Bangladesh J. Environ. Sci., Vol. 39, 57-60, 2020 @ BAED ISSN 1561-9206

PERFORMANCE AND SUITABILITY ASSESSMENT OF SOME SUGARCANE VARIETIES IN NORTHERN REGION OF BANGLADESH

M. M. Rashid*, M. A. Habib[1], A. M. S. Rahman[2], S. Mandal[3] and M. A. Azim[4]
Regional Sugarcrop Research Station, Thakurgaon, Bangladesh
[1]Physiology and Sugar Chemistry Division, [2]Breeding Division
[3]Farm Division, [4]Biotechnology Division
Bangladesh Sugarcrop Research Institute, Ishurdi-6620, Pabna, Bangladesh
*Corresponding author's e-mail: mamun.sau67@gmail.com

ABSTRACT

The experiment was carried out in farmers' field locations at Northern Panchagarh and Dinajpur districts under Old Himalayan Piedmont Plain Soils (AEZ-1) of Bangladesh during the cropping season of 2014-2015. For this study six selected varieties viz: Isd 37, Isd 38, Isd 39, Isd 40, BSRI Akh 43 and BSRI Akh 44 were planted following RCB design with three replications. Significant differences were observed for germination, tiller population, stalk diameter, millable cane, cane yield and brix (%) in both locations. At Panchagarh, the highest cane yield (96.57 tha^{-1}) was found in Isd 37 that was followed by Isd 39 and BSRI Akh 44, respectively. On the other hand, the highest cane yield (108.45 tha^{-1}) was found from Isd 39 that was followed by Isd 37 and BSRI Akh 44 at Dinajpur location. The highest brix (%) was observed in Isd 39 at both locations which followed by Isd 37 and BSRI Akh 44. At Panchagarh location, the highest BCR (2.31) was achieved from Isd 37 that was followed by Isd 39 and BSRI Akh 44 whereas at Dinajpur location the highest BCR (2.54) was achieved from Isd 39 that was followed by Isd 37 and BSRI Akh 44.

Key words: *S*ugarcane, brix (%), cane yield, benefit cost ratio

Introduction

Sugarcane (*Saccharum officinarum* L.) is a cash crop, main source of white sugar and also source of gur in Bangladesh. It is a commercially important crop that accounts for approximately 65% of the global sugar production (Deho *et al.*, 2002). Besides sugar production, it also produces numerous valuable by-products like alcohol, used in pharmaceutical products; ethanol, used as a fuel; bagasse; used for paper and chip board manufacturing; and used as a rich source of organic matter as well as nutrients for sustainable crop production (Majid, 2007). It is cultivated in many of the world countries with Brazil as a major producer followed by India, China, Thailand, Pakistan and Mexico (FAOSTAT, 2013). In Bangladesh the cane yield is around 46 tha^{-1} which is quite low in comparison to other sugarcane growing country (Islam *et al.*, 2017). The main reasons for the low yield of sugarcane in our country are infertile soils (low organic matter), irrigation constraints, traditional farming system, climatic hazards and non availability of promising varieties (Naich *et al.*, 2006). Sugarcane production could never be improved until and unless promising varieties and technologies are adopted on large scale (Glaz, 2000). Considering the fact a study evaluate the performance of some promising sugarcane varieties for replacing low yielding existing traditional sugarcane varieties in farmers' field in Northern region of Bangladesh.

Materials and Methods

The experiment was carried out in farmers' field of Northern Panchagarh and Dinajpur districts of Bangladesh during the cropping season of 2014-2015. The site represents the Old Himalayan Piedmont Plain Soil (AEZ- 1) with medium high land of typical sandy loam soil having pH 5.5. The six sugarcane varieties viz: Isd 37, Isd 38, Isd 39, Isd 40, BSRI Akh 43 and BSRI Akh 44 were planted following Randomize Complete Block Design with three replications. The unit plot size was 7 m × 6 m. Two budded setts were planted end to end with conventional method to maintain row to row distance was 90 cm. Setts were planted on in the Mid November 2014 and harvested on mid December 2015 in both locations. Fertilizers were applied following the recommended rate N, P, K, S and Zn for sugarcane @ 165, 55, 120,

30 and 2.5 kg ha^{-1}, respectively (BARC, 2012). 1/3 dose of N + 1/3 dose of K + full dose of P,S and Zn were applied at the time of planting, remaining 2^{nd} and 3^{rd} doses of N and K were applied at 1^{st} and 2^{nd} earthing up. Irrigation was applied 3 times at germination, tillering and stem elongation stage. The appropriate intercultural operations were done in proper time. In growth stage data were recorded on germination (%) was counted 30 DAP and tiller population was counted at 150 DAPs. Millable cane, stalk height, stalk diameter, yield, and brix (%) of cane were recorded at harvest. Data were analyzed statistically using analysis of variance (ANOVA) according to Gomez and Gomez (1984) procedure for a randomized complete block design with statistics 10 software package and the mean differences were compared by least significant difference (LSD) at 5% level of probability. 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 cane
Cost of production = Sum of the cost of the resources.

Results and Discussion

Responses of germination, tiller population and stalk diameter of sugarcane are represented in Table 1. Findings regarding milable cane, yield and brix % of cane are presented in Table 2.

Germination (%): In this study the highest germination (79.06%) was observed in Isd 40 which was statistically similar with the varieties Isd 39, Isd 37 and BSRI Akh 44 at Panchagarh location where at Dinajpur location the highest germination (84.79%) was observed in Isd 39 which was statistically similar with the varieties Isd 40, Isd 37 and BSRI Akh 44. The lowest germination (63.28%) and (60.28%) were observed in BSRI Akh 43 at both locations. These findings are analogous with Razzak *et al.* (2015) who found the highest germination from Isd 39 and Isd 37 among different tested varieties.

Number of tillers: Tillering potentiality of sugarcane ultimately effects on cane yield positively. The highest numberof tiller (215.13 x 10^3 $ha^{-1}$and 236.77 x 10^3 ha^{-1}) was recorded din Isd 39 at both locations. The lowest number of tiller 162.11 x 10^3 ha^{-1} was recorded in BSRI Akh 43 at Panchagarh location which was statistically similar with Isd 37 and Isd 38 where at Dinajpur location the lowest number of tiller 162.11 x 10^3 ha^{-1} was found in Isd 38 which was statistically similar with BSRI Akh 43. Similar finding was observed by Razzak *et al*. (2015).

Stalk diameter: The highest stalk diameter (2.34 cm) and ((2.41 cm) was obtained in the variety Isd 37 while the lowest cane diameter (2.10 cm) and ((2.41 cm) was obtained in Isd 38 at both locations. Similar report was reported by Poul *et al*. (2011).

Stalk height: The highest stalk height of 3.36m and 3.40 m were found from the variety Isd 39 which was statically similar with Isd 37(3.26) at Panchagarh location while Isd 37 (3.31) and BSRI Akh 44 (3.26) at Dinajpur location. The lowest stalk height of 2.91 m and 2.85 m were found from the variety Isd 38 in both locations. Similar result was agreement with Khan *et al*. (2007). They reported that stalk height varied among different sugarcane varieties.

Number of millable cane: The number of millable cane directly influences cane yield as it is the combined interaction of germination, tillering and tiller mortality. The highest number of millable cane was observed in the variety Isd 39 in both locations. The lowest number of millable cane were observed in the variety of Isd 38 which was statistically similar with Isd 40, BSRI Akh 43 and BSRI Akh 44 at Panchagarh location while similar with Isd 40 and BSRI Akh 43 at Dinajpur location.

Cane yield: The highest cane yield of 96.573 tha^{-1} was found from Isd 37 which was statically similar with Isd 39 (92.95 tha^{-1}) and BSRI Akh 44 (87.477 tha^{-1}) in Panchagarh location whereas at Dinajpur location the highest cane yield of 108.45 tha^{-1} was found from Isd 39 which was statically similar with Isd 37 (100.09 tha^{-1}) and BSRI Akh 44 (96.80 tha^{-1}). The lowest cane yield of 69.18 and 62.52 tha^{-1} were found from Isd 38 in both locations. Bashar *et al.* (2011) supported our results where they reported that different varieties give various amount yields at different level of field trial.

Brix (%): The highest brix (21.40%) and (21.07%) were obtained in Isd 39 which was statistically similar with other varieties except the variety Isd 38 at Panchagar location and BSRI Akh 43 at Dinajpur location.

Table 1. Performance of six tested sugarcane varieties for germination, number of tillers and stalk diameter at Panchagarh and Dinajpur locations

Treatments	Germination %		Tiller ($\times 10^3$ ha^{-1})		Diameter (cm)	
	Panchagarh	Dinajpur	Panchagarh	Dinajpur	Panchagarh	Dinajpur
V_1: Isd 37	76.85 ab	79.52 ab	170.36 bc	177.07 bc	2.34 a	2.41 a
V_2: Isd 38	67.22 bc	70.22 bc	166.77 bc	155.85 d	2.10 c	2.02 d
V_3: Isd 39	77.75 a	84.79 a	215.13 a	236.77 a	2.21 abc	2.18 bcd
V_4: Isd 40	79.06 a	81.06 ab	180.93 b	185.65 b	2.17 bc	2.13 cd
V_5: BSRI Akh 43	63.28 c	60.28 c	162.11 c	165.48 cd	2.25 ab	2.30 abc
V_6: BSRI Akh 44	71.38 abc	75.38 ab	182.06 b	191.52 b	2.27 ab	2.36 ab
Lsd (0.05)	10.18	13.30	18.47	15.80	0.13	0.18

Table 2. Performance of six tested sugarcane varieties for yield and yield attributes of sugarcane at Panchagarh and Dinajpur locations

Treatments	Millable cane ($\times 10^3$ ha^{-1})		Cane yield (tha^{-1})		Brix (%)	
	Panchagarh	Dinajpur	Panchagarh	Dinajpur	Panchagarh	Dinajpur
V_1: Isd 37	98.40 ab	105.75 b	96.573 a	100.09 ab	21.17 ab	20.30 ab
V_2: Isd 38	84.18 c	81.10 c	69.177 d	62.52 d	19.16 b	19.77 ab
V_3: Isd 39	107.46 a	122.89 a	92.950 ab	108.45 a	21.40 a	21.07 a
V_4: Isd 40	90.33 bc	87.79 c	79.070 bcd	75.83 c	20.12 ab	20.06 ab
V_5: BSRI Akh 43	86.05 bc	89.91 c	75.343 cd	79.51 c	19.33 ab	18.63 b
V_6: BSRI Akh 44	93.34 bc	100.79 b	87.477 abc	95.80 b	20.93 ab	19.86 ab
Lsd (0.05)	13.87	10.61	14.33	11.31	2.12	1.68

In a column, figures with similar letters do not differ significantly at 5% level

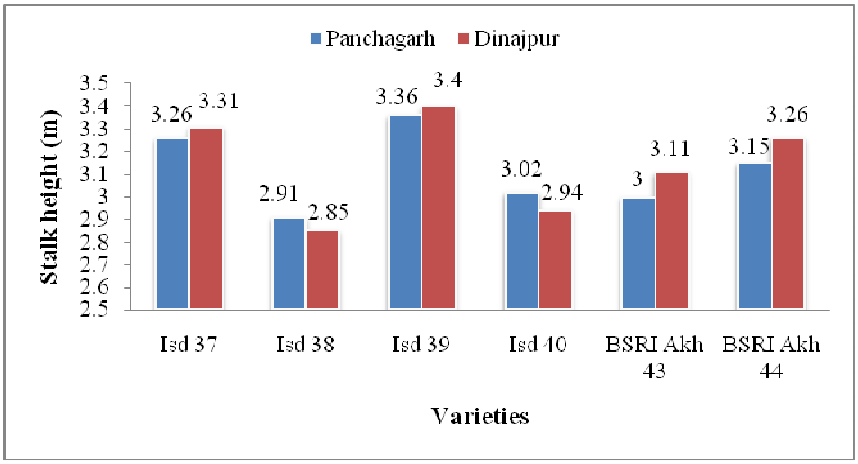

Fig. 1. Stalk height of different sugarcane varieties at harvest in both locations

Economics: The benefit cost ratio of the varieties was calculated and presented in Table 3. At Panchagarh location, the highest profit (45,2150.00 Tk. ha^{-1}) with BCR (2.31) that was found in Isd 37. On the other hand at Dinajpur, the highest profit (1,79,730.50 Tk. ha^{-1}) with BCR (2.54) was observed in Isd 39. The lowest profit (74,094.20 Tk. ha^{-1} and 56,178.80 Tk. ha^{-1}) and BCR (1.66 and 1.50) were detected in Isd 38 for both of the locations. The similar result was observed by Razzak *et al.* (2015).

Table 3. Economic return of different sugarcane varieties

Treatments	Total production cost (Tk. ha^{-1})	Gross return (Tk. ha^{-1})		Net return (Tk. ha^{-1})		Benefit cost ratio (BCR)	
	For both locations	Panch	Dinaj	Panch	Dinaj	Panch	Dinaj
V_1: Isd 37	1,12,000.00	259773.30	269242.10	147773.30	157242.10	2.31	2.40
V_2: Isd 38	1,12,000.00	186094.20	168178.80	74094.20	56178.80	1.66	1.50
V_3: Isd 39	1,12,000.00	250035.50	291730.50	138035.50	179730.50	2.23	2.54
V_4: Isd 40	1,12,000.00	212698.83	203982.70	100698.88	91982.70	1.90	1.82
V_5: BSRI Akh 43	1,12,000.00	202664.60	213881.90	90664.60	90664.60	1.81	1.91
V_6: BSRI Akh 44	1,12,000.00	235321.20	257702.00	123321.20	145702.00	2.10	2.30

Panch= Panchagar; Dinaj= Dinajpur; Price of sugarcane: 2,690.00 Tk. ton^{-1}

Conclusion

The overall result revealed that among tested sugarcane varieties Isd 39, Isd 37 and BSRI Akh 44 performed better than other varieties regarding yield, brix% and economic return. So, these three varieties are suggested for growing with optimum management packages to be achieved the targeted yield as well as economic benefits from sugarcane cultivation at farmer's field in the Northern region of Bangladesh.

References

BARC (Bangladesh Agricultural Research Council), 2012. Fertilizer Recommendation Guide. *Bangladesh Agri. Res. Coun*., New Airport Road, Farm gate, Dhaka-1225. pp.191.

Bashar, M. K., Rahman, M. S., Hossain, M. M. and Ahmed, T. 2011. Varietal suitability assessment under rainfed condition in high barind tract of Bangladesh. *Pak. Sugarcane J.*, 26(2): 6-9.

CIMMYT, 1988. From Agronomic Data to Farmers Recommendations: An Economics Training Manual. Completely revised edition. Mexico. D.F.

Deho, Z. A., Tunio, S. D., Minhas, Y. J. and Majeedano, H. I. 2002. Effect of mulching technique on the growth and yield of sugarcane. *Pak. Sugarcane J.*, 17:22-26.

FAOSTAT. 2013. Report, Food and Agriculture Organization of the United Nations: Economic and Social Department, The Statistical division FAOSTAT, http://faostat3.fao.org/home/index.html# Download.

Glaz, B. 2000. Sugarcane variety census; Sugar Y. Azucar. pp. 23.

Gomez, K. A. and Gomez, A. A.1984. Statistical Procedures for Agricultural Research. 2nd E^{dn}, John Wiley and Sons Inc., New York, USA., pp: 13-175.

Islam, M. R., Kabir, M. L., Rahman, M. A., Islam, M. S. and Al-Amin, H. M. 2017. Performance of promising sugarcane clones in different Agro-ecological zones under farmer's field. *Bangladesh J. Sugarcane*, 38: 86-92.

Khan, N.U., Kabiraj, R.C., Alam, K.S. and Rahman, M. H. 2007. Ratooning potential of BSRI released latest sugarcane varieties in old himalayan piedmont plain soils. *Bangladesh J. sugarcane*, 29:115-119.

Majid, M.A. 2007. Sugarcane variety composition in pakistan. *Pak. Sugarcane J.* 22(1): 2-23.

Naich, A. N., Baloch, P. A. and Abro. B. A. 2006. Evaluation of growth and yield parameters of different sugarcane (*Saccharum officinarum L.)* varieties under national uniform varietal trial on. *Pak. Sugarcane J.*, 21(1): 2-5.

Paul, G. C., Alam, K. M., Bokhtiar, G. M. A. Hossain, M. A. Haque and Islam, M. Z. 2011. Performance of Some Sugarcane Genotypes under N-Streesed Field Condition. *Bangladesh J. Sugarcane*, 32: 7-12.

Razzak, M. A., Shohel, M. A. T., Islam, A. K. M. R., Kamruzzaman, M., Islam, S., Islam M. J. and Karim, S. M. R. 2015. Performance of some newly release sugarcane varieties in farmers' field condition under high Ganges River Floodplain soils. *Bangladesh J. Sugarcane*, 36: 84-88.