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Performance of clopyralid, isoproturon and 2, 4-D on the control of Canada thistle (*Cirsium arvense*) in wheat (*Triticum aestivum*)

R. S. PANWAR, R. K. MALIK, R. S. BALYAN, S. S. PUNIA AND S. S. RATHI

Department of Agronomy, Chaudhary Charan Singh Haryana Agricultural University, Hisar 125 004

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With the continuous use of phenyl urea herbicides for several years in wheat (*Triticum aestivum* L. emend. Fiori & Paol.), some perennial weed like Canada thistle [*Cirsium arvense* (L.) Scope] and annual broad-leaf weeds have become serious problem in wheat-growing areas. For the control of such weeds some alternate broad-leaf herbicides alone or their tank mixture were evaluated.

A field experiment was conducted at Hisar during winter season of 1989–90 and 1990–91. The soil of the experimental field was sandy loam of medium fertility. There were 15 treatments (Table 1) in randomized block design with 3 replications. 'WH 283' wheat was sown on 10 and 16 November during 1989–90 and 1990–91 respectively. Other cultural practices were applied in accordance with standard local package of practices. The field was infested with the natural population of grassy weeds and annual broad-leaf weeds and Canada thistle. Weed population (No./m^2) and dry weight of total weeds (g/m^2) were recorded 90 days after sowing with the help of 0.5 m x 0.5 m random quadrate. All the herbicides were applied 30 days after sowing.

All the weed-control treatments significantly reduced the population and dry-matter accumulation of weeds compared with the weedy check. Combination of isoproturon and clopyralid @ 1.0 + 0.075, 0.75 + 0.10 and 1.0 + 1.0 kg/ha or clopyralid + fluroxypyr @ 0.125 + 0.10 kg/ha provided excellent control of Canada thistle and other annual broad-leaf weeds. Clopyralid alone @ 0.1 kg/ha or 0.125 kg/ha also proved very effective against this weed. Similarly, combination of isoproturon @ 0.750 or 1.0 kg/ha + clopyralid @ 0.10 kg/ha significantly reduced the population of *Phalaris minor* Retz., *Cirsium arvense* and *Chenopodium album* L. compared with the weedy check. The effect of this combination was also reflected on the total dry weight of weeds at 90 days (Table 1). The combination of isoproturon + clopyralid was more acceptable compared with the combination of clopyralid with 2, 4-D or fluroxypyr. However, under situations where *Cirsium arvense* occurs alone, clopyralid @ 0.10 or 0.125 kg/ha can effectively control this weed. Effect of clopyralid when applied alone was not evident against *Phalaris minor* and *Chenopodium album.* Singh and Malik (1992) also reported similar results.

The grain yield of wheat in the weedy check treatment decreased form 5,016 to 2,686 kg/ha during 1989–90 and from 4,840 to 2,800 kg/ha during 1990–91. Among the herbicidal treatments,

Table 1. Performance of clopyralid, isoproturon, 2, 4-D and fluroxypyr on individual and total weed populations, total dry weight of weed and grain yield of wheat

Treatment	Dose (q/ha)	Weed population (No/m²) at 90 DAS				Total weed population (No./m²) at 90 DAS		Total dry weight at (q/m²) at 90 DAS		Grain yield (kg/ha)	
		Phalaris minor		*Cirsium arvense*							
		1990	1991	1990	1991	1990	1991	1990	1991	1990	1991
Clopyralid	0.075	4.4 (19)*	3.7 (14)	3.9 (14)	1.4 (1)	8.6 (75)	8.3 (67)	120.2	80.0	3,285	3,376
Clopyralid	0.100	4.4 (19)	3.6 (12)	3.6 (12)	1.0 (0)	7.9 (62)	7.4 (56)	111.7	72.3	3,667	3,458
Clopyralid	0.125	4.2 (17)	2.9 (8)	3.0 (9)	1.0 (0)	7.8 (59)	7.4 (56)	96.0	56.9	3,863	3,600
Isoproturon	1.000	2.7 (7)	2.1 (4)	4.0 (15)	2.2 (7)	5.5 (30)	4.0 (15)	23.7	10.4	4,263	3,993
Isoproturon + clopyralid	0.750 + 0.750	3.2 (9)	1.4 (1)	3.4 (12)	1.0 (1)	6.3 (29)	4.3 (23)	29.0	16.6	3,989	3,581
Isoproturon + clopyralid	1.000 + 0.075	2.7 (7)	1.4 (1)	3.2 (11)	1.0 (1)	5.6 (31)	2.9 (8)	13.7	10.1	4,465	4,034
Isoproturon + clopyralid	0.750 + 0.100	3.2 (9)	1.0 (0)	3.1 (9)	1.0 (1)	6.4 (39)	3.6 (12)	16.7	6.3	4,326	3,787
Isoproturon + clopyralid	1.000 + 0.100	2.5 (6)	1.0 (0)	3.0 (9)	1.0 (0)	5.2 (27)	1.0 (8)	6.6	2.2	4,335	4,117
2, 4-D	0.500	6.4 (41)	3.9 (14)	3.6 (12)	1.0 (0)	6.8 (47)	5.7 (34)	82.0	36.8	3,808	3,623
Clopyralid + 2, 4-D	0.075 + 0.250		3.9 (14)		1.0 (0)		5.7 (32)		52.8		3,417
Clopyralid + 2, 4-D	0.125 + 0.250		3.4 (12)		1.0 (0)		5.4 (29)		42.4		3,581
Clopyralid + fluroxypyr	0.075 + 0.100		3.7 (13)		1.0 (0)		5.1 (26)		23.3		3,746
Clopyralid + fluroxypyr	0.125 + 0.100		3.9 (15)		1.0 (0)		5.7 (31)		18.3		3,811
Weedy check		6.6 (0)	4.2 (18)	4.3 (17)	3.1 (17)	9.5 (90)	9.7 (95)	167.9	165.2	2,668	2,800
Weed-free check		1.0 (0)	1.0 (0)	1.0 (0)	1.0 (0)	1.0 (0)	1.0 (0)	0.0	0.0	5,016	4,840
CD (P = 0.05)		1.4	1.3	0.8	1.1	1.7	1.9	36.1	15.4	682	630

DAS, days after sowing

*Actual weed counts are in parentheses, transformed to $\sqrt{x+1}$

isoproturon + clopyralid @ 0.75 + 0.1 or 1.0 + 0.1 kg/ha gave significantly higher grain yield of wheat compared with clopyralid applied alone @ 0.075 or 0.1 kg/ha (Table 1). Since the combination of both herbicides effectively controlled all these weeds, it may be concluded that wherever there is complex weed flora including *Cirsium arvense,* the application of isoproturon in combination with clopyralid @ 0.75 + 0.1 kg/ha may proved more effective than either herbicide applied alone.

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Response of maize (*Zea mays*) to different types of mulches under rainfed condition

B. N. MISRA, R. S. YADAV, A. L. RAJPUT AND S. M. PANDEY

Crop Research Station, Narendra Deva University of Agriculture and Technology, Bahraich, Uttar Pradesh 271 801

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Mulch conserves moisture and optimizes crop production (Mone and Umrani, 1981; Jain *et al.*, 1983), but farmers cannot afford to part with any agricultural by-product for moisture conservation in the rainy (*kharif*) seasons. Hence better method needs to be identified. Intercropping of a quick-growing and non-competitive crop and its use as a mulch on attainment of its maximum phytomass is one of the feasible alternatives. Therefore the present study was undertaken at the All-India Co-ordinated Maize Improvement Project to explore the possibility of increasing the productivity of maize (*Zea mays* L.) in the rainy season through use of mulches under rainfed conditions.

The field experiment was conducted during the rainy season of 1991 and 1992 at Bahraich. Annual precipitation of 816.7 and 737.3 mm was received during the crop season from June to October. The experiment was conducted in dryland block on sandy-loam alluvial well-drained soil, alkaline in reaction (pH 8.1 and 8.3), highly deficient in nitrogen (193 and 210 available kg/ha), low in available phosphorus (10.1 and 12.3 kg/ha), but fairly rich in potassium (249 and 257 kg/ha). 'Sweta' maize, 'K 12' sunnhemp (*Crotalaria juncea* L.). 'Russian Giant' cowpea [*Vigna unguiculata* (L.) Walp.] and 'Local' *dhaincha* [*Sesbania cannabina* (Retz.) Pers.] were sown on 4 and 6 July and maize was harvested on 21 and 26 October during 1991 and 1992