

Impact of integrated weed management on the performance of sunflower, weed dynamics and soil mycoflora

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Sunflower crop though a good competitor with weeds, still requires weed control measures to enhance the yield. The yield losses due to weeds are around 30 to 60% (Balyan 1993, Mishra 1997). Weeds that emerge during the early stages of crop growth are more competitive and harmful. Therefore, there is necessity to study the weeds and develop appropriate weed management practice for higher crop productivity. Herbicides that have phytotoxic effect on weeds may have positive or negative influence on soil mycoflora. Therefore, an attempt has been made to study the effect of soil applied herbicides on mycofloral changes during crop growing period.

The experiment was conducted at Instrutinal Farm Indira Gandhi Krishi Vishva Vidyalaya, Raipur (Chhattisgarh) during summer season of 1999. The soil was sandy loam with low organic carbon and nitrogen and medium P and K status. The experiment was carried out with 12 treatment combinations consisting of 9 herbicidal treatments and two hand hoeings, two hand weeding and unweeded check (Table 1) in a randomized block design with 3 replications. A basal dose of 60 kg N/ha, 90 kg P₂O₅/ha and 60 kg K₂O/ha was applied at the time of sowing and 15 kg N/ha was top dressed at 40 days after sowing (DAS). Herbicides were applied as per treatment and mechanical hoeing or hand weeding were done at 50 DAS. Various parameters of weeds and crop growth and yield were

recorded.

Marked weed infestation with diverse weed flora was observed in the experimental field. *Borreria hispida*, *Physalis minima*, *Cyperus rotundus*, *Echinochloa colona*, *Eclipta alba*, *Melilotus alba*, *Chenopodium album* made the bulk of the weed flora. Similar trend in weed flora was observed by Tripathi *et al.* (1996) Various weed management practices showed significant effect on total weed dry matter production (Table 1). Trifluralin, pendimethalin and metolachlor supplemented with either hand weeding or hand hoeing revealed significant reduction in weed dry matter. Lower weed growth rate during the initial period substantiated the minimum weed dry matter and weed competition under herbicide treated plot. Reddy *et al.* (1993) have reported that pre emergence application of pendimethalin 1.5 kg/ha and metolachlor 1.5 kg/ha reduced weed dry matter, when compared with weedy check. Hand weeding and hand hoeing twice were also found equally effective in reducing weed dry matter when compared to weedy check.

The highest seed yield was recorded with pre-emergence application of pendimethalin 1 kg/ha supplemented with one hand weeding at 50 days after sowing, which gave 189% increase in yield over unweeded check. It is followed by hand weeding twice, pre emergence application of pendimethalin 1 kg/ha supplemented with one hand

Table 1: Effect of treatments on sunflower crop growth, yield and weeds dry matter

Treatments	Seed yield (q/ha)	Seed weight (g/head)	Dry matter (g/plant)	Dry matter weeds (g/m ²)
Trifluralin 1.5 kg/ha	20.20	21.55	61.49	21.91
Trifluralin 1 kg/ha + one hand weeding	20.36	24.12	20.40	12.48
Trifluralin 1 kg/ha + one hand hoeing	19.62	18.57	59.97	14.23
Pendimethalin 1.5 kg/ha	19.52	19.88	55.99	21.08
Pendimethalin 1kg/ha+ one hand weeding	20.88	29.32	81.73	9.79
Pendimethalin 1 kg/ha + one hand hoeing	20.51	19.60	60.73	12.98
Metolachlor 1kg/ha	16.80	16.52	57.20	35.60
Metolachlor 0.75 kg/ha + one hand weeding	18.37	23.24	68.55	15.59
Metolachlor 0.75 kg/ha + one hand hoeing	16.70	18.09	60.33	18.60
Two Hand weeding	20.77	24.33	71.34	11.12
Two Hand hoeing	19.20	23.35	70.80	20.81
Unweeded control	9.97	14.02	52.71	63.71
LSD(P=0.05)	3.40	2.10	6.51	1.29

hoeing 50 days after sowing and hand hoeing twice in descending order. This may be due to suppression of weeds during early stages of crop growth by application of pendimethalin and trifluralin and subsequently hand weeding or hand hoeing which facilitated favourable soil and aerial environment in enhancing the crop growth, yield attributes and ultimately, seed yield of sunflower. The positive correlations between yield attributes and seed yield of sunflower confirmed the beneficial contribution (Table 2). The negative correlation between dry matter production of weeds and seed yield of sunflower indicated the harmful effect of weed competition on grain yield. This is in close conformity of the results of Suresh and Reddy (1994).

Table 2. Correlation studies between crop yield and parameters influencing yield

Parameters	Correlation coefficient
Grain yield q/ha and dry matter weed (g/m ²)	0.87*
Grain yield q/ha and dry weight/head (g)	0.76*
Grain yield q/ha and seed weight/head (g)	0.75*
Seed weight/head and weed dry matter (g)	-0.72*

Aspergillus niger, *A. terreus*, *Fusarium spp.* and *Trichoderma viridis* were predominant microflora observed during investigation. It was noted that under herbicide treatments viz. pendimethalin, metolachlor or trifluralin, the mycofloral population showed declining trend during the first 14 days of herbicide application. Preplant application of trifluralin showed maximum suppression of mycoflora (3.10 cfu /g) at 14 days after application followed by increasing trend from 30 days after application to harvest (Table 3). The immediate setback of microbial population due to herbicide application seems to be due to disturbed edaphic environment. However, increase in microbial population seems to be due to decrease in concentration of herbicides in soil at later and also simultaneous adoption of revised edaphic environment after lag phase which has increased microbial activity. Soil mycoflora might have used carbon of degrading herbicides as their source of energy or as a substrate to grow. The above results are in confirmation to the work done by Prabhakaran *et al.* (1994) who reported initial suppression of microbial counts on 5th day of pendimethalin application

Table 3. Microfloral population (x 10³) as influenced by different weed management practices

Weed management practices	Dose kg/ha	Days after application				
		7	14	30	At harvest	mean
Trifluralin	1.5	14.72	3.10	10.09	17.76	11.42
Trifluralin	1.0	15.77	4.66	9.99	15.88	11.58
Control I		18.15	0.66	1.21		6.67
Pendimethalin	1.5	7.87	3.54	11.43	21.49	11.08
Pendimethalin	1.0	4.99	7.16	8.66	24.98	11.44
Metolachlor	1.0	10.32	8.93	7.99	26.76	13.50
Metolachlor	0.75	3.43	4.16	5.54	22.20	8.83
Control II		10.04	10.00	3.93		7.99
Hand weeding		9.10	12.32	4.76	12.60	9.70
Hoeing		10.65	7.31	4.88	14.54	9.35
Control III		2.21	4.87	8.98	22.31	9.59
Mean		9.75	6.43	6.97	19.79	

at 1 kg/ha, however, the same were observed growing normally after 25 days of application.

Cyperus rotundus, *Borreria hispida*, *Physallis minima* were the most dominant weeds and were found throughout the period of crop growth, which constituted 17.7, 23.7, and 34.2%, respectively at harvest. Pre-emergence application of pendimethalin at 1 kg/ha followed by one hand weeding at 50 DAS produced maximum seed yield (kg/ha) and total dry matter accumulation of sunflower and minimum weed population and weed dry matter.

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