

Bioefficacy of azimsulfuron against sedges in direct seeded rice

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ABSTRACT

A field experiment was conducted to evaluate the bio-efficacy of azimsulfuron 50 DF against sedges especially *Cyperus rotundus*. As dose of azimsulfuron was increased from 25 to 30 g/ha, weed density and dry weight of weeds reduced at all the crop growth stages. Azimsulfuron was found comparable to pendimethalin and metsulfuron-methyl (MSM) alone but recorded significantly higher weed dry matter as compared to pendimethalin *fb* MSM at 45 DAS. Pendimethalin alone and azimsulfuron (30g) combined with MSM were comparable to standard check i.e. pendimethalin 1 kg/ha *fb* MSM 4 g/ha in terms of weed dry weight at 70 DAS. Azimsulfuron 30 g/ha along with MSM 2 g/ha recorded significantly higher yield (554 kg/ha) as compared to 25 g/ha along with MSM. There is no advantage of tank mixed application of azimsulfuron with MSM over azimsulfuron alone for the control of sedges and broad leaved weeds.

Key Words : Azimsulfuron, Bioefficacy, Sedges, Direct seeded rice

In the 21st century along with population pressure, rising scarcity of agricultural land and water and continuing shortage of labour will maintain pressure for a shift towards direct seeding method in rice production system (Mortimer *et al.* 2005). Despite several advantages, various production obstacles are also encountered in direct seeded rice in which heavy weed infestation is the major one. Weeds cause heavy damage to direct seeded rice (DSR) crop which can be to the tune of 5-100% (Moody and Mian 1979, Kolhe 1989). Weeds also deteriorate the grain quality and enhance the cost of production. Generally pre-emergence herbicides are used in direct seeded rice. However, sometimes due to unavailability of herbicides or less soil moisture leads to the situation where application of pre-emergence is questionable. Also pre-emergence herbicides in DSR impart only partial control and weeds like *Cyperus rotundus* become highly competitive. In such situations post emergence herbicides are needed for use in combination with pre-emergence herbicides to control weeds in direct seeded rice. Azimsulfuron 50 DF is a post-emergence herbicide, tested to evaluate the bio-efficacy and crop selectivity alone and in tank-mix application with metsulfuron methyl (MSM) as post-emergent application for control of weeds in direct dry seeded rice.

The experiment was conducted at Crop Research Centre of G.B. Pant University of Agriculture & Technology, Pantnagar during *kharif*, 2006. The soil of experimental plot was silty clay loam in texture, high in organic carbon (0.80%) medium in available P (19 kg/ha) and high in available K (225 kg/ha) with soil pH 7.65. The

experiment was planned in randomized block design with 3 replications. Total ten treatments, azimsulfuron (25 g), azimsulfuron (27.5 g), azimsulfuron (30.0 g), azimsulfuron (25 g) + met sulfuron methyl (MSM) (2 g), azimsulfuron (27.5 g) + MSM (2 g), azimsulfuron (30 g) + MSM (2 g), MSM (2 g), pendimethalin (1 kg), pendimethalin (1 kg) followed by MSM (2 g) and untreated control were tested on the rice crop. Rice variety NDR-359 was sown on 25th June, 2006. Pendimethalin was applied as pre emergence and azimsulfuron and metsulfuron methyl were applied as post emergence (25 DAS) by Knapsack sprayer fitted with flat fan nozzle using 300 l water per hectare. Crop was fertilized at the rate of 120 kg/ha N using urea and 60 kg P₂O₅/ha in the form of diammonium phosphate (DAP). Full dose of phosphorus and half dose of nitrogen were applied as basal and rest half nitrogen was top dressed in two equal proportions at tillering and panicle initiation stages. The weed count was recorded with the help of 1 x 0.25 m quadrat from two places in each plot. Weed biomass was weighed for fresh and dry weight at 45 and 70 days after sowing. Recommended package of practices was adopted to raise the crop in direct dry seeded situation.

The experimental plot was mainly infested with grasses. Among the grasses major weeds were *Leptochloa chinensis*, *Eragrostis japonica*, *Echinochloa colona* and *Echinochloa crusgalli*. Grass weeds accounted for 63.4 and 24.7% and sedges accounted for 27.5 and 11.1% of total weed density at 45 and 70 DAS, respectively. As dose of azimsulfuron was increased, weed density and dry weight of weeds reduced at all the stages. Azimsulfuron

was found to be effective against sedges i.e. *Cyperus* species. *Cyperus* was completely eliminated by azimsulfuron (Table 1). Among broad leaf weeds, *Cynotis axillaris*, *Caesulia axillaris* and *Commelina diffusa* were the major one. Pendimethalin fb MSM recorded the lowest grass weed density at both the stages which was significantly superior to pendimethalin when applied alone at initial stage, whereas at later stage it was comparable with pendimethalin. Azimsulfuron + MSM at all the doses were found to be more effective against weeds particularly against *Cyperus rotundus* as compared to other treatments. Whereas pendimethalin was not found effective against sedges and broad leaved weeds as it recorded the highest weed density among the treatments at both the stages.

Azimsulfuron 30 g was found comparable with pendimethalin applied alone at 1 kg/ha at 45 DAS in grass weed density, whereas at later growth stages it was comparable with azimsulfuron (30 g) + MSM (2 g) but not with pendimethalin (Table 1). Azimsulfuron (25 g) + MSM and azimsulfuron with its lower doses i.e. 25 and 27.5 g were not effective against grasses and were at par with weedy check at both the stages of crop growth. Pendimethalin was not found effective against the sedges as it recorded the highest weed density at both the stages, whereas treatments having azimsulfuron completely controlled sedges in treated plots. All dose of azimsulfuron

when applied with MSM recorded at par broad leaf weeds population and dry weight when MSM applied alone at both the stages of study.

Both at 45 and 70 DAS, plots treated with pendimethalin followed by MSM, recorded the lowest total weed density (94.7 and 83.3, respectively). At initial stage (45 DAS) it was followed by azimsulfuron (30 g) along with MSM which was at par with other treatments except the azimsulfuron at 25 g either alone or with MSM and weedy check (Table 2). At later stage (70 DAS), pendimethalin + MSM was at par with pedimethalin alone, with respect to weed density. As the crop growth progressed from 45 to 70 DAS, the weed dry matter also increased. Azimsulfuron was found comparable to pendimethalin and MSM alone but recorded significantly higher weed dry matter as compared to pendimethalin fb MSM at first stage of study (Table 2). Pendimethalin alone and azimsulfuron (30 g) combined with MSM were comparable to standard check i.e. Pendimethalin 1kg/ha fb MSM 4g/ha in terms of weed dry weight at 70 DAS. No significant difference was observed in weed dry weight at this stage when azimsulfuron was applied either alone or followed with MSM. Weed dry weight at 70 days after sowing was almost similar at all doses of azimsulfuron application. However, in initial crop growth stage (45 DAS), as the dose of azimsulfuron was increased, the weed dry weight decreased.

Table 1. Effect of weed management practices on weed density in direct seeded rice

Treatments	Dose (g/ha)	Stage of application (DAS)	Weed density (no./m ²)					
			45 DAS			70 DAS		
			Grasses	Sedges	Broad leaf weeds	Grasses	Sedges	Broad leaf weeds
Azimsulfuron 50DF + MSM 20SG + 0.2% surfactant	25.0+2	25	8.0 (65.0)	1.0 (0)	1.0 (0)	8.7 (75.3)	1.0 (0)	1.4 (1.3)
Azimsulfuron 50DF + MSM 20SG + 0.2% surfactant	27.5+2	25	7.0 (50.0)	1.0 (0)	1.0 (0)	7.6 (57.3)	1.0 (0)	1.8 (2.7)
Azimsulfuron 50DF + MSM 20SG + 0.2% surfactant	30.0+2	25	6.4 (40.7)	1.0 (0)	1.7 (2.0)	6.8 (46.0)	1.0 (0)	2.1 (4.0)
Azimsulfuron 50DF + 0.2% surfactant	25.0	25	8.7 (74.7)	1.0 (0)	3.1 (8.7)	8.5 (72.7)	1.0 (0)	2.2 (4.0)
Azimsulfuron 50DF + 0.2% surfactant	27.5	25	7.3 (52.0)	1.0 (0)	2.8 (7.3)	7.8 (59.3)	1.0 (0)	2.1 (4.0)
Azimsulfuron 50DF + 0.2% surfactant	30.0	25	6.8 (46.0)	1.0 (0)	2.5 (5.3)	6.9 (46.7)	1.0 (0)	2.8 (7.3)
MSM 20SG + 0.2% surfactant	2.0	25	7.3 (52.0)	1.2 (0.7)	1.7 (2.0)	7.8 (62.7)	1.2 (0.7)	1.2 (0.7)
Pendimethalin	1000	1	5.1 (26.0)	6.9 (47.3)	3.1 (9.3)	4.2 (17.3)	4.2 (17.3)	4.0 (15.3)
Standard check (pendimethalin fb MSM/CME)	1000fb 4	1fb 28	2.6 (6.0)	2.1 (4.0)	1.4 (1.3)	3.5 (12.0)	2.1 (3.3)	1.9 (3.3)
Untreated check	0		7.8 (60.0)	5.1 (26.7)	3.0 (8.7)	8.2 (68.0)	3.0 (9.3)	2.6 (6.0)
LSD(P=0.05)			2.0	1.3	1.2	1.6	0.9	1.4

MSM – Metsulfuron methyl, CME – Chlorimuron ethyl, Figure in paranthesis are original value, original values were square root transformed

Table 2. Effect of weed management practices on weed density and dry weight of direct seeded rice

Treatments	Dose (g/ha)	Stage of application (DAS)	Total weed density (no./m ²)		Weed dry weight (g/m)	
			45 DAS	70 DAS	45 DAS	70 DAS
Azimsulfuron 50DF + MSM 20SG + 0.2% surfactant	25.0+2	25	8.2 (60.0)	8.5 (71.3)	420.27	697.37
Azimsulfuron 50DF + MSM 20SG + 0.2% surfactant	27.5+2	25	7.1 (50.0)	7.8 (60.0)	433.67	519.10
Azimsulfuron 50DF + MSM 20SG + 0.2% surfactant	30.0+2	25	6.5 (42.7)	7.6 (57.3)	308.67	495.00
Azimsulfuron 50DF + 0.2% surfactant	25.0	25	9.3 (86.0)	8.5 (72.0)	350.80	679.03
Azimsulfuron 50DF + 0.2% surfactant	27.5	25	7.8 (60.0)	8.0 (62.7)	292.10	655.67
Azimsulfuron 50DF + 0.2% surfactant	30.0	25	7.2 (51.3)	7.4 (54.0)	486.93	636.87
MSM 20SG+ 0.2% surfactant	2.0	25	7.4 (54.7)	7.9 (63.3)	468.03	854.53
Pendimethalin	1000	1	7.7 (58.0)	7.1 (50.0)	340.07	426.2
Standard check (pendimethalin fb MSM/CME)	1000 + 4	1 + 28	3.5 (11.3)	5.3 (30.7)	55.97	283.48
Untreated check	-	-	9.7 (94.7)	9.1 (83.3)	547.17	900.67
LSD (P=0.05)			1.9	1.9	228.38	226.23

Figures in parentheses are original values, observations on weed density were transformed to $(\sqrt{x+1})$, MSM - Metseulfuron-methyl; surf. - surfactant, CME- chlorimuron ethyl

Table 3. Effect of weed management on yield attributes and yield of direct seeded rice

Treatments	Dose (g/ha)	Stage of application (DAS)	Panicle (no./m ²)	Grains per panicle	1000 grain weight (g)	Grain yield (q/ha)	Straw yield (q/ha)
Azimsulfuron 50DF + MSM 20SG + 0.2% surfactant	25.0+2	25	48.7	34.5	26.7	4.38	6.57
Azimsulfuron 50DF + MSM 20SG + 0.2% surfactant	27.5+2	25	50.3	35.1	27.3	4.83	7.23
Azimsulfuron 50DF + MSM 20SG + 0.2% surfactant	30.0+2	25	57.7	35.2	27.1	5.54	8.50
Azimsulfuron 50DF + 0.2% surfactant	25.0	25	41.0	35.0	26.7	4.17	6.36
Azimsulfuron 50DF + 0.2% surfactant	27.5	25	44.0	36.6	27.1	4.29	6.67
Azimsulfuron 50DF + 0.2% surfactant	30.0	25	45.3	37.9	27.2	4.80	7.67
MSM 20SG+ 0.2% surfactant	2.0	25	44.6	41.3	27.0	4.96	7.73
Pendimethalin	1000	1	62.0	42.0	27.8	6.83	10.52
Standard check (pendimethalin fb MSM/CME)	1000 + 4	1 + HW at 28	121.0	56.0	27.8	18.75	28.33
Untreated check	0	-	33.7	33.6	27.3	3.13	4.76
LSD (P=0.05)			16.7	2.2	NS	1.08	1.71

MSM - Metseulfuron-methyl; surf. - surfactant, CME- chlorimuron ethyl

Pendimethalin (1000 g/ha) fb MSM (4 g/ha) recorded the highest grain yield followed by pendimethalin 1000 g/ha which may be attributed to the more number of panicles per unit area and grains per panicle. It was followed by pendimethalin alone, azimsulfuron (30 g/ha) fb MSM, MSM (2 g/ha) alone, azimsulfuron (25 g/ha) fb MSM, and azimsulfuron (30 g/ha) alone. Azimsulfuron 30 g/ha along with MSM 2 g/ha recorded significantly higher yield (554 kg/ha) as

compared to 25 g/ha along with MSM. Higher doses of azimsulfuron recorded the higher yield as compared to lower doses, however, the differences was non-significant between the different doses. Lower grain yield in azimsulfuron treated plots was mainly due to infestation of grass weeds, since azimsulfuron was not effective against the grass weeds. Under the phytotoxicity observation, yellowing of leaf was seen when azimsulfuron was applied, however, crop recovered in 15-20 days. Thus it

can be concluded that azimsulfuron is effective against sedges and broad leaf weeds in direct seeded rice particularly against *Cyperus rotundus* a noxious weed in DSR. There is no advantage of tank mixed application of Azimsulfuron with MSM over azimsulfuron alone for the control of sedges and broad leaved weeds.

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