

Effect of Different Planting Techniques on the Tillering and Productivity of Sugarcane

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ABSTRACT

An experiment was conducted to evaluate relative tillering and productivity of two sugarcane varieties Isd-16 and Isd-18 under three planting methods such as conventional, direct spaced planting (DSP) and spaced transplanting (STP) techniques. Maximum tillers ($234.64 \times 10^3/\text{ha}$) were produced in variety Isd-18 under DSP at SRTI farm. Closer interplant spacing resulted higher tiller mortality (44.0-58.5%) than wider interplant spacing (16-40%). Variety Isd-18 showed less tiller mortality than variety Isd-16 under STP technique. Both varieties suffered equally in respect of tiller mortality under conventional planting. Significantly higher millable stalks ($115.3 \times 10^3/\text{ha}$) were obtained in variety Isd-18 under DSP and the same showed better performance under STP at 60 cm interplant spacing at SRTI farm. The highest cane yield ($95.1-102.4 \text{ t/ha}$) was obtained in variety Isd-18 at both locations under STP with 60 cm interplant spacing. Mean stalk weight was affected by the interplant spacing, and recoverable sucrose percentage was found little higher under DSP/STP compared to conventional planting.

INTRODUCTION

In Bangladesh the major causes of poor sugarcane yield have been identified to be insufficient number of millable stalks per unit area and lower unit stalk weight (James, 1971; Mariotti, 1971; Matherne, 1974; Khairwal and Babu, 1975; Irvine *et al.*, 1980; Rahman *et al.*, 1987). Sugarcane yield directly depends on final millable canes at harvest which is mainly regulated by interrow spacing, variety grown and seed rate used (Bull, 1975; Kanwar and Sharma, 1974; Miah and Rahman, 1981). Stalk population increases per unit area as the interrow spacing decreases (Matheme, 1974;)

To increase sugarcane yield in sub-tropical Bangladesh through reducing tiller mortality and increasing millable stalks different planting/transplanting techniques and management practices have received considerable attention in recent years (Rahman and Rahman, 1979; Srivastava *et al.*, 1985; Tang and Chen, 1974; Rahman *et al.*, 1987; Miah and sarkar, 1982). However, till many questions to be answered. Therefore, the present investigation has been undertaken to evaluate relative tillering and productivity potential of two selected cane varieties under three different methods of planting such as conventional, direct spaced planting and spaced transplanting. In this experiment, tiller production, mortality trend across the season to contribute in ultimate millable canes and yield have critically been analysed.

MATERIALS AND METHODS

The experiment was conducted during 1986-87 crop season using two sugarcane varieties such as Isd-16 and Isd-18 at two sites (SRTI and JSM farms). There were three planting techniques such as conventional method of planting (three-budded setts, end to end), direct spaced planting (DSP) of two budded two setts placed at 45 cm distance and spaced transplanting of six weeks old settlings at 45, 60 and 90 cm interplant spacings. Thus the treatment combinations were as follows:

- T₁: Isd-16 × conventional
T₂: Isd-16 × DSP with 45 cm interplant spacing.
T₃: Isd-16 × STP with 45 cm interplant spacing.
T₄: Isd-16 × STP with 60 cm interplant spacing.
T₅: Isd-16 × STP with 90 cm interplant spacing.
T₆: Isd-18 × conventional.
T₇: Isd-18 × DSP with 45 cm interplant spacing.
T₈: Isd-18 × STP with 45 cm interplant spacing.
T₉: Isd-18 × STP with 60 cm interplant spacing.
T₁₀: Isd-18 × STP with 90 cm interplant spacing.

The experiment was set up in late October 1986. The row to row distance was maintained one meter and plot size was 8m x 7.2m. The treatments were replicated four (at SRTI) and three (JSM) times in a Randomized Block Design. Commercial fertilizers viz. Urea, Triple Super Phosphate (TSP) and Muriate of Potash (MP) were applied (at 200-160-220 kg of N, P₂O₅ and K₂O ha⁻¹ (at SRTI site) and @ 200-80-185 kg N, P₂O₅ and K₂O (JSM site) respectively. Necessary intercultural operations like weeding, mulching, irrigation, mechanical control of pests etc. were done as per normal practice.

RESULTS AND DISCUSSION

Tillering of sugarcane progressively increased upto April and May at JSM and SRTI locations respectively (data not shown), and there after it suffered a gradual reduction through tiller mortality. But the varieties studied differ in their response in respect of tiller mortality under different planting techniques except conventional and direct spaced planting (Figures 1 & 2). It is seen from the Figure 1 that tiller mortality percentage is higher in the variety Isd-16 compared to variety Isd-18 except in conventional planting. It is also evident that the highest mortality was obtained on direct spaced planting, and it gradually decreased as interplant spacing increased under STP techniques (Figure 1). Tiller mortality was found to be identical in DSP planting method in both the varieties and the lowest mortality was recorded in the variety Isd-18 under conventional and STP method at 90 cm interplant spacing (Figure 2). These results confirm our previous findings that tiller mortality is higher at closer spacing compared to wider spacing, and the tiller mortality is affected by method of planting as well as variety grown (Rahman *et al.*, 1987). Both the varieties showed similar response in case of tiller mortality under STP techniques although mortality percentage is lower in Isd-18 under wider spacing. Highest tiller mortality of 45.0-58.5% was recorded under closer interplant spacing, while wider interplant spacing resulted into 15.0-40.0% tiller mortality.

The highest number of tillers was obtained in the variety Isd-18 at SRTI in the month of May, while it was found at JSM in the month of April (Tables 1 & 2). Higher number of millable canes at harvest was obtained at SRTI in Isd-18 through higher tiller productions, while at JSM it was obtained through lower tiller mortality (Tables 1 & 2). This variation at different locations is not clearly understood.

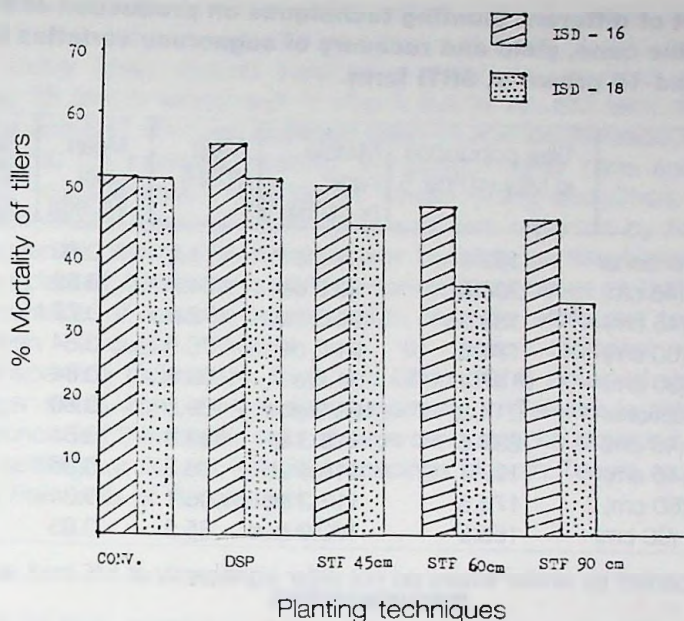


Figure 1. Tiller mortality of two sugarcane varieties (Isd-16 and Isd-18) under different planting techniques at SRTI farm (Ganges River Flood Plain soils).

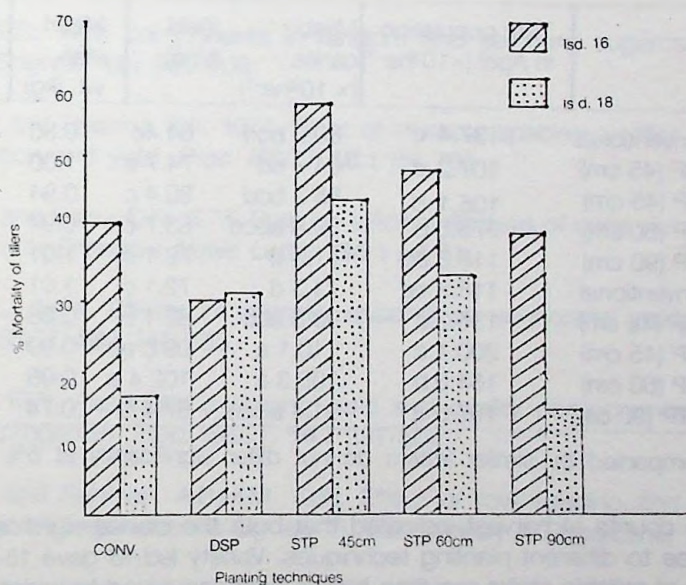


Figure 2. Tiller mortality of two sugarcane varieties (Isd-16 and Isd-18) under different planting techniques at JSM farm (Teesta Flood Plain Soils).

Table 1. Effect of different planting techniques on production of tiller, millable cane, yield and recovery of sugarcane varieties Isd-16 and Isd-18 grown at SRTI farm.

Treatments	Tiller population in May (10^3ha^{-1})	Millable cane ($\times 10^3\text{ha}^{-1}$)	Yield (TCH)	Mean stalk wt. (kg)	Recoverable able sucrose (%)
T ₁ =Isd-16 : Conventional	182.9	89.7 de*	71.5	0.80	8.7
T ₂ =Isd-16 : DSP (45 cm)	208.8	90.8 de	74.2	0.82	9.1
T ₃ =Isd-16 : STP (45 cm)	188.3	94.3 cde	72.8	0.77	9.0
T ₄ =Isd-16 : STP (60 cm)	171.6	91.2 de	76.9	0.84	8.9
T ₅ =Isd-16 : STP (90 cm)	147.4	81.5 e	68.3	0.84	9.3
T ₆ =Isd-18 : conventional	214.3	104.5 abc	89.5	0.80	8.2
T ₇ =Isd-18 : DSP (45 cm)	234.6	115.3 a	94.9	0.81	8.8
T ₈ =Isd-18 : STP (45 cm)	197.1	110.4 ab	88.3	0.80	8.4
T ₉ =Isd-18 : STP (60 cm)	174.5	113.2 ab	95.1	0.84	8.6
T ₁₀ =Isd-18 : STP (90 cm)	155.5	100.9 bcd	85.9	0.85	8.3

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

Table 2. Effect of different planting techniques on production of tiller, millable cane, yield and recovery of sugarcane varieties Isd-16 and Isd-18 grown at Jaipurhat Sugar Mills farm.

Treatments	Tiller population in April ($\times 10^3\text{ha}^{-1}$)	Millable canes ($\times 10^3\text{ha}^{-1}$)	Yield (t/ha)	Mean stalk wt. (kg)	Recoverable able sucrose (%)
T ₁ =Isd-16 : Conventional	137.4 c*	80.6 bcd	64.4c	0.80	8.1
T ₂ =Isd-16 : DSP (45 cm)	107.2 d	64.7 cd	74.7 c	1.00	9.2
T ₃ =Isd-16 : STP (45 cm)	105.1 d	85.2 bcd	80.4 c	0.94	8.7
T ₄ =Isd-16 : STP (60 cm)	175.6 b	89.8 abcd	83.7 bc	0.94	8.4
T ₅ =Isd-16 : STP (90 cm)	118.3 cd	71.3 d	72.1 c	1.01	8.8
T ₆ =Isd-18 : conventional	118.3 cd	71.3 d	72.1 c	1.01	8.8
T ₇ =Isd-18 : DSP (45 cm)	136.2 c	93.3 abc	82.1 c	0.88	8.8
T ₈ =Isd-18 : STP (45 cm)	200.1 a	110.1 a	99.0 ab	0.90	9.3
T ₉ =Isd-18 : STP (60 cm)	164.0 b	108.3 a	102.4 a	0.95	9.3
T ₁₀ =Isd-18 : STP (90 cm)	107.0 d	91.4 abcd	67.4 c	0.74	9.7

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

Millable cane counts at harvest indicated that both the clones significantly differed in their response to different planting techniques. Variety Isd-18 gave 15-25 $\times 10^3/\text{ha}$ higher number of millable stalks resulting higher yield compared to variety Isd-16 due to superior genetic potential to produce higher tillers with less tiller mortality at both locations. It was also found that spaced planting/transplanting showed better

performance in respect of millable stalks compared to the conventional method of planting. At SRTI location it was revealed that in respect of yield both the varieties responded better under spaced transplanting at 60 cm interplant spacing with the highest yield 95 t/ha in Isd-18 and 77 t/ha in Isd-16. At JSM farm, the highest yield of 102.4 t/ha and 83.7 t/ha was obtained in Isd-18 and Isd-16 respectively under STP technique at 60 cm interplant spacing. Significantly higher cane and sugar yield in transplanted sugarcane was reported in Taiwan (Tang and Chen, 1974). In India, higher millable stalks resulting higher yield was also reported by Narasiman *et al.*, (1981). Recoverable sucrose percentage was found to be little higher under spaced planting/transplanted canes compared to conventional canes at both locations. This higher percentage of sucrose accumulation may be attributed to higher rate of photosynthesis through efficient use of solar radiation under spaced planting/transplanting techniques. Tang and Chen (1974) obtained significantly higher (19.3%) sugar yields from transplanted sugarcane in Taiwan. In light of the above facts, it is concluded that higher yield of sugarcane may be obtained by transplanting sugarcane seedlings at 60 cm interplant spacings at both Teesta as well as Ganges River Flood Plain soils of Bangladesh.

REFERENCES

- Bull, T. A. 1975. Row spacing and potential productivity in Sugarcane. *Agron. J.*, 67 : 421-423.
- Irvine, J. E.; Benda, G.T.A. and Richard, C.A. 1980. Sugarcane spacing 1. Historical aspects. *Proc. ISSCT*, 17 : 350-356.
- James, N. 1971. Yield components in random and selected sugarcane population. *Crop Science*, 11 : 906-908.
- Kanwar, R.S. and Sharma, K.K. 1974. Effect of interrow spacing on tiller mortality, stalk population and yield. *Proc. ISSCT*, 15 : 151-155.
- Khairwal, I.S. and Babu, C.N. 1975. Path co-efficient analysis of cane yield in sugarcane. *Sugarcane Breeders News Letter*, 36 : 58-61.
- Matherne, R.J. 1974. Effects of interrow spacing on sugarcane yields in Louisiana. *Proc. ISSCT*, 15 : 746-750.
- Mariotti, J.A. 1971. Associations among yield and quality components in sugarcane hybrid progenies. *Proc. ISSCT*, 14 : 297-302.
- Miah, M.A.S. and Rahman, A.B.M.M. 1981. Effect of row spacing and seed rate on the yield of sugarcane variety Isd-16. *Bangladesh J. Sugarcane*, 3 : 33-36.
- Miah, M.A.S. and Sarkar, M.A.A. 1982. Effect of artificial defoliation and stalks binding on the cane quality. *Bangladesh J. Sugarcane*, 4 : 51-55.

- Narasiman, R.; Srivastava, K.K.; Shukla, R.K. and Singh, K. 1981. A Technology for rapid multiplication of seedcane. *Indian Sugar*, **34** (5) : 435-37.
- Rahman, A.B.M.M. and Rahman, M.M. 1979. Potential of spaced transplanting of sugarcane. *Bangladesh J. Sugarcane*. **1** : 50-53.
- Rahman, A.B.M.M. ; Matin, M.A. and Ali, M.Y. 1987. Tillering and productivity of Autumn and Summer transplanted sugarcane. *Bangladesh J.Sugarcane*, **9** : 1-8.
- Srivastava, A.K. ; Singh, K. and Saxena, Y.R. 1985. Production physiology of sugarcane cultivar Co. 1148. Tech. Bull. No. 15. Indian Institute of Sugarcane Research, Lucknow, India.
- Tang, K.H. and Chen, W.T. 1974. Studies on transplanting of sugarcane in Taiwan. *Proc. ISSCT*, **16** : 855-859.