

Effects of Earthing-up and Tying on the Yield of Cane and Sugar

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ABSTRACT

An experiment was conducted at the Bangladesh Sugarcane Research Institute farm during 1992-93 crop season to study the effect of earthing-up and tying on the yield of cane and sugar. Growth parameters like tiller and millable cane production were found to be influenced by the earthing-up and tying operations. The maximum cane and sugar yield with the highest additional income were obtained from two earthing-up (May and June) and wrapping as conventional practice. This was followed by two earthing-up (May and June) but without tying, and one earthing-up in May and one tying in August. The minimum cane and sugar yield with the lowest additional income were obtained from the control plot. Converted sugar yield from recoverable sucrose (%) was found to be largely affected by earthing-up and tying operations.

INTRODUCTION

Sugarcane (*Saccharum officinarum*, L.) is a long duration crop usually requiring 12 to 15 months to mature. It requires proper care and management for its normal growth and development as well as for obtaining higher yield. Cultural practices like date of planting/transplanting, soil moisture level, earthing-up and tying play vital role in the production of higher number of millable cane stalks and cane yield (Matin *et al.* 1989). The major objective of the sugarcane improvement programme is to increase sugarcane yield not only through breeding of the improved varieties but also through various cultural practices (Oworu, 1985). Earthing-up is one of the important cultural practices recommended for increasing cane and sugar yield by preventing lodging of cane (Yadava, 1993). Parwar (1983) reported that the yield of cane is increased with earthing-up than without it. Lodging of sugarcane occurs due to natural hazards and the magnitude of deterioration of cane quality depends on the degree of lodging (Parthasarathy and Rao, 1953). Purty (%) and recovery (%) of cane juice are significantly higher in erect canes compared with the lodged canes (Jabber *et al.* 1987). In sugarcane, lower portion of the stalk is associated with less fibre and lower sugar when lodging occurs (Borden, 1942). Erect canes are superior to partially lodged canes both in yield and juice quality. Delayed maturity is often associated with deterioration in lodged canes (Anon., 1971).

Sometimes only earthing-up cannot protect lodging of canes and the growers protect their crops by tying or wrapping the stools (Anon., 1992). Comparative studies on the performance of different combinations of earthing-up and tying have not yet been done in

respect of their impact on sugarcane production. Therefore, the present study was undertaken to determine the effect of earthing-up and tying on the yield of cane and sugar. Also the economic benefit of earthing-up and tying on sugarcane production was aimed to analyze.

MATERIALS AND METHODS

An experiment was conducted at the Bangladesh Sugarcane Research Institute Farm, Ishurdi, Pabna during 1992-93 crop season. This study was conducted under irrigated condition. High land free from flood was used for this experiment and was prepared by mechanical plough. The size of the individual plot was 12 m x 8m. Sugarcane variety Isd 16 was used as the test crop. Commercial fertilizers viz. urea, triple superphosphate, murate of potash and gypsum were applied @ 160, 53, 93 and 30 kg ha⁻¹ for N, P₂O₅, K₂O and S respectively. Recommended cultural practices like weeding, top dressing of fertilizers, irrigation and pest control etc. were done as per requirement of the experiment. For chemical control of pest, Furadan 5G @ 100 kg ha⁻¹ was used for all plots.

The experiment was laid out in a randomized complete block design with three replications. The following treatments were included in this experiment

- T₁: No earthing-up and no tying (control).
- T₂: No earthing-up but single tying in August.
- T₃: No earthing-up with two tyings in July and August.
- T₄: No earthing-up but wrapping as conventional practice.
- T₅: Single earthing-up in May but no tying.
- T₆: Single earthing-up in May and single tying in August.
- T₇: Single earthing-up in May and two tyings in July and August.
- T₈: Single earthing-up in May and wrapping as conventional practice.
- T₉: Two earthing-up in May and June but without tying.
- T₁₀: Two earthing-up in May and June and single tying in August.
- T₁₁: Two earthing-up in May and June, and two tyings in July and August.
- T₁₂: Two earthing-up in May and June, and wrapping as conventional practice.

Data on tiller production at 120 days after planting and millable cane stalks at harvest of cane were taken. Both the tiller population and millable cane stalks were expressed as 1000 ha⁻¹. The yield of sugarcane was also recorded at final harvest and it was expressed as tons ha⁻¹. Unit stalk weight of cane was calculated at harvest by dividing the weight of cane stalks from yield sample by the number of cane stalks and it was expressed as g per cane stalk. Yield of sugar was calculated from the cane yield data and recoverable sucrose (%). The sugar yield was also expressed as tons ha⁻¹. Additional cost due to the different treatments under investigation was calculated along with additional income for the various treatments compared to control. Necessary data were analyzed statistically.

RESULTS AND DISCUSSION

The Figure 1 shows the effect of earthing-up and tying on the tiller population of sugarcane. Tying and wrapping did not show any significant effect on the tiller population. But earthing-up showed a significant effect on tiller production. Higher the number of earthing-up, lower was the tiller population. Maximum suppression on the tiller production was observed in case of two earthing-up without any tying (T_9 treatment) while the minimum suppression was found in no earthing-up and single tying treatment (T_2). Furthermore, it was noticed that earthing-up was more effective than tying in respect of tiller suppression. It is revealed from the Figure 2 that no earthing-up, two tyings can increase millable cane production significantly ($P \leq 0.05$) compared to no tying treatment (T_5). But one tying or wrapping without earthing-up (T_2 and T_4 treatments) failed to increase millable cane production significantly over the no earthing-up and no tying treatment (T_1). Furthermore, single earthing-up without tying (T_5 treatment) or any level of tying (T_6 and T_7 treatments) or wrapping (T_8 treatment) also significantly improved the millable cane production compared with the no earthing-up and no tying treatment (T_1). Significantly, maximum millable cane production ($97.6 \times 1,000 \text{ ha}^{-1}$) was observed when two earthing-up without tying (T_9) or with wrapping (T_{12}) were done compared to control plot (T_1 , $66 \times 1,000 \text{ ha}^{-1}$).

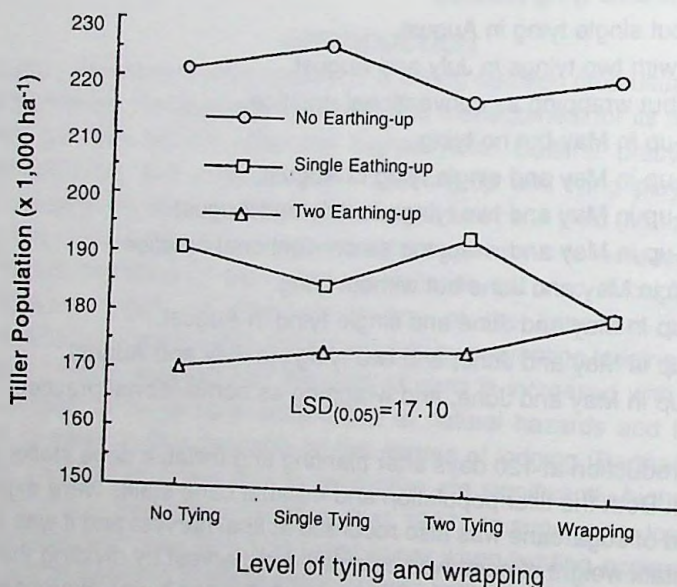


Figure 1. Effects of earthing-up and tying on the tiller population of sugarcane.

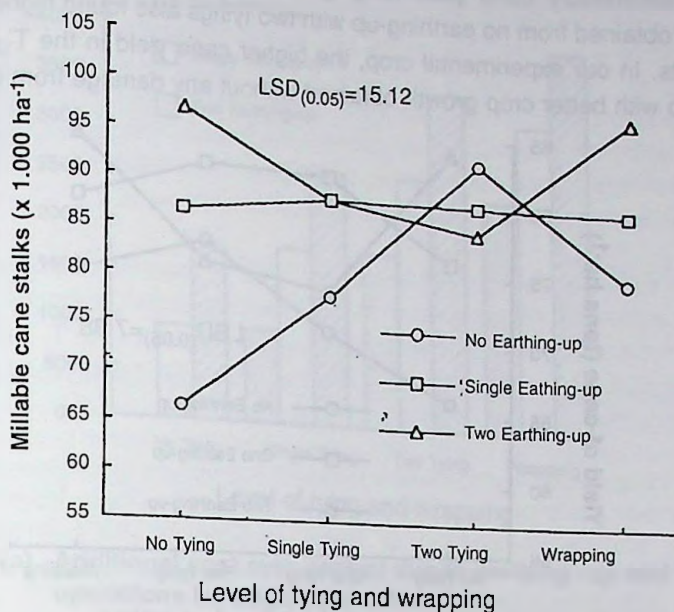


Figure 2. Effects of earthing-up and tying on the millable cane stalks production of sugarcane.

The unit stalk weight of sugarcane was found to be greatly affected by the earthing-up and tying operations. The maximum unit stalk weight of 991.0 g was recorded from the control plots (no earthing-up and no tying, T_1). On the contrary, the minimum unit stalk weight of 831.0 g was obtained from the T_3 treatment where two tyings without any earthing-up were done. However, a consistent relationship was not found between the unit stalk weight of cane and the level of different treatment combinations of earthing-up and tying.

The Figure 3 indicates the yield of sugarcane under different combinations of earthing-up and tying operations. Two earthing-up with wrapping (T_{12}) gave significantly the highest cane yield (84.2 tons ha^{-1}) followed by two earthing-up without tying (T_9) while the control plots (no earthing-up and no tying, T_1) gave the lowest cane yield (66.0 tons ha^{-1}). Parwar(1983) and Yadava (1993) reported that earthing-up showed positive contribution on sugarcane yield. They also observed that tying and wrapping could be good practices for improving cane quality by reducing the possibility of cane lodging. The highest cane yield in the T_{12} and T_9 treatments was attributed to the number of millable cane compared to the control and other plots. Furthermore, it is evident from the Figure 3 that single earthing-up with a single or two tying operations (T_6 and T_7 treatments) also

produced satisfactory cane yield ranging from 82.0 to 82.5 tons ha^{-1} . The yield of sugarcane obtained from no earthing-up with two tyings also found higher than that of the control plots. In our experimental crop, the higher cane yield in the T_{12} plot might have relationship with better crop growth obtained without any damage from cane lodging.

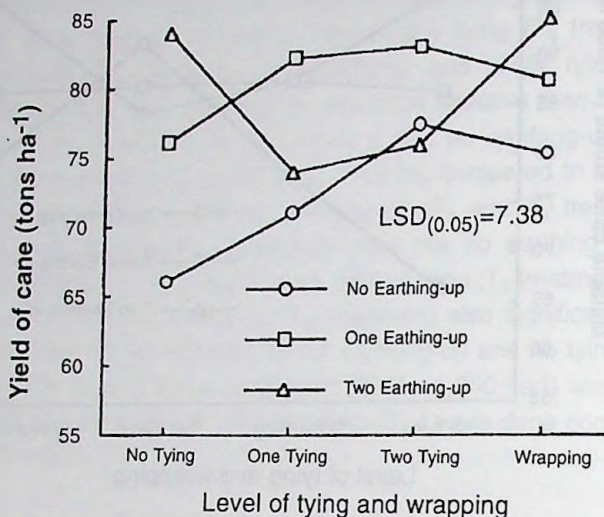


Figure 3. Effects of earthing-up and tying on the yield of sugarcane.

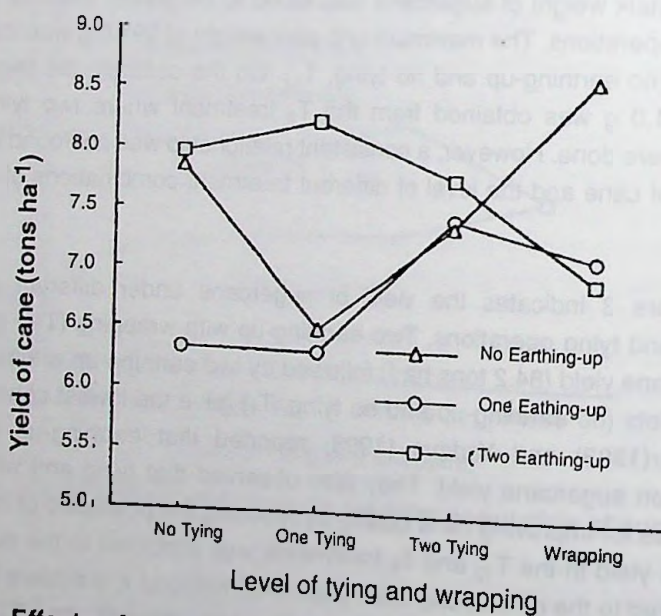


Figure 4. Effects of earthing-up and tying on the yield of sugar.

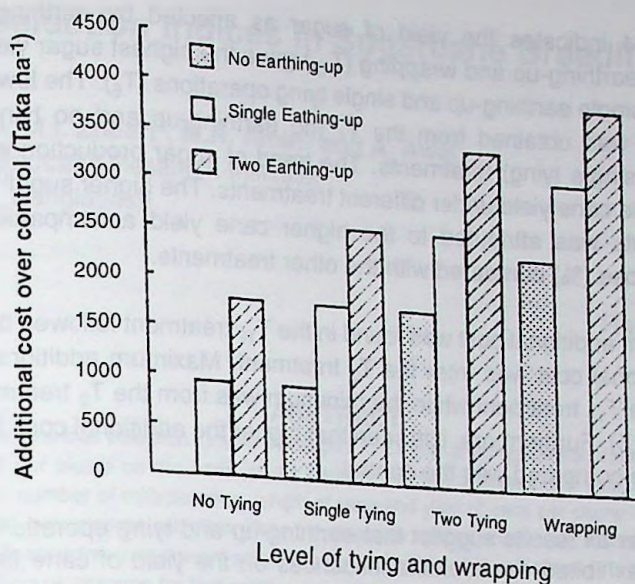


Figure 5(a). Additional cost over control due to earthing -up and tying operations for sugarcane cultivation.

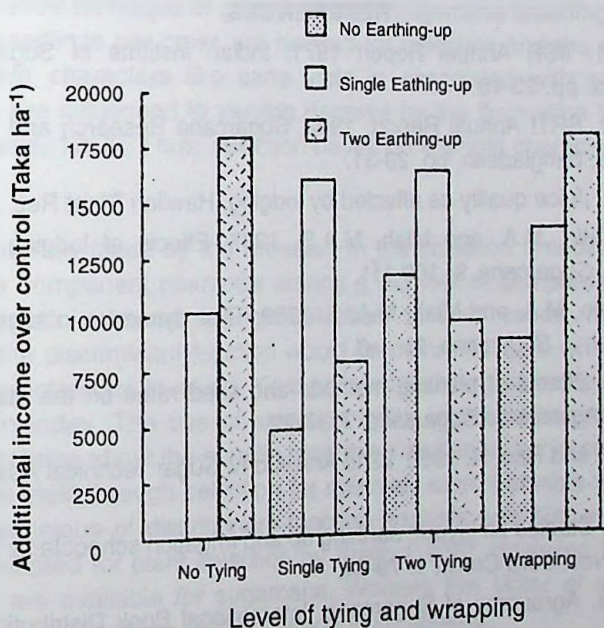


Figure 5(b). Additional income over control due to earthing-up and tying operations for sugarcane cultivation.

The Figure 4 indicates the yield of sugar as affected by earthing-up and tying operations. Two earthing-up and wrapping (T_{12}) gave the highest sugar yield of 8.54 tons ha^{-1} followed by single earthing-up and single tying operations (T_6). The lowest sugar yield of 6.0 tons ha^{-1} was obtained from the T_1 (no earthing-up and no tying) and T_2 (no earthing-up and single tying) treatments. The trend of sugar production was very much consistent with the cane yield under different treatments. The higher sugar yield in the T_{12} and T_6 treatments was attributed to the higher cane yield accompanied with higher recoverable sucrose (%) compared with the other treatments.

The maximum additional cost was found in the T_{12} treatment followed by the T_{11} while the lowest additional cost was from the T_2 treatment. Maximum additional income was obtained from the T_{12} treatment while the minimum was from the T_2 treatment compared to control (Figure 5). Furthermore, it is seen that higher the additional cost, higher was the additional income compared with the control.

Thus, the over all results suggest that earthing-up and tying operations done during cane cultivation exhibited considerable influences on the yield of cane and sugar. Two earthing-up and wrapping (T_{12}) or single earthing-up and two tying (T_7) can be recommended for obtaining higher sugar yield and maximum economic benefit from sugarcane cultivation in the farmers condition.

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