



## Integrated weed management studies in sugarcane ratoon

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### ABSTRACT

A field experiment was conducted at GB Pant University of Agriculture & Technology, Pantnagar (Uttarakhand) to study the effect of different weed management practices on sugarcane ratoon. The soil of the experimental field was clay loam in texture, medium in organic carbon (0.64 %), available phosphorus (26.5 kg P/ha) and potassium (240.3 kg K/ha) with  $P^H$  7.3. Experiment consisted of eight treatments was laid out in randomized block design with three replications. In the experimental field, *Digitaria sanguinalis*, *Echinochloa* spp., *Ipomoea* spp., *Cyperus rotundu* and *Parthenium hysterophorus* were major weeds in both the years. Other weeds were *Brachiaria mutica*, *Euphorbia hirta*, *Cleome viscosa*, *Phyllanthus niruri*, *Cannabis sativa*, *Lippia graveolens*, *Trichosanthes cucumerina* and *Physalis minima*. Lowest density as well as dry weight of total weeds were recorded with hand weeding thrice at 30, 60 and 90 days after ratoon (DAR) of main crop which was at par with metribuzin 0.88 kg/ha at 3 DAR followed by (fb) one hoeing at 45 DAR followed by (fb) 2,4-D (Na Salt) 0.75 kg/ha at 2-4 leaf stage of broad-leaved weeds fb pre-emergence application of atrazine 1.5 kg/ha at 3 days after ratooning (DAR) fb 2,4-D (Na salt) 0.75 kg/ha at 2-4 leaf stage of broad-leaved weeds. The highest cane yield was recorded with the execution of three hand weedings at 30, 60 and 90 DAR treatment which was closely fb metribuzin at 0.88 kg/ha at 3 DAR fb one hoeing at 45 DAR fb 2,4-D (Na salt) 0.75kg / ha at 2-4 leaf stage of weeds.

**Key words:** Density, Hand weedings, Herbicide, Integrated weed management, Sugarcane ratoon

Sugarcane is a long duration crop which takes longer time for germination due to which crop faces tough competition with weeds between 60 to 120 days of its planting which causes heavy reduction in cane yield ranging from 40-67% (Chauhan and Srivastava 2002). Sugarcane ratoon occupies about 50% of total sugarcane area, though its productivity is quite low (45 t/ha) against 80 t/ha, productivity of main planted crop. This low productivity is mainly due to heavy weed infestation (Srivastava *et al.* 2002). Widely spaced crop of sugarcane allows wide range of weed flora to grow profusely in the interspaces between the rows. Frequent irrigations and fertilizer application during early growth phases increase the weeds menace by many folds in the crop (Singh *et al.* 2008). It is well known that cultural method of weed management is most effective to control weeds but timely availability of labours is a problem besides increase in wages. Therefore, herbicidal control of weeds has been considered to be economical in sugarcane (Chauhan *et al.* 1994). Several herbicides have, been tried in sugarcane ratoon with varying degree of success but the information on combined use of chemical and cultural practices are scarce. The present investigation was

undertaken to study the integrated weed management practices in the sugarcane ratoon crop.

### MATERIALS AND METHODS

A field experiment was conducted during 2011 and 2012 at Norman E. Borlaug, Crop Research Centre, G.B. Pant University of Agriculture & Technology, Pantnagar (Uttarakhand). The soil of experimental field was clay loam in texture, medium in organic carbon (0.64%), available P (26.5 kg P /ha) and K (240.3kg K/ha) with  $p^H$  7.3. Experiment consisted of eight treatments *viz.* pre-emergence application of atrazine 1.5 kg/ha at 3 days after ratooning (DAR), 2, 4-D (Na salt) 0.75kg/ha at 2-4 leaf stage of broad-leaved weeds, atrazine 1.5 kg/ha at 3 DAR fb 2, 4-D (Na salt) 0.75kg/ha at 2-4 leaf stage of broad-leaved weeds, metribuzin 0.88 kg/ha at 3 DAR fb one hoeing at 45 DAR fb 2,4-D (Na salt) 0.75 kg/ha at 2-4 leaf stage of broad-leaved weeds, ethoxysulfuron 37.5 g/ha at 2-4 leaf stage of weeds, chlorimuron-ethyl 10% + metsulfuron-methyl 10% 8 g/ha at 2-4 leaf stage of broad-leaved weeds, hand weeding at 30, 60 and 90 days after ratooning with weedy check (Table 1) were laid out in randomized block design with three replications. Three budded setts of sugarcane variety 'Co. Pant 90223' were planted on 16 February, 2010 and March 13, 2011, respectively. Herbicides

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as per treatments were applied as spray using 600 liters of water per hectare. The crop was harvested on 15 February, 2011 during first year and 12 March, 2012 during second year. Data pertaining to density and dry matter accumulation by weeds were subjected to log transformation by adding 1.0 to original values prior to statistical analysis.

### RESULTS AND DISCUSSION

In the experimental field, *Digitaria sanguinalis*, *Echinochloa* spp., *Ipomoea* spp., *Cyperus rotundus*, *Solanum nigrum* and *Parthenium hysterophorus* were major weeds in both the years. Other weeds were *Euphorbia hirta*, *Cleome viscosa*, *Phyllanthus niruri*, *Cannabis sativa*, *Luffa graveolans*, *Trichosanthus cucumerina* and *Physalis minima*.

All the weed control measures led to significant reduction in density and dry matter accumulation by total weeds during both the years (Table 1). Lowest density (Table 1) as well as dry weight (Table 2) of total weeds were recorded under the treatment of three hand weeding at 30, 60 and 90 DAR which was at par with pre-emer-

gence application of metribuzin at 0.88 kg/ha at 3 DAR *fb* one hand weeding at 45 DAR *fb* 2,4-D Na salt 0.75 kg/ha at 2-4 leaf stage of broad-leaved weeds but recorded significant superiority over rest of the treatments. Among the herbicidal treatments, metribuzin at 0.88 kg/ha at 3 DAR *fb* one hand hoeing at 45 DAR *fb* 2,4-D 0.75 kg/ha at 2-4 leaf stage of broad-leaved weeds recorded lowest density and dry weight of total weeds which was at par with application of atrazine 1.5 kg/ha at 3 DAR *fb* 2,4-D (Na salt) 0.75 kg/ha at 2-4 leaf stage of broad-leaved weeds and chlorimuron-ethyl 10% + metsulfuron-methyl 10% 08 g/ha at 2-4 leaf stage of broad-leaved weeds in respect to total weeds density where as application of metribuzin at 0.88 kg/ha at 3 DAR *fb* one hand hoeing at 45 DAR *fb* 2,4-D 0.75 kg/ha at 2-4 leaf stage of broad-leaved weeds being at par with atrazine 1.5 kg/ha at 3 DAR *fb* 2,4-D 0.75 kg/ha at 2-4 leaf stage of broad-leaved weeds recorded significantly lower total weed dry weight as compared to rest of the herbicidal treatments.

On an average, presence of total weeds throughout the crop period caused 56.70% reduction in the ratoon cane yield when compared with the execution of three

**Table 1. Effect of weed management treatments on density of weeds at 120 days after ratooning (DAR).**

Treatment	Weed density (no./m <sup>2</sup> )												Total weeds	
	<i>C. rotundus</i>		<i>Digitaria sanguinalis</i>		<i>Echinochloa</i> spp.		<i>P. hysterophorus</i>		<i>Ipomoea</i> spp.		Other weeds			
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Atrazine 1.5 kg/ha , PE at 3 DAR (days after ratooning)	3.62 (37)	3.65 (41)	1.92 (7)	2.01 (8)	2.94 (19)	2.94 (19)	2.69 (15)	2.32 (9)	2.34 (11)	2.44 (11)	2.32 (9)	2.90 (17)	4.67 (107)	4.75 (116)
2,4-D (na-salt) 0.75 kg/ha at 2-4 leaf stage of broad-leaved weeds(BLW)	3.08 (21)	3.35 (29)	2.73 (15)	3.09 (23)	3.79 (44)	3.65 (39)	1.07 (3)	1.07 (3)	1.07 (3)	0.54 (1)	2.00 (7)	2.21 (9)	4.59 (114)	4.73 (112)
Atrazine 1.5 kg/ha at 3 DAR <i>fb</i> 2,4-D 0.75 kg/ha at 2-4 leaf stage of BLW	3.14 (23)	3.27 (27)	2.32 (9)	2.32 (9)	3.09 (21)	3.08 (21)	0.53 (1)	0.54 (1)	0.54 (1)	0.0 (0)	1.81 (5)	2.01 (8)	4.19 (68)	4.28 (73)
Metribuzin 0.88 kg/ha at 3DAR <i>fb</i> one hoeing at 45 DAR <i>fb</i> 2,4-D 0.75 kg/ha at 2-4 leaf stage of BLW	2.69 (15)	2.91 (20)	2.00 (7)	1.81 (5)	2.72 (15)	2.41 (11)	0.53 (1)	0.0 (0)	0.54 (1)	0.0 (0)	1.07 (3)	1.27 (4)	3.86 (47)	3.79 (44)
Ethoxysulfuron 37.5 g/ha at 2-4 leaf stage of weeds	1.27 (4)	1.07 (3)	2.69 (15)	3.18 (24)	3.72 (41)	3.55 (35)	3.14 (23)	0.54 (1)	1.07 (3)	1.27 (4)	2.00 (7)	1.81 (5)	4.59 (93)	4.33 (76)
Chlorimuron -ethyl 10% +metsulfuron-methyl 10% 8 g/ha at 2-4 leaf stage of BLW	2.44 (11)	2.60 (13)	2.87 (17)	2.97 (21)	3.77 (43)	3.72 (41)	0.0 (0)	0.0 (0)	0.54 (1)	0.0 (0)	2.12 (8)	1.81 (5)	4.42 (97)	4.42 (83)
Hand weeding at 30, 60 and 90 DAR	2.41 (11)	2.34 (12)	1.07 (3)	1.07 (3)	3.80 (5)	1.27 (4)	0.0 (0)	0.0 (0)	1.07 (3)	1.27 (4)	0.53 (1)	1.07 (3)	3.16 (27)	3.22 (26)
Weedy check	3.56 (35)	3.79 (45)	2.88 (17)	3.14 (23)	3.56 (35)	3.59 (37)	2.94 (19)	2.92 (19)	2.69 (15)	2.87 (17)	2.87 (17)	3.22 (25)	5.02 (163)	5.21 (182)
LSD (P=0.05)	0.90	1.04	0.86	0.90	0.47	0.68	1.07	1.05	1.57	1.25	1.03	1.15	0.72	0.61

Data in parentheses indicate actual values and transformed to loge (x+1)

**Table 2. Effect of treatments on total weed dry weight, yield attributing characters and cane yield of sugarcane ratoon**

Treatment	Weed dry weight (g/m <sup>2</sup> ) at 120 DAP		WCE (%)		Cane length (cm)		Millable cane (x10 <sup>3</sup> /ha)		Cane yield (t/ha)	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Atrazine 1.5 kg/ha, PE at 3 DAR (days after ratooning)	4.97 (142.9)	5.05 (155.6)	53.2	54.7	162.9	152.9	175.8	165.1	67.9	60.9
2, 4-D (Na-salt) 0.75 kg/ha at 2- 4 leaf stage of broad-leaved weeds (BLW)	5.13 (169.1)	5.21 (182.3)	44.6	46.9	156.5	146.0	144.8	141.8	57.9	52.5
Atrazine 1.5 kg/ha at 3 DAR fb 2, 4-D (Na-salt) 0.75 kg/ha at 2-4 leaf stage of BLW	4.50 (88.4)	4.56 (95.7)	71.0	72.1	166.1	157.4	188.7	178.7	78.3	72.0
Metribuzin 0.88 kg/ha at 3DAR fb one hoeing at 45 DAR fb 2, 4-D 0.75 kg/ha at 2-4 leaf stage of BLW	3.77 (42.4)	3.66 (38.3)	86.1	88.8	169.5	161.7	197.7	188.5	82.4	76.0
Ethoxysulfuron 37.5 g/ha at 2-4 leaf stage of weeds	5.01 (150.0)	5.11 (167.0)	50.9	51.3	159.7	149.5	150.9	145.8	60.5	54.1
Chlorimuron-ethyl 10% + metsulfuron-methyl 10% 8 g/ha at 2-4 leaf stage of BLW	5.05 (155.9)	5.09 (162.4)	49.0	52.7	158.0	147.9	149.5	147.5	59.4	54.1
Hand weeding at 30, 60 and 90 DAR	2.98 (18.7)	2.84 (16.5)	93.9	95.2	170.7	163.7	202.3	193.8	84.9	78.8
Weedy check	5.72 (305.5)	5.84 (343.2)	-	-	152.5	141.2	94.7	86.6	37.5	32.8
LSD (P=0.05)	0.82	0.90	-	-	5.0	6.48	11.7	0.45	3.6	3.7

Data in parentheses indicate actual values and transformed to loge (x+1)

hand weeding at 30, 60 and 90 days after ratooning (Table 2). The highest ratoon yield was obtained with the execution of three hand weeding at 30, 60 and 90 DAR which was closely followed by pre-emergence application of metribuzin 0.88 kg/ha at 3 DAR followed by one hand weeding at 45 DAR followed by 2,4-D at 0.75 kg/ha. The higher cane yield under these treatments was due to higher value of cane girth, cane length and millable cane per hectare.

It was concluded that application of metribuzin at 0.88 kg/ha at 3 DAR followed by one hand weeding at 45 DAR followed by 2,4-D at 0.75 kg/ha at 2-4 leaf stage of broad-leaved weeds of ratoon crop was found most effective for controlling the weeds of sugarcane ratoon crop.

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