

Tillering and Productivity of Autumn and Summer Transplanted Sugarcane

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ABSTRACT

Five sugarcane clones viz. Isd-17, L. Jaba-C, BS-96, I-59/74 and I-258/77 were examined for their tillering behaviour and productivity at the SRTI experimental farm under irrigated condition during 1985-86 crop season. Six week old seedlings were transplanted in the autumn at two inter-plant spacings, 30 cm and 60 cm. Monthly counts on tillers revealed peak tiller population in April which gradually declined as tiller mortality set in thereafter. Mortality of tiller was higher (38-58%) under 30 cm inter-plant spacing than under 60 cm spacing. The maximum (58-54%) tiller mortality was recorded with Isd-17 under closer (30 cm) spacing and the minimum (25.75%) with BS-96 under 60 cm spacing indicating a significant clonal variability. The highest yield (144.73 tons/ha) was obtained with the clone I-59/74 followed by BS-96 while the lowest yield (83.10 tons/ha) was from I-258/77. I-59/74 also gave the highest number of millable stalks per unit area followed by BS-96. There was no significant difference between the two inter-plant spacings in respect of cane and sugar yield. Summer transplanted cane showed peak tillering during June and July. In all the test clones, the level of productivity was lower in the Summer planted cane than in the Autumn-planted cane.

INTRODUCTION

Sugarcane is an ensured crop for low-rainfall regions (north-west and south-west) of Bangladesh with annual rainfall less than 1500 mm. This region occupies about 70% of the total cane acreage. The remaining 30% is scattered in other parts of the country. The average yield of sugarcane in Bangladesh is currently estimated at 45 TCH (ton cane per hectare) as against its theoretical potential of 30 TCA under rainfed condition. In the recent past, no significant improvement in the productivity of the crop has been noticed. Moreover substantial reduction in acreage has badly affected the over-all production of sugarcane—the basic raw material for sugar and gur industries of the country.

The major cause of poor yield of cane has been identified to be insufficient number of millable stalks per unit area. Earlier works on path coefficient analysis of sugarcane yield by Khairwal and Babu (1975) indicated that the number of Millable

cane had the strongest direct effect on cane yield followed by cane weight. Among the many agronomic practices that can be adopted for increasing the number of millable cane stalks, spaced transplanting (STP) received considerable attention in recent years (Rahman and Rahman, 1979; Srivastava *et al*, 1985, Narasiman, *et al*, 1981; Tang and Chen, 1974 *etc.*).

The present investigations were conducted to determine the relative tillering behaviour and yielding potential of some commercially important clones grown under STP in both autumn (early) and summer (late) of 1985-86 crop season. The major objectives of experiments were to find out the suitable inter-plant spacing (for transplanting settlings) of the test clones and the tiller production and mortality trend across season in addition to their overall yielding potential.

MATERIALS AND METHODS

Six weeks old settlings of five sugarcane clones *viz.* Isd-17, L. Jaba-C, I-59/74, I-258/77, BS-96 were transplanted in mid- November (Autumn) at two spacings, 30 cm and 60 cm. The row-to-row distance was mentioned at one meter. The treatments were replicated four times in a Randomized Block Design. Commercial fertilizers *viz.*, Urea, Triple-super Phosphate (TSP) and Muriate of Potash (MP) were applied @ 200-16-220 kg of N, P_2O_5 & K_2O ha^{-1} respectively. Necessary inter-cultural operations like weeding, mulching, mechanical control of insects *etc.* were done as per normal practice.

The summer experiment comprised of four sugarcane clones *viz.*, Isd-17, Is-16, L. Jaba-C, and I-258/77. Nine week old settlings of the clones were transplanted in early, April (Summer). The experiment was laid out in a Randomized Block design with three replications. Commercial NPK-fertilizers *viz.* Urea, Triple super phosphate (TSP) and Muriate of Potash (MP) were applied @ 165-125-200 kg of N, P_2O_5 & K_2O ha^{-1} respectively. Urea and MP were applied in two splits while the entire quantity of TSP was applied at the time of transplanting. The experiment received three rounds of irrigations. Data on tiller production and mortality was recorded every month on ten selected plants/settlings per plot (8m x 6m). Tiller mortality was determined in relation to the month attaining the highest tiller number. Data on millable cane yield and other yield- contributing characters were recorded at harvest. The recoverable sucrose (%) was determined at harvest according to conventional dry-lead-Sub-Acetate method. Yield of sugarcane was expressed both in terms of TCH (ton cane per hectare) and TSH (ton sugar per hectare) as per normal practice.

RESULTS AND DISCUSSION

Tillering of autumn-planted cane progressively continued until April and thereafter it suffered a gradual reduction with concomitant increase in tiller mortality. Closer inter-plant spacing of 30 cm resulted in higher tiller mortality than the wider spacing of 60 cm. Data on tillering for the earlier months further showed that the production of tiller is promoted under wider spacing. Except for the BS-96, about 60% tillers die out during the late growth stages (May-August). The tiller mortality rate of BS-96 was exceptionally lower (25-38%) than other clones under both the inter-plant spacings (Figures 1a & 1b).

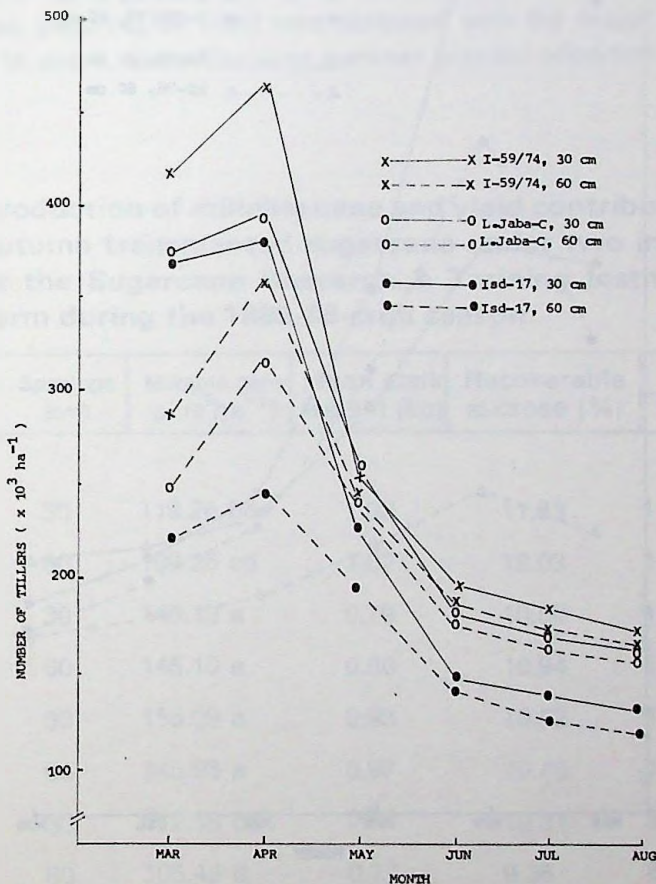


Figure 1a. Tiller dynamics of three sugarcane clones in different months at two inter-plant spacings.

Tillers and millable cane counts at the late crop stages indicated that clones significantly differed in their response to the variable inter-plant spacings and in their ultimate potential to produce millable stalks (Table 1). Wider spacing of 60 cm between plants/settlings was statistically as good as 30 cm for all the test clones in

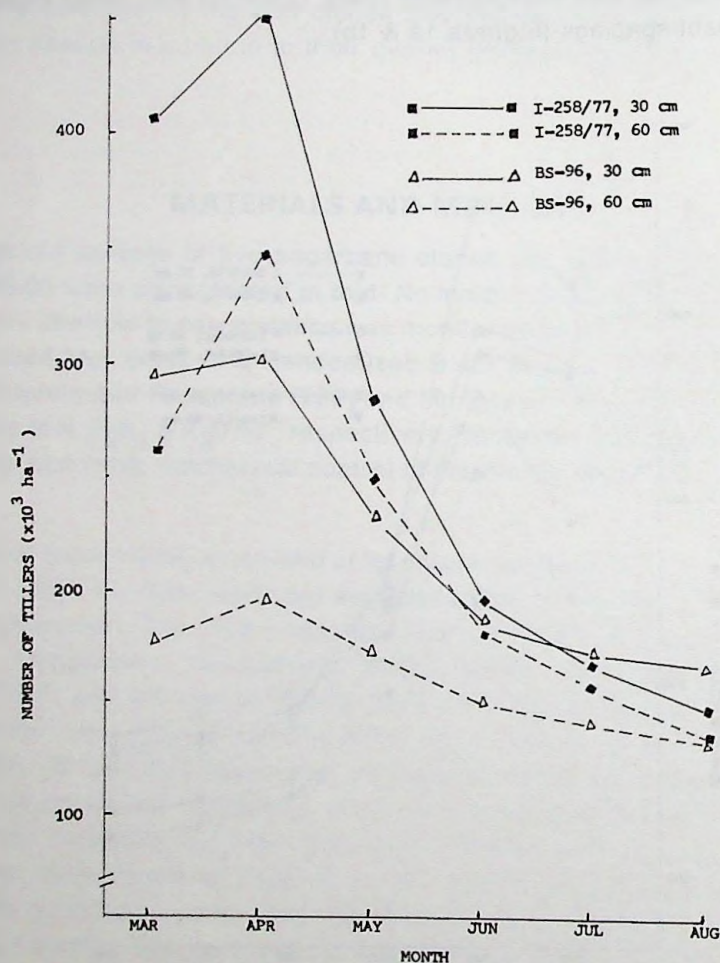


Figure 1b. Tiller dynamics of two sugarcane clones in different months at two inter-plant spacings.

terms of the ultimate cane and sugar yield. This situation is somewhat different in terms of millable cane indicating considerable variation in unit-stalk weight affected by inter-plant spacing. Mean stalk weight was found to be little higher under wider spacing indicating that thinner stalks are produced under closer spacing due to more acute inter-plant competition for light, nutrient etc. The highest productivity potential was demonstrated by I-59/74 followed by Isd-17 and L. Jaba-C in terms of both TCH and TSH. The clone I-258/77 gave the lowest yield due to fewer number of millable stalks accompanied by its lower stalk weight (Table 1). Spring-planted cane showed peak tillering during June and July. There was virtually no differential response due to variable spacing in any of the test clones at the later stages. The clone I-258/77 gave the highest cane yield (67–69 TCH) although this clone had the lowest yield under autumn-planting at the same location. Except for I-258/77, a low level of cane yield (42–54 TCH) was obtained with the major commercial clones (Isd-17, Isd-16 and L. Jaba-C) under summer planted condition.

Table 1. Production of millable cane and yield contributing characters of autumn transplanted sugarcane under two inter-plant spacing at the Sugarcane Research & Training Institute experimental farm during the 1985-86 crop season.

Clone	Spacings (cm)	Millable cane ($\times 10^3 \text{ ha}^{-1}$)	Mean stalk weight (kg)	Recoverable sucrose (%)	Yield	
					TCH	TSH
Isd-17	30	119.26 bc	1.00	11.83	118.75 b	13.59
	60	109.26 cd	1.02	12.03	111.75 b	13.02
L. Jaba-C	30	146.19 a	0.79	10.60	115.57 b	12.10
	60	145.10 a	0.80	10.94	116.68 b	12.62
I-59/74	30	156.09 a	0.93	10.52	144.73 a	14.94
	60	145.93 a	0.97	10.46	141.57 a	14.45
I-258/77	30	112.18 cd	0.74	10.31	83.10 c	8.31
	60	105.46 d	0.77	9.35	81.46 c	7.18
BS.96	30	148.74 a	0.81	9.04	120.00 b	10.61
	60	127.96 b	0.93	9.45	118.40 b	10.78

Table 2. Tillering potential and yield of summer transplanted sugarcane clones at two inter-plant spacings grown at the Sugarcane Research & Training Institute farm during the 1985-86 crop season.

Clones	Spacing (cm)	Tiller population (10 ³ ha ⁻¹)				Millable cane (x 10 ³ ha ⁻¹)	Recoverable sucrose (%)	Yield	
		MAY	JUN	JUL	AUG			TCH	TSH
Isd-17	30	93 bc	146 cd	146 d	117 ab	87.53	11.46	42.59 c	4.92
	45	74 cd	132 cd	140 d	112 b	82.71	12.30	43.08 c	5.30
Isd-16	30	88 bcd	124 de	140 d	96 c	75.68	11.61	47.46 bc	5.50
	45	68 d	107 e	113 e	86 c	70.49	11.64	48.14 bc	5.61
L. Jaba-C	30	81 bcd	153 bc	168 b	130 a	102.34	10.15	48.51 bc	6.98
	45	76 cd	150 c	154 c	125 a	106.66	10.83	54.44 b	7.33
I-258/77	30	123 a	189 a	187 a	127 a	90.86	10.00	69.13 a	4.82
	45	100 b	175 ab	163 bc	121 a	93.21	10.25	67.78 a	5.63

Narasiman *et al* (1981) reported that transplanted sugarcane seedlings at 0.54 m² per plant (90 cm between rows 60 cm within row) gave an average of 6-8 millable canes per clump resulting in more than 1,20,000 millable stalks ha⁻¹ as against 80,000 stalks obtained in conventional planting. Tang and Chen (1974) obtained significantly higher (18.9%) cane yields and 19.3% higher sugar yields from transplanted sugarcane in Taiwan.

Apart from inherent capacity of a variety, tillering of sugarcane is usually influenced by factors like light, nutrient level, time of planting, soil moisture etc. (Rao and Prasad, 1962). Among these factors, light is believed to have the maximum influence. Based on the concept of better utilization of solar energy and reduced mutual shading, spaced transplanting (STP) was initially developed.

This planting technique also has the advantage of considerable seed economy. Concurrently, information on the optimum distances between and within the rows of transplanted seedlings must be generated. Results obtained in the present investigations are in agreement with earlier research reports. Srivastava *et al* (1985) reported that stalk number being the most important yield component in sugarcane, consideration of inter-plant competition leading to ultimate population density is important. They maintained that as the inter-plant competition decreased (wider spacing), average height of stalks decreased. Since a decrease in inter-plant competition gradually induced increasing inter-plant competition, secondary and tertiary tillers had a comparatively shorter span of growth and, therefore, rendered them shorter. They also reported reduced mortality under wider spacing and varietal difference in response to various levels of inter-plant competition. Narasiman *et al* (1981) reported that wider inter-plant spacing (60 cm) was found appropriate for high tillering varieties whereas closer interplant spacing (30 cm) was found suitable for shy tillering varieties under STP technique. They also reported that the millable stalks obtained were uniform, heavy and less prone to lodging due to favourable aerodynamic characteristics of the plant community in the system. In the light of the results obtained, it could be concluded that (i) the within-row distance for transplanting sugarcane seedlings need not be lesser than 60 cm for both the Autumn and Summer transplanting, (ii) not all sugarcane varieties are suited to late planting situation, (iii) the level of yield, both in terms of cane and sugar, is normally lower in the Summer transplanted cane.

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