

Efficacy of post emergence herbicides to control broad leaf weeds in wheat in Indira Gandhi canal command area of western Rajasthan

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ABSTRACT

Field investigations were carried out during three consecutive *rabi* seasons (2000-01 to 2002-03) at Bikaner (Rajasthan) with a view to find out the broad spectrum post emergence herbicide against broad leaf weeds in wheat (*Triticum aestivum*). Results revealed all cultural and post emergence herbicidal treatments effectively reduced the dry weight of weeds by 33.6-91.3% as compared to weedy check. The highest values of tillers/plant, length of ear, test weight and grain yield of wheat (2530 kg/ha) obtained with B: C 3.1 under post emergence application of metsulfuron-methyl at 0.004 kg/ha. The grain yield recorded with this treatment was at par with that recorded with post emergence 2,4-D EE at 0.5 kg/ha.

Key words : Broad leaf weeds, Wheat, Metsulfuron methyl, 2,4-DEE

Wheat (*Triticum aestivum*) is an important winter cereal in India, which occupies 27.4 million hectares and contributes 75.57 million tons to total food grain production. A major constraint that limits wheat productivity is severe weed-crop competition. Grain yield losses due to weed infestation have been estimated to vary from 30 to 50% (Pandey and Singh 1997). 2,4-D recommended to control broad leaf weeds in wheat showed poor efficacy against several broad leaf weeds. Many wheat cultivars like HD 2009, WH 283, WH 416 and Sonalika have shown malformed spikes due to 2,4-D which led to reduced wheat yield (Balyan 1999). Hence, there is need to look for broad-spectrum alternate herbicide having no adverse effect on wheat crop. Keeping this in view the present investigation was undertaken.

MATERIALS AND METHODS

Field investigations were carried out on wheat cv *Raj-1482* during winter seasons in three consecutive years (2000-01 to 2002-03) at Agricultural Research Station, Bikaner (Rajasthan). The soil was sandy loam in texture and alkaline in reaction (pH 8.3) and low in available N (84.8 kg/ha), P (6.43kg/ha) and K (150 kg/ha) contents. Twelve treatments consisted with post emergence 2,4-D EE 0.5 kg/ha, trisulfuron 0.015 and 0.020 kg/ha, metsulfuron methyl 0.004 and 0.006 kg/ha, isoproturon 0.75 kg/ha + 2,4-D EE 0.25 kg/ha and isoproturon 1.0 kg/ha + 2,4-D EE 0.25 kg/ha, isoproturon 0.75 kg/ha + trisulfuron 0.015 kg/ha, isoproturon 0.75kg/ha + metsulfuron methyl 0.004 kg/ha, isoproturon 1.5 kg/ha, farmers practice (1 hand weeding) and weedy check, were tested in randomized block design with three replications. Wheat was sown in third week of November each year by drilling seeds at 100 kg/ha in rows 20 cm apart. A uniform

dose of 120 kg N + 40 kg P₂O₅/ha was applied through urea and single super phosphate, respectively. Half of the total N along with full P was applied as basal, while remaining half N was top dressed at 25 days after sowing (DAS) at the time of first irrigation. Herbicides were sprayed at 30 DAS with the help of Knapsack sprayer by using 500 litres of water per hectare. The dry weight of weeds was recorded at 45 days after sowing and at harvesting by using a quadrat of 0.5 x 0.5 m randomly placed at three places in each plot. Weed data were subjected to log $\sqrt{(x+2)}$ transformation.

RESULTS AND DISCUSSION

Weed flora

The major weeds observed in the weedy check plot of experimental field were bermuda grass (*Cynodon dactylon* (L.) Pers.) (5%), nut sedge (*Cyperus rotundus* L.) (7%), and wild onion (*Asphodelus tenuifolius* Cav.) (13%) in monocots and lambs quarters (*Chenopodium album* L.) (15%), goose foot (*Chenopodium murale* L.) (14%), sweet clover (*Melilotus alba* Medikus) (12%), clover [*Melilotus indica* (L.) All.] (11%), morning glory (*Convolvulus arvensis* L.) (11%), and golden duck (*Rumex dentatus*) (12%) among the dicots.

Effect on weeds

All treatments receiving herbicide application reduced the dry matter of weeds as compared to weedy check at 45 DAS and harvesting stage of crop (Table 1). Among the herbicides, post emergence application of metsulfuron methyl at 0.004 and 0.006 kg/ha reduced the dry matter of weeds where the dry matter of weeds was in the order of 69.6 and 32.0 g/m². The maximum dry matter of weed was recorded in weedy check (372 g/m²). Weed

control efficiency of metsulfuron-methyl treated plots was also maximum at 0.004 kg/ha (81.3%) and at 0.006 kg/ha (91.3%). Weed index indicates the reduction in yield. Minimum values of weed index were recorded in case of metsulfuron-methyl treatments at 0.004 kg/ha (7.4%) and at 0.006 kg/ha (19.5%). Application of 2,4-D EE at 0.5 kg/ha had more dry matter (124.4 g/m²) with less weed control efficiency of 66.5%. Metsulfuron-methyl was relatively better than 2,4-D. Singh *et al.* (2002) have also reported the similar findings on efficacy of metsulfuron methyl in wheat crop .

Effect on crop

On visual observation, there was no phytotoxic effect of any of the treatment on wheat crop at any stage. On an average, un-controlled weeds caused 58.3% reduction in the wheat grain yield over post emergence

application of 2,4-D EE at 0.5 kg/ha (Table 2). Grain yield under weedy check plot was significantly less than all other treatments. All the post emergence herbicide treatments registered significantly higher grain and straw yield of wheat over weedy check except straw yield with trisulfuron at 0.020 kg/ha. Maximum grain and straw yield of 2530 and 2900 kg/ha, respectively, were recorded with post emergence application of metsulfuron methyl at 0.004 kg/ha. This treatment was also responsible to give higher number of tillers/plant (5.3), length of ear (39.1 cm) and test weight (39.1 g) than weedy check. However, grain yield recorded with this treatment was at par with that recorded with post emergence 2,4-D EE at 0.5 kg/ha. Similar findings were documented by Singh *et al.* (2002) on efficacy of metsulfuron methyl in wheat crop. None of the treatments found significant with regard to plant height and number of leaves/plant.

Table 1. Effect of post emergence herbicides on weed dry matter, weed control efficiency, and weed index of wheat (mean for 3 years)

Treatments	Weed dry matter (g/m ²)						WCE (%)	WI (%)
	At 45 DAS			At harvesting				
	Monocot	Dicot	Total	Monocot	Dicot	Total		
2,4-D EE 0.5 kg/ha	16.7 (1.27)	26.0 (1.45)	42.7 (1.65)	49.7 (1.71)	74.7 (1.88)	124.4 (2.10)	66.5	-
Trisulfuron 0.015 kg/ha	12.3 (1.16)	20.0 (1.34)	32.3 (1.54)	77.0 (1.90)	170.0 (2.24)	247.0 (2.40)	33.6	19.4
Trisulfuron 0.020 kg/ha	8.7 (1.03)	13.7 (1.20)	22.4 (1.39)	66.0 (1.83)	91.0 (1.97)	157.0 (2.20)	57.8	41.5
Metsulfuron methyl 0.004 kg/ha	14.7 (1.22)	23.7 (1.41)	38.4 (1.61)	28.3 (1.26)	41.3 (1.48)	69.6 (1.64)	81.3	7.4
Metsulfuron methyl 0.006 kg/ha	9.7 (1.07)	10.7 (1.10)	20.4 (1.35)	13.3 (1.18)	18.7 (1.32)	32.0 (1.53)	91.3	19.5
Isoproturon 0.75 + 2,4 - D EE 0.25 kg/ha	5.7 (0.89)	6.0 (0.90)	11.7 (1.14)	43.3 (1.66)	47.3 (1.69)	90.6 (1.97)	75.6	22.2
Isoproturon 1.0 + 2,4-D EE 0.25 kg/ha	13.3 (1.18)	18.7 (1.32)	32.0 (1.53)	43.3 (1.66)	47.3 (1.69)	90.6 (1.97)	75.6	34.4
Isoproturon 0.75 + trisulfuron 0.015 kg/ha	11.0 (1.11)	17.7 (1.29)	27.7 (1.47)	78.3 (1.90)	162.0 (2.21)	240.3 (2.38)	35.5	32.3
Isoproturon 0.75 + metsulfuron methyl 0.004 kg/ha	5.0 (0.85)	8.7 (1.03)	13.7 (1.20)	49.7 (1.71)	74.7 (1.88)	124.4 (2.10)	66.5	19.9
Isoproturon 1.5 kg/ha	5.3 (0.86)	11.0 (1.11)	16.3 (2.39)	43.3 (1.66)	47.3 (1.69)	90.6 (1.97)	75.6	29.0
Farmers' practice	10.0 (1.08)	14.3 (1.21)	24.3 (1.42)	76.7 (1.90)	164.7 (2.22)	241.4 (2.39)	35.10	43.4
Weedy check	29.0 (1.49)	42.0 (1.64)	71.0 (1.86)	162.3 (2.22)	209 (2.33)	372.0 (2.57)	-	58.3
LSD (P=0.05)	-	-	1.4	-	-	1.5	-	-

WCE. - Weed control efficiency, WI - Weed index , OHW - One hand weeding; DAS - Days after sowing. Figures in parentheses are log $\sqrt{(x+2)}$ transformed value

Table 2. Effect of post emergence herbicides on growth, yield attributes and yield of wheat (mean for 3 years)

Treatments	Growth parameters		Yield attributes			Yield (kg/ha)		B:C
	Leaves/ plant (#)	Plant height (cm)	Tillers/ plant (#)	Length of ear (cm)	Test weight (g)	Grain	Straw	
2,4-D EE 0.5 kg/ha	7.0	1.1	5.1	9.1	39.0	2733	2913	3.1
Trisulfuron 0.015 kg/ha	6.0	1.0	4.3	8.7	37.2	2203	2520	FC
Trisulfuron 0.020 kg/ha	7.0	1.0	3.0	8.3	37.0	1600	1837	FC
Metsulfuron methyl 0.004 kg/ha	6.0	1.0	5.3	9.0	39.1	2530	2900	3.1
Metsulfuron-methyl 0.006 kg/ha	7.0	1.0	4.3	8.7	37.8	2200	2503	2.4
Isoproturon 0.75 + 2,4-D EE 0.25 kg/ha	7.0	1.0	4.3	8.3	37.0	2127	2447	2.3
Isoproturon 1.0 + 2,4D EE 0.25 kg/ha	6.0	1.0	3.3	8.3	35.8	1793	2137	1.6
Isoproturon 0.75 + trisulfuron 0.015 kg/ha	6.0	1.0	3.3	8.0	36.8	1850	2267	2.3
Isoproturon 0.75 + metsulfuron-methyl 0.004 kg/ha	7.0	1.0	3.7	9.0	39.0	2190	2437	2.0
Isoproturon 1.5 kg/ha	7.0	0.9	5.0	8.7	35.7	1940	2263	1.2
Farmers practice	6.0	0.9	4.3	7.7	37.8	1547	1863	1.0
Weedy check	6.0	0.9	2.7	6.7	36.8	1140	1317	-
LSD (P=0.05)	NS	NS	0.9	1.3	1.4	288	136	-

(#) Numbers, FC-free of cost sample

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