

Evaluation of Carfentrazone-ethyl Against *Convolvulus arvensis* L. and *Malwa parviflora* L. in Wheat

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ABSTRACT

Post-emergence application of carfentrazone at 20 g ha⁻¹ provided 92-100% control of all broadleaf weeds including hard to control weeds *Malwa parviflora* and *Convolvulus arvensis* in wheat with no residual effect on succeeding sorghum crop. Metsulfuron and 2, 4-D were not effective against *Malwa parviflora* and *Convolvulus arvensis*. Carfentrazone at 20-35 g/ha was very safe to wheat crop.

INTRODUCTION

Wheat is the most important cereal crop of Haryana state which is badly infested with grassy as well as broadleaf weeds. Due to continuous use of herbicides, infestation of broadleaf weeds is increasing every year. At present 2, 4-D and metsulfuron are being used against broadleaf weeds in wheat. These herbicides do not provide satisfactory control of some difficult to control weeds like field bind weed (*Convolvulus arvensis* L.), button weed (*Malwa parviflora* L.) and wild pea (*Lathyrus aphaca* L.). Moreover, 2, 4-D causes malformed spikes in many wheat varieties (Balyan and Panwar, 1997). So a new contact, non-residual, translocated herbicide carfentrazone-ethyl of aryl triazolinone family which has been found effective to control broadleaf weeds in wheat (Singh *et al.*, 2004) by inhibiting activity of protoporphyrinogen oxidase in chlorophyll biosynthetic pathway (Witkowski and Halling, 1989) was evaluated against these weeds and compared with existing recommended herbicides in wheat.

MATERIALS AND METHODS

Experiment 1

A field experiment was conducted at Agronomy Research area of CCSHAU, Hisar using wheat cv. PBW-343 in a randomized block design,

replicated thrice in a plot size of 7.0 x 2.1 m². Crop was sown on 7 November 2003 and 15 November 2004 and harvested on 9 April 2004 and 14 April 2005 during 2004 and 2005, respectively. The soil of the experimental field was sandy loam in texture having a pH 8.2 and organic carbon 0.29%. Treatments consisting of carfentrazone (40% DF, FMC Ltd.) at 15, 20 and 25 g/ha alone, metsulfuron at 3 and 4 g/ha and 2, 4-D at 400, 450 and 500 g/ha were compared with weedy and weed-free checks. All the herbicides were applied at 35 days after sowing by using knapsack sprayer using flat fan nozzle delivering 500 l water/ha. During both the years, grassy weeds were manually removed as and when required. Crop was raised as per recommended package of practices. Data on density and dry matter accumulation by broadleaf weeds were recorded at 70 DAS. Data on density and dry weight of weeds were subjected to $\sqrt{X+1}$ transformation before analysis.

Experiment 2

During 2003, one experiment to evaluate carfentrazone against *Malwa parviflora* was conducted in village Nagla Jagir (Yamuna Nagar) and it was repeated at KVK, Damla (Yamuna Nagar) during 2004 and different districts of the state. Carfentrazone at 15, 20 and 25 g/ha was compared with recommended dose of 2, 4-D (500 g/ha) and metsulfuron (4 g/ha). Data on visual control and dry

Table 1. Effect of carfentrazone on the density, dry weight and grain yield of wheat during 2003-04 and 2004-05

Treatment	Dose (g/ha)	Weed density (No. m ⁻²)				Weed dry weight (g m ⁻²)		Crop phytotoxicity (%) at 15 DAT		Spikes (No./m. r. l.)		Grain yield (kg ha ⁻¹)	
		<i>C. arvensis</i>		Other BLW		2004	2005	2004	2005	2004	2005	2004	2005
		2004	2005	2004	2005								
Carfentrazone	15	1 (0)	1 (0)	1 (0)	1 (0)	4.42	4.2	0	0	403	376	5380	4610
Carfentrazone	20	1 (0)	1 (0)	1 (0)	1 (0)	3.38	3.2	0	0	405	375	5450	4616
Carfentrazone	25	1 (0)	1 (0)	1 (0)	1 (0)	3.15	3.1	0	0	411	376	5480	4620
Metsulfuron	4	3 (8)	2.8 (7)	1 (0)	2.0 (3)	14.7	12.5	0	0	406	364	5380	4500
2, 4-D	500	3 (8)	2.0 (3)	2.8 (7)	4.5 (19)	27.8	24.8	0	0	386	360	5220	4424
Weed free	-	1 (0)	1 (0)	1 (0)	1 (0)	0	0	0	0	412	375	5480	4680
Weedy	-	3.1 (9)	2.8 (7)	4.7 (20)	6.9 (48)	42.4	58.7	0	0	340	334	4420	3950
C. D. at 5%	-	0.3	0.2	0.4	0.4	2.6	3.4			9	9	103	98

BLW-Broadleaf weeds, DAT-Days after transplanting.

Table 2. Bioefficacy of carfentrazone against *Mahwa parviflora* in wheat

Treatment	Dose (g ha ⁻¹)	Weed density (No.m ⁻²)				Visual control (%)				Grain yield (kg ha ⁻¹)			
		Nagla jagir 2003-04		Farmer's fields* 2004-05		Nagla jagir 2003-04		Farmer's fields* 2004-05		Nagla jagir 2003-04		Farmer's fields* 2004-05	
		2003-04	2004-05	2003-04	2004-05	2003-04	2004-05	2003-04	2004-05	2003-04	2004-05	2003-04	2004-05
Carfentrazone	15	1	0	-	-	92	95	95	95	4720	4300	4520	4520
Carfentrazone	20	0	0	-	-	100	100	100	100	4824	4380	4680	4680
Carfentrazone	25	0	0	-	-	100	100	100	100	4860	4400	4664	4664
Metsulfuron	4	6	0	-	-	0	0	0	0	4548	4406	4410	4410
2, 4-D	500	7	4	-	-	0	0	0	0	4480	4392	4236	4236
Weedy	-	6	16	-	-	0	0	0	0	4360	4100	4120	4120
C. D. at 5%	-	0.2	1.2	-	-	-	-	-	-	72	64	83	83

*No. of demonstrations : Fatehabad-2, Yamuna Nagar-2, Karnal-3, Sirsa-1, Ambala-1.

weight of weeds were taken at 30 days after spray. Visual estimates of per cent control were recorded at 120 DAS using a scale of 0-100 where, 0—no control to 100—complete control. Foliar chlorosis, necrosis, plant stunting, epinasty and hyponasty were considered when making visual estimates.

RESULTS AND DISCUSSION

Experiment 1

Experimental field was dominated with *Chenopodium album* L., *Lathyrus aphaca* L., *Convolvulus arvensis* L., *Rumex retroflexus* L., *Fumaria parviflora*, *Melilotus indica* and *Medicago denticulata* during both the years of experimentation.

Carfentrazone at all doses proved very effective against all broadleaf weeds in wheat (Tables 1 and 2). It caused mild bleaching on leaves of wheat after 2-3 days of application which disappeared within eight days without adverse effect on wheat. Weeds, treated with herbicide became necrotic and died within few hours after application. Complete control of hard to control obnoxious weed, *Convolvulus arvensis* (*Hirankhuri*) was observed regardless of application rate of carfentrazone, whereas application of metsulfuron and 2, 4-D caused only stunting in growth of *Convolvulus arvensis*. Dry weight of broadleaf weeds in

carfentrazone treated plots was significantly lower than metsulfuron and 2, 4-D treated plots. Brar *et al.* (2005) and Patel *et al.* (2005) also reported excellent efficacy of carfentrazone against broadleaf weeds in wheat. Grain yield and number of spikes were maximum under weed-free treatment which were at par with carfentrazone treated plots but significantly higher than all 2,4-D treatments. Lower grain yield in metsulfuron and 2, 4-D treated plots was due to insufficient control of field bind weed.

Experiment 2

Carfentrazone at 20 g/ha and above provided 100% control of *Malwa parviflora* as shown by density (Table 2). Density of weeds even at 20 g/ha was significantly lower than 2, 4-D and metsulfuron treatments. Even higher dose of carfentrazone (25 g/ha) did not cause any phytotoxic effect on crop as shown by number of effective tillers and grain yield. Metsulfuron and 2, 4-D did not prove effective in minimizing density and dry weight of *M. parviflora*. Maximum grain yield was recorded with carfentrazone applied at 25 g ha⁻¹ during first and second years and second year at 20 g ha⁻¹.

Residual Effect of Carfentrazone on Succeeding Crop of Sorghum

After harvest of wheat in April 2004, experimental plot was irrigated and sorghum crop

Table 3. Residual effect of different herbicides applied in wheat on succeeding sorghum crop at 30 DAS (2004-05)

Treatment	Dose (g/ha)	No. of plants/m ²	Plant height (cm)	Grain fodder yield (t/ha)
Carfentrazone	15	20.5	120	39.2
Carfentrazone	20	21.0	119	39.0
Carfentrazone	25	22.0	123	38.8
Carfentrazone	30	21.3	125	39.3
Carfentrazone	35	19.9	120	38.7
Metsulfuron	4	19.6	120	39.0
2, 4-D	500	21.0	121	39.5
Weedy		21.0	122	38.8
Weed-free		21.4	119	39.0
C. D. at 5%		NS	1.5	NS

NS- Not Significant.

var. Sudan grass multicut was planted on 28 April 2005 in the same field (after slight disking without disturbing the original layout). Data recorded on number of plants/m², plant height and green fodder yield did not show any adverse effect of residues of carfentrazone on these parameters (Table 3).

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