Indian Journal of Weed Science **45**(4): 260–262, 2013

Effect of weed management on weeds, growth and yield of toria

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Received: 4 October 2013; Revised: 30 November 2013

ABSTRACT

A field experiment was carried out at Ludhiana, Punjab during 2009 and 2010 to study the effect of different weed control treatments on growth and yield of rapeseed. Eight herbicide treatments, *viz*. trifluralin at 0.48 kg and 0.60 kg/ha (pre-plant and pre-emergence), pendimethalin at 0.56 kg and 0.75 kg/ha (pre-emergence), pendimethalin at 0.75 kg/ha (pre-plant) and oxyfluorfen at 0.25 kg/ha (pre-emergence), two hand weeding (25 and 45 days after sowing) and unweeded control were kept. Two hand weedings, pre-plant application of trifluralin at 0.60 kg/ha, and pre-plant and pre-emergence application of pendimethalin at 0.70 kg/ha significantly decreased dry weight of associated weeds as compared to unweeded control. Weed control efficiency recorded similar trend as of dry matter of weeds. Accordingly, the increased with application of these weed control treatments.

Key words: Pendimethalin, Oxyflourfen, Trifluralin, Toria, Yield

Among the various oilseeds grown in India, rapeseed and mustard group is the second most important crop after groundnut, contributing nearly 18% of the total oilseed production in the country. These crops are grown on an area of 5.59 million ha with a production of about 6.61 million tonnes, out of which Punjab occupies 30,000 ha and produces 39,000 tonnes, respectively (Anonymous, 2011). The agro-climatic conditions in Punjab are congenial for the production of oilseed crops. Rapeseed (toria) is an important oilseed crop. Adoption of high-yielding varieties with the judicious use of inputs and irrigation plays an important role in boosting its production. As it is exclusively grown under irrigated conditions, problem of weeds poses a serious threat to its potential production. The crop is infested with both grasses and broad-leaved weeds, which pose a serious competition during early period of crop growth, and reduce seed yield by 15-20% (Brar *et al*. 1991). Weeds cause enormous damage to the mustard and the magnitude of losses ranges from 30-50%, depending upon the growth and persistence of weed population (Gill *et al*. 1984). Weed competition not only decreases the mustard crop yield but also reduced its quality and market value. In the present study, new herbicides were tried at different levels and compared with recommended treatments to find out the most effective and safe method of weed control in this crop.

MATERIALS AND METHODS

The field investigation was carried out for two years at Punjab Agricultural University, Ludhiana during 2009 and 2010. The soil of the experimental field was loamy sand in texture, low in organic C, low in available N (230 kg/ha), medium in available P (18.6 kg/ha), available K (150 kg/ha), and neutral in reaction. The trial was laid out in randomized block design with four replications. Among the herbicidal treatments, trifluralin at 0.48 kg and 0.60 kg/ha, pendimethalin at 0.56 kg and 0.75 kg/ha as pre-emergance, pendimethalin 0.75 kg/ha as pre-plant and oxyfluorfen at 0.25 kg/ha were applied pre-emergence. In addition, two hand weedings (25 and 45 days after sowing) and unweeded control were also kept for comparison.

The sowing of rapeseed (toria) variety '*TL 15*' was done during mid-September, using a seed rate of 3.75 kg/ha at a distance of 30 cm in rows. Plant to plant distance of 10 cm was maintained by thinning after 20 days of sowing. All the nutrients, *i.e.* 62 kg N and 20 kg P_2O_5/ha were applied at the time of sowing. Herbicides were sprayed after dissolving in water as per the treatment with knapsack sprayer fitted with flat fan nozzle using a spray volume of 375 litres/ha. The data on dry matter production by weeds was recorded at 45 days after sowing with the help of quadrat (30 × 30 cm) placed randomly at two spots in each plot. Observations on plant height, branches/plant and siliqua/plant were recorded at harvest from randomly selected five plants from each treated plot. Crop was raised using recommended agronomic practices and protected against insects and diseases. The data on weeds were subjected to square root transformation to normalize their distribution. Weed control efficiency was calculated by using standard formula

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RESULTS AND DISCUSSION

All the weed control treatments reduced the dry matter of weeds significantly as compared with unweeded control (Table 1). Two hand hoeings and pre-plant application of trifluralin at 0.60 kg/ha resulted in minimum dry matter of weeds, which was significantly lower as compared to unweeded control. Hand weeding was at par with most of the herbicidal treatments, *viz.* trifluralin 0.48 kg and 0.60 kg as pre-plant and pre-emergence pendimethalin 0.75 kg/ha as pre-plant, and pendimethalin 0.56 kg and 0.75 kg/ha as pre-emergence in terms of dry matter of weeds. Oxyfluorfen 0.25 kg/ha resulted in significantly higher dry matter of weeds as compared to all other herbicidal treatments. Weed control efficiency recorded a similar trend as of dry matter of weeds. The maximum weed control efficiency (92.0%) was recorded with pre-plant application of trifluralin at 0.60 kg/ha and two hand hoeings. Minimum weed control efficiency (37.7%) was recorded with oxyfluorfen 0.25 kg/ha. Singh *et al.* (2001) reported that while the weed management methods significantly reduced the dry matter of weeds, two manual weeding at 25 and 45 days after sowing were found the most effective in reducing dry matter accumulation of weeds over the other methods of the weed control. Also, Rajput *et al.* (1993) concluded that application of hand hoeing twice at 30 and 45 days after sowing resulted in a decrease in dry weight of weeds associated with Indian mustard plants. Doshora *et al*. (1990) reported that pendimethalin at 0.75 kg/ha was found to be more effective than other treatments.

All the herbicidal treatments registered higher plant height as compared with unweeded control, except oxyfluorfen at 0.25 kg/ha (Table 2). The maximum plant height was recorded under two hand weedings, which

Table 1. Effect of different weed control treatments on dry matter of weeds

Treatment	Dose (kg/ha)	Time of application	Dry matter of weeds (t/ha)			Weed control efficiency (%)		
			2009	2010	Mean	2009	2010	Mean
Trifluralin	0.48	Pre-plant	0.54 (3.47)	0.57 4.00)	0.56 (3.74)	59.1	51.8	55.5
Trifluralin	0.60	Pre-plant	0.100 (0.00)	0.10 (0.00)	0.10 (0.00)	92.4	91.6	92.0
Pendimethalin	0.75	Pre-plant	0.26 (13.9)	0.10 (0.00)	0.18 (0.71)	80.1	91.6	85.9
Trifluralin	0.48	Pre-emergence	0.37 (3.33)	025 (2.25)	0.31 (2.79)	72.3	71.1	71.7
Trifluralin	0.60	Pre-emergence	0.34 (2.78)	0.20 (0.63)	0.27 (1.71)	74.2	82.9	78.6
Pendimethalin	0.56	Pre-emergence	0.31 (2.22)	0.25 (2.25)	0.28 (2.24)	76.4	78.7	77.6
Pendimethalin	0.75	Pre-emergence	0.25 (1.25)	0.10 (0.00)	0.18 (0.63)	80.8	91.6	86.2
Oxyfluorfen	0.25	Pre-emergence	0.81(8.60)	0.76 (5.63)	0.78 (7.12)	38.9	36.5	37.7
Two hand weedings (25 and 45 DAS)	-	-	0.10 (0.00)	0.10 0.00)	0.10 (0.00)	92.4	91.6	92.0
Unweeded Control	-	-	1.32 (17.34)	1.19 (14.88)	1.26 (16.11)	-	-	-
LSD (P=0.05)	-	-	0.46	0.29	-	-	-	-

Data are subjected to square root transformation; values in the parentheses are original values

Table 2. Plant height, number of branches, siliqua/plant and seed yield of toria as influenced by different herbicidal treatments

Treatment	Dose kg/ha	Time of application	Plant height (cm)		No. of branches/plant		No. of siliqua/plant		Seed yield (t/ha)	
			2009	2010	2009	2010	2009	2010	2009	2010
Trifluralin	0.48	Pre-plant	139.2	124.9	8.4	6.6	233.8	238.5	1.81	1.80
Trifluralin	0.60	Pre-plant	136.1	130.7	8.7	6.9	235.0	241.8	1.83	2.01
Pendimethalin	0.75	Pre-plant	137.3	131.4	8.5	7.0	235.9	243.0	1.84	1.97
Trifluralin	0.48	Pre-emergence	135.5	124.2	8.4	6.7	231.9	238.0	1.63	1.77
Trifluralin	0.60	Pre-emergence	133.1	128.2	8.4	6.9	240.3	241.8	1.79	1.89
Pendimethalin	0.56	Pre-emergence	134.9	124.3	8.0	6.8	235.2	239.3	1.67	1.71
Pendimethalin	0.75	Pre-emergence	137.4	133.5	8.4	7.0	234.8	240.8	1.88	2.18
Oxyfluorfen	0.25	Pre-emergence	119.8	116.6	7.2	6.2	199.1	214.3	1.13	1.47
Two hand weedings (25 and 45 DAS)	-	-	138.8	134.0	8.6	7.6	242.0	244.8	1.96	2.20
Unweeded control	-	-	115.4	107.8	8.5	5.9	192.7	229.8	0.99	1.29
LSD (P=0.05)	-	-	15.4	11.5	NS	NS	28.1	7.38	0.32	0.40

was at par with all the herbicidal treatments except oxyfluorfen at 0.25 kg/ha. Oxyflourfen showed phytotoxic effect on the crop. The differences in the number of branches/plant were non-significant. The maximum number of siliqua/plant (242.0) were recorded in two hand weedings, which was closely followed by trifluralin at 0.60 kg/ha. All the herbicidal treatments registered higher number of siliqua/plant as compared with unweeded control, except oxyfluorfen at 0.25 kg/ha. All the weed control methods significantly increased seed yield over unweeded control. Maximum seed yield of 1.96 and 2.20 t/ha was obtained with two hand weedings, which was at par with all other herbicidal treatments and significantly higher than oxyfluorfen at 0.25 kg/ha. The second best treatment was pendimethalin 0.75 applied as pre-emergence. These results are in line with Saudy (2004), Sharma and Jain, (2002). Sidhu *et al*. (1998) reported that pre-emergence application of pendimethalin 0.5 kg/ha was quite safe to crop along with good weed control. Jat and Giri (2000) concluded that the maximum increase in seed yields was recorded with pendimethalin.

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