

Effect of weed-management practices on spring-planted sugarcane

ROHITASHAV SINGH, DHIMAN SEN, V.K. SINGH, N.S. RANA AND SANJAY KUMAR

Department of Agronomy, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar,
Uttaranchal 263 145

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ABSTRACT

A field experiment was conducted during 1997–98 and 1998–99 to study the effect of weed-management practices on spring-planted sugarcane and associated weeds. Significantly lower density of *Echinochloa* spp. was recorded with the pre-emergence application of thiozopyr at 0.36 kg/ha than all other treatments, except it was at par with pre-emergence application of thiozopyr at 0.48 kg/ha, atrazine at 2.0 kg/ha applied just after hoeing and 2 hoeings at 50 and 80 days after planting. *Brachiaria mutica* was completely controlled by the application of thiozopyr at all the rates. Pre-emergence application of metribuzin at 1 kg/ha, atrazine at 2.0 kg/ha alone or atrazine at 1.5 kg/ha and 2.0 kg/ha just after hoeing caused complete control of *Parthenium hysterophorus*. Uncontrolled weeds on an average caused 65.3% reduction in the cane yield compared to weed-free treatments. Pre-emergence application of thiozopyr at 0.48 kg/ha gave significantly higher cane yield than its lower doses and was at par with thiozopyr at 0.36 kg/ha, metribuzin at 1.0 kg/ha and atrazine at 1.0 kg/ha just after hoeing. Atrazine at 1.5 kg/ha and 2.0 kg/ha applied after hoeing and 2 hoeings at 50 and 80 days after planting resulted in cane yield at par with weed-free condition.

Key words : Sugarcane, Weed management, Herbicides, Weed-control efficiency

Sugarcane is an important crop in the foothills (*tarai*) region of Uttaranchal. Due to slow germination and initial growth, wide row spacing, slow lateral spread, adequate supply of nutrient and moisture, long duration and diversity in weed population, sugarcane generally suffers from the tremendous weed problems (Lall, 1977, Rao *et al.*, 1987). Uncontrolled weeds may cause 12–72% cane yield reduction, depending on the crop (Johari and Singh, 1991). It is well established that mechanical methods of weed management is most effective to control weeds. However, higher cost involvement and lack of labour availability in proper time make it difficult to adopt by the farmers. On the other hand, only application of herbicide is not proved so effective against weeds like mechanical method (Chauhan *et al.*, 1984). Similarly, alternative herbicides should be tested to minimize the chances of weed resurgence against commonly used herbicides having same mode of action. Considering the above facts, the present investigation was undertaken to determine the effect of different pre-emergence herbicides along with integrated and cultural methods on weed control, growth and yield of spring-planted sugarcane.

MATERIALS AND METHODS

A field experiment was conducted during 1997–98 and 1998–99 at Crop Research Centre, Pantnagar,

Uttaranchal, India. The soil was clay loam, medium in organic carbon (0.69), high in available phosphorus (43 kg P/ha) and medium in available potassium (265.6 kg K/ha). Twelve treatments (Table 1) consisting of pre-emergence application of thiozopyr at 0.18, 0.24, 0.36 and 0.48 kg/ha; metribuzin at 1.0 kg/ha; atrazine at 2.0, 1.0, 1.5 and 2.0 kg/ha applied after first irrigation followed by hoeing at 40 days after planting along with weed-free and weedy check were replicated thrice in a randomized block design. Three budded sets of sugarcane variety 'CoS 767' were planted on 12 March 1997 and 17 March 1998 in rows 75 cm apart. Herbicides were applied as spray with a spray volume of 600 litres/ha.

RESULTS AND DISCUSSION

The major weeds of the experimental field at 100 days after planting were *Cyperus rotundus* L. (63.9%), *Echinochloa* spp. (10.4%) *Parthenium hysterophorus* L. (6.8%) and *Brachiaria mutica* Forsk (5.4%) and other weeds (13.4%) were *Cucumis trigonus* Roxb., *Cleome viscosa* L., *Cynodon dactylon* (L.) Pers., *Euphorbia hirta* L., *Dactyloctenium aegyptium* (L.) P. Beauv., *Fimbristylis dichotoma* L., *Digitaria sanguinalis* (L.) Scop., *Eleusine indica* (L.) Gaerth, *Cannabis sativa* L. and *Xanthium strumarium* L.

Significantly lower density of *Echinochloa* spp. was

Table 1. Effect of weed-management treatments on weed density, and dry matter of different species at 100 days after planting stage (pooled data of 2 years)

Treatment (dose kg/ha)	Weed density (No./m ²)					Weed dry weight (g/m ²)	Weed- control efficiency (%)
	<i>Parthenium hysterophorus</i>	<i>Cyperus rotundus</i>	<i>Echinochloa spp.</i>	<i>Brachiaria mutica</i>	Total		
Thiozopyr (0.18)	2.94 (18)	5.30 (200)	2.74 (15)	0 (0)	5.60 (269)	5.41 (221.8)	32.4
Thiozopyr (0.24)	2.83 (16)	5.05 (156)	2.25 (9)	0 (0)	5.35 (210)	5.20 (179.5)	45.3
Thiozopyr (0.36)	2.57 (12)	4.43 (83)	1.71 (5)	0 (0)	4.77 (117)	4.91 (135.1)	58.8
Thiozopyr (0.48)	2.48 (11)	4.21 (67)	1.50 (4)	0 (0)	4.55 (94)	4.52 (90.6)	72.4
Metribuzin (1.00)	0 (0)	5.16 (174)	3.11 (22)	2.20 (8)	5.42 (225)	4.78 (118.0)	64.0
Atrazine (2.00)	0 (0)	5.09 (158)	3.04 (20)	2.01 (7)	5.33 (206)	4.76 (110.1)	66.4
Atrazine* (1.00)	0 (0)	4.95 (141)	2.71 (14)	1.95 (6)	5.17 (176)	4.37 (78.4)	76.0
Atrazine* (1.50)	0 (0)	4.45 (85)	2.01 (7)	1.10 (2)	4.63 (103)	3.80 (43.9)	86.6
Atrazine* (2.00)	0 (0)	3.87 (47)	1.61 (4)	0 (0)	4.03 (56)	3.39 (28.6)	91.2
Manual hoeing-2	0 (0)	3.76 (420)	1.71 (5)	1.25 (3)	4.07 (58)	3.52 (32.8)	90.0
Weed-free	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	100.0
Weedy	3.13 (22)	5.36 (212)	3.57 (35)	2.94 (18)	5.80 (331)	5.80 (328.0)	0.0
CD (P=0.05)	0.1	0.2	0.3	0.4	0.3	0.3	-

*Applied after first irrigation and hoeing; original values are in parentheses

Table 2. Effect of weed-management treatments on yield parameters, commercial cane sugar, cane and sugar yield (pooled data of 2 years)

Treatment (Dose kg/ha)	Millable canes (10 ³)	Weight/cane (g)	Commercial cane sugar (%)	Yield (tonnes/ha)	
				Cane	Sugar
Thiozopyr (0.18)	60.4	745	10.5	53.1	5.58
Thiozopyr (0.24)	70.7	780	10.6	61.8	6.55
Thiozopyr (0.36)	86.3	806	10.6	72.9	7.73
Thiozopyr (0.48)	95.2	841	10.7	82.6	8.84
Metribuzin (1.00)	92.6	826	10.7	78.6	8.41
Atrazine (2.00)	93.5	823	10.7	78.7	8.42
Atrazine* (1.00)	99.1	860	10.8	87.1	9.41
Atrazine* (1.50)	104.2	896	10.8	97.1	10.49
Atrazine* (2.00)	111.4	919	10.8	104.9	11.33
Manual hoeing-2	106.8	900	10.9	102.2	11.14
Weed-free	114.3	926	10.9	108.5	11.83
Weedy	48.5	676	10.5	37.7	3.96
CD (P=0.05)	11.2	65	NS	11.7	1.40

*Applied after first irrigation and hoeing

recorded with the pre-emergence application of thiozopyr at 0.36 kg/ha than all other treatments, except it was at par with pre-emergence application of thiozopyr at 0.48 kg/ha atrazine at 2.0 kg/ha applied just after hoeing and 2 hoeings at 50 and 80 days after planting. *Brachiaria mutica* was completely controlled by the application of thiozopyr at all the rates. Pre-emergence application of metribuzin at 1.0 kg/ha, atrazine at 2.0 kg/ha alone or atrazine at 1.0, 1.5 and 2.0 kg/ha just after hoeing caused complete control of *Parthenium hysterophorus*. Significant reduction in the population of *Cyperus rotundus* was recorded with thiozopyr at 0.36 or 0.48 kg, atrazine 1.5 and 2 kg/ha just after hoeing and 2 hoeings at 50 and 80 days after planting. All the weed-management treatments significantly reduced total weed density as well as dry weight

than the weedy check except total weed density under thiozopyr at 0.18 kg/ha treatment. Among weed-management treatments, lowest weed density as well as dry weight were recorded under the treatment of atrazine 2.0 kg/ha applied just after hoeing at 40 days and it was at par with 2 hoeings at 50 and 80 days after planting. Excluding weed-free treatment, maximum weed-control efficiency was (91.2%) in case of atrazine 2.0 kg/ha applied after hoeing and that efficiency was very closer (90%) to the 2 hoeings at 50 and 80 days after planting treatment.

Uncontrolled weeds on an average caused 65.3% reduction in the cane yield compared to weed-free treatment. Pre-emergence application of thiozopyr at 0.48 kg/ha resulted in significantly higher cane yield than its lower doses, i.e. at 0.18 and 0.24 kg/ha, and was at par with

thiozopyr at 0.36 kg/ha, metribuzin at 1.0 kg/ha and atrazine 1.0 kg/ha just after hoeing. Atrazine at 1.5 and 2.0 kg/ha applied after hoeing and 2 hoeings at 50 and 80 days after planting resulted in cane yield at par with weed-free treatment. Total number of millable canes/ha, single cane weight, cane as well as sugar yield were highest under atrazine at 2.0 kg/ha applied after hoeing among different weed-management treatments. Commercial cane sugar percentage was not affected significantly by any of the weed-management treatment (Table 2).

It may be concluded that atrazine at 1.5 and 2.0 kg/ha applied after irrigation and hoeing at 40 days after planting were effective in sugarcane crop against most of the weeds and resulted in cane yield at par with 2 hoeings

done at 50 and 80 days after planting and weed-free treatment.

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