

## Weed Management Efficiency of Metsulfuron Methyl 20WP in Wheat Field

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### Abstract

An experiment was carried out during the *rabi* season of 2000-01 to study the bio-efficiency of Metsulfuron methyl 20WP herbicide in wheat field. The most dominant flora in the crop field were *Chenopodium album*, *Euphorbia hirta*, *Portulaca oleracea*, *Eclipta alba*, *Cyperus rotundus*, *Eleusine indica* and *Cynodon dactylon*. The experiment showed that hand weeding twice at 20 and 40 days after sowing (DAS) gave the highest grain yield. Among the chemical treatments, Metsulfuron methyl 20WP @ 2 g a.i. ha<sup>-1</sup> as pre-emergence application showed the best performance giving a grain yield of 30.67 q ha<sup>-1</sup> which was statistically at par with the hand weeding twice at 20 and 40 DAS. Higher dose of Metsulfuron methyl 20WP at 4 and 8 g a.i. ha<sup>-1</sup> failed to produce a satisfactory yield of the crop as they reduced the number of effective tillers per m<sup>2</sup> to 357 and 362, respectively.

### Introduction

Wheat is an annual cereal having erect and cylindrical stem of solid nodes and hollow internodes. It consists of two sets of roots viz. the seminal or seedling roots and adventitious crown root or clonal roots which arise from the basal nodes of the plant at least 20 DAS to form the permanent root system. So the plant faces a stringent competition for space, light and nutrients to be established at its early stages of growth from persisting weed flora. Besides, to increase the productivity of the crop, row to row spacing is reduced to 20 cm resulting in higher plant population which also leads to a heavy competition between crop and weeds. Earlier report shows that hand weeding twice at 25 and 42 DAS increased grain yield of wheat to the tune of 63% (Ray *et al.*, 1996). Losses in wheat grain yield may be as high as 82% depending upon the weed infestation and their growth at different soil fertility levels (Mukhopadhyay and Bera, 1980) *Phalaris minor* alone reduces grain yield of the crop to the extent of 40% (Verma and Bharadwaj, 1963). With the changeable environment weed species are getting upper hand to ignore the effects of formerly bulky herbicides with their vigorous growth and competitiveness. Keeping this view in mind, this experiment was conducted to find out a suitable weed management method with a low dose of sulfonyl urea herbicide in wheat field during the *rabi* season of 2000-01.

### Materials and Methods

The experiment was carried out at University Teaching Farm, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal with randomized block

design having seven treatments with four replications and a plot size of 4m x 5m. The treatments were Metsulfuron methyl 20WP at 1 (T<sub>1</sub>), 2 (T<sub>2</sub>), 4 (T<sub>3</sub>) and 8 (T<sub>4</sub>) g a.i. ha<sup>-1</sup> applied at 25 DAS, 2, 4-D 80 WP at 500 g a.i. ha<sup>-1</sup> applied at 25 DAS (T<sub>5</sub>), handweeding at 20 and 40 DAS (T<sub>6</sub>) and unweeded control (T<sub>7</sub>). Soil of the experimental site was well drained sandy loam with moderate fertility having a pH of 6.7. The wheat variety used in the experiment was HP 1731 (*Rajlakhmi*). The sowing was done on 24th November 2000 with a spacing of 20 cm x 6 cm at a depth of 2.5 cm below the soil surface. The applied fertilizer dose was 100 kg N, 50 kg P<sub>2</sub>O<sub>5</sub> and 50 kg K<sub>2</sub>O ha<sup>-1</sup> in the form of urea, single superphosphate and muriate of potash, respectively. Half of total N and full doses of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O were applied as basal and rest N was applied as equal halves at CRI stage and at 49 DAS. The crop was harvested on 10 March, 2001. Weed population per sq. m. was recorded using a quadrat thrown randomly at four places in each plot at 30, 60 and 90 DAS. Weed dry weight per sq. m. for each plot was recorded keeping the weeds in a drier at 60° C until a constant weight of samples was obtained. Average number of effective tillers per sq. m., number of filled grain per earhead, length of earhead and 1000-grain weight for each plot were recorded at the time of harvest. After harvesting, threshing and drying, grain yield was recorded. Weed index (reduction in yield due to presence of weeds in comparison with weed-free situation) value was also calculated.

### Results and Discussion

The predominant weed flora in the experimental

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TABLE 1. Effect of weed control treatments on population of different categories of weeds (Nos M<sup>-2</sup>)

Treatment	40 DAS				60 DAS				90 DAS			
	Grass	Sedge	Broad leaved	Total	Grass	Sedge	Broad leaved	Total	Grass	Sedge	Broad leaved	Total
T <sub>1</sub>	48.33	19.00	21.67	89.00	53.67	25.67	25.33	104.67	39.67	21.33	16.33	77.33
T <sub>2</sub>	21.67	14.67	12.67	49.00	32.33	16.33	15.67	64.33	25.33	17.67	11.67	54.67
T <sub>3</sub>	20.67	14.33	11.33	46.33	26.67	15.67	14.33	57.67	18.67	16.33	9.33	44.33
T <sub>4</sub>	19.67	14.67	10.67	45.00	25.33	15.33	12.67	53.33	16.33	12.00	9.67	38.00
T <sub>5</sub>	39.33	16.00	17.00	72.33	31.67	19.67	20.67	82.00	29.67	19.67	14.67	64.00
T <sub>6</sub>	18.67	6.67	12.33	37.67	26.67	10.33	15.67	52.67	19.33	14.33	10.33	44.0
T <sub>7</sub>	69.67	21.33	34.67	125.67	73.67	29.67	38.33	141.67	51.67	27.67	26.67	106.00
SEm ±	3.45	3.06	2.08	4.65	3.27	2.34	1.09	5.63	1.94	1.45	1.61	5.78
C.D. at 5%	10.63	9.43	6.41	14.33	10.08	7.21	3.36	17.35	5.98	4.47	4.96	17.81

TABLE 2. Effect of weed control treatments on dry weight of different categories of weeds (g. m<sup>-2</sup>)

Treatment	40 DAS				60 DAS				90 DAS			
	Grass	Sedge	Broad leaved	Total	Grass	Sedge	Broad leaved	Total	Grass	Sedge	Broad leaved	Total
T <sub>1</sub>	9.01	4.46	4.25	17.72	14.11	4.97	5.49	24.57	10.16	4.21	5.87	20.24
T <sub>2</sub>	4.23	3.03	3.16	10.42	7.36	3.44	3.72	14.52	6.54	3.83	4.16	14.53
T <sub>3</sub>	3.99	3.29	2.84	10.12	6.42	3.01	3.26	12.69	5.03	3.56	3.19	11.78
T <sub>4</sub>	3.45	3.05	2.56	9.06	6.08	2.93	3.14	12.15	4.68	3.07	3.41	11.16
T <sub>5</sub>	6.91	3.65	3.92	14.48	9.94	4.76	5.16	19.86	7.12	4.01	5.27	16.40
T <sub>6</sub>	2.87	0.86	2.21	5.94	5.79	2.58	3.46	11.83	5.13	3.35	3.92	12.40
T <sub>7</sub>	12.09	4.93	7.38	24.40	17.45	7.08	8.25	32.78	12.87	6.16	9.22	28.25
SEm ±	1.12	0.54	0.48	1.78	1.34	0.31	0.57	1.71	1.05	0.25	0.38	1.82
C.D. at 5%	3.45	1.66	1.48	5.49	4.13	0.96	1.76	5.27	3.24	0.77	1.17	5.61

TABLE 3. Effect of weed control treatments on grain yield and yield attributes of wheat

Treatment	No. of active tillers/sq. m.	Length of ear head (cm)	No. of filled grain/panicle	1000-grain weight (g)	Grain yield (q. ha <sup>-1</sup> )	Yield increase over unweeded control	Weed index (WI)
T <sub>1</sub>	336	8.86	38.85	36.72	25.94	36.81	20.69
T <sub>2</sub>	358	8.97	49.38	36.82	30.67	67.04	5.86
T <sub>3</sub>	357	8.83	50.67	36.75	22.69	19.67	30.36
T <sub>4</sub>	362	8.93	51.45	36.86	21.56	13.71	16.67
T <sub>5</sub>	341	8.85	47.82	36.37	27.15	43.20	—
T <sub>6</sub>	365	8.95	51.44	36.92	32.58	71.84	41.80
T <sub>7</sub>	304	8.76	34.96	36.70	18.96	—	—
SEm ±	4.15	0.31	1.06	0.54	1.24	—	—
C.D. at 5%	12.79	NS	3.27	NS	3.82	—	—

field were *Chenopodium album*, *Euphorbia hirta*, *Portulaca oleracea*, *Eclipta alba*, *Cyperus rotundus*, *Elusine indica* and *Cynodon dactylon*.

#### Effect on weed

Hand weeding twice at 20 and 40 DAS resulted in the lowest total weed population and weed dry weight at 40 and 60 DAS but at 90 DAS the highest dose of Metsulfuron methyl 20 WP i.e. 8 g a.i. ha<sup>-1</sup> recorded the lowest weed population and weed dry weight. This indicates that Metsulfuron methyl persisted for more than two months in the crop field (Table 1).

Among the chemical treatments, though Metsulfuron methyl 20WP @ 8 g a.i. ha<sup>-1</sup> recorded the lowest weed population and weed dry weight, it was statistically at par with the treatments Metsulfuron methyl 20 WP @ 4 g a.i. ha<sup>-1</sup> and Metsulfuron methyl 20 WP @ 2 g a.i. ha<sup>-1</sup>. These three doses (2, 4 and 8 g a.i. ha<sup>-1</sup>) of Metsulfuron methyl 20 WP showed statistically at par performance in controlling weeds in different stages of crop growth with hand weeding twice at 20 and 40 DAS (Table 2).

The lowest dose of Metsulfuron methyl 20 WP (1 g a.i. ha<sup>-1</sup>) was found less effective than other doses of the same herbicide. 2, 4-D 80 WP @ 500 g a.i. ha<sup>-1</sup> did not give satisfactory weed control throughout growth

stages of the crop.

It is very interesting to note that at 40 DAS different doses of Metsulfuron methyl 20 WP and 2, 4-D 80 WP @ 500 g a.i. ha<sup>-1</sup> gave satisfactory at par effect in controlling sedge weed population and dry weight with unweeded control treatment that may be due to the limitation of their bioefficiency to control sedge weeds in the crop field.

#### Effect on crop

All the chemical treatments used in the experiment showed no visual phytotoxic symptom to crop plants with the exception that higher doses of Metsulfuron methyl 20 WP (4 and 8 g a.i. ha<sup>-1</sup>) recorded lower number of active tillers per sq. m. than hand-weeding twice and other chemicals used in the experiment (Table 2).

Though the doses like 4 and 8 g a.i. ha<sup>-1</sup> of Metsulfuron methyl 20 WP gave a better performance in controlling weed population and weed dry weight per sq. m. but failed to show a satisfactory yield increase over un-weeded control treatment due to their inhibiting effect on tillering capacity of the crop plants.

Similar observation was obtained by Kumbhakar and Bhattacharya (1993). The treatment hand weeding twice at 20 and 40 DAS recorded the highest grain yield of the crop (32.58 q. ha<sup>-1</sup>) which was statistically at par

with pre-emergence application of Metsulfuron methyl 20 WP @ 2 g a.i. ha<sup>-1</sup> which recorded 30.58 q. ha<sup>-1</sup> yield of wheat crop.

The grain yield obtained in the treatment Metsulfuron methyl 20 WP @ 2 g a.i. ha<sup>-1</sup> was significantly higher than with 2, 4-D 80 WP @ 500 g a.i. ha<sup>-1</sup> applied 25 DAS.

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