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Effect of Row and Interplant Spacings on the Productivity of Transplanted Sugarcane

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ABSTRACT

An experiment was conducted at SRTI experimental farm during 1986-87 crop season to study the effect of row and interplant spacing on the yield and yield contributing parameters of transplanted cane. Forty five days old settlings of the variety Isd 16 were transplanted during November at two row spacing of 90 and 120 cm and six interplant spacings viz. 45,60,75,90,105 and 120 cm. Mortality of tiller was higher (48%) under closer spacing of 90 cm × 45 cm while minimum (32%) under wider spacing of 120 cm × 120 cm. Tillers and millable canes per clump and mean stalk weight were higher under wider row and plant spacing. Significantly higher number of tillers (201 × 10^3/ha) and millable canes (105 × 10^3/ha) were obtained from the closer spacing of 90 cm × 45 cm while the minimum tillers (109 × 10^3/ha) and millable stalks (74 × 10^3/ha) were recorded from the wider spacing of 120 cm × 120 cm. The highest yield (89 t/ha) was obtained with closer spacing of 90 cm × 45 cm while the lowest yield (70 t/ha) was from the widest spacing of 120 cm × 120 cm. However the sucrose recovery (%) was also significantly higher under wider row and interplant spacing than the closer row and interplant spacing indicating the effectant solar energy utilization as well as higher rate of photosynthate under wider spacings. For economic yield 90 cm × 45 cm row and plant spacing may be recommended under Ganges alluvium soil condition.

INTRODUCTION

Transplanting of sugarcane settlings received considerable research attention elsewhere in the mid 1970's (Rahman and Rahman, 1989 ; Srivastava *et al*, 1985). Experiments on spaced transplanting (STP) was also initiated extensively in Bangladesh since 1980 at Sugarcane Research & Training Institute. Recently the STP technique is gaining popularity among the growers to increase the yield with maximum economic benefit. In sugarcane stalk population and cane yield are correlated especially in sub-tropical cane growing area (Kanwar and Sharma, 1974; Bull, 1975; Miah and Rahman, 1981). The stalk population is essentially governed by the variety grown, interrow as well as interplant spacing (Matherne, 1974). Therefore, this experiment was undertaken to find out the optimum row and interplant spacing for transplanting the cane settlings for getting higher yield of cane and sugar.

MATERIALS AND METHODS

The experiment was conducted at the SRTI experimental farm during 1986-87 crop season. The most high yielding and popular cane variety, Isd 16 was used and the experiment was laid out in Randomized Complete Block design with four replications. The treatments were as follows :

Treatments	Row X Interplant spacing
T_1 :	90 cm × 45 cm
T_2 :	90 cm × 60 cm
T_3 :	90 cm × 75 cm
T_4 :	90 cm × 90 cm
T_5 :	120 cm × 60 cm
T_6 :	120 cm × 75 cm
T_7 :	120 cm × 90 cm
T_8 :	120 cm × 105 cm
T_9 :	120 cm × 120 cm

Forty five days old settlings raised in 12.5 cm × 10 cm sized polythene bags were transplanted on 15th November, 1986. Trenches were prepared by spade on the mechanically prepared land at spacings specified in the treatments. Fertilizers were used at the rate of 120, 120 and 110 kg N, P_2O_5 and K_2O per hectare respectively following recommended methods of application. Measured quantity of fertilizers were applied per plant which varied depending upon the row- plant spacing. Three irrigations were applied during the entire growth period of the crop. All normal cultural practices appropriate to the crop were followed. The crop was harvested in the middle of January of the following year. Chemical analysis of juice was done following the conventional dry- lead- subacetate method. Relevent data were recorded, tabulated, analysed and presented in appropriate place.

RESULTS AND DISCUSSION

The results of the experiment are shown in Tables 1 and 2. Row and interplant spacings were found to have significant effect on the number of tillering, millable stalks, cane yield and yield of sugar/ha. Data on tiller population indicated that row X plant spacing of 90 cm X 45 cm gave significantly the maximum number of tillers (200.82 × 10^3/ha) followed by 120 cm × 60 cm row-plant spacing (157.92 ×10^3/ha). The treatment T_9 with 120 cm X 120 cm spacing resulted the minimum tillers (109.29 X 10^3/ha). This result further revealed that closer spacing induced higher number of tiller production compared to wider spacing. Rahman *et al.* (1987) also reported similar trend of tillering under variable interplant spacing. Treatments T_1 and T_2 showed identical performance in respect of millable stalk production (105 × 10^3/ha) and were superior to rest of the treatments. The lowest number of millable stalks (74×10^3/ha) were obtained under 120 cm X 120 cm wider spacing. Higher number of millable canes at relatively closer row and interplant spacing might be attributable due to the higher number of early tiller production. The lower number of millable stalks under wider spacings was possibly due to fewer number of initial plant population. However, the number of tillers and millable cane production per clump was significantly higher in wider row and plant spacings. Almost similar response was observed in case of cane yield/ha. All the treatments except T_1 (90 cm × 45 cm) showed

identical performance and found statistically insignificant in terms of cane yield. Narrow spacing of 90 cm × 45 cm gave significantly the highest cane yield of 89 t/ha while the wider spacing produced the lowest yield ranging from 67.34-69.66 t/ha. This result was in agreement with the findings of Nickell (1965) and Hebert *et. al.* (1965) who also obtained higher yield with closer spacings. Further recoverable sucrose (%) was higher at wider row and interplant spacing, while significantly lower at higher population in closer row and interplant spacing (Table 1). Statistically similar results were also

Table 1. Effect of row and interplant spacing on the tillering, millable stalks, yield of cane, sugar and recovery (%).

Treatment	Tiller (X 10^3/ha)	Millable cane (X 10^3/ha)	Yield of cane (t/ha)	Recovery (%)	Yield of sugar (t/ha)
T_1-90 cm × 45 cm	200.82 a*	105 a	89.08 a	8.96 c	8.64 a
T_2-90 cm × 60 cm	155.92 b	105 a	79.39 ab	10.29 ab	8.21 a
T_3-90 cm × 75 cm	152.28 b	95 ab	81.72 ab	10.29 ab	8.75 a
T_4-90 cm × 90 cm	142.53 bc	88 bc	78.83 ab	10.80 ab	8.56 a
T_5-120 cm × 60 cm	157.92 b	88 bc	79.04 ab	9.85 bc	7.84 a
T_6-120 cm × 75 cm	129.14 bc	77 c	71.74 ab	10.88 ab	7.78 a
T_7-120 cm × 90 cm	120.67 bc	80 bc	67.34 b	10.22 ab	6.89 a
T_8-120 cm × 105 cm	126.32 bc	82 bc	71.43 ab	10.29 ab	7.39 a
T_9-120 cm × 120 cm	109.29 c	74 c	69.66 ab	11.13 a	7.77 a

* Figures accompanied by similar letters do not differ significantly as per DNMR test at 5% level of probability.

Table 2. Effect of row and interplant spacing of settlings on individual clump of sugarcane.

Treatment	No. of tiller/ clump in May	No. of millable cane/ clump at harvest.	% of tiller mortality/ clump	Wt. of cane stalk (kg)	No. of internode/ stalk
T_1-90 cm × 45 cm	8.33 c*	4.36 c	47.60	0.91 b	21.78 b
T_2-90 cm × 60 cm	8.92 de	6.01 d	32.60	0.93 b	21.66 b
T_3-90 cm × 75 cm	11.62 cd	7.25 cd	37.60	0.97 ab	22.39 b
T_4-90 cm × 90 cm	13.05 bc	8.06 c	38.20	0.97 ab	21.66 b
T_5-120 cm × 60 cm	12.05 bcd	6.71 cd	44.30	0.94 b	2.28 b
T_6-120 cm × 75 cm	13.14 bc	7.83 c	40.40	0.97 ab	22.66 ab
T_7-120 cm × 90 cm	14.73 abc	9.77 b	33.60	0.95 b	21.33 b
T_8-120 cm × 105 cm	15.42 ab	10.01 ab	36.00	1.04 ab	22.34 b
T_9-120 cm × 120 cm	16.69 a	11.30 a	32.22	1.19 a	24.22 a

* Figures accompanied by similar letters do not differ significantly as per DNMR test at 5% level of probability.

obtained in terms of tons sugar per hectare. Rice (1978) also found the higher sucrose concentration and yield of sugar at row spacing 150 cm than at 90 cm.

The number of tiller production per clump increases as the row and plant spacings increased. Significantly highest number of tillers (17/clump) were recorded at wider spacing while the lowest tiller (8/clump) was obtained at closer spacing. Similar trend was also observed in case of millable cane per clump. Mortality of tillers was found maximum (47.60%) at closer spacing and minimum (32.22%) under wider spacing (Table 2). This result further revealed that the tiller mortality may be reduced at least by 15 percent through increasing the interplant spacing from 45 cm to 60 cm without manipulating the row to row distance of 90 cm. Higher mortality of tillers at closer spacing was also reported by Rahman *et. al.* (1987). It is revealed from Table 2 that mean stalk weight was little higher under wider spacing indicating that thinner stalks are produced under closer spacing due to more acute interplant competition possibly for light, nutrient and water. Number of internodes/stalk were found significantly higher under wider spacing of 120 cm × 120 cm compared to other spacings. Moreover, all the treatments except T_9 (120 cm × 120 cm) showed statistically identical performance in terms of internodes/stalk. From results, it could be concluded that for practical purposes the row to row and interplant spacing should be 90 cm X 45 cm for transplanting sugarcane settlings during November.

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