

Lime soaking of sugarcane (*Saccharum* species) setts under moisture-stress condition

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ABSTRACT

A field experiment was conducted at Cane Farm, Perambalur, Tamil Nadu, during 1993 and 1994 with 'CoC 671' and 'Co 6304' sugarcane (*Saccharum* sp.). The treatment combinations were with and without soaking of cane setts in 40% lime solution along with the irrigation intervals of 10, 20, 30, 45 and 90 days, scheduled during 60–150 days of the crop age. Both the cultivars with lime soaking, significantly increased the germination percentage, tillers, millable cane number, cane and sugar yields. Interval of 10 days between irrigations registered higher cane and sugar yields of 93 and 12.6 tonnes/ha respectively.

Key words : Millable cane, Lime soaking, Irrigation interval, Tillers, Yield

Sugarcane is being cultivated both in lowland and upland conditions in Tamil Nadu. Due to failure of electricity, the farmers are unable to irrigate the crop in upland conditions. The cane yield of the tract is low when compared with that of lowland tract, mainly due to sub-optimal millable cane numbers at harvest. Dry spell during formative phase of the crop affects the cane population and consequently reduces the cane yield (Singh and Reddy, 1980). Since some package of practices are to be evolved to mitigate the dry spell during formative phase of the crop, the present study was undertaken on this aspect in sugarcane crop.

MATERIALS AND METHODS

A field experiment was conducted at Cane Farm of Jawaharlal Nehru Sugar Mills Ltd, Perambalur, Tamil Nadu, during 1993 and 1994 (mid-season, February planting) with 'CoC 671' and 'Co 6304' varieties of sugarcane. The soil was sandy loam, low in available N (215–228 kg/ha), medium in available P (30–33 kg/ha) and high in available K (450 kg/ha). The treatments were: varieties with and without soaking of setts in 40% lime solution in main plot, and irrigation interval in subplot, once in 10, 20, 30, 45 and 90 days, after 60 days of the crop age, i.e. during tillering phase (formative phase is considered to be

very critical for moisture stress) up to 150 days of the crop age. Maximum and minimum temperatures were 39.2°–39.7°C and 24.7°–25.2°C respectively during the period of irrigation treatment in the respective years. Before 60 days and after 150 days, the crop was treated as a normal crop for irrigation. The source of irrigation was well. The experiment was laid out in split-plot design, replicated 3 times :

Data were recorded on germination and soil-moisture content before irrigation, tillers on 90 and 150 days after planting (DAP) and millable cane at harvest. Germination (%) was calculated by dividing the germinated buds $\times$ 100 by total planted buds. Soil-moisture percentage was worked out based on gravimetric methods. Cane juice was analysed as per the method of Spencer and Meade (1945). Sugar yield was calculated by the formula :

$$\text{Sugar yield} = \frac{\text{Cane yield} \times \text{CCS} (\%)}{100}$$

Commercial cane sugar (CCS) percentage was worked out as per the procedure given by Parthasarathi *et al.* (1979).

RESULTS AND DISCUSSION

Soaking setts in lime solution and irrigation interval influenced the germination and tiller number on 90 and 150 days after planting (DAP) and at harvest (Table 1).

Germination

Germination (%) was increased with the progress of the crop age from 15 to 30 days (Table 1). But beyond that the increase was

minimum. Both the cultivars were influenced by lime soaking and recorded the mean percentage of 63.8 compared with 50.4% registered by 'CoC 671' and 48.1% by 'Co 6304' without lime-soaking treatment. 'Co 6304' showed the lowest germination (%) in the setts planted without lime soaking, which perhaps led to hardness of its dried bud's scale in contrast to the of 'CoC 671.' It was softened by soaking in lime solution, resulting in higher germination. Van Dillewijn (1952) reported that the stimulated germination by lime soaking may be due to the increased intake of water, which in turn promotes the conversion of carbohydrates into reducing sugars.

Number of tillers

Irrigation interval significantly influenced the tiller number at 90 and 150 DAP. Interval of 10 days between 2 irrigations resulted in significantly higher tillers than further delay in irrigation. Numerical difference was observed at 90 DAP between treatments with and without lime soaking. The maximum number of 240,000 tillers/ha was registered by 'Co 6304' in lime solution soaking treatment. Lime soaking had significant effect at 150 DAP and the same trend was also observed as 90 DAP.

Millable cane

The maximum millable canes of 68,200/ha were obtained due to irrigation interval of 10 days and of 62,500/ha by the setts soaked in lime solution. Interaction effect between lime soaking and irrigation interval was not significant. It was obvious

Table 1. Effect of lime soaking and irrigation interval on germination and tillers (mean data of 2 years)

Variable	'CoC 671'		'Co6304'		Mean	'CoC 671'		'Co 6304'		Mean
	Lime soaking		Lime soaking			Lime soaking		Lime soaking		
	With	Without	With	Without		With	Without	With	Without	
<i>Tillers at 90 days (1,000/ha)</i>										
<i>Millable canes at harvest (1,000/ha)</i>										
<i>Irrigation intervals</i>										
10 days	253	234	257	237	245	66.7	65.2	72.3	68.5	68.2
20 days	235	209	243	221	227	63.6	61.2	67.5	69.3	63.9
30 days	226	203	234	210	218	58.1	55.9	62.3	59.0	58.8
45 days	224	200	233	207	216	56.7	52.2	56.7	53.7	54.8
90 days	216	190	232	210	212	49.7	47.4	53.7	49.5	50.2
Mean	231	207	240	217		58.9	56.4	62.5	58.9	
CD (P = 0.05)	LS : NS	II : 0.04	L × I :	NS	LS : 326	II : 3.64	L × I :	NS		
<i>Tillers at 150 days (1,000/ha)</i>										
<i>Soil moisture before irrigation (%)</i>										
<i>Irrigation intervals</i>										
10 days	177	169	200	187	183	18.5	17.9	18.1	18.6	18.3
20 days	159	153	189	178	170	16.7	16.5	16.5	16.5	16.5
30 days	152	147	182	174	164	13.7	13.5	13.6	14.3	13.8
45 days	145	140	172	164	155	11.7	12.1	11.8	12.5	12.0
90 days	142	137	161	157	149	11.9	11.4	11.6	11.9	11.7
Mean	155	149	181	172		14.5	14.2	14.3	14.7	
CD (P = 0.05)	LS : 0.10	II : 0.05	L × I :	NS						
<i>Germination (%)</i>										
<i>Irrigation intervals</i>										
15 days	36.3	29.5	38.8	29.6	33.5					
30 days	77.6	58.6	76.1	57.0	67.3					
45 days	77.7	63.3	76.7	57.9	68.9					
Mean	63.8	50.4	63.8	48.1						
CD (P = 0.05)	LS : 3.24	II : 4.11	L × I :	3.27						

LS, Lime soaking; II, irrigation intervals

Table 2. Yield (tonnes/ha) of sugarcane as affected by irrigation interval and lime soaking

Variable	'CoC 671'		'Co 6304'		Mean	'CoC 671'		'Co 6304'		Mean	
	Lime soaking		Lime soaking			Lime soaking		Lime soaking			
	With	Without	With	Without		With	Without	With	Without		
<i>Irrigation interval</i>	<i>Cane yield</i>					<i>Sugar yield</i>					
10 days	96	89	102	87	93	13.5	12.6	13.3	11.0	12.6	
20 days	84	73	93	78	82	11.7	9.8	12.0	10.0	10.9	
30 days	71	65	73	70	70	9.2	8.2	9.0	8.5	8.7	
45 days	64	56	67	59	61	8.4	7.4	8.5	7.4	7.9	
90 days	58	50	61	52	56	8.5	7.4	7.7	6.7	7.6	
Mean	75	66	79	69		10.3	9.1	10.1	8.7		
CD (P = 0.05)	LS : 4.2	II : 8.1	L × I : NS				LS : 0.88 I.I. : 1.30 L × I : 1.51				

to note that the soil moisture was the highest (18.3%) in irrigation interval of 10 days and the least (11.7%) in that of 90 days interval.

Cane and sugar yield

Setts soaked in the lime solution significantly increased the cane yield, with a mean of 79 and 75 tonnes/ha, which was 14.4 and 13.6% more than that without soaking in 'Co 6304' and 'CoC 671' varieties respectively. Regarding sugar yield, this treatment gave significantly higher yield than without lime soaking. Among irrigation schedules the maximum cane yield of 93 tonnes/ha was registered significantly by the irrigation interval of 10 days. This yield was 13.4, 32.8, 52.4 and 66.0% higher than that under the intervals of 20, 30, 45, and 90 days respectively. In 'CoC 671', the irrigation interval of 30 days registered the same cane yield with 45 days interval, which was on a par with that of 60 days with lime-soaking treatments, whereas

in the treatment without lime soaking the interval of 20 days registered the cane yield on a par with that of 30 days. It shows that soaking 'CoC 671' sets in lime solution can enable it to tolerate the dry spell further for 10 days. The similar trend was also observed in 'Co 6304'. But, this variety had the inherent ability to produce more cane yield than 'CoC 671'. The sugar yield under irrigation interval beyond 20 days without lime soaking was reduced greatly. The interaction effect of lime soaking and irrigation interval of 10 days significantly increased the sugar yield in 'CoC 671' variety. But this effect was not observed in 'Co 6304'. This may be due to the inability of the genotypes to withstand the period of dryness. Dixit *et al.* (1975) reported that irrigation interval of 10 days gave more cane yield than that of 20 days.

It was concluded that irrespective of variety, lime soaking and irrigation interval of 10 days resulted in significantly higher cane and sugar yields than the treatment

without lime soaking.

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