Performance of Chewing Sugarcane Genotypes in Old Himalayan Piedmont Plain Soil

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ABSTRACT

An experiment was conducted with six treatment for six chewing sugarcane varieties namely T_1: BSRI Akh 41, T_2: Babulal, T_3: Banpara gandary, T_4: BSRI Akh 42, T_5: Co-208 and T_6: China at RSRS farm, Thakurgaon, Bangladesh during 2014-2015 to find out suitable chewing varieties of sugarcane. The lowest settling mortality % (2.24) was found in BSRI Akh 41. The highest internode stalk^{-1}, tiller, chewable cane, average cane yield was found from BSRI Akh 41 (27.66, 145.56 103 ha^{-1}, 99.11 103 ha^{-1}, 142.17 t ha^{-1}) respectively. BSRI Akh 42 produced second highest cane yield (135.32 t ha^{-1}) , the highest stalk height (3.11 m), single cane weight (1.52 kg), Brix % (18.67) and (BCR) BSRI Akh 42 (3.73). Considering the yield, yield attributes and BCR BSRI Akh 42 and BSRI Akh 41 performed better compared to other genotypes.

Key words: *Saccharum officinarum*, mortality%, brix%, cane yield, benefit cost ratio.

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is a cash crop and main source of white sugar in Bangladeesh. It is also an important food crop of the tropics and subtropics (Sivanesan and Waller, 1986). Sugarcane was originally grown for the sole purpose of chewing in South Eastern Asia and the Pacific. The rind was removed and the internal tissues sucked or chewed. The soft cane that also called chewing cane is mainly chewed raw for its sweet juice. Some of it is further processed into different crude chewing cane production is of major commercial interest (Busari and Misari, 1996). The bulk of these are consumed raw for its sweetness of the juice but some of it is processed into a variety of products such as sugar, molasses, baggasse, sweets and left-over leaves/stalks (Busar and Misari, 2007). Four sugar states (Bacita, Numan, Suntia and Lafiagi) in Nigeria grow sugarcane on a relatively large scale, while the majority of smallholder farmers grow soft sugarcane (chewing cane) on land holdings of 0.2-0.5 ha (Anon., 1997). Wayagri *et al.* (2003) reported that chewing sugarcane is an indicator as money making enterprise in the central zone of Nigeria. Cane juice gives energy directly and it has medicinal value for treating jaundice affected people. Lu Nai *et al.* (2004) reported that the aqueous extracts of three varieties of sugarcane showed

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good antioxidant properties those were also able to protect against radiation induced DNA damage in pBR322 plasmid DNA and *Escherishia coli* cultures. Again observed that sugarcane juice have the ability to scavenge free radicals, reduce iron complex and inhibit lipid peroxidation, may explain possible mechanisms by which sugarcane juice exhibits its beneficial effects in relation to its reported health benefits. The demand of chewing cane is increasing day by day. There is an ample scope to expand the area under chewing cane cultivation particularly in the non mill zone areas in Bangladesh. Some promising clones having chewing characters are being cultivated in different locations of the country. The present findings will be popular, choose able and beneficial to human being. The study was undertaken with a view to find out the location specific chewing genotypes suitable for cultivation in Thakurgaon areas.

MATERIALS AND METHODS

The experiment was conducted at experimental farm of Regional Sugarcrop Research Station, Thakurgaon, Bangladesh during 2014-2015. The site represents the Old Himalayan Piedmont Plain Soil (Agro Ecological Zone 1) with medium high land of typical sandy loam soil having P^H 5.5. Six Chewing sugarcane varieties were transplanted in RSRS farm, Thakurgaon following RCB design and replicated thrice times. Two eyed setts after cutting were dipped in 0.1% Bavistin 50 WP solution for 30 minutes. Then the setts were placed in soil bed and covered with straw for germination in 1 October 2014. All the varieties of two budded soil bed settlings were transplanted in main field of 8 m × 6 m plot with 119 settlings in 17 November 2014. Distance from settling to settling was 0.45 m and line to line 1.00 meter. Recommended doses of fertilizers and insecticides were applied properly. The appropriate intercultural operations were done in proper time. Settling mortality rate was recorded 10 days after transplanting. Tiller population of sugarcane was recorded at 150 days after transplanting. Chewable cane, stalk height, no. of internode $stalk^{-1}$, stalk diameter, single cane weight, yield, and Brix % of cane were recorded at harvest. The cane was harvested in 30 October 2015. The data were analyzed following standard statistical procedures (Gomez and Gomez, 1984). The analyses of variance for different parameters were performed and mean differences were compared by Duncan's Multiple Range Test (DMRT) using a computer operated program named MSTAT-C (Russel, 1986).

Benefit cost ratio indicated whether the cultivation was profitable or not, which was calculated as follows (CIMMYT, 1988):

$$BCR = \frac{\text{Gross return (Tk. ha}^{-1})}{\text{Cost of production (Tk. ha}^{-1})}$$

Gross return = Value of chewing cane
Net Return = Gross return (Tk. ha^{-1}) – Total cost of production (Tk. ha^{-1}).

The treatments were composed as below

T_1: BSRI Akh 41
T_2: Babulal
T_3: Banpara gandary
T_4: BSRI Akh 42
T_5: Co 208
T_6: China

RESULTS AND DISCUSSION

The performances of the tested different sugarcane genotypes, settling mortality %, stalk height (m), internode stalk^{-1} (no.) and cane diameter (cm) were represented in Table 1. The highest settling mortality was observed in the genotype China (9.52 %), which was significantly different from other genotypes. The lowest mortally was observed in genotype BSRI Akh 41 (2.24 %) that was statistically significant. Similar result was found by Alam *et al* (2011). Among different varieties the highest stalk height was found from BSRI Akh 42 (3.11 m), which was statistically similar with BSRI Akh 41 (2.95 m) and Babulal (3.03 m). The lowest stalk height was found from the genotype of China (1.27 m) that significantly differed from other genotypes. The highest no. of internode stalk^{-1} was recorded from BSRI Akh 41(27.66), which was statistically similar with Co 208 (26.33), but significantly different from other genotype. The lowest no. of internode stalk^{-1} was recorded from the genotype of China (20.33) and the effect was significantly different from other genotypes. The highest cane diameter (3.26 cm) was found from the genotype of China that was statistically similar with BSRI Akh 41 (2.89 cm) and BSRI Akh 42 (3.01 cm). The lowest cane diameter was found in Co 208 (2.56 cm), which was identical with that in the genotype of Babulal and Banpara gandary. The similar result was reported by Rashid *et al.*(2001).

Table 1. Growth attributes in different chewing sugarcane genotypes

Treatments	Settling mortality (%)	Stalk height (m)	No. of internode stalk^{-1} (no.)	Cane diameter (cm)
T_1: BSRI Akh 41	2.24 e	2.95 ab	27.66 a	2.89 a
T_2: Babulal	6.67 b	3.03 ab	24.33 c	2.69 b
T_3: Banpara gandary	5.32 c	2.13c	24.67 bc	2.74 b
T_4: BSRI Akh 42	3.92 d	3.11a	25.67 bc	3.01a
T_5: Co 208	5.60 bc	2.67 b	26.33 ab	2.56 b
T_6: China	9.52 a	1.27d	20.33 d	3.26 a
LSD (0.05)	1.14	0.24	1.73	0.33
CV %	11.32	5.84	3.82	6.43

Results from our study further indicated that genotypes of sugarcane exerted significant influence on the yield and its component, viz, tiller, chewable cane, single cane weight, yield and cane Brix (%) presented in Table 2. The highest number of tiller was obtained in BSRI Akh 41 (145.56 10^3 ha^{-1}), which was statistically similar with Banpara gandary (142.36 10^3 ha^{-1}), Babulal (130.55 10^3 ha^{-1}) and BSRI Akh 42 (120.84 10^3 ha^{-1}), but significantly different from other genotypes. The lowest tiller was obtained in the genotype of China (97.25 $10^3 ha^{-1}$) which was significantly different from other genotypes except BSRI Akh 41 and BSRI Akh 42. The similar result was found by Alam *et al.*(2011). The highest number of chewable cane was observed in BSRI Akh 41 (99.11 10^3 ha^{-1}) that was significantly similar with Babulal (96.21 10^3 ha^{-1}) but significantly different with other four genotypes. The lowest number of chewable cane was observed from the genotype of China (70.11 $10^3 ha^{-1}$), which was significantly different from other genotypes. The highest single cane weight was found in BSRI Akh 42 (1.52 kg) but it was statistically similar with BSRI Akh 41 (1.44). The lowest single cane weight was measured in China (0.93 kg), which was identical with the genotype of Banpara gandary (0.96) but statistically different from other genotypes. Significantly highest cane yield (142.17 t ha^{-1}) was obtained from BSRI Akh 41 among all the tested genotypes of sugarcane except BSRI Akh 42 (135.32 t ha^{-1}). The lowest cane yield (65.37 t ha^{-1}) was obtained from China and the effect was significant. The similar result was demonstrated by Alam *et al.* (2011) in their study. The highest Brix (%) was obtained from BSRI Akh 42 (18.67), which was statistically similar with the varieties BSRI Akh 41 and Co 208, but significantly different from other genotypes. The lowest Brix (%) was obtained from the genotype of china (15.00) which was statistically similar with other genotypes except BSRI Akh 41 and BSRI Akh 42. The similar result was reported by Sohel *et al.*(2009).

Table 2. Yield and yield components of different chewing sugarcane genotypes

Treatments	Tiller (10^3 ha^{-1})	Chewable cane (10^3 ha^{-1})	Single cane weight (kg)	Cane yield (t ha^{-1})	Brix (%)
T_1: BSRI Akh 41	145.56 a	99.11 a	1.44 ab	142.17 a	17.67 ab
T_2: Babulal	130.55 ab	96.21 a	1.28 b	124.02 b	16.33 bc
T_3: Banpara gandary	142.36 a	85.16 b	0.96 c	81.90 d	15.33 c
T_4: BSRI Akh 42	120.84 ab	89.00 b	1.52 a	135.32 ab	18.67 a
T_5: Co 208	116.25 b	78.11b	1.27 b	98.97 c	16.67 a-c
T_6: China	97.25 b	70.11c	0.93 c	65.37 e	15.00 c
LSD (0.05)	33.49	7.87	0.19	11.95	2.0385
CV %	15.01	4.88	8.59	6.11	6.75

The benefit cost ratio of the chewing genotype was calculated and presented in Table 3. Among the six genotypes, BSRI Akh 42 gave the highest profit (423.5 10^3 Tk. ha^{-1}) with BCR (3.73) followed by BSRI Akh 41 with profit (390.11 10^3 Tk. ha^{-1}) and BCR (3.52). The lowest profit (69.39 10^3 Tk. ha^{-1}) and BCR (1.44) was obtained from the genotype of china followed by Co 208 with profit (235.55 10^3 Tk. ha^{-1}) and BCR (2.52), Banpara gandary profit (249.51 10^3 Tk. ha^{-1}) and BCR (2.71) and Babulal profit (301.47 10^3Tk. ha^{-1}) and BCR (2.95). The similar result was observed by Rashid *et al* (2009).

Table 3. Economic return of chewing sugarcane verities

Treatments	Chewable cane ($10^3 ha^{-1}$)	Cost Of production (Tk.ha^{-1})	Gross return (Tk.ha^{-1})	Net return (Tk.ha^{-1})	BCR
T_1: BSRI Akh 41	99.11	1,55,000.00	5,45,105.00	3,90,105.00	3.52
T_2: Babulal	96.10	1,55,000.00	4,56,475.00	3,01,475.00	2.95
T_3: Banpara gandary	85.16	1,55,000.00	4,04,510.00	2,49,510.00	2.71
T_4: BSRI Akh 42	89.00	1,55,000.00	5,78,500.00	4,23,500.00	3.73
T_5: Co 208	78.11	1,55,000.00	3,90,550.00	2,35,550.00	2.52
T_6: China	70.11	1,55,000.00	2,24,385.00	69,385.00	1.45

Sugarcane seed price: 2750.00 Tk. t^{-1}, Selling price: BSRI Akh 41 = 5.50 Tk./stalk, Babulal = 4.75 Tk./stalk, Banpara gandary = 4.75 Tk./stalk, BSRI Akh 42 = 6.50 Tk./stalk, T_5: Co 208 = 5.0 Tk./ stalk, China = 3.50 Tk./ stalk.

The overall results suggested that BSRI Akh 42 and BSRI Akh 41are the suitable chewing varieties for commercial cultivation as plant cane in the tested environment. Therefore, based on cane yield, quality, colour, market price and farmer's acceptance the varieties of BSRI Akh 42 and BSRI Akh 41 might be recommended for commercial chewing cane cultivation in Piedmont Plain Soil area.

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