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Original Research Article

Bio-efficacy of Halosulfuron Methyl with other Herbicides to Control the *Cyperus* Spp. and other Associated Weeds in Autumn Planted Sugarcane (*Saccharum officinarum* L.)

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A B S T R A C T

A field experiment was conducted at Crop Research Farm of National Post Graduate College, Barhalganj, Gorakhpur (U.P.) during the rabi season of (2015 – 16) to study the effect of different herbicides on weed management of sugarcane. The experimental field was laid out in Randomized Block Design with three replications with the following eight treatments viz. T_1 : Halosulfuron methyl + 2,4-D EE 38 % EC,T_2 : Halosulfuron methyl + 2,4-D amine salt 58 % SL, T_3 : Halosulfuron methyl + 2,4-D Na salt 80 % WP, T_4 : Halosulfuron methyl + Metribuzin, T_5 : Halosulfuron methyl + Atrazine, T_6 : Halosulfuron methyl + M.S.M. 4 g,T_7 : Halosulfuron methyl + Ethoxysulfuron, T_8 : Weedy check. The planting of sugarcane was done at 75 cm row spacing on ridges and furrows. Weed flora of experimental site was divided with 6o percent broad leaved and 40 percent grassy weeds. Among broad leaved weeds *Chenopodium album*, *Melilotus alba*, *Anagallis arvensis*, *Commelina benghalensis* and *Ageratum conyzoides* were found dominant. Whereas among grassy weeds *Cynodon dactylon* and *Cyperus rotundus* were found as dominant. As a result, the cane yield of sugarcane (tha^{-1}) was significantly influenced due to various herbicidal treatments. Results revealed that all the herbicide had a significant effect on growth and yield of sugarcane over weedy check. Out of all treatments, T_5 : Halosulfuron methyl + Atrazine has proved very effective to control all type of weeds and recorded high yield and quality of sugarcane.

Keywords

Weeds, Herbicides, Weed Control Efficiency, Cane yield and Sugarcane

Introduction

Sugarcane (*Saccharum officinarum* L.) is an important cash crop in the tropics and sub tropics and more than 70 % of the world's sugar production comes from it. India is the second largest consumer and second largest producer after Brazil producing nearly 15 % and 25 % of global sugar and sugarcane, respectively (Mohan and Kanaujia, 2017). Sugarcane is the most important sugar crop in India occupying an area of 5.03 M ha with an average 70.86 t ha^{-1}. U.P. has the highest sugarcane producing state in sub – tropical zone having area about 22.7 Lakh ha. with the production of 135.64 M tonnes whereas Haryana has highest productivity of sugarcane in sub – tropical zone. Sugarcane takes about 30 – 40 days to germinate in the sub tropical India. During this period broad

variety of weeds infest sugarcane field. Among different weeds, purple nutsedge (*Cyperus rotundus*) germinate first and covers the ground immediately which affect the crop germination and early crop vigour by competing for the soil moisture, nutrients, space and light.

Due to continuous use of Atrazine, Metribuzin and 2,4-D in sugarcane fields, the population of broad leaved weeds (*Chenopodium album, Melilotus alba, Anagallis arvensis, Commelina benghalensis* and *Ageratum conyzoides*) has been decreased, whereas the population of *Cyperus rotundus* has increased tremendously. *Cyperus rotundus* population has been reported to be 60-80 % of total weed flora in sugarcane field in India (Raskar, 2004; Roshan *et al.*, 2006). This status is related to its perennial nature, longevity of viable tubers and prolific tuber production (Bariuan *et al.*, 1999). The problem of weeding becomes more critical in sugarcane crop due to the shortage of labourers at appropriate time. As a result sugarcane yield will be reduced drastically. Singh and Tomar (2005) reported yield loss of sugarcane crop to an extent of 27 – 38 % due to presence of weed in crop and the critical period for weed competition was between 30 and 60 days after planting.

Keeping in view the losses caused by weeds, the present study was designed to examine weed effect on sugarcane.

Materials and Methods

The field experiment was conducted at the Crop Research Farm, Barhalganj, Gorakhour (U.P.). The experimental site is situated in sub tropical zone in Indo – Gangatic plains and lies between $26^{0}47^{1}$ North latitude, $82^{0}10^{1}$ East longitude and 1130 m above sea level. The soil of the experimental field was silty loam in texture and slightly alkaline in reaction with P^{H} 7.6, EC 0.20 ds^{-m} organic carbon 0.40 % and available Nitrogen 136 Kg ha^{-1}, Phosphorus 18.4 Kg ha^{-1} and Potassium 258.42Kg ha^{-1} at 0 – 15 cm soil depth. The experiment was laid out in Randomized Block Design with eight different treatments viz.T_1 : Halosulfuron methyl (67.5g) + 2,4-D EE 38 % EC (1.51), T_2 : Halosulfuron methyl (67.5g) + 2,4-D amine salt 58 % SL (2.17), T_3 : Halosulfuron methyl (67.5g) + 2,4-D Na salt 80 % WP (2.0 Kg), T_4 : Halosulfuron methyl (67.5g) + Metribuzin (525 gm), T_5 : Halosulfuron methyl (67.5g) + Atrazine (1.25Kg), T_6 : Halosulfuron methyl (67.5g) + M.S.M.@ 4 g,T_7 : Halosulfuron methyl (67.5g) + Ethoxysulfuron,T_8 : Weedy check. The treatments were replicated thrice. The gross plot size was 10.5m x 4m. The planting of sugarcane was done at 75 cm row spacing on ridges and furrows. The sugarcane variety Co 91269was used for study. All the recommended management practices were followed.

Among broad leaved weeds *Chenopodium album, Melilotus alba, Anagallis arvensis, Commelina benghalensis* and *Ageratum conyzoides* were found dominated. While among grossy weeds *Cyperus rotundus* and *Cynodon dactylon* were found as dominant.

Results and Discussion

Weed density and weed control efficiency

The data presented in Table 1 revealed that Treatment T_5 : Halosulfuron methyl (67.5g) + Atrazine (1.25Kg), caused the highest reduction in total weed density (71.3%) followed by T_3 : Halosulfuron methyl (67.5g) + 2,4-D Na salt 80 % WP (2.0 Kg) (62.1%). However, all the herbicidal treatments caused the substantial deduction in weed density over weedy check. This might be due to effective control of weeds under these treatments. Similar results were also reported

by Singh and Lal (2008). As for as the total Weed Control Efficiency (W.C.E.) was concerned, Treatment T_5: Halosulfuron methyl (67.5g) + Atrazine (1.25Kg) recorded substantially higher value of W.C.E. (89.3%) followed by T_4 : Halosulfuron methyl (67.5g) + Metribuzin (525 gm) (82.3%). Presently, a new herbicides "Halosulfuron methyl" (Sempra 75 WG) has been found to control the *Cyperus rotundus* very effectively by Etheredge *et al.,* (2010).

Yield attributes and yield

The higher length of cane (258.9 cm) Table 2 with the application of T_5 : Halosulfuron methyl (67.5g) + Atrazine (1.25Kg) being at par with metribuzin, metsulfuron methyl, ethoxysulfuron and 2,4-D Na salt recorded significantly superior over rest of the treatments. As for as the total girth of cane was concerned, almost similar trend was observed as in case of length of cane. It is well established fact that better crop growth had better portioning of photosynthates from source to sink. This is an agreement with the findings of Kabir *et al.,* (2000).

Yield is the final outcome of better growth characters and yield attributes. While cane yield of sugarcane of T_5: Halosulfuron methyl (67.5g) + Atrazine (1.25Kg) being at par with T_6: Halosulfuron methyl (67.5g) + M.S.M. 4 g and T_4: Halosulfuron methyl (67.5g) + Metribuzin (525 gm) were recorded significantly higher cane yield over rest of the treatments. This might be due to effective weed control and higher values of yield attributes. This is in agreement with the findings of Rawat *et al.,* (2002).

The inference, from the above study has been drawn that among different treatments of weed control T_5: Halosulfuron methyl (67.5g) + Atrazine (1.25Kg) proved very effective to control all type of weed and recorded higher yield and quality of sugarcane.

Table.1 Weed Density (%) and Weed Control Efficiency (%) as influenced by different treatments.

Treatments		Weed density (%)	% Reduction on per treatment	Weed control efficiency (%)
T_1	Halo. +2, 4-D EE	42.2	37.4	75.8
T_2	Halo. +2, 4-D amine salt	36.9	46.2	78.5
T_3	Halo. +2,4-D Na salt	27.0	62.1	79.8
T_4	Halo. + Metribuzin	35.7	46.5	82.3
T_5	Halo. + Atrazine	20.0	71.3	89.3
T_6	Halo. + M.S.M.	33.6	52.1	81.7
T_7	Halo. + Ethoxysulfron	45.8	3.55	80.8
T_8	Weedy check	126.0	-83.9	-

Table.2 Yield attributes and yield of sugarcane as influenced by different treatments

Treatments		Length of cane (cm)	Girth of cane (cm)	Yield (q ha^{-1})
T_1	Halo. +2, 4-D EE	205.1	7.9	488.0
T_2	Halo. +2, 4-D amine salt	216.6	8.2	530.9
T_3	Halo. +2,4-D Na salt	246.5	8.6	590.4
T_4	Halo. + Metribuzin	252.1	9.3	690.4
T_5	Halo. + Atrazine	258.9	9.5	733.33
T_6	Halo. + M.S.M.	253.7	9.3	704.7
T_7	Halo. + Ethoxysulfron	237.6	8.8	602.3
T_8	Weedy check	189.5	7.0	405.0
	SEm±	10.30	0.4	27.5
	CD(P=0.05)	31.2	1.1	83.4

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