

## PERFORMANCE OF MEFENACET+BENSULFURON METHYL 53% WP AGAINST WEED SUPPRESSION IN TRANSPLANTED PADDY

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### ABSTRACT

*The study was conducted during dry season of 2007 in two different agro-ecological zones of Bangladesh to evaluate the usefulness of Mefenacet + bensulfuron methyl 53% WP, for weed management in transplanted paddy. Mefenacet + bensulfuron methyl 53%WP @ 524,594 and 657g ai ha<sup>-1</sup> was evaluated for its bio-efficacy against broad spectrum of weeds and safety to crop. Standard for comparison was butachlor 5G @ 1250g ai ha<sup>-1</sup>. Weed flora in the experimental plots in the two different agro-ecological zones comprised of the grasses Cynodon dactylon, Echinochloa crus-galli, Leptochloa chinensis, the sedges, Cyperus difformis, Scirpus juncooides and the broadleaves Enhydra fluctuans, Monochoria vaginalis, Lindernia anagallis, Marsilea minuta and sphencoclea zeylanica. Pre-emergence application of Mefenacet + bensulfuron methyl 53%WP @ 594g ai ha<sup>-1</sup> led to higher weed control efficiency and lowest number and dry weight of weeds which ultimately resulted in higher yield attributes and grain yield of rice that were comparable to the standards at both location.*

**Key words:** Mefenacet+bensulfuron methyl 53%WP, broad spectrum weed control, transplanted paddy.

### INTRODUCTION

In Bangladesh, severe weed infestation reduces the grain yield by 70-80% in Aus rice (early summer), 30-40% for transplanted Aman rice (Late summer) and 22-36% for modern boro rice (winter rice) cultivation (BRRI, 2006; Mamun, 1990). Severe infestation of weeds is one of the major factors responsible for the low productivity of rice. Hence, proper weed management practices are essential to obtain better yields in transplanted paddy. Quite a lot of pre and post emergence herbicides such as butachlor, pretilachlor, oxadiazon, pyrazosulfuron ethyl, ethoxysulfuron alone or supplemented with one hand weeding have been found to be useful for weed management in transplanted paddy. Continuous use of these herbicides has to be

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restricted to avoid undesirable inter and intra-specific weed shift (Singh *et al.*, 2005). Sometimes single use of these herbicides cannot control a broad spectrum of weeds. Use of single herbicide might be effective for only sedges or only grass or broad leaf weeds. Mefenacet whose chemical name is N-methyl -n-phenyl-2-(1,3 benzothiazol-2-yloxy) acetamide has recently been developed for pre-emergence control of graminaceous weeds having a high efficacy on *Echinochloa crusgalli*, but also has adverse effect on broadleaf weeds. Bensulfuron methyl whose chemical name is Methyl-2[[[(4,6-dimethoxy-pyrimidin-2-yl)amino]carbonyl]amino] sulfonyl]methyl]benzoate has been developed for selective pre- and post-emergence control of annual and perennial weeds and sedges. Bensulfuron methyl has a unique effect on broadleaf weeds and sedges but also has adverse effect on *Echinochloa crusgalli*. Mefenacet + bensulfuron methyl 53% WP together have a wonderful effect on broad leaf and sedge weeds. So herbicide combination can make up the deficiency of single use. Furthermore such type of herbicide mixture is almost new perception in Bangladesh for control of weeds. So to give farmers a wider choice of effective herbicide there is a need to develop environmental eco friendly molecules of newer chemistries with different mode of action. In view of this, the present study has been undertaken to evaluate the usefulness of Mefenacet + bensulfuron methyl 53% WP for broad spectrum control of weeds for the use of farmers as an effective weed control option in rice.

#### **MATERIALS AND METHODS**

Mefenacet + bensulfuron methyl 53% WP; a new pre emergence herbicide, was evaluated at Bangladesh Rice Research Institute farm, Bhanga, Faridpur (Included AEZ 12- Lower Ganges River Floodplain) and at Burichang of Comilla district (Included AEZ 19- Old Meghna Estuarine Floodplain) during winter season (Boro), 2007 to observe its weed control efficiency, impact on plant growth and yield of rice. The treatments were i) Mefenacet + bensulfuron methyl 53% WP @ 524 g a.i.ha<sup>-1</sup> ii) Mefenacet + bensulfuron methyl 53% WP @ 594 g a.i. ha<sup>-1</sup> iii) Mefenacet + bensulfuron methyl 53% WP @ 657 g a.i. ha<sup>-1</sup> iv) Butachlor 5G @ 1250 g a.i. ha<sup>-1</sup> v) Weed free by hand weeding and vi) Control (Un weeded). Butachlor 5G was used to compare the new herbicide. The experiment was laid out in a RCB design with 3 replications. Forty days old seedlings of BRRI dhan28 were transplanted on 12<sup>th</sup> January, 2007 at 20x20 cm spacing with 2 seedlings hill<sup>-1</sup> at BRRI farm Bhanga, Faridpur and on 5<sup>th</sup> February at Burichang, Comilla with same spacing and design. For Comilla location rice variety Eratom-6 was used. Fertilizer was applied following BRRI recommended dose. Butachlor 5G were sprayed at 5 days after

transplanting, Mefenacet+ bensulfuron methyl 53% WP was mixed with urea and scattered in the treated plots 6 DAT as pre-emergence action. In weed free treatment, the plots were kept weed free up to 50 DAT by two hand weeding. Weed control efficiency (WCE%) was calculated using the formula according to Rao (1985). Mefenacet+ bensulfuron methyl 53% WP herbicide is innovative in Bangladesh and its phytotoxicity needs to be evaluated on rice crop. The phytotoxicity of the herbicide to rice plants was determined by visual observations (Yellowing leaves, burring leaf tips, stunting growth etc). The degree of toxicity on rice plant was measured by the following scale used by IRRI (1965).

1. No toxicity
2. Slightly toxicity
3. Moderate toxicity
4. Severe toxicity
5. Toxic (plant kill)

The rating of toxicity was done within 7 days after application of herbicides. It was observed three times at 3,5 and 7 days after application of herbicide and the mean rate was calculated from 10 sample plants of a unit plot. Yields and yield contributing characters of rice were recorded after harvest. The data were analyzed following analysis of variance (ANOVA) technique and mean differences were depicted by multiple comparison test (Gomez and Gomez, 1984) using the statistical program MSTAT-C (Russell, 1986).

## RESULTS AND DISCUSSION

### Phytotoxicity of herbicides on rice plant

The degree of toxicity of the herbicide to rice plants and the symptoms produced on plant are presented in Table-1. It is observed that Mefenacet + bensulfuron methyl 53%WP @ 524 g a.i. ha<sup>-1</sup> and 594 g a.i. ha<sup>-1</sup> showed very slight yellowing of leaves while Mefenacet+bensulfuron methyl 53% WP @ 657 g a.i. ha<sup>-1</sup> showed temporary yellowing of leaves. It is observed that phytotoxicity symptoms were not more prominent for using this herbicide.

**Table-1. Rating of herbicide toxicity on rice plant under different treatments.**

Treatment	Rating	Symptom observed on rice crop
T1= Super clean 53% WP @ 523 g a.i.ha <sup>-1</sup>	1.14	Sometimes very slight yellowing of leaves.
T2= Super clean 53% WP @ 594 g a.i.ha <sup>-1</sup>	1.16	Sometimes slight yellowing of leaves.
T3= Super clean 53% WP @ 657 g a.i.ha <sup>-1</sup>	1.30	Temporary slight yellowing of leaves which required 5-7 days to recover
T4= Butachlor 5 G @ 1250 g a.i.ha <sup>-1</sup>	1.11	No toxicity

**Efficacy of herbicide on weed species**

Bio efficacy data of Mefenacet+ bensulfuron methyl 53% WP @ 594 g a.i.ha<sup>-1</sup> spraying at 6 DAT against weed suppression indicated that at BRRF farm Bhanga, 80% control of *Cyperus difformis*, 82% control of *Enhydra fluctuans*, 81% control of *Echinochloa crus-galli*, 86% control of *Monochoria vaginalis*, 87% control of *Scirpus juncooides*, 85% control of *Leptochloa chinensis* and only 36% control of *Cynodon dactylon* was achieved (Table-2).

**Table-2. Effect of Mefenacet + bensulfuron methyl 53% WP on weed and weed control efficiency on BRRF dhan 28 in Boro, 2007 at BRRF farm, Bhanga, Faridpur.**

Weed Name	T1		T2		T3		T4		T5		*WCE (%)
	W1	W2	W1	W2	W1	W2	W1	W2	W1	W2	
<i>Cyperus difformis</i>	7	7.01	3	1.53	5	2.41	6	6.06	18	7.80	80
<i>Cynodon dactylon</i>	6	9.16	4	7.38	3	4.37	6	9.48	14	11.29	36
<i>Enhydra fluctuans</i>	4	3.55	2	1.47	3	0.36	4	4.73	9	8.13	82
<i>Echinochloa crus-galli</i>	4	5.47	2	1.76	3	0.65	3	4.51	9	9.43	81
<i>Monochoria vaginalis</i>	3	2.90	3	1.70	2	0.41	4	2.84	13	12.32	86
<i>Scirpus juncooides</i>	3	2.33	2	0.97	2	0.62	3	2.05	14	7.71	87
<i>Leptochloa chinensis</i>	3	3.07	2	0.85	1	0.46	2	2.23	7	6.01	85

Bio efficacy data of Comilla experiment showed 80% control of *C. difformis*, 84% control of *Lindernia anagallis*, 82% control of *E. crus-galli*, 81% control of *Marsilea minuta*, 80% control of *Sphenoclea zeylanica* and only 35% control of *C. dactylon* was achieved with Mefenacet+ bensulfuron methyl 53% WP @ 594 g a.i.ha<sup>-1</sup> (Table-3). Kim and Im (2002) reported that the mixture of Mefenacet + bensulfuron-methyl gave 90% control of annual and perennial weeds.

**Table-3. Effect of Mefenacet+ bensulfuron 53% WP on weed and weed control efficiency on rice in Boro, 2007 at Burichang, Comilla.**

Weed Name	T1		T2		T3		T4		T5		*WCE (%)
	W1	W2	W1	W2	W1	W2	W1	W2	W1	W2	
<i>Cyperus difformis</i>	4	3.00	3	1.89	3	1.97	4	3.39	13	9.64	80
<i>Cynodon dactylon</i>	3	6.36	4	5.71	4	4.18	4	4.92	8	8.80	35
<i>Lindernia anagallis</i>	3	2.03	3	1.40	2	1.54	3	2.36	7	8.74	84
<i>Echinochloa crus-galli</i>	4	2.23	2	1.80	2	1.82	3	3.48	7	9.97	82
<i>Marsilea minuta</i>	2	1.04	3	0.87	2	0.60	2	2.11	6	4.71	81
<i>Sphenoclea zeylanica</i>	2	1.15	2	0.82	2	0.79	2	1.37	3	4.13	80

T1 = Mefenacet+ bensulfuron 53 WP @ 523 g a.i.ha<sup>-1</sup>

T2 = Mefenacet+ bensulfuron 53 WP @ 594 g a.i.ha<sup>-1</sup>

T3 = Mefenacet+ bensulfuron 53 WP @ 657 g a.i.ha<sup>-1</sup>

T4 = Butachlor 5G @ 1250 g a.i.ha<sup>-1</sup>, T5 = Control (Unweeded), W1= Weed number m<sup>-2</sup>

W2 = Weed dry matter weight (g m<sup>-2</sup>), \*WCE = Weed Control Efficiency= % Control of weed species by Mefenacet+ bensulfuron 53 WP @ 450g acre<sup>-1</sup> over no weeding

#### Yield and yield attributes

Effect of Mefenacet+bensulfuron methyl 53% WP on growth, yield and yield contributing characters are showed in Table-4. Different doses of Mefenacet+bensulfuron methyl 53% WP spraying at 6 DAT significantly influenced the No. of panicle m<sup>-2</sup>, filled grains panicle<sup>-1</sup> and grain yield in both Faridpur and Comilla locations. Plant height did not differ significantly due to different treatments. But numerically higher plant height was observed in weed free plot and un-weeded plot obtained lower plant height in both locations. In Faridpur location, the highest panicle m<sup>-2</sup> (382) was observed from weed free plots which are alike with other treatments except un-weeded plots. The lowest panicles m<sup>-2</sup> (254) was observed from un-weeded plots. Number of filled grains panicle<sup>-1</sup> was statistically higher in weed free plot (130) which is statistically at par with other treatments except un-weeded plot. The lowest grains panicle<sup>-1</sup> (75) was observed in un-weeded plots. Similar trend in results was found in Comilla region. In Faridpur location, weed free plot gave the highest grain yield (7.42 t ha<sup>-1</sup>) which was statistically comparable with other herbicide treatments except Mefenacet+bensulfuron methyl 53% WP @ 594 g a.i.ha<sup>-1</sup> and un-weeded check. The lowest grain yield was obtained from un-weeded plot (4.55 t ha<sup>-1</sup>). In Comilla location similar trend of grain

yield was found but grain yield was little lower than Faridpur Region. Pacanoski and Glatkova (2009) found significant increase in rice grain yield with the use of Mefenacet+ bensulfuron methyl in comparison with untreated control.

**Table-4. Effect of Mefenacet+ bensulfuron 53% WP on growth and yield attributes of rice in Boro, 2007 at Faridpur and Comilla district.**

Treatment	Plant ht. (cm)		Panicle m <sup>-2</sup>		Filled grain panicle <sup>-1</sup>		Grain yield t ha <sup>-1</sup>	
	L <sub>1</sub>	L <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>
T1	114.47	92.66	347.66a	341.00a	106a	102a	6.69b	6.22c
T2	114.40	92.66	371.33a	346.33a	111a	108a	7.03ab	6.90ab
T3	113.10	91.66	373.33a	355.00a	112a	113a	7.05ab	6.92ab
T4	112.73	92.33	363.33a	343.33a	110a	107a	7.00ab	6.48bc
T5	115.36	93.66	382.33a	358.00a	130a	119a	7.42a	7.14a
T6	112.26	85.00	254.00b	245.33b	75b	75b	4.55c	4.31d
CV (%)	2.56	9.18	9.21	5.92	13.74	11.80	5.44	6.55
LSD <sub>(0.05)</sub>	NS	NS	58.39	35.73	26.78	22.33	0.065	0.56

T1 = Mefenacet+ bensulfuron 53% WP @ 523 g a.i.ha<sup>-1</sup>

T2 = Mefenacet+ bensulfuron 53% WP @ 594 g a.i.ha<sup>-1</sup>

T3 = Mefenacet+ bensulfuron 53% WP @ 657 g a.i.ha<sup>-1</sup>

T4 = Butachlor 5g @ 1250 g a.i.ha<sup>-1</sup>

T5 = Weed Free

T6 = Control( Un weeded)

L<sub>1</sub> = Bhanga, Faridpur

L<sub>2</sub> = Comilla

NS = Not significant

## CONCLUSION

From the above discussion it is concluded that Mefenacet+ bensulfuron methyl 53% WP @ 594 g a.i.ha<sup>-1</sup> controlled many weeds effectively and produced optimum grain yield in both agro-ecological zones (AEZ 12 and 19) of Bangladesh in Boro rice. No plant injury was observed during the crop growing period due to the application of Mefenacet + bensulfuron methyl 53% WP.

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