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Tiller Dynamics in Sugarcane Variety Isd-16

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ABSTRACT

An experiment was conducted to study the tiller dynamics in sugarcane variety Isd-16 under different planting/transplanting techniques such as planting of three-budded setts, paired spaced planting of two-budded setts, planting of plant settlings and spaced transplanting of soil bed and polybag settlings. Monthly counts on tiller production showed maximum tiller population in May irrespective of planting/transplanting techniques which gradually declined due to mortality of tillers thereafter. Higher tiller was obtained from transplanted settlings compared to direct planted two/three-budded setts. Tillers produced by May, 65-78% of them died till harvest in December, and only 22-35% tillers become millable canes. The present findings sought for research attention towards manipulation of soil and nutrition levels as well as improved management practices on tillers for maximizing millable canes to contribute in sugarcane yield.

INTRODUCTION

Tillers are the principal functional unit of sugarcane contribute to millable canes, and ultimately to yield. Sugarcane has a vast potentiality of producing 70 tillers from a single bud (Nickel, 1977) but all tillers produced do not necessarily develop into millable canes and contribute to yield resulting a huge loss of photosynthate and applied nutrients. Earlier studies of the authors and elsewhere showed that 20-61 percentage tillers die as a result of interplant competition for light, space, nutrients, and moisture (Anon., 1981; Miah and Sarkar, 1982; Srivastava *et al.*, 1985; Miah *et al.* 1983; Rahman *et al.* 1987; Rahman and Matin, 1988).

Production of tillers are affected by several factors such as date of planting/ transplanting, variety, spacing, nutrition, soil moisture level, intercultural operations etc. Tillering of Autumn-planted cane may progressively continue until May and there after it suffers from a gradual reduction with concomitant increase in tiller mortality. Tiller production and degree of its survivality are also linked with planting/transplanting techniques (Kanwar and Sharma, 1974; Miah and Sarkar, 1982; Rahman *et al.*, 1987). In recent past some attention was given to understand means to increase tiller production with the hope to get higher millable canes and yield. However, earlier findings showed that higher production of tillers do not contribute much to ultimate yield due to higher rate of mortality of late tillers. Therefore, the present investigation was undertaken to study the tiller production, tiller mortality, and development of tillers into millable canes under different planting/transplanting techniques in sugarcane variety Isd-16.

MATERIALS AND METHODS

An experiment was conducted at Sugarcane Research and Training Institute (SRTI) farm with the variety Isd-16. The experiment was laid out in a Randomized Complete

Block Design with three replications. Row to row distance was maintained one meter, and inter-plant spacing 60 cm at 8m×9m plot. Five different sources of planting materials were used such as plant settlings, two-budded setts, three-budded setts, soil bed settlings and polybag settlings. Plant settling refers to the settlings raised through detopping of standing sugarcane in the field.

Variable plant densities were maintained using variable number of buds/settlings per hill. One irrigation was applied after planting/transplanting to ensure germination of setts, and establishments of settlings. NPK fertilizers at the rate of 152:54:92 kg/ha were applied according to normal practice. Necessary intercultural operations like weeding, mulching, supplimentary irrigation, pests and diseases control etc were done. The experiment comprised of the following nine treatment combinations :

T_1 = Planting of three-budded setts (end to end placement).
T_2 = Paired spaced planting of two-budded setts (PSP.)
T_3 = Planting of single Plant settling per hill (PS-One).
T_4 = Planting of two Plant settlings per hill (PS-Two).
T_5 = Planting of three Plant settlings per hill (PS-Three).
T_6 = Transplanting of one two-budded soil bed settlings per hill (SBS-Single).
T_7 = Transplanting of two two-budded soil bed settlings per hill (SBS-Two).
T_8 = Transplanting of one polybag settling per hill (PBS-single).
T_9 = Transplanting of two polybag settlings per hill (PBS-two).

Data on tiller production and mortality were recorded in every months in each treatment. Mortality of tiller was determined according to Miah and Sarkar (1982). Final millable canes were recorded at harvest.

RESULTS AND DISCUSSION

Results on monthly tiller production indicated that all the methods of planting/transplanting attained their peak tiller population during the month of May, and thereafter a gradual reduction with increase in tiller mortality was found until harvest (Figure 1). Similar trend in tiller production and its mortality across the growing season for autumn planted cane was reported earlier (Miah and Sarkar, 1982; Rahman *et al.* 1987). The Figure 1 shows that among all planting/transplanting techniques, polybag settlings transplanted at the rate of two settlings per hill gave the highest tiller population (282.4×10^3/ha) followed by three plant-settlings per hill. The lowest tiller populations (125.4×10^3/ha) were obtained from paired spaced planting of two-budded setts. The figure also shows that density of settlings per hill exerted a significant positive influence on tiller production. Higher the density of settlings per hill, higher was the production of tillers. However, higher bud density per hill failed to give higher tiller population. The figure also shows that single polybag settling per hill produced the highest tiller (199×10^3/ha) followed by single plant settling (159×10^3/ha) and two-budded single soil-bed settlings (144×10^3/ha). Rao and Prasad (1962) reported that apart from inherent capacity of variety and methods of planting, tillering of sugarcane is usually influenced by several other factors such as light, nutrient level, time of planting, soil moisture etc.

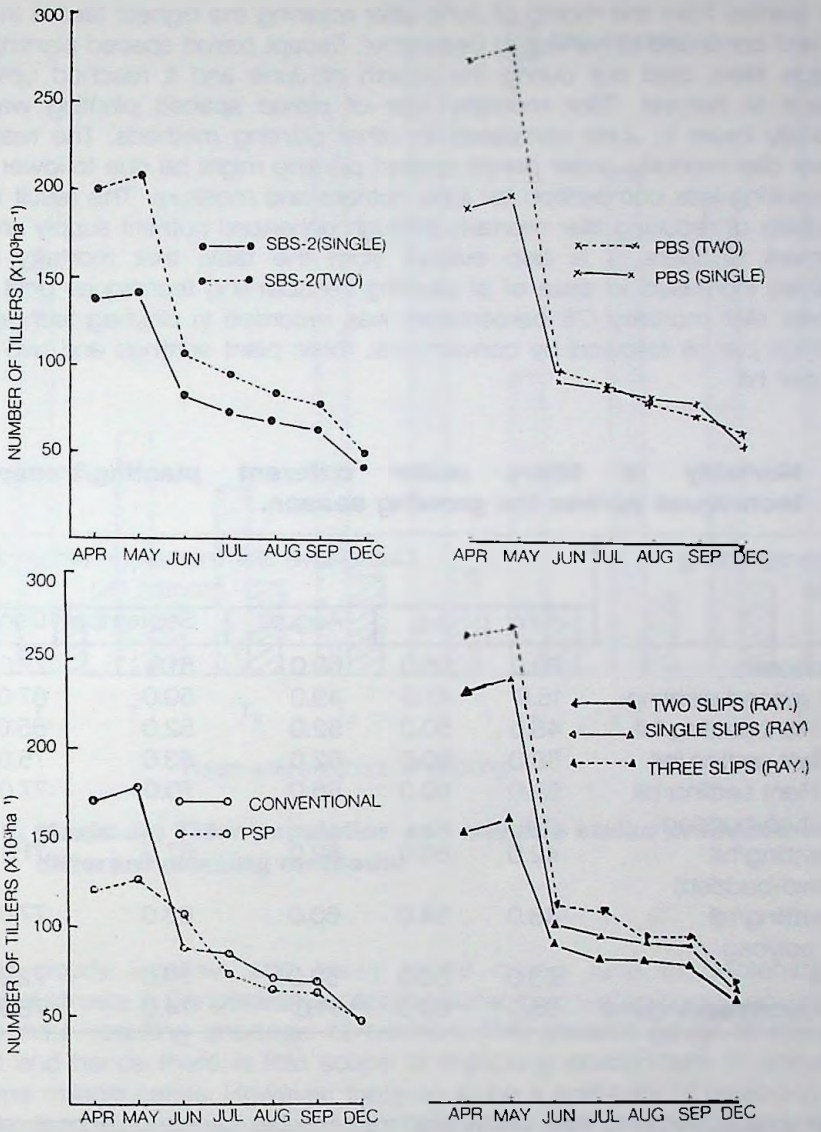

Figure 1. Tiller dynamics of variety lsd-16 under different planting techniques.

The mortality of tillers has been presented in the Table 1. The table shows that tiller mortality started from the month of June after attaining the highest tiller in the month of May, and continued till harvest in December. Except paired spaced planting, 42-65 percentage tillers died out during the month of June and it reached upto 65-78 percentage till harvest. Tiller mortality rate of paired spaced planting was found exceptionally lower in June compared to other planting methods. The reasons for such lower tiller mortality under paired spaced planting might be due to lower number of tiller resulting less competition for light, nutrient and moisture. This result indicates the possibility of reducing tiller mortality through enhanced nutrient supply and better management of tillers. It is also evident from the table that mortality of tillers progressively increased in case of all planting/transplanting techniques untill harvest. The highest tiller mortality (78 percentage) was recorded in ploybag technique with two settlings per hill followed by conventional. three plant settlings and two soil bed settlings per hill.

Table 1. Mortality of tillers under different planting/transplanting techniques across the growing season.

Planting/transplanting techniques	Cumulative tiller mortality in different months (%)				
	June	July	August	September	December
T_1-Conventional	50.0	55.0	60.0	61.0	77.0
T_2-Paired spaced planting	15.0	47.0	49.0	50.0	67.0
T_3-Single Plant settling/hill	45.0	50.0	52.0	52.0	65.0
T_4-Two Plant settling/hill	58.0	60.0	62.0	63.0	75.0
T_5-Three Plant settling/hill	59.0	60.0	66.0	70.0	77.0
T_6-Single (two-budded) soil bed settling/hill	42.0	50.0	52.0	57.0	71.0
T_7-Two (two-budded) soil bed settling/hill	48.0	54.0	60.0	63.0	77.0
T_8-Single polybag settling/hill	53.0	56.0	58.0	59.0	72.0
T_9-Two polybag settlings/hill	65.0	69.0	71.0	74.0	78.0

The tiller production and their conversion into millable canes have been shown in the Figure 2. The figure shows that 22-35 percentage of tillers become millable canes, and contributed to yield. It can also be seen from the figure that higher rate of tiller production had little contribution on ultimate millable cane production. This trend of tillers production and their mortality indicate that autumn planted/transplanted sugarcane is getting adequate time and environment to produce sufficient tillers but there are certain limitations to convert tiller into millable canes. These limitations probably includes soil and environments, and present level of tiller management practices. Environmental factors such as rainfall, sunshine hour, humidity have direct influence during elongation phase after tillering phase upto end of May.

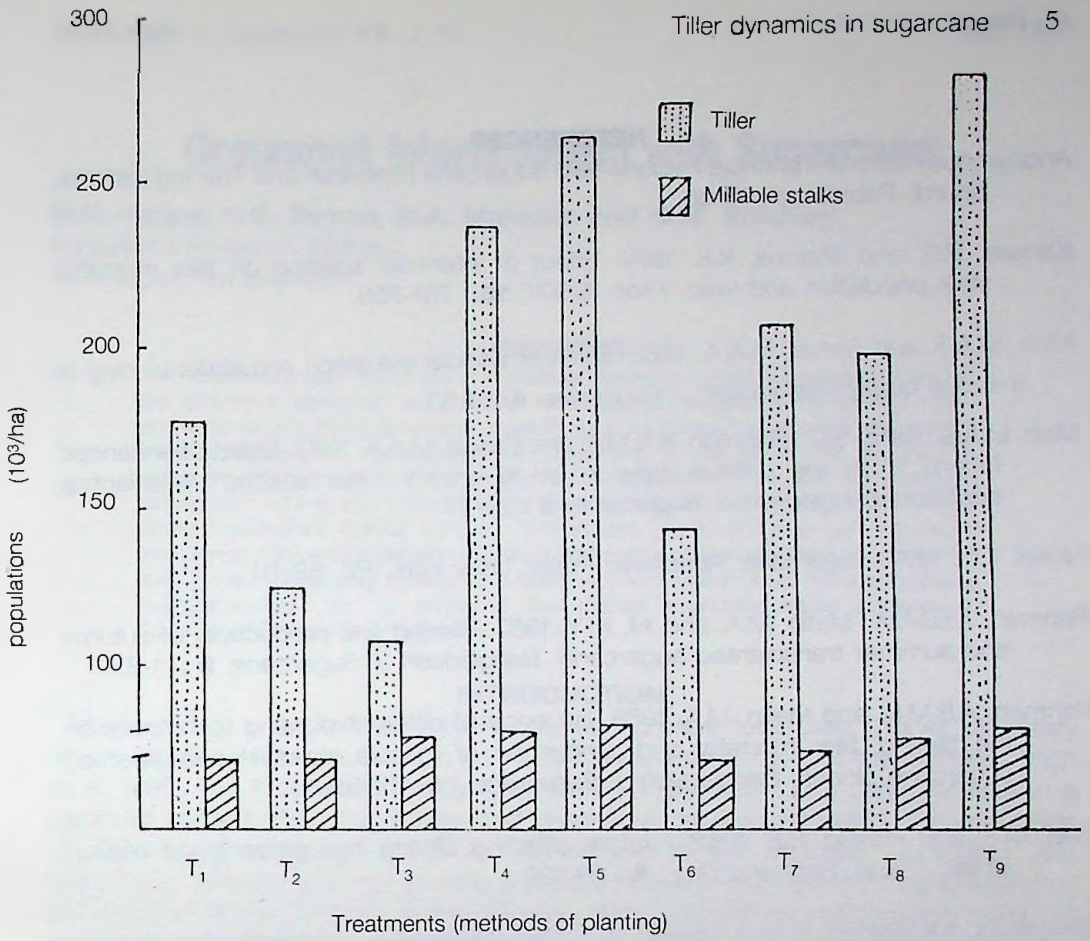

Figure 2. Maximum Tiller population and millable stalks produced under different planting methods.

Due to cloudy weather, and heavy rainfall during June to September under sub-tropical climate in Bangladesh sugarcane suffer from water-logging and insufficient sunshine hour resulting shortage of nutrition. This situation cannot be regulated or changed and hence there is little scope of improving environment to enforce tillers to become millable canes. However, there could be a possibility of improving nutrition level through manipulation of soil condition and application of higher dose of nutrients. Improvement in tiller management practices can be done so that tiller can be enforced to become millable canes.

The present results indicate some possibilities of increasing millable canes production through increasing planting/transplanting density per hill. However, the information regarding the inter-plant spacing with higher planting density per hill is till lacking. Therefore, present finding sought for directing research attention towards manipulation of soil and nutrition level as well as improvement in tiller management practices for maximizing millable canes to contribute in ultimate sugarcane yield.

REFERENCES

Anonymous, 1981. SRTI Annual Report 1981. Sugarcane Research and Training Institute, Ishurdi, Pabna. pp. 35-36.

Kanwar, R.S. and Sharma, K.K. 1974. Effect of inter-row spacing on tiller mortality, stalk population and yield. *Proc. ISSCT*, **15 :** 751-755.

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.

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.

Nickel, L.G. 1977. Sugarcane. Academic Press, New York. PP. 89-111.

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.

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* **9** *117-119.*

Rao, M.S. and Prasad, R.B. 1962. Factors affecting tillering in sugarcane - A review. Indian J. Sug. Res. and Dev., **6 :** 96-100.

Srivastava, A.K. ; Singh, K. and Saxena, Y.R. 1985. Production physiology of sugarcane cultivation Co. 1148. Indian Institute of Sugarcane Research. Lucknow, India. 128 P.