

Bioefficacy of New Formulations of Clodinafop (10 EC) and Fenoxaprop (Puma Power 10 EC) in Wheat (*Triticum aestivum* L.)

S. S. Dahiya, B. S. Arya, S. S. Punia, Yash Pal Malik, O. P. Lathwal and Baldev Kamboj

Department of Agronomy

CCS Haryana Agricultural University, Hisar-125 004 (Haryana), India

Little seed canary grass (*Phalaris minor*) is most serious weed of wheat crop in North-Eastern districts of Haryana. Isoproturon was introduced as a very effective and economical herbicide for the control of this weed in wheat but due to its continuous use for 25 years, *P. minor* in some pockets of Haryana and Punjab has developed resistance to isoproturon (Malik and Malik, 1994; Walia *et al.*, 1997). To tackle the resistance problem, alternate herbicides fenoxaprop-p-ethyl, sulfosulfuron and clodinafop-propargyl have been recommended (Malik and Yadav, 1997) and are being used by the farmers on large scale. Purpose of present investigation was to evaluate the bioefficacy of new formulations of clodinafop (Topik 10 EC) and fenoxaprop (Puma Power 10 EC) and to determine comparative efficacy of all new and existing formulations being used by farmers against resistant population of *P. minor*.

Present experiment was conducted at farmers' fields in six districts of the state viz., Ambala, Kurukshetra, Yamuna Nagar, Sonapat, Jind and Fatehabad, where rice-wheat is most popular cropping sequence and alternate herbicides are being used by the farmers since last 5-6 years. Experiment consisting of eight treatments (Table 1) was conducted in randomized block design with three replications at each site, keeping a big plot size of 500 m². Wheat variety PBW-343 was grown at all sites by following all the recommended package of practices of CCS Haryana Agricultural University, Hisar. All the herbicides were sprayed at 35-40 days after sowing with hand operated knapsack sprayer fitted with flat fan nozzle delivering 300 litres of water/ha. Hasten cationic surfactant at 0.2% was used with clodinafop (EC), whereas surfactant puma activator (0.3%) was used with puma power (fenoxaprop). Per cent control of *P. minor* was

recorded at 120 DAS, on 0-100 scale, where 0 means no control and 100 means complete control and grain yield was recorded at harvest on per plot basis and converted to kg ha⁻¹.

Both formulations of clodinafop (WP) at 60 g ha⁻¹ and clodinafop (EC) at 50 g ha⁻¹ provided excellent control of *P. minor* (Table 1). Isoproturon provided only 45% control of this weed indicating presence of resistance against this herbicide at all sites. Efficacy of sulfosulfuron was comparatively less as compared to clodinafop and fenoxaprop at all sites and complete mortality of *P. minor* could not be achieved due to use of this herbicide at any of the sites under study. Moreover regeneration of this weed after 15 days of spray was observed at Jind, Fatehabad and Ambala. Higher dose of fenoxaprop (120 g ha⁻¹) provided significantly higher control of *P. minor* than fenoxaprop (puma power) at 100 g ha⁻¹+surfactant (puma activator). Use of surfactant with fenoxaprop at 120 g ha⁻¹ slightly increased its efficacy over its use alone but grain yield was statistically at par at all sites except Ambala, where grain yield with fenoxaprop at 120 g ha⁻¹+surfactant was 6% higher than fenoxaprop alone at 120 g ha⁻¹. Lowest efficacy of isoproturon (25%) was recorded at Fatehabad, whereas it was highest in Sonapat (60%). On an average, highest grain yield (5045 kg ha⁻¹) was recorded with the use of clodinafop (WP) at 60 g ha⁻¹+surfactant closely followed by clodinafop (EC) at 50 g ha⁻¹+surfactant which was 48.3% higher than isoproturon at 1.0 kg ha⁻¹ (3402 kg ha⁻¹).

Based on results of above trials, it can be inferred that bioefficacy of clodinafop (EC) at 50 g ha⁻¹ with surfactant was at par with clodinafop (WP) at 60 g ha⁻¹ and higher than fenoxaprop and sulfosulfuron against resistant population of *P. minor*. Efficacy of fenoxaprop at 120 g ha⁻¹ is more

Table 1. Grain yield (kg ha⁻¹) of wheat and *P. minor* control (%) as affected by different treatments

Herbicide	Dose (g ha ⁻¹)	Grain yield (kg ha ⁻¹)						Mean
		Ambala	Jind	Kurukshetra	Yamunanagar	Sonepat	Fatehabad	
Fenoxaprop	120	4480 (87)	4600 (88)	4650 (90)	4180 (88)	5500 (93)	5400 (90)	4788 (88.1)
Clodinafop (WP)	60	4700 (95)	4820 (96)	4680 (100)	4450 (95)	5600 (97)	5750 (98)	4999 (96.8)
Sulfosulfuron	25	4380 (78)	4160 (65)	4300 (8)	4120 (85)	5240 (80)	5140 (70)	4556 (76.3)
Clodinafop 10 EC+Hasten (S)	60+0.2%	4800 (100)	4880 (95)	4590 (94)	4500 (98)	5600 (100)	5900 (100)	5045 (97.8)
Clodinafop 10 EC+Hasten (S)	50+0.2%	4850 (100)	4860 (95)	4600 (95)	4580 (98)	5564 (95)	5725 (98)	5021 (96.8)
Fenoxaprop+puma activator (S)	120+0.3%	4750 (100)	4625 (86)	4600 (90)	4240 (90)	5520 (93)	5400 (90)	4862 (91.5)
Fenoxaprop+puma activator (S)	100+0.3%	4460 (80)	4410 (81)	4550 (8)	4000 (75)	5200 (80)	5200 (82)	4336 (80.5)
Isoproturon	1000	3825 (45)	3490 (35)	3200 (37)	2980 (35)	4050 (60)	2870 (25)	3402 (45.3)
C. D. (P=0.05)		94	232	109	172	164	139	

Values in parentheses are weed control efficacy on *P. minor*.

than its use at 100 g ha⁻¹ alongwith surfactant.

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