

Effects of Tiller and Leaf Management in Sugarcane

M.A.S.Miah, M.A.Hossain and M.A.Matin

Sugarcane Research & Training Institute,
Ishurdi, Pabna, Bangladesh.

Received on 15.2.94

ABSTRACT

An investigation was conducted at Sugarcane Research & Training Institute (SRTI) farm to study the effects of tiller and leaf management in sugarcane yield and sugar recovery. Results showed that suppression and removal of late tillers and defoliation of 50% leaves had positive effects on yield and quality of sugarcane. Leaf and tiller management increased cane yield by 2-17 t. ha⁻¹ and sugar recovery by 0.3-0.7% over untreated check. The lowest tiller suppression and actual tiller mortality as well as the highest productivity were found in treatment where tiller removed by cutting in mid May leaving 8-10 tillers per clump. Leaf and tiller management might be practised to enhance both cane yield and sugar recovery in sugarcane production.

INTRODUCTION

Sugarcane has a vast tillering potential and tillers are structural and functional growth unit of sugarcane contribute to millable cane, and ultimately to yield. But all tillers produced do not turn into millable cane, and contributes to yield. Earlier studies of the authors showed that 14-78 percentage tillers die out as a result of interplant as well as intra clump competition for light, space and nutrients (Miah and Sarkar, 1982; Miah *et al.* 1983; Rahman and Matin, 1988; Miah *et al.* 1988; Matin *et al.* 1989). Tiller mortality for want of space, nutrients light and moisture has also been reported elsewhere (Anon. 1978; Singh and Singh, 1984; Srivastava *et al.* 1985). Mortality of tillers incurs huge loss of photosynthates resulting lower unit weight of millable cane. Earlier reports from this laboratory show that defoliation/detrashing and tiller management reduce tiller mortality and enhance cane yield and sugar recovery (Miah and Sarkar, 1981; 1982; Miah *et al.* 1988). Therefore, an investigation has been carried out to determine the effects of defoliation, late tiller cutting, tiller suppression by earthing up or tiller removal followed by tiller suppression by earthing up on ultimate millable cane production, yield and sugar recovery.

MATERIALS AND METHODS

A experiment was conducted at Sugarcane Research & Training Institute (SRTI) farm with sugarcane variety Isd-16. The experiment was laid out in RCB design with three replications and comprised the following treatments :

T_0 – Check (No tiller removal or suppression).

T_1 – Tiller suppression by earthing up in mid May.

T_2 – Tiller suppression by earthing up in mid June.

$T_3 = T_1 + T_2$.

T_4 – Tiller removal in mid May leaving 8-10 tillers per clump.

T_5 – Tiller removal in mid June leaving 8-10 tillers per clump.

$T_6 = T_4 + T_5$.

$T_7 = T_4 + \text{earthing up}$.

$T_8 = T_5 + \text{earthing up}$.

T_9 – Defoliation of 25% leaves in mid May and mid June.

T_{10} – Defoliation of 50% leaves in mid May and mid June.

T_{11} – Defoliation of 75% leaves in mid May and mid June.

Tiller suppression and removal were done by earthing up and tiller cutting respectively and defoliation of leaves was done from the lower part of stalks as scheduled for each treatment. Tiller count was taken at an interval of 15 d starting from 1st March. Maximum tiller number was recorded in the month of May. Millable cane, yield, unit stalk weight, and sucrose percentage by chemical analysis were recorded at harvest. Percentage of tiller suppression and actual tiller mortality were calculated as follows :

$$(a) \quad \text{Tiller Suppression (\%)} = \frac{\text{Tiller before suppression} - \text{Tiller after suppression}}{\text{Tiller before suppression}} \times 100$$

$$(b) \quad \text{Actual Tiller Mortality (\%)} = \text{Total mortality (\%)} - \text{Tiller suppression (\%)}.$$

RESULTS AND DISCUSSION

The results of the experiment have been presented in the Tables 1-2 and Figures 1-2. It is seen from the Table 1 that suppression and removal of late tillers and defoliation of upto 50% leaves have positive effects on yield and quality of sugarcane. The Table 1 shows that cane yield was increased by approximately 2-17 t. ha⁻¹ compared to check except where 75% leaves were cut off. Significantly higher yield of cane was obtained in a treatment where tiller suppression was done twice in the months of mid May and mid June followed by treatment having defoliation of 50% leaves (Table 1). Similar results were obtained in our earlier investigations where approximately 10 t. ha⁻¹ higher cane yield was obtained in treatments where tiller suppression or tiller removal was done twice in the months of April and June (Miah *et al.* 1988).

Table 1. Effects of tiller suppression and leaf defoliation on yield, unit stalk weight and sucrose % of sugarcane variety Isd-16.

Treatments	Yield (t.ha ⁻¹)	Unit stalk wt. (kg)	Recovery (%)
T ₀	80.7 bc	1.0	9.1
T ₁	88.3 abc	1.1	9.4
T ₂	86.7 abc	1.1	9.4
T ₃	97.2 a	1.1	9.4
T ₄	83.7 abc	1.0	9.6
T ₅	84.5 abc	1.1	9.5
T ₆	87.2 abc	1.1	9.7
T ₇	84.2 abc	1.1	9.4
T ₈	82.4 bc	1.1	9.1
T ₉	89.2 abc	1.1	9.7
T ₁₀	92.5 ab	1.1	9.8
T ₁₁	77.3 c	0.9	9.0

* Figures accompanied by same letters are not significantly different at 0.05 level as per DNMR test.

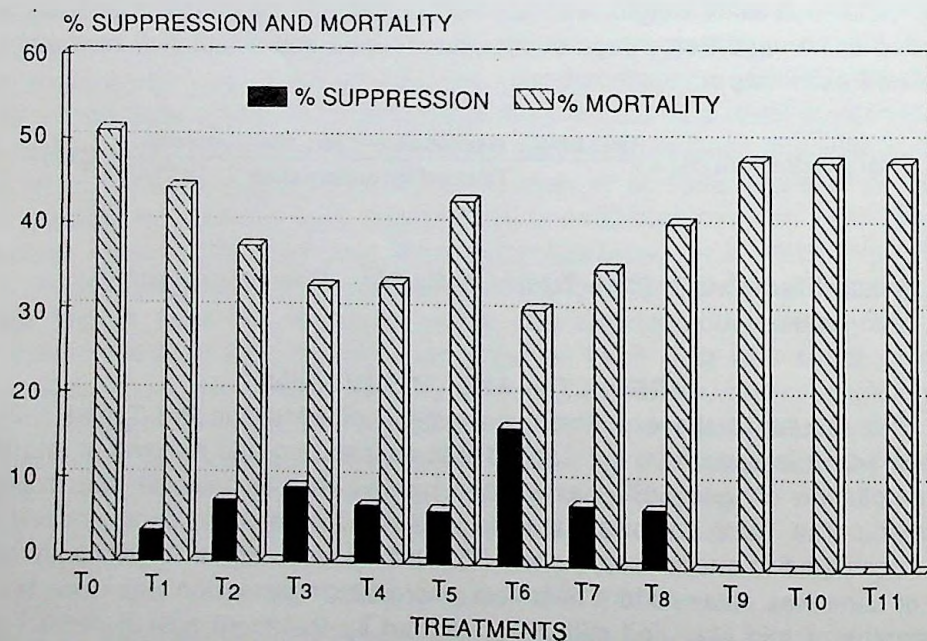


Figure 1. Effects of tiller suppression and tiller mortality at different treatments.

Table 2. Effects of tiller and leaf management on tiller mortality and productivity of sugarcane.

Treatments	Tiller ($\times 10^3 \text{ ha}^{-1}$)	Millable cane ($\times 10^3 \text{ ha}^{-1}$)	Tiller suppre- ssion (%)	Actual tiller mortality (%)	Total TS/TM (%)	Increased productivity (%)
T ₀	165.9	80.7	0.0	51.1	51.1	0.0
T ₁	160.6	80.2	3.6	44.3	47.9	3.2
T ₂	145.8	78.8	7.4	37.5	44.9	6.2
T ₃	151.3	88.4	9.0	32.7	41.7	9.4
T ₄	141.2	83.7	6.8	33.1	39.9	11.2
T ₅	153.8	76.8	6.3	42.9	49.2	1.9
T ₆	148.5	79.2	16.1	30.3	46.4	4.7
T ₇	160.7	76.5	7.3	34.9	42.2	8.9
T ₈	141.8	74.9	6.9	40.4	47.3	3.8
T ₉	155.6	81.0	0.0	47.8	47.8	3.3
T ₁₀	160.9	84.1	0.0	47.6	47.6	3.5
T ₁₁	164.2	85.9	0.0	47.5	47.5	3.6
LSD (0.05)	28.0	11.0	4.4	8.3	—	—

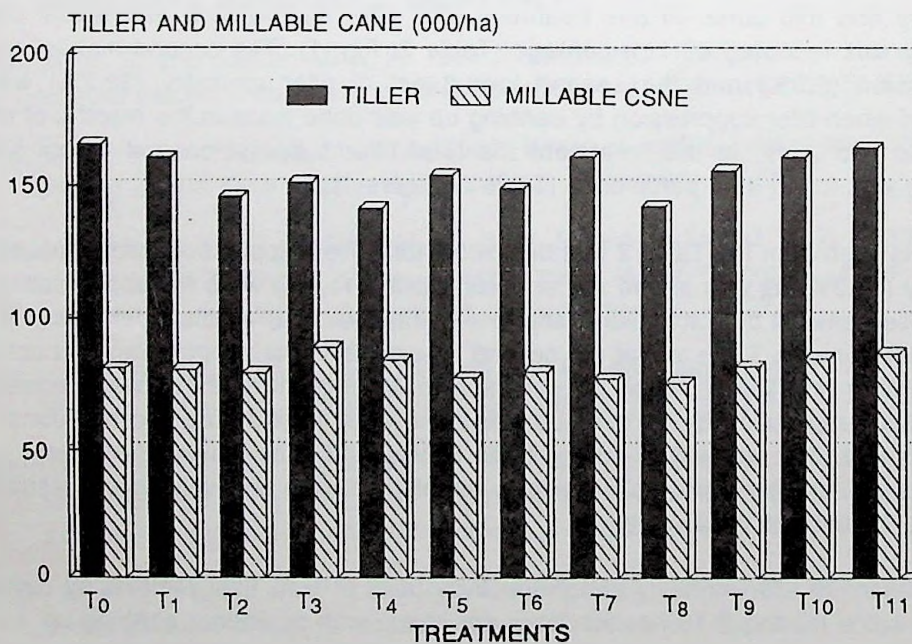


Figure 2. Effects of different treatments on tiller and millable cane production.

The table also shows that late tiller suppression or tiller removal or defoliation of upto 50% leaves have positive effects on sucrose accumulation, and recorded 0.3 to 0.7 percentage higher sugar recovery compared to check except in treatments where tiller removal followed by earthing up was done in mid June as well as 75% leaves defoliation. Higher sugar recovery obtained when 25-50% leaves or late tiller removed in mid May and in mid June. Similar results were also obtained in our earlier studies, and found significantly higher sugar recovery in tiller suppression made twice in the months of April and June, and tiller removal by cutting leaving 8-10 tiller per clump (Miah *et al.*, 1988). The tiller suppression or tiller removal and defoliation upto 50% leaves have contributed to unit weight of stalks except where 75% leaves were defoliated, and removal of tiller in mid May leaving 8-10 healthy tillers per clump.

The Table 2 and Figure 2 show that the highest millable cane was obtained when tiller suppression was done twice in mid May and mid June. The second highest millable cane was recorded in treatment where 75% leaves were defoliated followed by 50% leaves defoliation. Similar results were recorded in our earlier studies (Miah *et al.* 1988). Positive effects of upto 50% leaves defoliation were obtained in our earlier investigation (Miah and Sarkar, 1981; 1982).

The highest tiller suppression (16.1%) and the lowest actual tiller mortality (30.3%) were obtained when tiller removal by cutting was done twice in the months of mid May and mid June. In this treatment total tiller suppression and actual tiller mortality was recorded 46.4 percentage (Table 2, Fig. 1). The second highest tiller suppression (9.0%) and the second lowest actual tiller mortality (32.7%) were recorded when tiller suppression by earthing up was done twice in the months of mid May and mid June. In this treatment the total tiller suppression and actual tiller mortality was found 41.7 percentage (Table 2, Figure 1).

It is seen from the Table 2 that the lowest total tiller suppression and actual tiller mortality (39.9%) as well as the highest productivity (11.2%) were found in treatment where tiller removal by cutting was done in mid May leaving 8-10 tillers per clump. It is also seen from the Table 2 that the second lowest total tiller suppression and actual tiller mortality (41.7%) as well as the second highest productivity (9.4%) were recorded when tiller suppression by earthing up was done twice in mid May and mid June. It indicates that tiller removal by cutting twice in May and June leaving 8-10 tillers per clump as well as tiller suppression twice by earthing up were relatively severe resulting lower contribution to productivity.

Regarding tiller mortality and productivity point of view tiller removal by cutting once or twice leaving 8-10 healthy tillers per clump with or without earthing up, tiller suppression once or twice by earthing up and defoliation are superior practices over no tiller and leaf management (Table 2).

It is seen that tiller and leaf management in sugarcane has positive effects on tiller mortality, millable cane, yield and sugar recovery. Due to tiller and leaf management tiller mortality reduced, and millable cane production, productivity and ultimately cane yield and sugar recovery were increased. Therefore, sugarcane grower may be advised to remove late tillers by cutting and harvested tillers may be used as fodder or fuel. Since defoliation of upto 50% leaves had the highest positive impact on sugar recovery, sugarcane growers may be given incentive to defoliate upto 50% lower leaves in may and in June, and the green leaves may be used as cattle feed.

Therefore, it is recommended that tiller management through tiller suppression by earthing up or removal of late tillers by cutting or tiller removal followed by earthing up and defoliation of upto 50% leaves may be practised for higher cane yield and sugar recovery. Green leaves and late tillers may be used as cattle feed.

REFERENCES

- Anonymous, 1978. Annual Report 1978. Indian Institute of Sugarcane Research. Lucknow, India. p. 31.
- Matin, M. A.; Hossian, M. A. and Miah, M. A. S. 1989. Tiller dynamics in sugarcane variety Isd-16. *Bangladesh J. Sugarcane*, 11 : 1-6.
- Miah, M. A. S. and Sarkar, M. A. A. 1981. Preliminary investigation on the effect of artificial defoliation on cane quality. *Bangladesh J. Sugarcane*, 3 : 55-57.
- Miah, M. A. S. and Sarkar, M. A. A. 1982. Effect of artificial defoliation and stalk binding on the cane quality. *Bangladesh J. Sugarcane*, 4 : 51-55.
- Miah, M. A. S.; Saha, S. C.; Rahman, S. B. M. F. and Sarkar, M. A. A. 1983. Effect of enhanced N and P on the millable cane in Isd-16 grown under spaced transplanting condition. *Bangladesh J. Sugarcane*, 5 : 23-27.
- Miah, M. A. S.; Matin M. A. and Hossain, M. A. 1988. Optimization of productive tillers in sugarcane. *Bangladesh. J. Sugarcane*, 10 : 114-116.
- Rahman, A. B. M. M. and Matin, M. A. 1988. Influence of different planting techniques on the tillering, tiller mortality and production of millable stalks in two selected sugarcane clones. *Bangladesh J. Sugarcane*, 10 : 117-119.
- Singh, R. P. and Singh, P. P. 1984. Studies on growth and dry matter accumulation under different canopy structures in sugarcane. *Indian Sugar*, 34 (7) : 563.
- Srivastava, A. K.; Singh, K. and Saxena, Y. R. 1985. Production physiology of sugarcane cultivar Co 1148. IISR, Lucknow, India. p. 59.