 0.941 | Y = 2.111x + 11.62 |
| Branches/plant (90 DAS) | Plant height at harvest (cm) | 0.935 | Y = 1.755x + 12.59 |
| Seed yield (t/ha) | Plant height at harvest (cm) | 0.970 | Y = 1.734x + 13.80 |
| Seed yield per plant (g) | Plant height at harvest (cm) | 0.979 | Y = 4.745x + 15.25 |
| No. of umbels per plant | No. of branches/plant (60 DAS) | 0.944 | Y = 0.321x + 0.855 |
| No. of umbellets per plant | No. of branches/plant (60 DAS) | 0.979 | Y = 0.039x + 2.496 |
| Plant height at harvest | Weed Population/m2 at harvest | 0.913 | Y = 0.045x + 22.94 |
| Seed yield (t/ha) | No. of umbels per plant | 0.973 | Y = 2.283x + 1.811 |
| Seed yield (t/ha) | No. of umbellets per plant | 0.963 | Y = 19.15x – 29.17 |
| Seed yield per plant (g) | No. of umbels per plant | 0.985 | Y = 6.265x + 3.694 |
| Seed yield per plant (g) | No. of umbellets | 0.945 | Y = 51.49x - 11.91 |
| Straw yield (t/ha) | Plant height at harvest (cm) | 0.952 | Y = 1.633x + 8.534 |
| Harvest index (%) | Seed yield(q/ha) | 0.969 | Y = 0.370x – 8.669 |
| Harvest index (%) | Seed yield per plant (g) | 0.950 | Y = 0.133x – 3.417 |
| No. of umbels per plant | No. of branches/plant (90 DAS) | 0.931 | Y = 0.378x + 0.567 |
| No. of umbellets per plant | No. of branches/plant (90 DAS) | 0.965 | Y = 0.046x + 2.501 |
| Seed yield (t/ha) | Test weight (g) | 0.909 | Y = 0.380x + 2.061 |
| Seed yield per plant (g) | Test weight (g) | 0.903 | Y = 1.025x + 2.400 |
| Harvest index (%) | Plant height at harvest (cm) | 0.925 | Y = 0.631x – 0.848 |
| Days to 50% flowering | Plant height at harvest (cm) | 0.933 | Y = 0.714x + 62.76 |
| Straw yield (q/ha) | No. of umbels per plant | 0.977 | Y = 2.198x – 5.513 |
| Straw yield (q/ha) | No. of umbellets per plant | 0.920 | Y = 17.56x – 83.54 |
| Weed Population/$m^2$ at harvest | Plant height at harvest | 0.913 | Y = 0.045x + 22.94 |
| Weed dry matter g/$m^2$ at harvest | Weed Population/m2 at harvest | 0.980 | Y = 0.467x – 4.085 |
| Weed dry matter g/$m^2$ at harvest | Weed Population/m2 30 DAS | 0.939 | Y = 0.428x + 0.457 |
| Weed dry matter g/$m^2$ at harvest | Weed Population/m2 60 DAS | 0.976 | Y = 0.426x – 2.127 |
| Weed dry matter g/$m^2$ at harvest | Weed Population/m2 90 DAS | 0.981 | Y = 0.452x – 3.641 |

cost ratio was recorded in weedy check (table 2). Correlation coefficients and regression lines showing relationship between independent variable (x) and dependent variable (y) under different weed management methods in cumin is shown (Table 3). Similar trend was also observed by Mehriya *et al* (2007), Meena *et al* (2009) and Yadav *et al* (2012).

## SUMMARY

A field experiment was conducted during 2013-14 at Research Farm, College of Horticulture, Mandsaur (Madhya Pradesh) to study the weed management practices in cumin. Twelve weed management treatments were laid in randomized block design with three replications. Weed free treatment recorded significant maximum growth and yield attributes of cumin followed by oxadiargyl at 0.06 kg/ ha (PE) *fb* two hand weeding at 40 and 60 DAS. Similarly, significant maximum seed yield (595 kg/ha), straw yield (900 kg/ha) and harvest index (39.7%) was observed with oxadiargyl at 0.06 kg/ha as pre-emergence *fb* two hand weeding at 40 and 60 DAS. Maximum weed population was measured in case of weedy check, which was followed by hand weeding (40 DAS) at all the growth stages of cumin. It may be concluded that application of oxadiargyl at 0.06 kg/ha as pre-emergence *fb* two hand weeding at 40 and 60 DAS may be use for higher yield of cumin.

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