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Weed control efficiency of SULM 70 WG a triazinone herbicide in sugarcane and its impact upon growth and yield

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Abstract

Field efficacy of SULM 70 WG and Metribuzin 70 WP herbicide was tested in controlling of grasses, sedge and broad-leaf weeds in sugarcane at Zonal Agricultural Research Station, Powarkheda (MP) during 2017-18. Results revealed that all the treatments of herbicides significantly reduced the weed density and increased the cane yield significantly as compared to untreated control. Among different treatments, SULM 70 WG @ 3.0 kg /ha applied pre emergence was found to be superior as recorded lowest weed counts viz. 3.8, 2.8, 4.1, 3.6 and 2.9 as compared to highest weed density viz. 31.2, 14.9, 25.7, 33.3 and 23.4 of *Cynodon dactylon*, *Echinochloa crusgalli*, *Cyperus rotundus*, *Chenopodium album* and *Parthenium hysterophorus* in control, respectively at 60 days after sowing of sugarcane. The lowest Weed Dry Weight (12.16 g) as compare to untreated control (55.65 g) and the highest weed control efficiency (78.15%) was also recorded under SULM 70 WG @ 3.0 kg/ha. Likewise, the highest cane yield of 114.14 and 133.35 t/ha was also received from SULM 70 WG @ 2.5 kg /ha and 3.0 kg/ha, respectively.

Keywords: Sugarcane, herbicide, SULM 70 WG, yield

Introduction

Sugarcane is one of important cash cum industrial Crop grown in most of the state in India. It is a perennial crop with tall and relatively strong that are known to have high sugar content. As it is long duration crop, the weed infestation is always a big problem which seriously reduces the yield of sugarcane with varying extent. Because of delayed germination, slow initial growth, wide row space and enough supply of nutrients, the crop is always provide favorable conditions for infestation of different kind of weed. It has been estimated that weeds can cause 12 to 72 per cent reduction in yield depending on the severity of infestation^[1]. Many workers have also estimated loss in cane yield due to weeds ranging between 12 to 83 per cent^[2] and^[3]. It has been observed many times at our stations that Sugarcane suffering from weed competitions negatively impacted upon growth parameters and yield of the crops. Cultural methods of weed management are most effective to manage the weeds but the increasing cost of labour and availability is also a problem while applying it in larger scale. It has been estimated that chemically management of weeds in sugarcane is also considered economical measure^[4]. Many herbicides have been experimented and are being used in sugarcane with varying degree of success. In this continuation, this investigation was undertaken to know the bio efficacy of a new molecules in controlling the broad and narrow leaved complex weeds as well as impacts on growth and yield of sugarcane.

Material and methods

To evaluate the field efficacy of SULM 70 WG a triazinone herbicide in controlling of grasses, sedge and broad-leaf weeds in sugarcane, an experiment was conducted during 2017-18 at Zonal Agricultural Research Station, Powarkheda, Hoshangabad (MP). It has comprised of different treatments of SULM 70 WG and Metribuzin 70 WP (imported and marketed samples) and 2,4-D Dimethyl Amine salt 58% SL as commercial standards along with untreated control. Three budded sets of sugarcane variety, Co-06027 was planted in the month of January, 2017 with gross plot size of 7.2 × 6.0 m² and spacing between row to row kept 120 cm. The experiment was laid out in randomized block design with three replication.

During the entire period of crop all package of practices were followed as per the recommendation. Metribuzin 70 WP and SULM 70 WG (Triazinone herbicide) were applied as pre-emergence within five days after planting with using spray volume of 600 liters per hectare. Observations on population density and dry weight were taken and calculation of weed control efficiency was done as mentioned below.

Weed count: A quadrat (1 × 1 m²) was placed randomly in all the plots of the experimental field and the number of weed flora were counted at 20, 40 and 60 DAS and expressed in number/ m².

Total dry weight of weeds: The weeds were collected at harvest from net plot area and allowed to sun-dry. The dry weight of weeds was recorded from respective treatments and expressed in kg/ha.

Weed control efficiency (WCE): Weed control efficiency (WCE) is defined as the efficiency to control the weed in term of dry matter accumulation in treated plot compared to

unweeded control plot and expressed in per cent. WCE (%) was computed by using the following formula.

$$\text{WCE (\%)} = \frac{\text{DW}_c - \text{DW}_T}{\text{DW}_c} * 100$$

Where, WCE = Weed control efficiency, DW_C = Dry matter accumulation of weeds in unweeded control, DW_T = Dry matter accumulation of weeds in treated plot

The data was statistically analyzed after square root transformation and presented in table 2 and 3.

Yield attributes like plant height (20, 40, 60 at DAP and harvest), number of canes count at 60 DAS and cane yield at harvest were also recorded and presented in table 3. The effect of different herbicidal treatments on Follow-up sugarcane ratoon crop was also observed during 2018 and the data is presented in Table 4. To study the phytotoxic effect of Metribuzin 70 WP and SULM 70 WG on sugarcane crop a higher dose was applied and visual observation was taken as per the scale and compared with the untreated check.

Table 1: Treatment details including phytotoxicity doses.

Treatments	Dose/ha (kg/ha)		
	a.i.	Formulation	Applied dose
Metribuzin 70 WP (Sample from imported technical)	1.05-2.0	1.5-3.0	1.5
Metribuzin 70 WP (Sample from imported technical)			3.0
Metribuzin 70 WP (Sample from imported technical) *	4.0	6.0	6.0
SULM 70 WG (Triazinone herbicide)	1.05-1.4	1.5-2.0	1.5
SULM 70 WG (Triazinone herbicide)			2.0
SULM 70 WG (Triazinone herbicide)			2.5
SULM 70 WG (Triazinone herbicide)	1.4-2.0	2.0-3.0	3.0
SULM 70 WG (Triazinone herbicide)*			6.0
Metribuzin 70 WP (Market sample)	1.05-2.0	1.5-3.0	1.5
Metribuzin 70 WP (Market sample)			3.0
2,4-D Dimethyl Amine salt 58% SL	3.5	6.3	6.3
Untreated control	-	-	-

*- Applied for Phytotoxicity evaluation

Table 2: Influence of different herbicidal treatments on density of *Cynodon dactylon*, *Echinochloa crusgalli*, *Cyperus rotundus*, *Chenopodium album* and *Parthenium hysterophorus* at 20, 40 & 60 days after sowing of sugarcane during 2017

T. no.	Treatments	<i>Cynodon dactylon</i>			<i>Echinochloa crusgalli</i>			<i>Cyperus rotundus</i>			<i>Chenopodium album</i>			<i>Parthenium hysterophorus</i>		
		20 DAS	40 DAS	60 DAS	20 DAS	40 DAS	60 DAS	20 DAS	40 DAS	60 DAS	20 DAS	40 DAS	60 DAS	20 DAS	40 DAS	60 DAS
T ₁	Metribuzin 70 WP ⁺ @ 1.5 kg /ha	2.2 (1.6)	2.6 (1.8)	10.4 (3.3)	2.0 (1.6)	1.9 (1.5)	4.1 (2.1)	1.2 (1.3)	3.3 (1.9)	13.0 (3.6)	1.7 (1.5)	2.2 (1.6)	7.1 (2.7)	1.7 (1.5)	2.1 (1.6)	5.0 (2.3)
T ₂	Metribuzin 70 WP ⁺ @ 3.0 kg /ha	2.3 (1.6)	1.9 (1.5)	6.3 (2.6)	1.9 (1.5)	2.1 (1.6)	3.9 (2.1)	1.4 (1.3)	3.4 (1.9)	8.4 (3.0)	1.4 (1.4)	2.1 (1.6)	6.0 (2.5)	1.4 (1.3)	1.7 (1.5)	4.3 (2.2)
T ₃	SULM 70 WG @ 1.5 kg /ha	1.9 (1.5)	2.4 (1.7)	8.4 (3.0)	1.9 (1.5)	2.1 (1.6)	4.3 (2.2)	1.7 (1.4)	2.4 (1.7)	9.1 (3.1)	1.72 (1.5)	2.3 (1.7)	10.0 (3.2)	3.1 (1.9)	2.1 (1.6)	5.1 (2.3)
T ₄	SULM 70 WG @ 2.0 kg /ha	2.0 (1.6)	2.4 (1.7)	7.8 (2.9)	1.8 (1.6)	3.2 (1.9)	4.0 (2.1)	1.1 (1.2)	2.4 (1.7)	8.4 (2.9)	1.55 (1.4)	2.6 (1.7)	8.2 (2.9)	2.5 (1.7)	3.0 (1.9)	4.6 (2.2)
T ₅	SULM 70 WG @ 2.5 kg /ha	2.0 (1.6)	2.2 (1.6)	7.8 (2.9)	1.6 (1.4)	5.4 (2.4)	3.9 (2.1)	1.1 (1.2)	2.3 (1.6)	5.1 (2.3)	1.22 (1.3)	1.3 (1.3)	5.5 (2.5)	2.1 (1.6)	2.2 (1.6)	4.3 (2.2)
T ₆	SULM 70 WG @ 3.0 kg /ha	1.5 (1.4)	1.4 (1.3)	3.8 (2.1)	1.1 (1.2)	2.9 (1.8)	2.8 (1.8)	1.0 (1.2)	2.3 (1.6)	4.1 (2.2)	0.65 (1.1)	1.0 (1.2)	3.6 (2.0)	1.3 (1.3)	1.4 (1.3)	2.9 (1.8)
T ₇	Metribuzin 70 WP ⁺⁺ @ 1.5 kg /ha	2.3 (1.7)	2.9 (1.9)	10.9 (3.9)	2.1 (1.6)	1.9 (1.5)	4.3 (2.2)	2.0 (1.5)	4.5 (2.2)	13.4 (3.7)	1.7 (1.4)	2.3 (1.7)	7.1 (2.7)	1.9 (1.5)	2.1 (1.6)	5.2 (2.3)
T ₈	Metribuzin 70 WP ⁺⁺ @ 3.0 kg /ha	2.3 (1.7)	2.5 (1.7)	6.4 (2.6)	1.8 (1.5)	2.1 (1.6)	4.0 (2.1)	1.4 (1.3)	3.7 (2.0)	8.5 (3.0)	1.5 (1.4)	2.1 (1.6)	5.6 (2.5)	1.3 (1.3)	1.5 (1.4)	4.4 (2.2)
T ₉	2,4-D Dimethyl Amine salt 58% SL @ 6.3 kg /ha	3.2 (1.9)	6.6 (2.7)	27.9 (5.3)	4.2 (2.2)	4.8 (2.3)	4.8 (2.3)	3.7 (2.1)	3.5 (2.0)	19.5 (4.5)	3.7 (2.0)	3.8 (2.1)	20.1 (4.5)	2.8 (1.8)	2.9 (1.8)	8.6 (3.0)
T ₁₀	Untreated control	9.4 (3.2)	10.5 (3.3)	31.2 (5.6)	7.0 (2.7)	11.8 (3.5)	14.9 (3.9)	11.1 (3.4)	18.1 (4.3)	25.7 (5.1)	7.8 (2.9)	18.6 (4.4)	33.3 (5.8)	4.9 (2.3)	19.0 (4.4)	23.4 (4.8)

C.D.	0.85	0.95	1.10	0.47	0.75	0.82	0.42	0.45	1.00	0.57	0.82	0.99	0.43	0.46	0.58
SE(m)	0.28	0.32	0.37	0.16	0.24	0.27	0.14	0.15	0.33	0.19	0.27	0.33	0.14	0.15	0.19

Figures in parenthesis are transformed values ($\sqrt{x+0.5}$) for analysis

+ = Sample from Imported technical, ++ = Market sample

Table 2: Total weed dry weight, weed control efficiency of different herbicidal treatments and effects on plant height, cane count and yield of sugarcane during 2017

T. no.	Treatments	WDW at 60 DAS (g/plot)	WCE (%)	Plant height (cm)				Number of canes count 60 DAS	Cane yield (t/ha)
				20 DAS	40 DAS	60 DAS	At harvest		
T ₁	Metribuzin 70 WP ⁺ @ 1.5 kg /ha	22.12	60.25	18.45	107.55	198.89	264.55	114	112.30
T ₂	Metribuzin 70 WP ⁺ @ 3.0 kg /ha	17.84	67.94	18.85	94.95	178.90	262.00	95	111.95
T ₃	SULM 70 WG @ 1.5 kg /ha	20.95	62.35	17.65	96.50	175.50	265.90	97	107.10
T ₄	SULM 70 WG @ 2.0 kg /ha	19.95	64.15	18.48	97.90	176.70	264.00	99	106.24
T ₅	SULM 70 WG @ 2.5 kg /ha	17.94	67.76	19.95	93.90	173.40	266.16	95	114.14
T ₆	SULM 70 WG @ 3.0 kg /ha	12.16	78.15	18.85	95.55	180.95	266.50	105	133.35
T ₇	Metribuzin 70 WP ⁺⁺ @ 1.5 kg /ha	23.79	57.25	19.10	95.10	180.28	257.56	108	112.15
T ₈	Metribuzin 70 WP ⁺⁺ @ 3.0 kg /ha	18.31	67.10	17.99	97.00	184.10	259.55	95	111.18
T ₉	2,4-D Dimethyl Amine salt 58% SL @ 6.3 kg /ha	35.87	35.54	18.89	93.40	176.55	239.17	90	94.55
T ₁₀	Untreated control	55.65	0.00	19.50	92.05	170.10	214.25	71	59.80
	C.D.	3.81	-	1.47	3.93	5.20	12.99	0.94	0.96
	SE(m)	1.27	-	0.52	1.31	1.70	4.33	0.31	0.32

Figures in parenthesis are transformed values ($\sqrt{x+0.5}$) for analysis

+ = Sample from Imported technical, ++ = Market sample, WDW=Weed Dry Weight, WCE=Weed Control Efficiency

Table 3: Effect of different herbicidal treatments on Follow –up sugarcane ratoon crop during 2018

T. no.	Treatments	Plant population (M ²)	Height (cm)	Yield (t/ha)
T ₁	Metribuzin 70 WP ⁺ @ 1.5 kg /ha	15	247	108.95
T ₂	Metribuzin 70 WP ⁺ @ 3.0 kg /ha	14	246	110.25
T ₃	SULM 70 WG @ 1.5 kg /ha	15	246	110.95
T ₄	SULM 70 WG @ 2.0 kg /ha	14	245	109.85
T ₅	SULM 70 WG @ 2.5 kg /ha	15	245	110.00
T ₆	SULM 70 WG @ 3.0 kg /ha	15	245	112
T ₇	Metribuzin 70 WP ⁺⁺ @ 1.5 kg /ha	15	245	108.25
T ₈	Metribuzin 70 WP ⁺⁺ @ 3.0 kg /ha	14	246	109.15
T ₉	2,4-D Dimethyl Amine salt 58% SL @ 6.3 kg /ha	14	244	107.25
T ₁₀	Untreated control	13	243	106.85
	C.D.		1.75	3.76
	SE(m)		0.58	1.25

Result and Discussion

The prominent grassy and the broad leaf weeds namely *Echinochloa crusgalli*, *Cynodon dactylon*, *Chenopodium album*, *Parthenium hysterophorus* and *Cyperus rotundus* were present in the experimental plot.

A. Effect on weed density: All the herbicidal treatments were significantly reduced the weed population as compared to untreated control. SULM 70 WG @ 3.0 kg /ha was found to be superior as recorded lowest weed populations viz. 3.8, 2.8, 4.1, 3.6 and 2.9 as compared to highest weed density viz. 31.2, 14.9, 25.7, 33.3 and 23.4 of *Cynodon dactylon*, *Echinochloa crusgalli*, *Cyperus rotundus*, *Chenopodium album* and *Parthenium hysterophorus* in control, respectively at 60 days after sowing of sugarcane. In respect of *Cynodon dactylon*, all the chemical treatments were significantly superior to untreated control at 20, 40 and 60 DAS except 2, 4-D Dimethyl Amine Salt 58% SL @ 6.3 ltr/ha at 40 and 60 DAS. Whereas Metribuzin 70% WP imported and marketed sample @ 1.5 & 3.0 kg/ha was at par to each other but significantly higher to untreated control. In case of *Echinochloa crusgalli*, the other best is Metribuzin 70% WP (imported), Metribuzin 70% WP (market), 2, 4-D Dimethyl Amine Salt 58% SL and SULM 70% WG @

1.5, 2.0 & 2.5 kg/ha (applied dose) at 20, 40 and 60 DAS. Significant lowest density of *Cyperus rotundus* was recorded under SULM 70% WG @ 2.5 and 3.0 kg/ha which was followed by Metribuzin 70% WP (Imported) @ 1.5 and 3.0 kg/ha. The density of *Chenopodium album* was also reduced significantly by SULM 70% WG @ 2.5 and 3.0 kg/ha. *Parthenium hysterophorus* was recorded lowest by SULM 70 WG @ 3.0 kg/ha which was followed by Metribuzin 70% WP (Imported) @ 1.5 & 3.0 kg/ha at 20, 40 and 60 DAS.

B. Effect on Plant height, no. of canes count and Cane yield: The data indicated that all the treatments were superior to untreated control at harvest in terms of plant height. The results on cane yield, numbers of canes count at 60 DAS revealed that all the chemical treatments were superior over control. The highest cane yield of 114.14 and 133.35 t/ha was received from SULM 70 WG @ 2.5 kg /ha and 3.0 kg/ha, respectively. The cane yield of untreated plot was lowered and received 59.80 t/ha.

C. Weed dry weight and Weed control efficiency: The data revealed that all the treated plots significantly reduced the weed dry weight over untreated control. Among the treated plots, the lowest WDW (12.16 g) was recorded under SULM 70 WG @ 3.0 kg/ha which was

followed by Metribuzin 70% WP (Imported) @ 3.0 kg/ha (17.84 g) and SULM 70 WG @ 2.5 kg/ha (17.94 g). Whereas in untreated control, the highest weed dry weight (55.65) was recorded this differed significantly with all the remaining treatments. Highest weed control efficiency was recorded with treatment SULM 70% WG @ 3.0 kg/ha (78.15%), followed by Metribuzin 70% WP (Imported) @ 3.0 kg/ha (67.94%), SULM 70% WG @ 2.5 kg/ha (67.76%).

D. Phytotoxicity effect: Chlorosis and vein clearing was only observed on few plants in sugarcane field due to application of Metribuzin 70 WP (imported) @ 6.0 k/ha and SULM 70 WG @ 6.0 k/ha.

Many other workers found application of herbicides as important weed management practices. Determined efficacy of halosulfuron methyl in controlling early emergence weeds in sugarcane and observed good growth and yield ^[5]. Evaluated the efficacy of halosulfuron 12% + metribuzin 55% WG ready-mix (RM) in sugarcane and its carry over impact on succeeding lentil and found highest weed control efficiency by application as post-emergence at higher doses (600 and 900 g/ha) which was superior over atrazine 50% WP @ 2000 g and 2,4-D amine 58% SL @ 3500 g/ha ^[6]. Recorded the highest cane yield and CCS yield with the treatment of Metribuzine 70 per cent WP @ 1 Kg/ha (POE) along with 2,4 D sodium salt 80 percent WP tank mixed ^[7]. Obtained highest pooled cane yield with pre-emergence application of metribuzin 1.4 kg/ha and 2,4-D 1.6 kg/ha at 45 days after ratoon initiation ^[8].

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