Indian Journal of Weed Science 41(1&2) : 78-81, 2009

Evaluation of bio-efficacy of AEF 046360-8% EC+ DIC 1468 -14 -22% EC against complex weed flora in wheat crop

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ABSTRACT

A field experiment was conducted to evaluate the bio-efficacy of new herbicides AEF 046360-8% EC and DIC 1468-14-22% EC alone and in combination at different doses against the complex weed complex in wheat crop. Wheat crop was mainly infested with grassy weeds like *Avena ludoviciana*, *Phalaris minor* and broad leaf weeds *viz., Coronopus didymus*, *Anagallis arvensis*, *Melilotus* spp. and *Chenopodium album*. Combined application of AEF 046360-8% EC and DIC 1468-14-22% EC (100+175 g/ha) was found effective against all the weeds as shown by the the lowest weed density of grassy as well as broad leaf weeds. AEF 046360-80% had better control over grassy weeds, whereas, DIC 1468-14-22% EC was found effective against broad leaf weeds. The highest grain yield was obtained with the application of AEF 4630-8% EC+ DIC 1468–14-22% at (100 + 175 g/ha) and was found at par with application of sulfosulfuron and AEF 4630-8% EC + DIC 1468-14-22% EC with their lower doses (80 + 140 g/ha).

Key words: Wheat, Weed complex, AEF 046360-8% EC , DIC 1468 -14 -22% EC

In wheat, acute problem of both grassy and broad leaf weeds is becoming very common in north–western zone of India, which often results in huge yield loss and makes the weed control more complex (Singh *et al*. 2002). Among grassy weeds, little seed canary grass (*Phalaris minor* Retz.) and wild oat (*Avena ludoviciana* Dur) are problematic in irrigated wheat under rice-wheat and non rice-wheat sequence. Among broad-leaved weeds, golden dock (*Rumex dentatus*) and field bindweed (*Convolvulus arvensis*) are also a problem in wheat crop (Chhokar *et al.* 2007). Since the continuous use of herbicides with similar mode of action may result in resistance development as well as build up residue in soil, the present investigation was conducted to evaluate the bio-efficacy of new herbicides AEF 046360-8% EC and DIC 1468-14-22% EC either alone or in combination at different doses against the mixed weed complex in wheat crop.

MATERIALS AND METHODS

The present investigation was carried out at Crop Research Centre of G.B. Pant University of Agriculture and Technology, Pantnagar during *rabi* 2007-08 and 2008-09. Total ten treatments comprising of alone application of AEF 046360-10% EC at 100 g/ha and DIC 1468-70% WP at 175 g/ha and combination of AEF046360-8% EC and DIC 1468-14-22% EC at 60+105, 80+140, 100+175, 200+350 g/ha, mesosulfuron + iodosulfuron 14.4 g/ha + surfactant (500 ml/ha), sulfosulfuron at 25 g/ha + surfactant (1250 ml/ha), weed free and weedy check were taken during the investigation. All the herbicides were applied at 40 days after sowing at 3 to 5 leaf stage of weeds. Wheat cv. *UP 2382* was sown on December 7, 2007 and December 13, 2008 with the seed rate of 100 kg seed/ha with 20 cm row spacing. The experiment was laid out in randomized block design and replicated thrice. The soil of the experimental field was clay loam in texture having pH 7.0, organic carbon 0.73%, low in available N, medium in available P_2O_5 and high in available K_2O. Recommended doses of fertilizers with 120:60:40 kg/ha of N:P:K, respectively were applied in the field. Full dose of phosphorus and potassium and half of nitrogen was applied at a time of final land preparation and remaining half dose of nitrogen was top dressed in two equal splits. All the herbicides were sprayed by using 300 liters of water/ha with the help of Maruti foot sprayer fitted with flat fan nozzle. Weed control efficiency was calculated using by following formula as given by Mani *et al*. (1973).

$$WCE\ (\%) = \frac{DMC - DMT}{DMC} \times 100$$

Where, WCE = Weed control efficiency (%), DMT = Dry matter production by weeds in treated plot (g), DMC = Dry matter production by weeds in control plot (g)

RESULTS AND DISCUSSION

Effect on weeds

The experimental field was mainly infested with grassy weeds like *Avena ludoviciana*, *Phalaris minor* and broad leaved *Coronopus didymus*, *Anagalis arvensis*, *Melilotus* spp. and *Chenopodium album* which account

11.7 and 8.6; 41.3 and 29.2; 10.4 and 32.5; 23.9 and 14.0; 5.5 and 9.1; 6.9 and 6.5 per cent during *rabi* 2007 and 2008, respectively (Table 1 and 2). As the doses of herbicide mixture i.e. AEF 046360-8% EC + DIC 1468-14-22% EC were increased from (60+105g/ha) to (100+175 g/ha), a reduction in weed density and dry weight was recorded during both the years. Combined application of AEF 046360-8% EC and DIC 1468-14-22% EC (100+175 g/ha) was found effective against all the weeds as it recorded the lowest weed density of grassy as well as broad leaf weeds (Table 1 and 2). Alone application of AEF 046360-8% EC at 100 g/ha showed good efficiency over grassy weeds, *Avena ludoviciana* and *Phalaris minor* as compared to alone application of DIC 1468-14-22% EC at 175 g/ha. However, AEF 046360-8% EC was found ineffective against broad leaf weeds as compared to DIC 1468-14-22% EC. Atlantis (mesosulfuron + iodosulfuron) had better control over broad leaved weeds as compared to sulfosulfuron at 20 days after application during both the years.

Combined application of AEF 046360-8% EC and DIC 1468-14-22% EC with their higher doses (100+175 g/ha) was found effective against *Phalaris minor* at 20 days after application and followed by application of AEF 046360-10%EC at 100 g/ha and sulfosulfuron which were at par with each other during both the seasons. Combined application of AEF 046360-8% EC and DIC1468–14- 22% EC with their higher doses (100+175 g/ha) and (80+140 g/ha) had better control over broad leaved weeds as compared to lower dose of alone application of AEF 046360-10% EC and sulfusulfuron. Among the herbicidal treatments, combined application of AEF 046360-8% EC and DIC1468–14-22% EC (100+175 g/ha) recorded lowest weed dry weight followed by standard check (Atlantis and sulfosulfuron) during both the seasons. These were followed by combined application of AEF 046360-8% EC and DIC 1468-14-22 % (80+140 g/ha), lone application of AEF046360-10% EC 100 g/ha and combined application of AEF 046360-8% EC and DIC1468–14- 22% EC with their lower (60+105) g/ha doses.

Highest weed control efficiency were obtained with combined application of AEF 046360-8% EC and DIC 1468–14-22% EC (100+175) g/ha followed by application of Atlantis (mesosulfuron+iodosulfuron), sulfosulfuron and combination of AEF 046360-8% EC and DIC 1468–14- 22% EC (80+140 g/ha) during both the years (Fig. 1).

Effect on crop

Application of both the herbicides AEF 046360-8% EC and DIC 1468–14- 22% EC have not shown any phytotoxic effect on wheat crop. Variation in plant height (cm) and tillers (no./m²) were found significant among the different herbicides either applied alone or in combination (Table 3). Plant height and tillers were increased between interval 60-75 DAS. Combined application of AEF 046360-8% EC and DIC 1468–14-22% EC at all the doses recorded the highest number of tillers at all the stages of crop growth as compared to lone application of other herbicides *viz*., AEF 046360-10% EC, DIC 1468, sulfusulfuron and atlantis. Combined application of AEF 046360-8% EC and DIC 1468–14- 22% EC at all the doses were at par with respect to their plant height during both

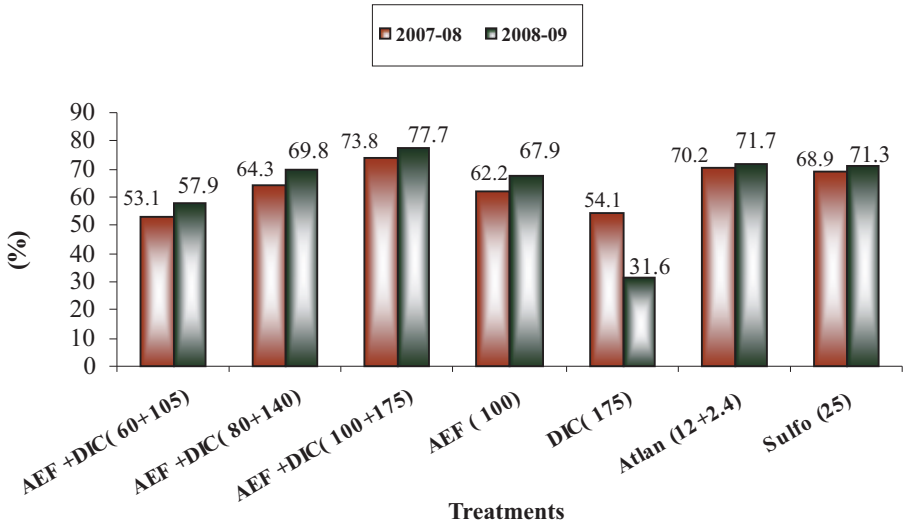

Fig. 1. Effect of treatments on weed control efficiency (%)

Table 1. Effect of herbicide treatments on weed density at 20 days after spray during 2007-08 and 2008-09 (pooled data)

Treatment	Dose (g/ha)	Weed density (no./m^2)						Weed dry weight (g/m^2)
		A. ludovciana	*P. minor*	*C. didymus*	*A. arvensis*	*Melilotus* spp.	*C. album*	
AEF046360-8% EC +DIC1468-14%-22% EC	60+105	2.5 (10.7)	3.4 (29.7)	2.9 (18.0)	0.6 (1.0)	1.5 (3.7)	0.3 (0.4)	34.3
AEF046360-8% EC +DIC1468-14%-22% EC	80+140	2.3 (9.2)	2.9 (18.0)	2.5 (11.3)	0 (0)	1.1 (2.4)	0.0 (0)	25.5
AEF046360-8% EC +DIC1468-14%-22% EC	100+175	2.1 (7.5)	2.4 (10.0)	1.8 (5.0)	0 (0)	0.3 (0.4)	0.0 (0)	18.7
AEF 046360 10%EC	100	2.2 (8.0)	2.7 (13.4)	3.6 (37.5)	3.5 (33.5)	2.7 (14.0)	2.7 (13.7)	27.0
DIC 1468 70%WP	175	3.1 (21.7)	3.7 (37.7)	1.9 (5.7)	0 (0)	0.8 (1.4)	0.0 (0)	43.3
Atlantis 3.6WG (Meso. 3%+ Iodo. 0.6%) + Surfactant	(12+2.4) +500	2.4 (10.2)	3.2 (23.7)	1.4 (3.2)	1.3 (3.0)	0.3 (0.4)	0.5 (1.4)	22.4
Sulfosulfuron75%WG	25+1250	2.2 (8.3)	3.3 (25.3)	3.0 (19.0)	1.8 (5.4)	1.8 (5.4)	1.4 (3.0)	23.1
Weedy	-	3.2 (24.5)	4.4 (84.7)	4.0 (53.7)	3.8 (45.4)	2.9 (18.0)	2.8 (16.4)	76.9
LSD (P=0.05)	-	0.3	0.2	0.2	0.5	0.6	0.4	5.9

Values in parentheses were transformed to log (x+1) for analyses.

Table 2. Effect of management option on plant height and no. of tillers at different stages of wheat crop growth during 2007-08 and 2008-09 (pooled data)

Treatment	Dose (g/ha)	Plant height (cm)		Tillers (no./m^2)	
		60 DAS	75 DAS	60 DAS	75 DAS
AEF046360 -8% EC +DIC1468 -14% -22% EC	60+105	55.5	85.9	406	413
AEF046360 -8% EC +DIC1468 -14% -22% EC	80+140	67.1	86.4	437	441
AEF046360 -8% EC +DIC1468 -14% -22% EC	100+17 5	75.8	86.8	447	448
AEF 046360 10%EC	100	65.1	85.6	381	393
DIC 1468 70%WP	175	42.9	84.8	372	392
Atlantis 3.6WG (Meso. 3%+ Iodo. 0.6%) + surfactant	12+2.4	71.0	84.1	416	404
Sulfosulfuron 75%WG	25	70.1	85.4	419	415
Weedy	-	-	83.3	357	336
LSD (P=0.05)			NS	32	26

Table 3. Effect of weed control treatments on yield and yield attributing characters in wheat (pooled data)

Treatment	Dose (g/ha)	Spikes (no./m^2)	Grains / spike (no.)	1000 grain weight (g)	Grain yield (kg/ha)
AE F0 46360 - 8% + DIC 1468 - 14%-22% EC	60+105	347	43.1	40.1	4497
AE F0 46360 - 8% + DIC 1468 - 14%-22% EC	80+140	378	44.0	43.7	4991
AE F0 46360 - 8% + DIC 1468 - 14%-22% EC	100+175	396	43.0	41. 9	5090
AE F0 46360 - 10% EC	100	330	41.8	42.3	4387
DIC 1468 - 70%WP	175	341	28.3	42.5	4412
Atlantis 3.6WG (Meso. 3%+ Iodo. 0.6%) + Surfactant	(12+2.4) +500	348	42.1	42.8	4805
Sulfosulfuron 75% WG + surfactant	25+1250	369	42.8	43.5	4987
Weedy (control)		303	40.4	39.6	3341
LSD (P=0.05)		33	NS	0.9	125

the years, however, combined application of AEF 046360-8% EC and DIC 1468–14- 22% EC at their lower dose (60+105 g/ha) recorded significantly lower number of tillers as compared to their higher dose (100+175 g/ha).

Effect on yield

Among yield and yield attributes, significant differences were observed in number of spikes/m^2, grains per spike and test weight (Table 3). Reduction in spikes/m^2 were observed as the doses of combined application of AEF 4630-8% EC+ DIC 1468–14-22% EC decreased from 100 + 175 to 60 + 105 g/ha, however, the highest number of grains per spike were recorded in combined application of AEF 4630 -8%EC+ DIC 1468–14-22% EC at (80 + 140 g/ha) being at par with sulfosulfuron during both the years. Weedy plots recorded lowest yield contributing characters due to which recorded the lowest yield. The highest grain yield was achieved with application of AEF 4630-8%EC+ DIC 1468 – 14- 22% EC at (100 + 175 g/ha) and it was found at par with application of sulfosulfuron and AEF 046360-8% EC + DIC 1468–14-22% EC with their lower doses (80 + 140) g/ha. Weedy plots recorded 31 and 37% lower grain yield as compared to the highest grain yield achieved through application of AEF 4630-8% EC+DIC 1468–14- 22% EC at 100+175 g/ha during *rabi* 2007-08 and 2008-09, respectively. Higher grain yield of these treatment combinations was mainly attributed to increasing the number of spikes per unit area. Lone application of the AEF 4630-10% EC and DIC1 468 –70% WP at 100 and 175 g/ha, respectively were found comparable to each other and also with combination of both herbicides at their lowest (60+105) g/ha dose with respect to their grain yield.

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