

Comparative Performance of Newly Released Sugarcane Varieties in Southern Region of Bangladesh

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ABSTRACT

An experiment was conducted at growers' field in Babuganj, Barisal under irrigated condition during 2003-2004 cropping season to study the performance of nine newly released sugarcane varieties viz. Isd 21, Isd 24, Isd 26, Isd 29, Isd 30, Isd 31, Isd 32, Isd 33 and Isd 34. Isd 16 was used as standard variety for comparison. It was found that all the test varieties except Isd 26 produced significantly higher cane yield compared to standard variety Isd 16. The highest (163.50 t ha⁻¹) cane yield was produced by variety Isd 31 followed by Isd 32 (159.10 t ha⁻¹), Isd 33 (144.40 t ha⁻¹) and Isd 34 (133.00 t ha⁻¹). The highest brix 22.33 % was obtained from variety Isd 33 followed by Isd 24 (21.17 %) and Isd 30 (21.17 %) while the lowest (18.83 %) was recorded from variety Isd 32. In terms of economic return, the variety Isd 31 showed higher benefit cost ratio of 3.52 followed by Isd 32, Isd 33 and Isd 34. Thus, the sugarcane varieties Isd 31, Isd 32, Isd 33 and Isd 34 may be cultivated in southern region of Bangladesh for higher economic benefit.

Key words : Sugarcane varieties, performance, southern region, brix

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is a vegetatively propagated perennial crop. The sugarcane yield of a particular variety depends upon the heredity potential of the genotype and the environment where it is exposed during the course of its life cycle (Yadava, 1993). Variety of a crop plays an important role as regards to the yield and quality, sugarcane is no exception (Anon.1978). Although most of the varieties of sugarcane now grown in the sugar mill zones of Bangladesh are recommended for cultivation but a promising variety may not show better performance in all the ecological zones due to variations of Agro-climatic factors (Anon.1979). Moreover, sugarcane varieties gradually degenerate over a considerable period of cultivation and show a tendency to decline in yield and vigour (Barnes, 1954 and Humbert, 1959). The highest number of millable cane, height and girth might have contributed to cane yield as reported by Singh and Sangwan (1980). Miah *et al.* (1986) also observed that the varieties/clones having tall cane, more diameter and maximum number of millable canes have produced higher yield per unit area. The newly developed cane variety should be disseminated among the sugarcane farmers of a particular area to replace the local variety under cultivation to increase cane yield eventually to improve per unit yield of the crop and as a result, total income will be increased. Alam *et al.* (1997) reported that soils of Bangladesh are deficient in nutrients and does not produce better yield without fertilizers. In Bangladesh, most of the sugarcane farmers get low yield due to late plantation, adoption of inadequate pests and disease control practices and poor agronomic management of crop cultivation. Introduction of suitable varieties with package recommended practice may help to bring substantial improvement in cane and gur yield which in term will upgrade the farmers income. In view of the above factors the experiment was undertaken to study the performance of BSRI bred varieties at Barisal region to screen out suitable ones for that locality.

MATERIALS AND METHODS

An experiment was conducted at grower's field in Ganges Tidal Floodplain soils (AEZ-13) during 2003-2004 cropping season under BSRI Sub-station Rahmatpur, Barisal. The land was medium high and typical loamy soil with pH 7.5. The experiment was laid out in a randomized complete block design (RCBD) with three replications. Each variety was considered as a treatment. The unit plot size was 6.0m × 5.0m. The varieties used were Isd 16 (Standard), Isd 21, Isd 24, Isd 26, Isd 29, Isd 30, Isd 31, Isd 32, Isd 33 and Isd 34. Forty five days old one budded soil bed settlings of sugarcane were transplanted in main field on 30 November, 2003 and was harvested on 15 January, 2004. The land was prepared as per requirement. Trenches were made by hand spade. The settlings were transplanted in the main field at distance of 100 cm from row to row and 30 cm from plant to plant. Application of fertilizers for sugarcane was done @ 290, 175, 120, 190 and 9 kg ha⁻¹ as Urea, TSP, MP, Gypsum and Zinc Sulphate respectively. Full doses of TSP, Gypsum, Zinc Sulphate and 1/3rd MP were applied in trenches during the time of plantation. One third of Urea was applied as side dressing at 21 days after transplanting. The rest of MP and Urea were applied in two equal splits at early tillering stage and late tillering phase of sugarcane. Necessary intercultural operations like weeding, mulching, irrigation and pest management were done as and when required. For the control of Top shoot borer Furadan 5G @ 40 kg ha⁻¹ was applied as per recommendation. Tiller, tiller mortality (%), millable cane were recorded. Both the tiller population and millable cane stalks were recorded and expressed as 1000 ha⁻¹. The yield of sugarcane was also recorded at harvest. 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 kg per cane stalk. Brix (%) was determined by hand refractometer. Data on different parameters were analyzed following the standard statistical procedures. The tiller mortality was calculated following the procedure as mentioned below:

$$\text{Tiller mortality (\%)} = \frac{\text{Number of tillers} - \text{Number of millable cane}}{\text{Number of tillers}} \times 100$$

RESULTS AND DISCUSSION

Tiller population

Data on tiller population showed that there was significant difference in tiller population among the varieties. The highest ($209.00 \times 10^3 \text{ ha}^{-1}$) tiller population was obtained from the variety Isd 34 followed by the variety Isd 33 ($199.00 \times 10^3 \text{ ha}^{-1}$) while the lowest $92.00 \times 10^3 \text{ ha}^{-1}$ tiller was in the variety Isd 26 (Table 1). Variation in tiller production among the different varieties was reported by Miah *et al.* (1994) and Rashid *et al.* (2001).

Table 1. Tiller, millable cane, unit stalk weight, height, girth, cane yield and % brix of different cane varieties in farmers field, Babuganj, Barisal, 2004.

Varieties	Tiller ($\times 10^3 \text{ ha}^{-1}$)	Millable cane ($\times 10^3 \text{ ha}^{-1}$)	Unit stalk weight (kg)	Height (m)	Girth (cm)	Cane yield (t ha ⁻¹)	% Brix
Isd 16	148.0 c	91.00 ef	1.05 cd	2.85 de	2.17 b	95.55 de	20.17 bcd
Isd 21	179.0 abc	116.00 bcd	1.02 cd	3.03 c	2.36 ab	118.30 cd	20.50 bc
Isd 24	150.0 c	106.00 de	1.04 cd	2.65 f	2.56 a	110.20 cde	21.17 ab
Isd 26	92.0 d	81.00 f	1.07 cd	2.64 f	2.38 ab	86.67 e	20.17 bcd
Isd 29	163.0 bc	113.00 cd	1.08 c	3.08 bc	2.33 ab	122.00 bc	19.17 cd
Isd 30	171.0 abc	116.0 bcd	1.06 cd	2.77 ef	2.40 ab	123.00 bc	21.17 ab
Isd 31	180.0 abc	134.00 ab	1.22 b	3.38 a	2.15 b	163.50 a	20.33 bc
Isd 32	171.0 abc	109.00 de	1.46 a	3.20 b	2.54 a	159.10 a	18.83 d
Isd 33	199.0 ab	143.00 a	1.01 cd	3.00 cd	2.11 b	144.40 ab	22.33 a
Isd 34	209.0 a	133.00 abc	1.00 d	2.98 cd	2.13 b	133.00 bc	20.83 b
LSD (5 %)	39.95	20.66	0.08	0.15	0.29	26.10	1.73

Values having common letter(s) in a column do not differ significantly at 5% level

Tiller mortality

Different factors like varietal characteristics, light, nutrient level, time of planting, soil moisture etc. usually influence tiller mortality (%) of sugarcane (Rao and Prasad, 1962). In this experiment, the highest (41.50 %) tiller mortality was recorded in variety Isd 24 while the lowest (13.58 %) tiller mortality was recorded in variety Isd 26. Among the other test varieties tiller mortality ranges from 25.56-38.50 % (Fig.1). Bokhtiar and Sakurai (2005) in a study reported that tiller mortality varied from 40-50 % under different fertilizer management practices which is very close to the present findings.

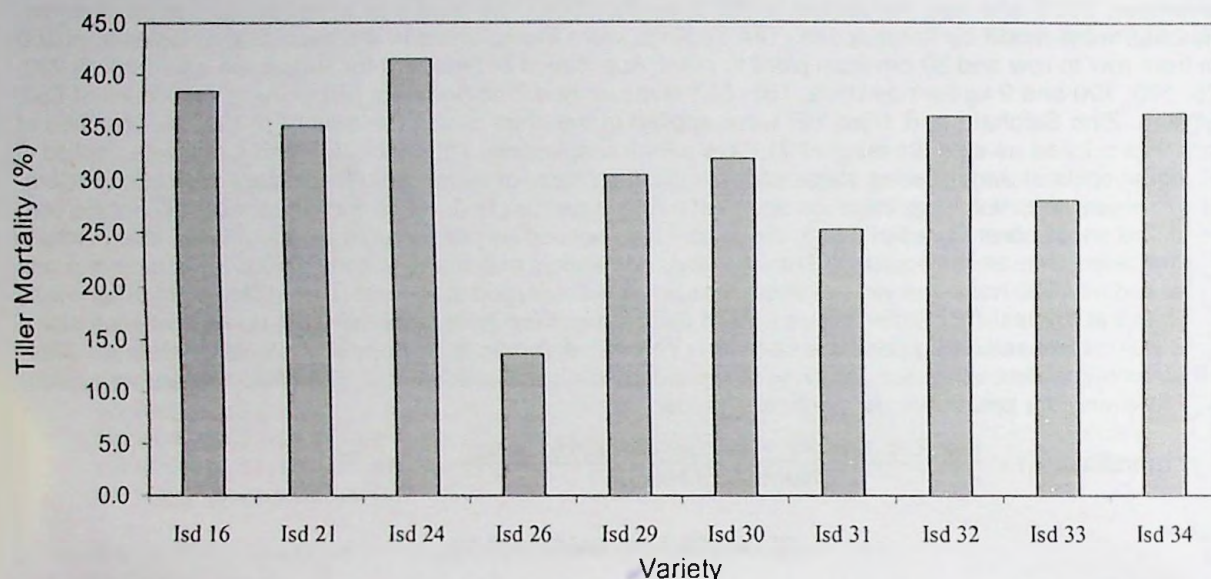


Figure 1. Tiller mortality of different cane varieties in farmer's field, 2004

Millable cane stalks

The number of millable cane stalks was also significantly affected by different varieties. The highest ($143.00 \times 10^3 \text{ ha}^{-1}$) number of millable cane stalks was recorded from the variety Isd 33 and the lowest ($81.00 \times 10^3 \text{ ha}^{-1}$) number of millable cane was recorded from the variety Isd 26. The maximum number of millable cane production in the variety Isd 33 might be due to the higher number of tiller production compared to other varieties. Matin *et al.* (1989) and Paul *et al.* (1994) also reported similar results on millable cane production. The varieties Isd 31 and Isd 34 also produced statistically similar number of millable cane to that of Isd 33.

Unit stalk weight

Statistically significant differences of unit stalk weight was noticed among the cane varieties which was highest (1.46 kg) with Isd 32 and lowest with Isd 34 (1.0 kg). Such differences may contribute to bring variation in total yield production.

Height and Girth

Cane height and girth are the important attributes which induces the yield of cane per unit area. Significantly higher cane height of 3.38m was recorded in the variety Isd 31 followed by Isd 32 (3.20 m) and Isd 29 (3.08 m). Comparatively lowest cane height (2.64 m) was obtained in the variety Isd 26. The varieties Isd 33, Isd 34, Isd 29 and Isd 21 produced statistically identical cane height. While considering girth of the cane varieties it was evident from the table that the maximum girth was found with Isd 24 and Isd 32. The girth of cane was significantly different among the test varieties. The varieties Isd 30, Isd 26, Isd 21 and Isd 29 produced statistically similar girth.

Cane yield

Yield is the contribution of several attributes like number of millable stalk, stalk length, girth of cane. Table 1 depicts the above factors along with number of tillers, unit stalk weight, height and Brix. It is evident from the table the maximum cane yield of 163.50 t ha⁻¹ with variety Isd 31 followed by Isd 32 (159.10 t ha⁻¹), Isd 33 (144.40 t ha⁻¹) and Isd 34 (133.00 t ha⁻¹) was harvested. The lowest cane yield (86.67 t ha⁻¹) was obtained in Isd 26. The cane yield varied among the varieties due to variation in yield producing attributes like height, girth, unit stalk weight and number of millable cane as shown in table 1. The findings of the present experiment is in agreement with Singh et al. (1999) and Arvind et al. (1997) where they found variation in cane yield among different varieties. Number of tiller ha⁻¹ and stalk height have some positive effect in increasing cane yields among the test varieties in the experiment. Yadava (1993) reported the strong relationship of among above factors for obtaining higher yield of sugarcane. In the present investigation the highest millable cane of 1.43 105 ha⁻¹ having individual stalk weight of 1.01 kg were produced in Isd 33. Again per stalk weight is contributed by the girth and height of cane while discussing the yield of varieties under experiment, it reflected from Table 1 that the maximum cane yield was obtained with variety Isd 31 followed by Isd 32. Although maximum number of tiller was found with variety Isd 34, it failed to contribute higher yield due to higher % of tiller mortality and low per stalk weight. The higher girth of Isd 32 produced higher per stalk weight which ultimately produced second highest yield despite of having lower number of millable cane per unit area. However, the yield obtained with any of the variety the experiment is much higher compare to national average yield of 46 t ha⁻¹.

Brix (%)

Table 2. Yield and economic return for different sugarcane varieties in southern region of Bangladesh, Babuganj, Barisal, 2004.

Treatments	Cane yield (t ha ⁻¹)	Total production cost (Tk. ha ⁻¹)	Gross return (Tk. ha ⁻¹)	Gross margin (Tk. ha ⁻¹)	BCR
Isd 16	95.55 de	42,690	1,06,538.25	63,848.25	2.50
Isd 21	118.30 cd	45,738	1,31,904.50	86,166.50	2.88
Isd 24	110.20 cde	44,650	1,22,873.00	78,223.00	2.75
Isd 26	86.67 e	41,500	96,637.05	55,137.05	2.33
Isd 29	122.00 bc	46,235	1,36,030.00	89,795.00	2.94
Isd 30	123.00 bc	46,370	1,37,145.00	90,775.00	2.96
Isd 31	163.50 a	51,795	1,82,302.50	1,30,507.00	3.52
Isd 32	159.10 a	51,200	1,77,396.50	1,26,196.50	3.46
Isd 33	144.40 ab	49,235	1,61,006.00	1,11,771.00	3.27
Isd 34	133.00 bc	47,700	1,48,295.00	1,00,595.00	3.10

Price of cane: Tk. 1115 t ha⁻¹

The highest brix 22.33 % was recorded from variety Isd 33 followed by Isd 24 (21.17 %) and Isd 30 (21.17 %) while the lowest (18.83 %) was obtained from variety Isd 32. Variety Isd 21, Isd 26, Isd 31 and Isd 34 produced brix (%) almost similar to Isd 16 (20.17 %) the standard variety. Higher brix % of any variety is an indication to produce higher gur and sugar. Considering the brix and yield of cane in the experimental area variety Isd 31 and Isd 32 were found superior to other varieties.

Economics

Table 2 shows the economic analysis of the experiment for different cane varieties. The highest (Tk. 1,82,302.50) gross return per hectare was recorded from Isd 31 followed by Isd 32 (Tk. 1,77,396.50) and the lowest (Tk. 96,637.05) was from Isd 26. In case of gross margin same trend was observed. The highest benefit cost ratio (BCR) of 3.52 was recorded from Isd 31 followed by Isd 32 (3.46), Isd 33 (3.27) and Isd 34 (3.10) while the lowest BCR of 2.33 was from Isd 26. Variety Isd 31 showed the highest cane yield, gross return, gross margin and maximum benefit cost ratio followed by Isd 32, Isd 33 and Isd 34. From the present findings it might be concluded that substantial yield improvement and higher economic return may be achieved by replacing the local degenerated varieties by BSRI released cane varieties like Isd 31, Isd 32, Isd 33 and Isd 34 in Barisal area of Bangladesh.

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