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Herbicides Application Alone and in Combination with Urea for Control of Weeds in Wheat

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Abstract

Five substituted area based herbicides namely Isoproturon (Alrelon 500 FW), Isoproturon + Diflufenican (Panther 520 FW) soproturon + Bromoxynil + MCPA (Doublet 48 FW), Chlortoluron + MCPA (Agmol combi 60 WP) and Isoproturon (Milron 75 WP) applied @ 2.5 1, 2.0 1, 2.5 1, 2.5 kg and 1.25 kg ha^{-1}, respectively, controlled, 87.2 to 90.8 per cent weeds in wheat and caused 10.29 to 15.98 per cent increase in grain yield over weedy check. These herbicides, when applied with 3 per cent urea solution, gave 92.6 to 95 per cent weed control and 19.24 to 25.47 per cent increase in grain yield over weedy check.

Introduction

Use of herbicides for the control of a variety of broad and narrow-leaved weeds is gaining popularity in Pakistan. Among the various factors influencing the absorption of post-emergence herbicides the leaf surface is critical. Surface of leaf is covered with wax-like cuticle. This cuticle acts as barrier against intimate contact between the sprayed herbicides and the leaf surface by repelling water. Consequently, penetration of a herbicide into cellular targets is reduced. Use of nitrogenous solution, acting as adjutants, may enhance toxicity, assist emulsification, increase spreading properties, promote leaf absorption, penetration, retention and effective action of herbicides (Anderson, 1977 and Bayer *et al.*, 1982). Bhan (1987) found that in the field heavily infested with Phalaris minor along with broad leaved weeds, a combination of substituted urea herbicides with 3 per cent urea solution proved better in controlling weeds and gave maximum grain yield than sole application of herbicides. Three Isoproturon formulations namely Arelon, Tolkan and Milron each @ 1 kg ha^{-1} were equally effective for control of Phalaris minor, when applied 35 days after the sowing. The yields obtained were 5.53, 5.99 and 5.66 t ha^{-1}, respectively as compared to 3.62 t ha^{-1} of weedy check (Punia *et al.*, 1989).

Singh *et al.*, (1989) found that Isoproturon applied @ 1 kg ha^{-1} as post-emergence controlled almost all the annual monocotyledonous and dicotyledonous weeds. Varsheney and Singh (1990) reported 82 per cent reduction in weed dry matter when a mixture of urea and Isoproturon @ 0.5 and 0.75 kg ha^{-1} was sprayed to the field of wheat.

Subhan and Khan (1991) recorded 90 per cent control of *Avena Fatua, Fumaria officinalis, Phalaris minor* and *Vicia sativa* with Dicuran MA-60 (Chlortoluron + MCPA) at 2.25 kg ha^{-1}. Wheat yield increased as a result of herbicide treatment by 29-71 per cent above average weedy control levels of 2015 kg ha^{-1}. Sharar *et al.*, (1994) stated that Panther @ 2 1, Doublet @ 2.5 1, Tolkan @ 2 1, Agmol comb, @ 2.5 1, Milron @ 1.25 kg and Sencor @ 750 and 875 g ha^{-1} gave significantly maximum grain yield of 1.97, 1.64 and 1.60 t ha^{-1}, respectively.

Keeping all these in view, present study was undertaken to see the comparative efficacy of urea-based herbicides applied alone and in combination with urea solution, as an adjuvant, to control weeds in wheat.

Materials and Methods

Field study to evaluate the effect of five post-emergence herbicides namely Isoproturon (Arelon 500 FW) @ 2.5 1 ha^{-1}, Isoproturon + Diflufenican (Panther 520 FW) @ 2 1 ha ^{1}, Isoproturon + Bromoxynil + NCPA (Doublet 48 FW) @ 2.5 1 ha^{-1}, Chlortoluron NCPA (Agmol combi 60 WP) @ 2.5 kg ha^{-1} and Isoproturon (Milron 75 WP) @ 1.25 kg ha^{-1} alone and in combination with 3 per cent urea solution against weedy check, on weeds and yield of wheat, was undertaken at the Agronomic Research Area, University of Agriculture, Faisalabad. Experiment was quadruplicated in randomized complete block design., Wheat variety "Pak-81" was sown with a single row hand drill in rows 30 cm apart in plots measuring 7 x 1.8 m. The herbicides were sprayed with a knapsack hand sprayer, fitted with specially made boom of 1.8 m in width, after the first irrigation in well moisture conditions. Observations on weed prevalence were recorded by counting the weed from randomly selected 1 m^{-2} area in each experimental unit three weeks after spraying herbicides. Number of fertile tillers was counted from 1 m ^{2} area and ten spikes were selected at random for counting the number of grains per spike. The data were analyses by using Fisher's analysis of variance technique. Treatments means were compared by using Duncan's New Multiple Range Test at 5 per cent probability (Steel and Torrie, 1984).

Results and Discussion

The common weeds found in the field were Phalaris minor, Rumex dentatus, Coronopus didymus, Convolvulus arvensis and Medicago denticulate. Phalaris minor was the most frequent weed. All the herbicides offered 87.2 -90.8 per cent and 92.6 - 95.0 per cent control of broad and grass weeds up to 3 weeks when applied alone and with 3 per cent urea solution, respectively (Table 1). All the herbicides gave complete control of Rumex dentatus, Coronopus

Table 1: Weed population (m^{-2}) and mortality per cent 3 weeks after spray

			Mortality					
			Gross weed	Broad leaved weeds				Total of broad leaved weeds
	Total weeds	Mortality percent	*P.minor*	*M.denticulata*	*C.didymus*	*C.arvensis*	*R.dentatus*	
Weed check	500a	-	-	-	-	-	-	-
Isoproturon @ 2.5 l ha^{-1}	51c	90	90.0	100.0	100	0	100	97.0
Isoproturon @ 2.5 l ha^{-1} + 3 % urea	37cde	92.6	91.7	100.0	100	0	100	93.0
Isoproturon + Diflufenican @ 2 l ha^{-1}	46cd	90.8	92.9	98.9	100	0	100	95.0
Isoproturon + Diflufenican @ 2 l ha^{-1} + 3 % urea	35de	93.0	95.7	100.0	100	0	100	97.0
Isoproturon + Bromoxynil + MCPA @ 2.5l ha^{-1}	46cd	90.8	91.6	100.0	100	0	100	96.0
Isoproturon + Bromoxynil + MCPA @ 2.5l ha^{-1} + 3 % urea	26e	94.8	96.4	99.0	100	0	100	95.0
Chlortoluron + MCPA @ 2.5 kg ha^{-1}	49cd	90.2	92.3	88.5	100	0	100	92.6
Chlortoluron + MCPA @ 2.5 kg ha^{-1} + 3 % urea	30e	94.0	94.9	96.0	100	0	100	95
Isoproturon @ 1.25 kg ha^{-1}	64b	87.2	90.7	100.0	100	0	100	9
Isoproturon @ 1.25 kg ha^{-1} + 3 % urea	25e	95.0	95.2	98.0	100	0	100	

Means not sharing a letter in common differ significantly at 5 per cent probability level.

Table 2: Grain yield and yield components of wheat

Treatments	Fertile tillers (m^{-2})	No. of grains per	1000-grain weight (g)	Grain yield (q ha^{-1})	Inc yie che
Weed check	341.3c	36.5d	40.6d	36.9c	
Isoproturon @ 2.5 l ha^{-1}	395.3b	41.5bc	42.2bcd	41.3cd	11
Isoproturon @ 2.5 l ha^{-1} + 3 % urea	415.3a	46.6a	45.3a	44.1abc	19
Isoproturon + Diflufenican@ 2 l ha^{-1}	395.0b	41.6bc	42.8abcd	44.6abc	20
Isoproturon + Diflufenican@2 l ha^{-1} + 3 % urea	415.0a	45.7a	43.8abc	46.3a	25
Isoproturon + Bromoxynil + MCPA @ 2.5 l ha^{-1}	401.0b	41.4bc	41.0cd	40.7d	10
Isoproturon + Bromoxynil + MCPA @ 2.5 l ha^{-1} + 3 % urea	420.0a	46.8a	44.1ab	44.0abc	19
Chlortoluron + MCPA @ 2.5 kg ha^{-1}	402.0b	41.3bc	41.5bcd	44.2abc	19
Chlortoluron + MCPA @ 2.5 kg ha^{-1} + 3 % urea	420.0a	44.9ab	44.4ab	45.4ab	23
Isoproturon @ 1.25 kg ha^{-1}	400.7b	39.1cd	41.8bcd	42.8bcd	15
Isoproturon @ 1.25 kg ha^{-1} + 3% urea	418.3a	44.6ab	44.1ab	45.6ab	23

Means not sharing a letter in common differ significantly at 5 per cent probability level.

idymus and more than 88.5 per cent control of Medicago enticulate. Convolvulus arvensis showed 100 per cent ontrol of Medicago denticulate. Convolvulus arvensis howed 100 per cent survival against all the treatments. er cent weed control for four broad leaved weeds was in ne range of 92.0 to 97.0 (Table 1). As regards Phalaris inor the respective figure for its per cent control ranged om 90 -96.4. These results showed a better control of eeds as compared to when these herbicides were applied lone. These results are also supported by Bhan (1987) and arsheney and Singh (1990).

ll the herbicides treated plots produced significantly more umber of fertile tillers, grains per spike and 1000-grain eight than weedy check (Table 2). It is also clear that all ne herbicides varied considerably with one another in spect of above cited yield components. Moreover all the erbicides with 3 per cent urea solution were statistically milar to one another and produced relatively more fertile llers, grains per spike and 1000-grain weight.

inimum number of fertile tillers, grains per spike and 000-grain weight in weedy check could be attributed to resence of weeds which competed with crop plant for nvironmental resources. More number of yield components herbicide and urea treated plots might had resulted from etter growth and development of crop plants due to ddition of urea.

here was a significant enhancement in grain yield of the eated plots over the weedy check (Table 2). The nhancement was in the range of 10.29 - 19.78 per cent r herbicides applied alone and 19.24 - 25.47 per cent for erbicides applied with 3 per cent urea solution. Higher ain yield was resulted from more number of fertile tillers, umber of grains per spike and 1000-grain weight. he increase in grain yield and yield components could be ttributed to better weeds control resulting in more uptake of moisture, nutrients and the light harvest by the crop plants. Punia *et al.* (1989) and Sharar *et al.* (1994) also obtained a significant increase in grain yield over the weedy check.

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