

Inter-plant Spacing on the Yield of Transplanted Sugarcane

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ABSTRACT

An experiment was conducted in the Old Himalayan Piedmont Plain soil under irrigated condition to study the effect of interplant spacing on yield, and yield contributing parameters in five sugarcane varieties, such as Isd-2/54, Isd-18, Isd-19, Co-63015 and Isd-20. Forty five days old seedlings raised in polybag were transplanted with two interplant spacings of 30 cm and 60 cm. All the varieties produced the highest tillers in May at both the spacings which gradually declined due to tiller mortality. Closer inter plant spacing resulted in higher tiller mortality than wider inter plant spacing. Tiller mortality was the highest in Isd-18, and the lowest in Isd-20. Higher cane and sugar yield, number of millable canes and lower sucrose concentration were obtained at closer spacing in all the varieties. Lower sucrose concentration was found at higher population. The highest sugar yield was obtained from Isd-18 followed by Isd-20 at both the spacings. Sugar yield was directly associated with sucrose concentration, number of millable cane and cane yield.

INTRODUCTION

In sugarcane, stalk population is positively correlated with cane yield in sub-tropical cane growing areas (Kanwar and Sharma, 1974; Bull, 1975; Miah and Rahman, 1981). Variety, inter row, as well as inter plant spacing govern stalk population (Matherne, 1974; Oworu, 1986). Spaced transplanting of sugarcane seedlings received considerable research attention for increasing the number of millable stalks (Rahman and Rahman, 1979; Srivastava *et al.* 1985). Recently, this technique is becoming popular among the cane growers for increasing sugarcane yield in the Old Himalayan Piedmont Plain region of Bangladesh.

Higher plant population, and yield may be obtained from modern sugarcane varieties by adjusting inter plant spacing in spaced transplanted sugarcane. Several works were done on the effect of interrow spacing on cane yield in different countries but little attention was given on inter plant spacing. Therefore, an experiment was carried out to determine the effect of inter plant spacing of spaced transplanted sugarcane under irrigated condition in Old Himalayan Piedmont Plain soil.

MATERIALS AND METHODS

An experiment was conducted in Old Himalayan Piedmont Plain soil of North Regional Station farm, Thakurgaon. Forty five days old polybag seedlings of five sugarcane varieties, such as Isd-2/54, Isd-18, Isd-19, Co-63015, and Isd-20 were transplanted in early December at 30 cm and 60 cm inter plant spacings. The row to row distance was maintained one meter. The experiments was laid out in a factorial randomized complete block design with four replications. The plot size was 8m x 6m.

Recommended doses of different plant nutrients were applied equally to all the plots. The doses in kg/ha were: 170 N as urea, 125 P_2O_5 as triple super phosphate, 222 K_2O as muriate of potash, and 33 S as gypsum. Furadan 5G was applied @ 40 kg/ha to control white grub and top shoot borer. Plots were irrigated thrice. Necessary intercultural operations, and mechanical control of insects were done as per normal practice. Tiller counts were taken every month for each plot from March to August, and the tiller mortality was calculated following Miah and Sarkar (1982). Data on millable cane, yield, stalk height and thickness were recorded for each plot at harvest. The recoverable sucrose percentage was determined at harvest according to Horne's Dry Lead Method (Meade 1963).

RESULTS AND DISCUSSION

Tillering of all varieties progressively increased at both the spacings, and the highest number of tillers was obtained in the month of May, and thereafter gradual reduction was recorded due to tiller mortality (Figure 1). The figure shows that wider inter plant spacing in all the varieties produced lower tillers and closer spacing resulted in higher tiller production per unit area as well as mortality than wider spacing. These results agree with the reports published elsewhere (Miah and Rahman, 1981, Oworu, 1986; and Rahman *et al.* 1987). Variety, and spacing had significant effect on the yield, and millable cane production but the interaction of variety, and spacing had significant effect on millable cane production only. All the varieties produced higher number of millable cane, consequently higher yield at closer spacing compared to wider spacing. Matherne (1971) also noted that higher yield of sugarcane could be obtained by increasing plant population as a result of varying interrow spacing and planting rates. In Louisiana, highly significant correlation coefficient between stalk population and yield of cane was observed by Matherne and Irvine (1978). In India, Kanwar and Sharma (1974) and in Bangladesh, Miah and Rahman (1981) also reported higher stalk population and yield at closer spacing. The variety Isd-2/54 produced significantly higher millable cane under both the spacings. The variety Isd-20 produced statistically identical millable cane with Isd-2/54 30 cm spacing, and with Isd-18 in 60 cm spacing (Table 1). Although Isd-2/54 and Isd-20 produced statistically identical millable cane at closer spacing, but Isd-20 produced significantly higher cane yield (83.4 TCH) followed by Isd-18 (81.1 TCH). Again, in wider spacing, Isd-2/54 produced significantly higher number of millable cane but cane yield was significantly higher in Isd-18 (78.4 TCH). This was due to higher stalk height of Isd-20 and Isd-18 over Isd-2/54 (Table 2). Positive correlation between cane yield and stalk height was also reported by Srivastava *et al.* 1985). The variety Isd-19 produced the lowest yield at both the spacings.

Sucrose concentration was observed higher at wider inter plant spacing and lower at closer inter plant spacing in all the varieties but sugar yield per hectare was found higher in closer spacing due to higher number of millable cane, and yield per hectare. Therefore, sugar yield was found directly associated with sucrose concentration, number of millable cane and cane yield. Similar results were reported by Miah and Rahman (1981). Higher sucrose concentration and yield of sugar were also found by Rice (1978) at wider spacing (row spacing 150 cm) than at closer spacing (row spacing 90 cm). This worker believed this reduction in sucrose concentration at

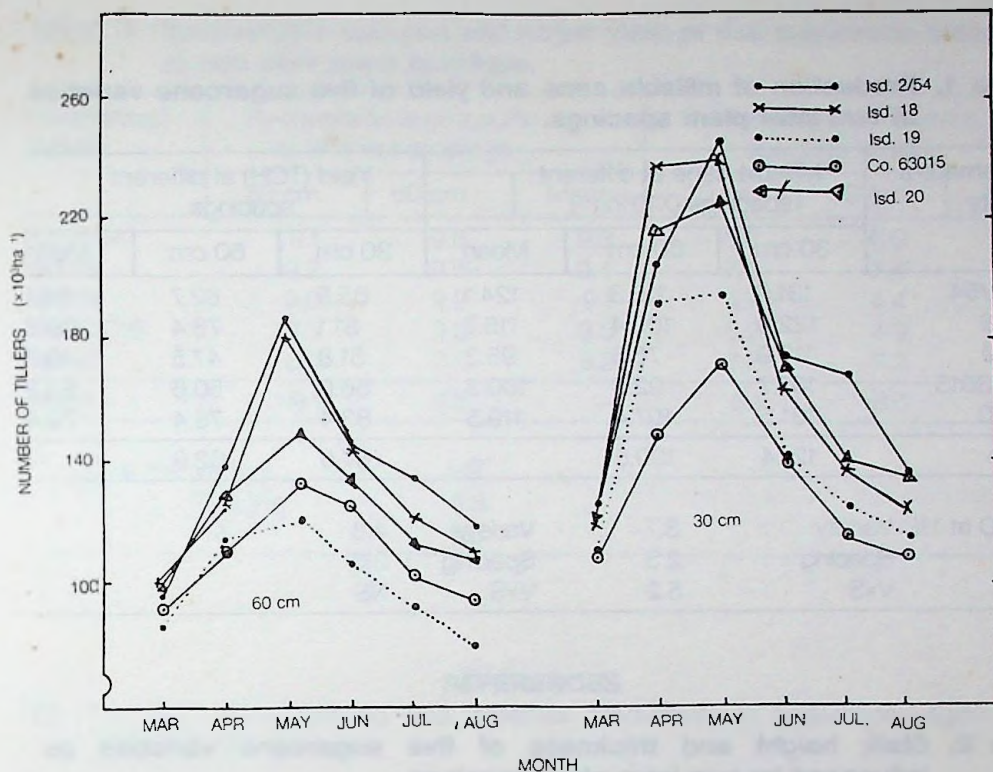


Figure 1. Tillering pattern of five sugarcane varieties in different months at two inter plant spacings.

narrow spacing to be due to higher population per unit area. Higher sucrose content at wider spacing might be due to uniform interception of light on leaves (Imam *et al.* 1982). However, Matherne (1974) and Matherne and Irvine (1978) stated that closer spacing did not result in a reduction of sucrose concentration. The varieties Isd-18 and Isd-20 produced higher sugar yield at both closer and wider interplant spacing but the highest sugar yield was produced by Isd-18 followed by Isd-20 at closer spacing (Table 3). From the results, it could be concluded that sugarcane should be transplanted using closer plant spacing (30 cm) for late transplantation at the Old Himalayan Piedmont Plain soil condition.

Table 1. Production of millable cane and yield of five sugarcane varieties at two inter-plant spacings.

Parameters Variety	Millable cane at different spacings (X10 ³ ha ⁻¹)			Yield (TCH) at different spacings		
	30 cm	60 cm	Mean	30 cm	60 cm	Mean
Isd-2/54	131.9	116.3	124.1	65.5	62.7	64.1
Isd-18	122.0	109.4	115.7	81.1	78.4	79.8
Isd-19	113.9	76.6	95.3	51.8	47.5	49.7
Co-63015	107.7	92.9	100.3	56.0	50.6	53.3
Isd-20	131.5	107.4	119.5	83.4	75.4	79.4
Mean	121.4	100.5	—	67.6	62.9	—

CD at 1% Variety :	3.7	Variety :	4.8
Spacing :	2.3	Spacing :	3.0
VxS :	5.2	VxS :	NS

Table 2. Stalk height and thickness of five sugarcane varieties as influenced by two inter plant spacings.

Parameters/ Variety	Stalk height (m) at different spacings			Stalk thickness (cm) at different spacings		
	30 cm	60 cm	Mean	30 cm	60 cm	Mean
Isd-2/54	2.0	2.1	2.1	1.89	1.97	1.93
Isd-18	2.4	2.4	2.4	1.91	1.96	1.94
Isd-19	1.8	1.9	1.9	1.86	1.94	1.90
Co-63015	1.8	1.9	1.9	1.87	1.93	1.90
Isd-20	2.7	2.8	2.8	2.06	2.17	2.12
Mean	2.1	2.2	—	1.92	1.99	—

CD at 1% Variety :	0.3	Variety :	0.07
Spacing :	NS	Spacing :	0.05
VxS :	0.4	VxS :	NS

Table 3. Recoverable sucrose and sugar yield of five sugarcane varieties at two inter plant spacings.

Parameters/ Variety	Recoverable sucrose (%) at different spacings			Yield of sugar at different spacings (t/ha)		
	30 cm	60 cm	Mean	30 cm	60 cm	Mean
Isd-2/54	9.1	9.5	9.3	6.0	6.0	6.0
Isd-18	9.2	9.5	9.4	7.5	7.4	7.5
Isd-19	9.0	9.2	9.1	4.7	4.4	4.6
Co-63015	9.3	9.6	9.5	5.2	4.9	5.1
Isd-20	8.8	9.5	9.2	7.3	7.2	7.3
Mean	9.1	9.5	—	6.1	6.0	—

CD at 1% Variety : NS
 Spacing : 0.3
 VxS : NS

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