

Bioefficacy of herbicides against *Trianthema portulacastrum* in toria (*Brassica campestris* subsp. *oleifera* var toria)

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ABSTRACT

A field experiment was conducted during the 1990–92 on loamy-sand soil of Ludhiana. The pre-plant application of trifluralin at 0.5 and 0.75 kg/ha and pre-emergence application of pendimethalin at 0.5 kg/ha provided effective control of weeds, particularly of *Trianthema portulacastrum* L. and thus increased the seed yield by 10.1 and 36.9% (average of 3 years) over hand-hoeing and unweeded control respectively. Poor yields were obtained with pre-emergence application of metolachlor at 0.5 and 0.75 kg/ha and isoproturon at 0.56 and 0.75 kg/ha, as these herbicides failed to provide an effective control of *Trianthema portulacastrum*, the predominant weed under study.

In oilseed crops, the cultivation of toria [*Brassica campestris* ssp. *oleifera* (Metzger) Sinsk. var. toria] is fast becoming popular in many parts of north India. Adoption of improved varieties and the judicious use of fertilizers and irrigation though played a pivotal role in boosting its production, lack of effective weed-control measures is a major bottleneck in the realization of the potential yield of this crop. Toria is infested with annual weeds, of which *Trianthema portulacastrum* L., poses a serious competition, especially during early periods of crop growth. The infestation of these weeds results in the reduction of seed yield by 15–20% (Brar *et al.*, 1991). This study was thus planned to find out the most effective and a safe herbicide for timely weed control in this crop.

MATERIALS AND METHODS

The field investigation was carried out for 3 years at the experimental farm of Punjab Agricultural University, Ludhiana, dur-

ing 1990, 1991 and 1992. The soil of the experimental field was loamy sand in texture, low in nitrogen, high in phosphorus and potassium, and neutral in reaction. Trial was laid out in randomized block design with 4 replications. Among the herbicidal treatments, trifluralin at 0.5, 0.75 and 1.0 kg/ha was applied as pre-plant, followed by incorporation in the soils, whereas isoproturon at 0.56 and 0.75 kg, pendimethalin at 0.5 and 0.75 kg and metolachlor at 0.5 and 0.75 kg/ha were applied as pre-emergence. Tank-mix combination of pendimethalin + isoproturon (0.3 + 0.5 kg/ha) and trifluralin + isoproturon (0.3 + 0.5 kg/ha) were also applied as pre-emergence. Apart from these 2 hand hoeings (3 and 5 weeks after sowing) and control (unweeded) treatments were also included.

Sowing of toria variety 'TL 15' was done on 3, 19 and 21 September during 1990, 1991 and 1992 respectively. A uniform seed rate of 3.75 kg/ha was used. Crop was sown at a row spacing of 30 cm and plant-to-plant

distance of 10 cm was maintained at thinning, which was done 20 days after sowing. All the nutrients, i.e. 62 kg N/ha and 20 kg P₂O₅/ha, were applied at sowing. Crop was raised with recommended plant-protection measures. Data on dry-matter production by *Trianthema* was recorded with the help of a quadrat measuring 50 cm x 50 cm. Number of branches and pods of crop were recorded from randomly selected 5 plants from each treated plots and afterwards converted to per plant.

RESULTS AND DISCUSSION

Effect on weeds

All the treatments except metolachlor at 0.5 kg/ha produced significantly less dry matter of this weed compared with unweeded (control) crop (Table 1). During 1990 all the doses of pendimethalin and trifluralin provided a good control of weeds, particu-

larly of *Trianthema portulacastrum* (the predominant weed) and proved significantly superior to isoproturon and hand-hoeing. Similar observations were recorded during 1991 and 1992, except at higher dose of isoproturon. Lower doses of metolachlor (0.5 kg/ha) and isoproturon (0.56 kg/ha) failed to provide desired control of weeds, particularly of *Trianthema* during all 3 years of investigation, but these herbicides at higher doses provided significantly better control of weeds than their lower rates (Table 1). Combinations of isoproturon with pendimethalin (0.5 + 0.3 kg/ha) or with trifluralin (0.5 + 0.3 kg/ha) also excelled their weed-control potential over alone application of pendimethalin or trifluralin. Earlier reports also indicated that in Indian mustard, weeds can be effectively controlled with pre-plant application of either trifluralin or fluchloralin at 0.5 and 0.75 kg/ha or pre-emergence applica-

Table 1. Effect of weed-control treatments on dry matter of *Trianthema* at 45 days

Treatment	Dose (kg/ha)	Dry matter of weeds (kg/ha)			
		1990	1991	1992	Mean
Trifluralin	0.50	230	570	280	360
Trifluralin	0.75	100	220	190	170
Trifluralin	1.00		250	190	220
Isoproturon	0.56	1,890	1,620	1,650	1,720
Isoproturon	0.75	770	1,010	680	820
Pendimethalin	0.50	90	0	0	30
Pendimethalin	0.75	0			0
Pendimethalin + isoproturon	0.3 + 0.5		0	80	40
Trifluralin + isoproturon	0.3 + 0.5		300	100	200
Metolachlor	0.50		2,060	2,150	2,105
Metolachlor	0.75		1,060	900	980
2 hand-hoeings at 3, 5 WAS		1,100	190	240	510
Control (unweeded)		2,710	2,350	2,850	2,547
CD (P = 0.05)		550	430	640	

WAS, Weeks after sowing

Table 2. Number of branches, pods/plant and seed yield of *toria* as influenced by different treatments

Treatment	Dose (kg/ha)	Branches/plant			Pods/plant			Seed yield (kg/ha)			
		1990	1991	1992	1990	1991	1992	1990	1991	1992	Mean
Trifluralin	0.50	6.8	6.7	5.3	219	234	161	1,310	1,360	855	1,175
Trifluralin	0.75	6.8	6.7	5.3	199	228	172	1,220	1,310	980	1,170
Trifluralin	1.00		6.0	5.2		238	187		1,170	1,095	1,133
Isoproturon	0.56	6.8	6.4	5.8	210	228	173	980	940	890	937
Isoproturon	0.75	6.6	6.6	5.3	210	234	167	1,160	960	755	958
Pendimethalin	0.50	6.5	6.2	5.2	198	232	171	1,380	1,210	930	1,173
Pendimethalin	0.75	6.6			185			1,050			1,050
Pendimethalin + isoproturon	0.3 + 0.5		6.8	5.5		234	169		1,190	835	1,013
Trifluralin + isoproturon	0.3 + 0.5		6.5	5.2		234	173		1,330	1,100	1,215
Metolachlor	0.50		4.3	5.4		190	177		860	830	845
Metolachlor	0.75		4.5	5.6		187	168		880	1,010	945
2 hand-weedings at 3, 5 WAS		6.2	6.6	5.3	192	226	176	1,240	1,000	955	1,065
Control (unweeded)		6.6	4.4	5.4	175	160	160	970	850	750	857
CD (P = 0.05)	NS	0.9	NS	NS	19	NS	200	330	185		

WAS, Weeks after sowing

tion of pendimethalin at 0.5 and 0.75 kg/ha (Gill *et al.*, 1984; Brar *et al.*, 1991).

Effect on crop

Differences among number of branches and pods/plant, were significant only during 1991 (Table 2). Metolachlor at both the levels (0.5 and 0.75 kg/ha) significantly reduced these parameters compared with other herbicidal treatments. During the 3 years isoproturon at 0.56 or 0.75 kg/ha and metolachlor at 0.5 kg/ha during 1991 and 1992 and metolachlor 0.75 kg/ha during 1991 gave the lowest seed yields and were on par with unweeded crop (Table 2). Lower seed yields under these treatments might be due to their poor weed-control efficiency (Table 1). Seed yield with other treatments, viz. pendimethalin 0.75 kg/ha during 1990, trifluralin 1.0 kg/ha during 1991 and trifluralin 0.5 kg/ha, pendimethalin 0.5 kg, pendimethalin + isoproturon 0.3 + 0.5 kg/ha, and metolachlor 0.5 kg/ha during 1992 were at par with unweeded control.

On an average, highest seed yield was recorded in tank-mix application of trifluralin plus isoproturon (0.3 + 0.5 kg) and it was 14.1 and 41.7% more than hand-

hoeing and unweeded plots respectively. This was followed by pre-plant application of trifluralin 0.5 and 0.75 kg/ha, and pre-emergence application of pendimethalin 0.5 kg/ha and these treatments increased seed yield by 10.1 and 36.9% compared with hand-hoeing and unweeded (control) crop respectively. Better yields under these treatments were obtained due to their efficient weed-control potential (Table 1) and safety to the crop (Table 2). In the wheat-Indian mustard intercropping, Sidhu *et al.* (1988) reported that the pre-emergence application of pendimethalin 0.5 kg/ha was found quite safe to both the crops along with good weed-control potential.

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