

Effect of Tillage and Irrigation Levels on the Persistence of Fluchloralin and Pendimethalin Applied in Cumin on Succeeding Crop of Pearl millet under Arid Conditions

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Fluchloralin and pendimethalin are commonly used to control weeds in cumin but these herbicides may persist for a longer period under low soil moisture and poor organic matter soil conditions. Yadav *et al.* (1991) reported residual activity of fluchloralin even after 234 days of its application in mustard-sorghum cropping system in semi-arid conditions. Some agronomic practices like tillage, irrigation, burying plant residues influenced the persistency of herbicides as reported by Covarelli (1993). Keeping these points in view, the study was undertaken to investigate the residual effect of fluchloralin and pendimethalin applied in cumin on succeeding pearl millet under different irrigation and tillage practices in arid conditions.

Field experiment was conducted during 1996-97 and 1997-98 at the Agricultural Research Station, Mandor, Jodhpur. The soil of experimental plot was loamy sand with pH 8.1, low in organic carbon (0.21) and available P (8.1 kg ha⁻¹) and high in available K (261 kg ha⁻¹). The moisture content at field capacity and permanent wilting point was 10.5 and 3.4% (w/w), respectively. A split plot design with three replications was used. Treatments consisted of two irrigation levels (3 and 4) and two tillage treatments (no tillage and tillage applied in the month of May after harvesting of cumin in April) were in main plots. Three weed control treatments (hand weeding, fluchloralin at 1.0 kg ha⁻¹ as PPI and pendimethalin at 1.0 kg ha⁻¹ pre-emergence applied in cumin) were in sub-plots. Cumin crop was sown on 15 November in both the years. The cumin crop was harvested on 15 March in 1997 and 20 March in 1998. After harvesting of cumin, tillage treatments were given in the first fortnight of May in both the years. Pearl millet (cv. HHB 67) was sown on 12 July,

1997 and 17 June, 1998 after the first major rains of seasons as per the practices recommended to the region as a rainfed crop. The long term average rainfall at Jodhpur is 360 mm, however, 570.6 and 409.4 mm rainfall was recorded in 1997 and 1998, respectively.

Plant stand of succeeding pearl millet was not significantly affected due to tillage (Table 1). Fluchloralin/pendimethalin applied in cumin significantly reduced the plant stand of succeeding pearl millet compared to untreated control (Table 1). Significantly higher reduction in the plant stand of pearl millet was observed in pendimethalin than fluchloralin applied plots. The ear length of succeeding pearl millet was significantly affected due to the residues of pendimethalin compared to control. No significant effect was observed due to residues of herbicides on the panicles plant¹.

Tillage significantly increased the grain and stover yield of pearl millet (Table 1). The residues of fluchloralin and pendimethalin significantly reduced the grain and stover yield of succeeding pearl millet compared to untreated control. This may be explained in the light of fact that cereals are selective to pendimethalin due to the placement of crop seed below herbicidal layer (positional selectivity) and here positional selectivity might be disturbed during the sowing of succeeding pearl millet after cumin. The overall residual effect of pendimethalin was significantly greater on succeeding pearl millet than that of fluchloralin. A significant tillage x herbicide interaction was observed for the grain yield of succeeding pearl millet. Tillage in fluchloralin treated plots improved the seed yield of succeeding pearl millet to the level of untreated control, while it was significantly less under no tillage condition.

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Table 1. Residual effect of herbicides applied in cumin in relation to irrigation and tillage practices on growth and yield of succeeding pearl millet (Mean of two seasons)

Treatment	Plant stand ('000 ha ⁻¹)	Panicles plant ⁻¹	Earhead length (cm)	Stover yield (kg ha ⁻¹)	Seed yield (kg ha ⁻¹)
Tillage in summer after harvest of cumin					
No tillage	81.7	3.3	19.9	4190	2277
Tillage	82.2	5.0	22.1	5510	2894
LSD (P=0.05)	NS	0.7	1.5	320	282
Irrigation in cumin*					
Three irrigations	80.2	4.3	21.3	4850	2508
Four irrigations	83.6	4.2	20.8	4850	2663
LSD (P=0.05)	NS	NS	NS	NS	NS
Weed control in cumin					
Hand weeding	99.1	3.8	21.9	5270	2854
Fluchloralin as PPI at 1.0 kg ha ⁻¹	80.2	3.8	21.1	4930	2671
Pendimethalin as pre-em. at 1.0 kg ha ⁻¹	66.4	4.5	20.1	4360	2232
LSD (P=0.05)	9.1	NS	1.0	230	160

*Three irrigations at 10, 40 and 70 DAS; four irrigations at 10, 35, 60 and 85 DAS.

NS—Not Significant.

This might be due to the dilution effect of tillage (Covarelli, 1993) and more volatile nature of fluchloralin. Tillage improved the grain yield in pendimethalin treated plots but not to the level of untreated control or fluchloralin treated plots. There was no significant effect of irrigations (upto 4) applied in cumin on the persistence of fluchloralin and pendimethalin.

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