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Bioefficacy of halosulfuron-methyl against sedges in bottle gourd

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ABSTRACT

A field experiment was conducted at Bhubaneswar to evaluate the efficacy of halosulfuron-methyl for the control of weeds in bottle gourd. The treatments constituted of new herbicide formulation halosulfuron-methyl (75% WG) in different doses (52.5, 67.5, and 135 g/ha) at 3-4 leaf stages of *Cyperus rotundus* compared with recommended dose of metribuzin at 490 g/ha and two hand weeding on 20 and 40 DAS with unweeded control. The results revealed that the density of *Cyperus rotundus* was distinctly controlled by application of halosulfuron-methyl. But grasses and broad-leaved weeds were considerably lower in pre-emergence application of metribuzin at 490 g/ha. The lowest total weed dry weight, higher weed control efficiency and cane yield were recorded in metribuzin 490 g/ha followed by halosulfuron-methyl 135 g/ha. The herbicide tested in this study did not show any residual phytotoxic effect on succeeding crop of cowpea.

Key words: Bottle gourd, Halosulfuron-methyl, Chemical control, Sedges

Botttle gourd (*Langenaria siceraria* (Mol.) Standl) is a commonly grown vegetable of India and belongs to family Cucurbitacea. It is cultivated in the 0.11million ha area with a production and productivity of 1.43 million tones and 13.2 t/ha, respectively (Anonymous 2011). Besides, many reason for its low productivity, poor management of weed is the one of them. Due to slower early growth and close canopy structure, the bottle gourd faces severe competition from weeds, particularly the perennial sedges resulting in huge yield loss. The loss in fruit yield of bottle gourd due to weeds was estimated to be up to 40% (DWSR 2013). Halosulfuron-methyl is known to be very effective against sedges (Rathika *et al.* 2013). However, no information is available on testing of the newer herbicides on the bottle gourd in the state of Odisha; hence the present investigation was carried out.

MATERIALS AND METHODS

Field experiment were conducted at the Central Farm of OUAT, Bhubaneswar during the *Kharif* season of 2012 and 2013 to evaluate the bioefficacy of halosulfuron-methyl against sedges especially *Cyperus rotundus* L. Six different treatments consisting of three different doses of halosulfuron-methyl *i.e* 52.5, 67.5 and 135 g/ha and one conventional herbicide *i.e* pre-emergence application of metribuzin 490 g/ha along with two hand weeding *i.e* 20 and 40 DAS and one untreated control were evaluated in a randomized block design with four replications. The soil of the experimental site was sandy clay loam in texture, neutral in soil reaction (pH7.4), low in organic carbon C (0.41%) and available N (192 kg/ha),medium in available P (12.8 kg/ha) and K(235 kg/ha). The bottle gourd variety "*Devagiri*" was sown in three seeds/pit where the pit size was (20×20×20 cm) on 25 June 2011 and 30 June 2012. All the standard packages of practices with pro-phylactic measure against insect pests were followed. The herbicide halosulfuron-methyl was applied at 3-4 leaf stage of the *Cyperus rotundus* L. and the metribuzin was applied 2 days after sowing of the crop. Herbicides were sprayed with knapsack sprayer fitted with flat fan nozzle with water as a carrier at 500 litres/ha. Data on weed density and total weed dry weight at 30 and 45 DAS were recorded by adopting standard procedure of 0.25 m^2 quadrate. Weed control efficiency was calculated using the accepted formula and expressed in percentage. The yield of crop and economics were also recorded for observation.

RESULTS AND DISCUSSION

The crop was mainly infested with the sedges (21%) along with grasses (53%) and broad- leaved weeds (26%). The predominant grasses were *Cynodon dactylon* and *Digitaria sanguinalis.* Weeds like *Chenopodium album, Melilotus indica, Ludwiga parviflora, Celosia argentia, Coronopus didymus* were dominant among broad-leaved weeds and *Cyperus rotundus* among sedges. The application of halosulfuron-methyl completely controlled the sedges particularly the *Cyperus rotundus* population and dry

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matter irrespective of doses followed by the metribuzin treated plots where the population were 14/m^2 and 6.8 g/m^2 in 1st year and 17/m^2 and 7.1 g/m^2 in 2nd year respectively (Table 1). However the lowest total weed population (21/m^2 and 25/m^2) were observed in case of two hand weeding at 20 and 40 DAS followed by the application of metribuzin in both the years. The significantly lowest weed dry weight (21.52 g/m^2 and 22.63 g/m^2) was also recorded in this treatment in comparison to all other treatments. It is evident that the grasses and other broad leaved weeds are effectively controlled by the metribuzin treatments whereas the halosulfuron-methyl effectively controlled the sedge population *i.e. Cyperus rotundus*. The result was in conformity with the findings of Rathika *et al.* (2013) and Meher *et al.* (2013).

The highest fruit yield of (22.8 and 23.6 t/ha) was recorded with two hand weeding followed by metribuzin treatments and the lowest (14.3 and 13.9 t/ha) was obtained in unweeded check (Table 2). Among different doses of halosulfuron-methyl, the application 52.5 g/ha recorded 48 and 67% of yield advantage over unweeded control in both the years, respectively and it was at par with the higher dose of 67.5 g/ha. The higher dose of 135 g/ha significantly reduced the yield in comparison to other two lower doses. The variation in fruit yield in different treatments was due to different weed density and nature of weed flora. The effective weed control at the initial stage of crop weed competition resulted into higher yield in case of two hand weeding followed by the pre- emergence application of metribuzin. Lower fruit yield was obtained in unweeded control. These results were in conformity to the findings of Vyas and Jain (2003).

The herbicidal treatments brought about lower cost of cultivation as compared to two hand weeding (14.52×10^3 and 14.98×10^3 `/ha). The highest B:C ratio of 2.63 and 2.59 was observed in halosulfuron-methyl 52.5 g/ha, followed by metribuzin treated plots and lowest with unweeded check 1.19 and1.31 respectively in both the years (Table 2).

There was no phytotoxic symptoms observed in the bottle gourd crop even in higher doses of the herbicide and there was no residual effect on the succeed-

Table 1. Effect of halosulfuron-methyl on weed growth at 30 DAS in bottle gourd

Treatment	*C. rotundus* density (no/m^2)		*C. rotundus* dry matter (g/m^2)		Total weed density (no/m^2)		Total weed dry matter (g/m^2)		WCE (%)	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Halosulfuron-methyl 52.5 g/ha	1	0	0.02	0	38	42	28. 21	32.94	61.2	63.2
Halosulfuron-methyl 67.5 g/ha	0	0	0	0	32	37	30. 34	34.01	58.3	62.1
Halosulfuron-methyl 135 g/ha	0	0	0	0	27	33	33.56	39.94	53.9	55.5
Metribuzin 490 g/ha	14	17	6. 8	7.1	25	31	24.18	31.34	67.1	65.0
Two hand weeding (20 and 40 DAS)	16	21	7.4	8.3	21	25	21.52	22.63	70.6	74.7
Unweeded check	37	43	13.6	14.5	89	104	72.87	89.74	-	-
LSD (P=0.05)	2.31	2.28	1.31	1.85	3.15	4.36	7. 11	9.98	-	-

WCE-Weed control efficiency, DAS-Days after sowing

Table 2. Effect of halosulfuron-methyl on yield and economics in bottle gourd and its residual effect on succeeding cowcrop

Treatment	Yield (t/ha)		Cost of cultivation ($\times 10^3$ `/ha)		B:C ratio		Seed yield of cowpea (kg/ha)	
	2012	2013	2012	2013	2012	2013	2012	2013
Halosulfuron-methyl 52.5 g/ha	21.25	23.34	13.21	13.54	2.63	2.59	742	756
Halosulfuron-methyl 67.5 g/ha	20.30	19.85	13.34	13.69	2.57	2.48	754	798
Halosulfuron-methyl 135 g/ha	18.54	20.10	13.56	13.87	2.41	2.34	712	734
Metribuzin 490 g/ha	22.64	23.56	13.18	13.09	2.60	2.58	781	812
Two hand weeding(20 and 40 DAS)	22.87	23.67	14.52	14.98	2.13	2.37	802	826
Unweeded check	14.32	13.90	12.87	12.75	1.19	1.31	721	744
LSD (P=0.05)	1.88	2.06	-		-	-	NS	NS

ing crop cowpea. However the yield of cowpea obtained in each treatments showed no significant difference among them (Table 2). The result was also similar with the findings of Punia *et al*. (2011).

Post-emergence application of halosulfuron-methyl 52.5 g/ha at 3-4 leaf stage of sedges was very effective in controlling the specific weed and thereby increase the yield and profitability of the bottle gourd.

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