

**PERFORMANCE OF HERBICIDES FOR WEED CONTROL IN SUGARCANE FIELD**

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**Abstract**

An experiment was conducted at the farmers' field of Godagari Upazilla of Rijshahi district and Mirpur Upazilla of Kustia district during 2011-12 cropping season. The study was under taken in irrigated condition to find out the feasibility of using herbicide and to evaluate effective and promising herbicide for weed management in sugarcane field. All the weed control treatments recorded significantly lower weed dry weight in comparison to no weeding (control). Among different weed control treatments three weeding by cultural practices at 45, 90, and 135 DAP significantly recorded lowest weed dry weight (27.33 g/m<sup>2</sup>) and (27.00 g/m<sup>2</sup>) in both the locations compared to other treatments. Highest weed control efficiency (71.18%) and (78.34%) were recorded with treatment of weeding by cultural practices. Weeding by SENCOR 70 WG produced significantly higher number of millable canes (128.0 × 10<sup>3</sup> ha<sup>-1</sup>) and (124.0 × 10<sup>3</sup> ha<sup>-1</sup>) in both the locations. But, the highest cane yield 96.72 t ha<sup>-1</sup> and 94.50 t ha<sup>-1</sup> were observed with the treatment of conventional method of weed control (weeding by cultural practices). The highest benefit cost ratio (BCR) of 2.37 and 2.34 were recorded from T<sub>2</sub> and the lowest BCR were recorded from 1.53 and 1.88 from T<sub>1</sub> in both the locations. Though best management of weeds has been observed by adopting of weeding by cultural practices but the availability of labour required for conducting these cultural operations may be a constrain to pursue the operation in time. The efficiency of pre and post emergence application of SENCOR 70 WG @ 1.5 kgha<sup>-1</sup> and TOPSTAR 400SC @ 1.5 litreha<sup>-1</sup> in managing weed population have been proved effective and may be adopted as a means of weed management in commercial cane cultivation.

**Key words:** Sugarcane, weed management, herbicide, yield

**Introduction**

Weed means a plant persists in growing where it is not wanted or any plant that is found out of its place. These unwanted plant interfered with agricultural operations, increase cost and compete for light, space, nutrient and moisture and thus reduce crop yield. They also harbour insects, pests and micro-organisms. Sugarcane crop gets heavily infested with weeds mainly because of its slow germination and initial growth, slow lateral spread, long crop duration, heavy fertilization and frequent irrigation through the crop season. Regarding cane yield declining due to weed infestation was estimated up to 75% (Singh and Moolani, 1975). Uncontrolled growth of weeds in Sugarcane may cause yield loss up to 40% (Verma et al., 1983). During early stage, due to wider spacing and slow growth of sugarcane luxuriant growth of weeds takes place which results into substantial reduction in sugarcane yield by 38% (Chauhan and Singh, 1993). Keeping the sugarcane field weed free up to 135 days after transplanting (DAT) is the most significant for obtaining maximum cane yield (BSRI Annual Report, 1998-99). Although, conventional method of weed control (manual hoeing and weeding) in sugarcane is effective but it is labour intensive, cumbersome, expensive and subject to the availability of labourers.

Chemical weed control has been found suitable under labour constraint condition and in plantation crops like sugarcane (Parker and Frayer, 1975). Use of herbicides holds promise for effective and economic management of weed in sugarcane as reported by Kumar and Shrivastava (1994), Shankraiah et al., (1995) but very limited works regarding weed control by herbicides were done in Bangladesh. Therefore, this study was aimed to find out the feasibility of using herbicide and to evaluate effective and promising herbicide for weed management in sugarcane field.

**Materials and methods**

The experiment was conducted at Godagari Upazilla of Rijshahi district (High Brand Tract, AEZ-26) and Mirpur Upazilla of Kustia district (High Ganges River Flood Plain Soil, AEZ-11) of Bangladesh during 2011-12 cropping Season under irrigated condition. The soils of the experiment site were loamy with high land. There were five treatments including one control (no weeding). The experiment was laid out in randomized complete block design (RCBD) with three replications. Double budded sugarcane settings of variety Isd 39 were directly planted in mid November, 2011 and harvested at its maturity after twelve months of planting. Cane planting was done in deep furrows at

row distance of 100cm and plant to plant distance 30cm, keeping plot size 8m×8m.

Treatments were as follows:

T<sub>1</sub>=No weeding (control)

T<sub>2</sub>=Weeding by cultural practices at 45, 90 and 135 DAP

T<sub>3</sub>=Herbicide TOPSTAR 400SC (Oxadiazole) @1.5 litre ha<sup>-1</sup>

T<sub>4</sub>=Herbicide METRO 70 WG (Triazines) @1.5 kg ha<sup>-1</sup>

T<sub>5</sub>=Herbicide SENCOR 70 WG (Metribuzin) @1.5 kg ha<sup>-1</sup>

The crop was fertilized with 95, 30, 60, 20, 12 and 1.5 kg ha<sup>-1</sup> N, P, K, S, mg and Zn respectively (Fertilizer Recommendation Guide-2005). Herbicidal spray was done @1.5 litre/kg ha<sup>-1</sup> in 1000 litre water with the help of knapsack sprayer. Pre- emergence spray was done immediately after cane planting where as post emergence spray was done 60 days after cane planting (DAP). Weed sample for dry matter estimation were collected from per meter square, Placed randomly at three places from each plot after 120 days crop planting. The weed control efficiency (WCE) was worked out by using the following formula:

$$WCE = \frac{DMC - DMT}{DMC} \times 100$$

Where, DMC = Dry matter weight of weeds in control plot and DMT = Dry matter weight of weeds in treated plot.

Weeding was done once in every 45 days intervals starting from 45 DAP for treatment T<sub>2</sub> up to April, 2012. To control insect pest, Furadan 5G was applied @ 40 kg ha<sup>-1</sup> as per recommendation. Intercultural operations like irrigation, gap filling, earthing-up, tying etc. were done in time. Tiller population of sugarcane was recorded at 90, 120, 150 and 180 DAP. Malleable cane and cane yield were recorded at harvest. Economic and statistical analysis on different parameters was done following the standard procedures.

## Result and discussion

At Rajshahi, all the weed control treatments gave significantly lower weed dry weight in comparison to the control (no weeding). Among different weed control treatments three weeding by cultural practices at 45, 90, and 135 DAP significantly recorded lowest

weed dry weight (27.33 g/m<sup>2</sup>) than rest of the treatments. Highest weed control efficiency (71.18%) was recorded with treatment of weeding by cultural practices followed by 49.18% from weeding using herbicide SENCOR 70 WG, 43.04% from herbicide TOPSTAR 400SC and the lowest (35.35%) was recorded with weeding using herbicide METRO 70 WG (Table 1).

None of the herbicidal treatments could differ significantly in producing number of tiller per hectare. All the herbicidal treatments produced significantly higher number of millable canes than no weeding (control). Similar trend was also observed by Shiv Kumer and Srivastava (1994) on sugarcane ratoon as regards the effect of weeds on sugarcane yield. Weeding by SENCOR 70 WG and TOPSTAR 400SC produced significantly higher number of millable canes (128.0×10<sup>3</sup> ha<sup>-1</sup>) and (127.1×10<sup>3</sup> ha<sup>-1</sup>) respectively. But, the highest cane yield 96.72t ha<sup>-1</sup> was observed with the treatment of conventional method of weed control (weeding by cultural practices). This may be attributed to the fact that weeding by cultural practices not only suppressed the weeds but also improved the soil physical condition which helps in tiller production and growth of cane. The 2<sup>nd</sup> highest yield (90.56 tha<sup>-1</sup>) was obtained from T<sub>5</sub> (SENCOR 70 WG) followed by 82.52 tha<sup>-1</sup> from T<sub>3</sub> (TOPSTAR 400SC), 72.70 tha<sup>-1</sup> from T<sub>4</sub> (METRO 70 WG) whereas T<sub>1</sub> (control) produced the lowest cane yield of 54.9 tha<sup>-1</sup>.

At Kustia, all the weed control treatments recorded significantly lower weed dry weight in comparison to the control (no weeding). Among different weed control treatments three weeding by cultural practices at 45, 90, and 135 DAP significantly recorded lowest weed dry weight (27.00 g/m<sup>2</sup>) than rest of the treatments. Highest weed control efficiency (78.34%) was recorded with treatment of weeding by cultural practices followed by 43.60% from weeding using herbicide TOPSTAR 400SC, 41.45% from herbicide SENCOR 70 WG and the lowest (39.59%) was recorded with weeding using herbicide METRO 70 WG (Table 2).

Table 1. Effect of Different Herbicide on Weed dry matter, number of tillers, millable cane and cane yield at Rajshahi in 2011-2012 cropping year

Treatments	Dry wt. of weeds (g/m <sup>2</sup> )	Weed control efficiency (%)	Tiller (×10 <sup>3</sup> ha <sup>-1</sup> )	Millable cane (×10 <sup>3</sup> ha <sup>-1</sup> )	Cane yield (t ha <sup>-1</sup> )
T <sub>1</sub> = No weeding (control)	125.3a	-	160.2	93.7c	54.9d
T <sub>2</sub> =Weeding by cultural practices at 45, 90 and 135 DAP	27.33c	71.18	175.2	117.2b	96.72a
T <sub>3</sub> = Herbicide TOPSTAR 400SC @1.5 litre ha <sup>-1</sup>	71.33b	43.04	165.1	127.1a	82.52bc
T <sub>4</sub> = Herbicide METRO 70 WG @1.5 kg ha <sup>-1</sup>	81.00b	35.35	174.8	116.5b	72.70c
T <sub>5</sub> = Herbicide SENCOR 70 WG @1.5 kg ha <sup>-1</sup>	63.67b	49.18	173.4	128.0a	90.56ab
LSD (5 %)	29.73	-	NS	8.81	11.52

Table 2. Effect of Different Herbicide on Weed dry matter, number of tillers, millable cane and cane yield at Kustia in 2011-2012 cropping year

Treatments	Dry wt. of weeds(g/m <sup>2</sup> )	Weed control efficiency (%)	Tiller (×10 <sup>3</sup> ha <sup>-1</sup> )	Millable cane (×10 <sup>3</sup> ha <sup>-1</sup> )	Cane yield (t ha <sup>-1</sup> )
T <sub>1</sub> = No weeding (control)	124.7 a	-	187.70	113.80 ab	67.63 b
T <sub>2</sub> = Weeding by cultural practices at 45, 90 and 135 DAP	27.00 c	78.34	187.10	120.00 ab	94.50 a
T <sub>3</sub> = Herbicide TOPSTAR 400SC @1.5 litre ha <sup>-1</sup>	70.33 bc	43.60	237.00	121.20 ab	87.29 a
T <sub>4</sub> = Herbicide METRO 70 WG @1.5 kg ha <sup>-1</sup>	75.33 b	39.59	182.30	105.00 b	74.83 ab
T <sub>5</sub> = Herbicide SENCOR 70 WG @1.5 kg ha <sup>-1</sup>	73.00 b	41.45	207.60	124.00 a	89.43 a
LSD (5 %)	45.94	-	NS	18.60	19.34

None of the herbicidal treatments could differ significantly in producing number of tiller per hectare. Weeding by SENCOR 70 WG produced significantly the highest number of millable cane (124.0×10<sup>3</sup> ha<sup>-1</sup>) followed by TOPSTAR 400SC (121.20×10<sup>3</sup> ha<sup>-1</sup>), weeding by cultural practices (120.00×10<sup>3</sup> ha<sup>-1</sup>), No weeding (113.80×10<sup>3</sup> ha<sup>-1</sup>) and the lowest number of millable cane (105.00×10<sup>3</sup> ha<sup>-1</sup>) was recorded with weeding using herbicide METRO 70 WG (Table 2). But, the highest cane yield 94.50t ha<sup>-1</sup> was observed with the treatment of conventional method of weed control (weeding by cultural practices). This may be attributed to the fact that weeding by cultural practices not only suppressed the weeds but also improved the soil physical condition which helps in tiller production and growth of cane. The 2<sup>nd</sup> highest yield 89.43 tha<sup>-1</sup> was obtained from T<sub>5</sub> (SENCOR 70 WG) followed by 87.29 tha<sup>-1</sup> from T<sub>3</sub> (TOPSTAR 400SC), 74.83 tha<sup>-1</sup> from T<sub>4</sub> (METRO 70 WG) whereas T<sub>1</sub> (control) produced the lowest cane yield of 67.63 tha<sup>-1</sup>.

#### Economics analysis

At Rajshahi, from economic analysis of different treatments, the highest total production cost of TK.

1,02,000 was for treatment T<sub>2</sub> (weeding by cultural practices) followed by TK. 96,000 for T<sub>4</sub> and T<sub>5</sub>, TK. 95,000 for T<sub>3</sub> and the lowest of TK. 90,000 for treatment T<sub>1</sub> (no weeding). The maximum gross return of TK. 2, 41,800 was recorded from T<sub>2</sub> followed by TK. 2, 26,400 from T<sub>5</sub>, TK. 2, 06,300 from T<sub>3</sub>, TK. 1, 81,750 from T<sub>4</sub> and the lowest was from T<sub>1</sub> of TK. 1, 37,250. The highest gross margin of TK. 1, 39,800 was obtained from T<sub>2</sub> followed by T<sub>5</sub> (TK. 1, 30,400), T<sub>3</sub> (TK. 1, 11,300), T<sub>4</sub> (TK. 85, 750) while the lowest of TK. 47250 was recorded from T<sub>1</sub> (Table 3). The highest benefit cost ration (BCR) of 2.37 was recorded from T<sub>2</sub> followed by T<sub>5</sub> (2.35), T<sub>3</sub> (2.17), T<sub>4</sub> (1.89) and the lowest BCR was from T<sub>1</sub> (1.52).

At Kustia, total cost of production was same as Rajshahi. The maximum gross return of TK. 2, 38,750 was recorded from T<sub>2</sub> followed by TK. 2, 18,225 from T<sub>3</sub>, TK. 1, 94,275 from T<sub>5</sub>, TK. 1, 86,575 from T<sub>4</sub> and the lowest was from T<sub>1</sub> of TK. 1, 69,075. The highest gross margin of TK. 1, 23,225 was obtained from T<sub>3</sub> followed by T<sub>2</sub> (TK. 1, 21,575), T<sub>5</sub> (TK. 98,275), T<sub>4</sub> (TK. 90,575) while the lowest of TK. 79,075 was recorded from T<sub>1</sub> (Table 4).

Table 3. Economics and benefit cost ration (BCR) as influenced by different weed control practices at Rajshahi in 2011-2012 cropping year

Treatments	Total production cost(Tk. ha <sup>-1</sup> )	Gross return (Tk. ha <sup>-1</sup> )	Gross margin (Tk. ha <sup>-1</sup> )	BCR
T <sub>1</sub> = No weeding (control)	90,000	1,37,250	47,250	1.52
T <sub>2</sub> = Weeding by cultural practices at 45, 90 and 135 DAP	1,02,000	2,41,800	1,39,800	2.37
T <sub>3</sub> = Herbicide TOPSTAR 400SC @1.5 litre ha <sup>-1</sup>	95,000	2,06,300	1,11,300	2.17
T <sub>4</sub> = Herbicide METRO 70 WG @1.5 kg ha <sup>-1</sup>	96,000	1,81,750	85,750	1.89
T <sub>5</sub> = Herbicide SENCOR 70 WG @1.5 kg ha <sup>-1</sup>	96,000	2,26,400	1,30,400	2.35

Price: Sugarcane: 2500Tk/ton, TOPSTAR 400SC: 2000 Tk/litre, METRO 70 WG: 3000 Tk/kg and SENCOR 70 WG: 3000 Tk/kg

Table 4. Economics and benefit cost ration (BCR) as influenced by different weed control practices at Kustia in 2011-2012 cropping year

Treatments	Total production cost(Tk. ha <sup>-1</sup> )	Gross return (Tk. ha <sup>-1</sup> )	Gross margin (Tk. ha <sup>-1</sup> )	BCR
T <sub>1</sub> = No weeding (control)	90,000	1,69,075	79,075	1.88
T <sub>2</sub> = Weeding by cultural practices at 45, 90 and 135 DAP	1,02,000	2,38,750	1,21,575	2.34
T <sub>3</sub> = Herbicide TOPSTAR 400SC @1.5 litre ha <sup>-1</sup>	95,000	2,18,225	1,23,225	2.30
T <sub>4</sub> = Herbicide METRO 70 WG @1.5 kg ha <sup>-1</sup>	96,000	1,86,575	90,575	1.94
T <sub>5</sub> = Herbicide SENCOR 70 WG @1.5 kg ha <sup>-1</sup>	96,000	1,94,275	98,275	2.02

Price: Sugarcane: 2500Tk/ton, TOPSTAR 400SC: 2000 Tk/litre, METRO 70 WG: 3000 Tk/kg and SENCOR 70 WG: 3000 Tk/kg

The highest benefit cost ration (BCR) of 2.34 was recorded from T<sub>2</sub> followed by T<sub>3</sub> (2.30), T<sub>5</sub> (2.02), T<sub>4</sub> (1.94) and the lowest BCR was from T<sub>1</sub> (1.88).

### Conclusion

The overall results suggested that application of SENCOR 70 WG @1.5 kg ha<sup>-1</sup> and TOPSTAR 400SC @ 1.5 litre ha<sup>-1</sup> found superior to application of METRO 70 WG 1.5 kg ha<sup>-1</sup> in both the locations. Though best management of weeds has been observed by adopting of weeding by cultural practices but the availability of labour required for conducting these cultural operations may be a constrain to pursue the operation in time. The efficiency of pre and post emergence application of SENCOR 70 WG @ 1.5 kg ha<sup>-1</sup>, TOPSTAR 400SC @ 1.5 litre ha<sup>-1</sup> in managing weed population have been proved effective and may be adopted as a means of weed management in commercial cane cultivation.

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