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Studies on Integrated Weed Management in Spring Planted Sugarcane under *Tarai* Conditions of Uttaranchal

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ABSTRACT

Field experiments were conducted to study the efficacy of different weed management practices in sugarcane during 1997-99. *Cyperus rotundus, Cynodon dactylon* and *Sorghum halepense* were the dominating weeds associated with the crop and constituted 42, 21 and 17.5% of total weed population, respectively. One hoeing at 30 days after planting followed by application of atrazine at 2.0 kg ha^{-1} (just after hoeing) provided 70.5% weed control efficiency. This also resulted in highest cane yield being 49.5% higher than weedy and 2.4% than three hoeings done at 30, 60 and 90 days after planting. The weed infestation did not affect juice sucrose content. Commercial cane sugar yield was highest (10.0 t ha^{-1}) with three hoeings during 1997-98 and with one hoeing fb atrazine (11.0 t ha^{-1}) during 1998-99, though the differences were non-significant.

INTRODUCTION

Sugarcane is cultivated under wide range of agro-ecological systems in India. *Tarai* belt of Uttar Pradesh and Uttaranchal occupies a sizable area under the crop. Weed infestation is one of the major barriers in realizing high yields of sugarcane in the area having fertile soils with sufficient moisture. Additionally, sugarcane, being a widely spaced crop with slow initial growth, provides a congenial ambiance to weeds for their growth and development. Weeds by virtue of their competitiveness reduce sugarcane yields to the extent of 60-75%. The situation is further aggravated due to inaccessibility to manual hoeing owing to labour shortage and soil wetness. Under such conditions, chemical options can help in augmenting proper weed management. Keeping this in view, the present investigation was conducted to study the effect of herbicides in combinations in spring planted sugarcane.

MATERIALS AND METHODS

The field experiments were conducted during 1997-99 at Crop Research Centre of G. B. Pant University of Agriculture & Technology, Pantnagar. The soil was silty loam, rich in organic carbon, medium in available phosphorus and potassium with pH. 7.3. Treatments comprising hoeing at 30 days after planting (DAP) fb atrazine at 2.0 kg, atrazine at 2.0 kg, metribuzin at 1.5 kg and pendimethalin at 2.0 kg ha^{-1} applied alone as pre-emergence or each supplemented with 2,4-D at 1.0 kg ha^{-1} at 60 DAP, glyphosate at 1.0 kg ha^{-1} as directed spray at 30 DAP and oxyfluorfen at 3.0 l ha^{-1} as pre-emergence+same amount as post-emergence were tested in randomized block design with three replications. Sugarcane variety CoS 767 was planted in furrows 75 cm apart on March 20 and 15 during 1997 and 1998, respectively. The crop was supplied with 120 : 60 : 40 kg ha^{-1} of N : P_2O_5 : K_2O, respectively. Other inputs-cum-operations were practised as per recommended package of practices. The crops were harvested on February 25 and 20 during 1998 and 1999, respectively.

RESULTS AND DISCUSSION

Effect on Weeds

The predominant weeds were : *Cyperus*

Table 1. Effect of treatments on weeds

Treatment	Dose	Weed population (No. m^{-2})		Weed dry matter (g m^{-2})	
	(kg ha^{-1})	1997-98	1998-99	1997-98	1998-99
Weedy	-	17.6 (308)	17.9 (320)	18.5 (342.4)	19.1 (368.5)
Manual hoeing at 30, 60 and 90 DAP	-	0.7 (00)	0.7 (00)	0.7 (00.0)	0.7 (00.0)
Atrazine fb 2, 4-D	2.0+1.0	10.5 (110)	10.9 (115)	10.8 (115.6)	11.2 (127.5)
One hoeing fb atrazine	2.0	9.8 (97)	9.8 (95)	10.2 (104.2)	10.3 (105.7)
Metribuzin	1.5	11.0 (120)	11.5 (124)	11.5 (132.6)	11.9 (142.5)
Pendimethalin	2.0	12.4 (154)	12.6 (160)	12.9 (165.6)	14.1 (198.9)
Metribuzin fb 2, 4-D	1.5+1.0	10.3 (105)	10.6 (113)	11.0 (120.5)	11.7 (138.0)
Pendimethalin fb 2, 4-D	2.0+1.0	11.4 (128)	11.5 (132)	12.4 (152.1)	12.6 (160.2)
Glyphosate	1.0	10.8 (115)	10.8 (120)	10.9 (119.2)	11.6 (135.0)
Oxyfluorfen	3.0	11.1 (124)	11.2 (125)	12.1 (146.3)	12.3 (152.5)
LSD (P=0.05)		1.6	1.5	1.5	1.8

Figures in parentheses indicate original values. fb–followed by, DAP–Days after planting.

rotundus (42.0%), *Sorghum halepense* (17.5%), *Cynodon dactylon* (21.0%), *Digitaria sanguinalis* (3.1%), *Eleusine indica* (4.2%), *Amaranthus viridis* (1.8%), *Cirsium arvense* (5.6%), *Cleome viscosa* (3.8%) and *Physallis minima* (1.0%). Respective share in terms of weed dry matter was 35,19.5, 31.2, 2.3, 3.6, 1.4, 4.3, 2.0 and 0.7%.

All the weed control measures led to significant reduction in total weed population and weed dry weight during both the years (Table 1). Hoeing at 30, 60 and 90 days after planting resulted in lowest weed dry matter. Hoeing at 30 DAP fb atrazine at 2.0 kg ha^{-1} caused significant reduction in weed population (69.4%) and weed dry matter (70.5%) over untreated crop. None of the other treatments could prove as effective as manual hoeing treatment. Treatment 2,4-D at 60 DAP coupled with pre-emergence application of metribuzin or pendimethalin increased weed control efficiency markedly over their respective sole applications. This might have been due to effective suppression of lately emerged broad-leaved weeds. Glyphosate at 1.0 kg ha^{-1} remained at par with one hoeing at 30 DAP followed by atrazine spray. Pendimethalin and oxyfluorfen applied alone proved least effective. Pechiappan *et al.* (1999) were also of the similar opinion.

Effect on Crop

Cane yield was significantly higher when any of the weed control measures was adopted as compared to weedy conditions (Table 2). The highest cane yield was recorded with one hoeing at 30 DAP followed by application of atrazine which was at par with three hoeings done at 30, 60 and 90 day stages. The differences in cane yields obtained from crops given three hoeings, one hoeing+atrazine, atrazine or metribuzin or pendimethalin supplemented with 2, 4-D at 60 DAP were non-significant. The respective increase in mean cane yield under these treatments over weedy crop was 52.4,49.7, 34.2, 37.4 and 31.9%. Such increase might have accrued to suppression of weed growth.

Commercial cane sugar yield, a function of cane yield and available sugar, was, however, maximum with three hoeings at 30, 60 and 90 DAP during 1997-98 and with one hoeing+atrazine during 1998-99. Such differences were, however, non-significant and possibly accrued to marginal variation in sucrose content. Crops grown with three manual hoeings, one hoeing+atrazine, atrazine or metribuzin or pendimethalin supplemented with 2,4-D at 60 DAP gave 48.9, 50.3, 37.4, 40.3 and 34.5% more commercial cane sugar yield (t ha^{-1}) than weedy crop. Sucrose content did not show

Table 2. Effect of treatments on yield, yield attributes and quality of sugarcane

Treatment	Dose (kg ha^{-1})	Cane length (cm)		Cane weight (g)		No. of millable canes ('000 ha^{-1})		Cane yield (t ha^{-1})		Juice sucrose (%)		Commercial cane sugar yield (t ha^{-1})	
		1997-98	1998-99	1997-98	1998-99	1997-98	1998-99	1997-98	1998-99	1997-98	1998-99	1997-98	1998-99
Weedy	-	221.4	224.7	640	652	76	80	65.2	67.9	15.3	15.4	6.8	7.1
Manual hoeing at 30, 60 and 90	-	271.6	265.0	835	860	109	112	94.8	99.9	15.4	15.2	10.0	10.7
DAPAtrazine fb 2, 4-D	2.0+1.0	265.2	252.3	830	832	106	107	89.4	89.2	15.7	15.9	9.6	9.5
One hoeing fb atrazine	2.0	270.0	268.4	840	860	111	116	96.5	102.8	15.3	15.2	9.9	11.0
Metribuzin	1.5	238.3	245.2	812	815	95	100	84.2	87.9	15.5	15.6	8.9	9.3
Pendimethalin	2.0	239.4	243.6	750	760	79	88	80.5	83.6	15.4	15.4	8.5	8.8
Metribuzin fb 2, 4-D	1.5+1.0	268.6	260.5	828	837	105	111	86.1	96.8	15.6	15.4	9.2	10.3
Pendimethalin fb 2, 4-D	2.0+1.0	264.5	256.3	835	837	103	110	85.2	90.3	15.6	15.3	9.1	9.6
Glyphosate	1.0	254.2	250.2	810	812	101	105	84.6	88.3	15.5	15.4	8.9	9.4
Oxyfluorfen	3.0	238.1	240.5	780	787	89	94	81.3	84.0	15.8	15.9	8.8	8.8
LSD (P=0.05)		16.6	13.5	62	60	12	11	12.0	14.4	NS	NS	1.5	1.8

fb–followed by, DAP–Days after planting, NS–Not Significant.

any significant variation owing to weed management options. Srivastava *et al.* (2002) were also of the similar opinion.

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