Ratooning Potentiality of Newly Released Sugarcane Varieties in Farmer's Field Condition under High Ganges River Floodplain

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Abstract

A field experiment was conducted in farmer's field of two locations under High Ganges River Floodplain (AEZ-11) of Bangladesh during 2014-2015 cropping season for evaluating the ratooning potentiality of six newly released sugarcane varieties viz. Isd 34, Isd 36, Isd 37, Isd 38, Isd 39 and Isd 40 with one earlier released popular variety Isd 16 as standard. The experiment was laid out in a Randomized Complete Block (RCB) design with three replications. The results reveal that the tested varieties varied significantly in case of number of tiller, millable cane, brix (%) and cane yield. Ratoon cane of Isd 36, Isd 16, Isd 37 and Isd 39 contained higher sugar. At Chuadanga site, the highest cane yield of 90.96 t ha^{-1} was obtained in Isd 37 which is statistically similar with Isd 39 followed by Isd 40 and the lowest cane yield was obtained from the variety Isd 36. However at Jessore site, the maximum value of 94.36 t ha^{-1} was recorded from Isd 39 followed by Isd 37, Isd 40 and the minimum value from Isd 36. Similarly, the ratoon of the newly released varieties Isd 37, Isd 39 and Isd 40 gave higher economic return compared to standard one at both locations under High Ganges River Floodplain of Bangladesh. Therefore, these three sugarcane varieties can be cultivated as ratoon in this area with recommended management practices for acquiring higher yield and economic benefit.

Key words: Newly released, sugarcane varieties, ratooning potentiality

Introduction

Sugarcane like other perennial grass is able to regenerate shoots from the left–over stalk of preceding crops known as ratoon crop. Ratooning of sugarcane is a common practice throughout the world and ratoon occupies almost 50 percent of the total area under sugarcane production (Sundara, 2008). It is an age old practice in almost all the major sugarcane growing countries, following at least two even more ratoon from the same plantation. In Hawaii, Mauritius, Philippines and Cuba 4 to 6 ratoons are quite common (Misra and Mathur, 1983). The main advantage of ratooning in sugarcane lies in its reduced crop life and cost of production as well as higher sugar recovery (Verma, 2002). Ratoon is profitable because nothing is spent on land preparation, planting operation and seed materials etc. (Yadav, 1986). It saves about 30-35% money spent on the cost of cultivation (Singh *et al.* 2003). Rather the yield of ratoon almost as good as those obtained with plant cane if the ratoon cane grown with recommended production and protection practices (Kapoor, 1966 and Mathur, 1886). In Bangladesh, only 20 % of the cane area is ratooned every year producing an average of 40 t ha^{-1} while the potential yield has been found to be around 80 t ha^{-1} (Anon., 2001). Different varieties do differ in their ratooning potential (Yadav, 1992). Ratoon crop have often failed to produce satisfactory germination, growth and yield in Bangladesh due to lack of suitable ratooning varieties and proper management practices (Majid and Alam, 1998). In recent years there has been found considerable increased interest on multi-ratooning to reduce the cost of cultivation and also to improve sugar recovery in early part of the crushing season. But often it is found that ratoon canes of the existing varieties are not always satisfactory as that of the plant cane, which disappoints the growers. Therefore, this experiment was undertaken to evaluate the ratooning potentiality of BSRI released latest sugarcane varieties at Chuadanga and Jessore site under High Ganges River Floodplain.

Materials and Methods

The experiment was conducted in farmer's field of two locations viz. Uthali, Chuadanga (23^{0}29′21.4″N, 88^{0}50′26.4″E) and Baro Bazar, Jessore (23^{0}18′12.0″N, 88^{0}09′10.2″E) under High Ganges River Floodplain. The land was medium high and the soil was typical loamy with pH 7.5.

The experiment was laid out in a Randomized Complete Block (RCB) design with three replications. During the cropping season 2013-2014, six newly released sugarcane varieties such as Isd 34, Isd 36, Isd 37, Isd 38, Isd 39, Isd 40 and one older popular variety Isd 16 (standard) were planted as treatments. The unit plot size was 8m×8m where one meter row to row distance was maintained. Ratoon crops were raised from left over stubble of the harvested plant cane in the next cropping season (2014-2015). Stubble shaving was done in 6 January 2015 just after harvesting of plant cane. The inter row spacing between two cane rows were tilth well by country plough and laddering. Recommended dose of N, P, K, S and Zn were applied in proper way. Applications of Regent 3 GR @ 20 kg ha^{-1} and Furadan 5 GR @ 40 kg ha^{-1} were done during basal and side dressings of fertilizers respectively. Other intercultural operations like weeding, mulching, irrigation, earthing up, tying and cultural control of insect pest etc. were done as and when required. Data were collected at different growth stages of crop. Tiller population of ratoon cane was recorded at 150 days after stubble shaving. Brix (%) reading was recorded by hand refractometer from standing cane at proper maturity. Number of millable cane and yield data were taken at harvest in 15 December 2015. Collected data were compiled and tabulated in proper form and were subjected to statistical analyses using the computer package Statistix 10 program for Windows version. Economic analysis such as total production cost, gross margin, gross return and benefit cost ratio (BCR) of the tested sugarcane varieties were calculated following standard procedure. Total production cost included all variable cost (fuel, labour, fertilizer, machine hiring cost, pesticide and other expenses) and fixed cost (land opportunity cost) from land preparation to harvesting operation. Same amount of fertilizer and pesticide were applied in all the plots. Gross margin is the difference between gross return and total production cost and BCR is the ratio of the gross return and total production cost.

Result and Discussion

Tiller population

Tillering is the most desirable character of sugarcane from farmers' point of view. Good tillering ensures good yields and better ratoon ability of a sugarcane crop (Islam *et al.* 2016). Data presented in table 1 showed that there was no significant difference in tiller population among the sugarcane varieties at Chuadanga site. However at Jessore site, the tested varieties showed significant difference in producing tiller population. In this site Isd 34 produced the highest number of tiller (252.77×10^3 ha^{-1}) followed by Isd 40 (244.47×10^3 ha^{-1}) while Isd 38 produced the lowest number of tiller (138.43×10^3 ha^{-1}). Variation in tiller population among different varieties could be probably attributed to the differences in the genetic makeup of the varieties (Worku and Chinawong, 2006). The results are also supported by Rashid *et al. (*2001) and Alam *et al.* (2006).

Millable cane

Junejo *et al.* (2010) reported that millable canes are the most important yield contributing parameters. Data on number of millable cane at both locations showed that there was significant difference among the varieties (Table 1). At Chuadanga site, the maximum number of millable cane (102.88×10^3 ha^{-1}) was recorded from the variety Isd 37 followed by Isd 39 and Isd 34 while the minimum number of millable cane (75.38×10^3 ha^{-1}) was obtained from Isd 40. However at Jessore site, the maximum number of millable cane (138.90×10^3 ha^{-1}) was recorded from the variety Isd 34 followed by Isd 40 and Isd 39. The minimum number of millable cane (67.27×10^3 ha^{-1}) was obtained from Isd 38. The maximum number of millable cane production in the variety Isd 34 might be due to the higher number of tiller production compared to other varieties. Matin *et al*. (1989) and Alam *et al.* (2006) also reported similar results on millable cane production.

Cane yield

Yield is the contribution of several attributes like tiller, millable cane, stalk length and girth of cane. It is evident from the data on cane yield that there were significant differences among the varieties at both locations. At Chuadanga site the highest cane yield (90.96 t ha^{-1}) was found in Isd 37 which is statistically similar with Isd 39 (89.33 t ha^{-1}) followed by Isd 40 (66.38 t ha^{-1}) and Isd 16 (62.02 t ha^{-1}). The lowest yield was obtained from the variety Isd 36 (46.61 t ha^{-1}). However at Jessore site the highest yield (94.36 t ha^{-1}) was recorded from Isd 39 which was statistically different from

Table 1. Number of tiller, millable cane and cane yield of the tested sugarcane varieties at Chuadanga and Jessore site

Treatments	Chuadanga site			Jessore site		
	No. of Tiller ($\times 10^3$ ha^{-1})	No. of Millable cane ($\times 10^3$ ha^{-1})	Cane Yield (t ha^{-1})	No. of Tiller ($\times 10^3$ ha^{-1})	No. of Millable cane ($\times 10^3$ ha^{-1})	Cane Yield (t ha^{-1})
Isd 16	165.83	62.60 d	62.06 bc	157.17 bc	100.30 cd	81.96 b
Isd 34	230.81	93.87 b	63.15 bc	252.77 a	138.90 a	77.13 b
Isd 36	191.37	91.87 b	46.61 d	143.33 c	67.27 e	45.03 d
Isd 37	179.2	102.88 a	90.96 a	148.23 c	92.27 d	83.76 b
Isd 38	183.48	72.83 c	54.73 cd	138.43 c	81.70 de	58.36 c
Isd 39	205.03	94.93ab	89.33 a	156.67 bc	113.90 bc	94.36 a
Isd 40	186.7	75.38 c	66.38 b	244.47 ab	123.67 ab	82.00 b
LSD (0.05)	NS	8.47	10.57	88.32	21.57	9.91

Note: Figures in different columns accompanied by similar letters do not differ significantly as per DMRT at 0.05 levels.

other varieties while the lowest yield was recorded from Isd 36 (45.03 t ha^{-1}).

Total soluble solids (Brix)

Total soluble solid or brix (%) is the percent amount of sugars and minerals dissolved in water. However, many other chemicals may be present and contribute some small factor to the brix reading. The tested varieties exhibited variation in brix (%) reading at both locations (Fig. 1). At Chuadanga site, the highest brix (%) was found in Isd 36 (25.13) followed by Isd 39 (21.88) and the lowest brix (%) was in Isd 34 (19.86). At Jessore site, the highest brix (%) was found in Isd 36 (21.78) followed by Isd 16 (21.06) and the lowest brix (%) was in Isd 38 (19.17). It is evident from the Figure 1 that, the ratoon of Isd 36, Isd 16, Isd 37 and Isd 39 showed higher brix (above 20%) at both locations. Higher brix (%) of any variety is an indication for the production of higher sugar, jaggery and bio-fuel. Verma (2002) also reported similar results on sugar recovery.

Economic analysis

Economic analysis of different sugarcane varieties are presented in table 2. At Chuadanga site, the highest gross return (Tk. 2,27,400 ha^{-1}), gross margin (Tk.1,37,400 ha^{-1}) and BCR (2.53) was achieved from Isd 37 followed by Isd 39, Isd 40 and Isd 34. The lowest economic return was recorded in Isd 36.

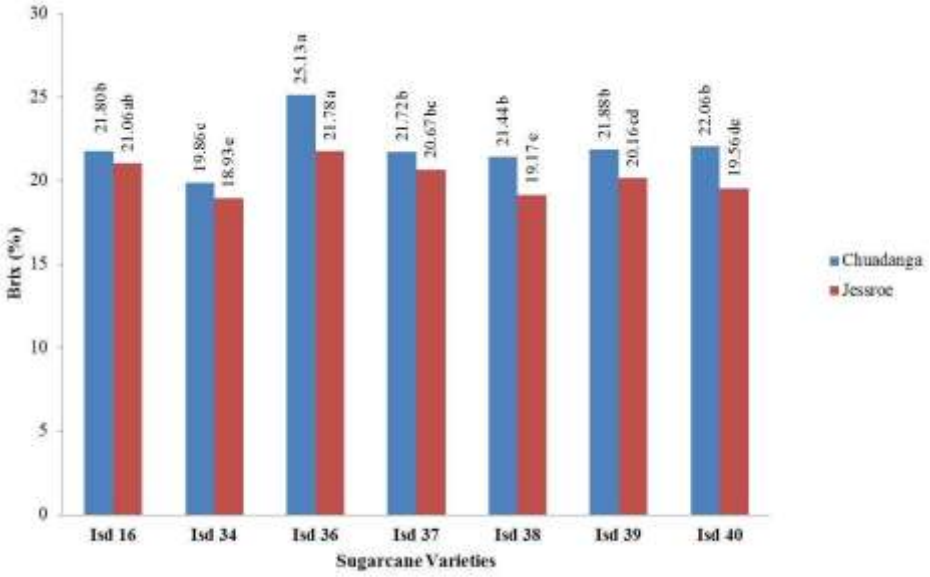

Fig. 1. Brix (%) of the tested sugarcane varieties at Chuadanga and Jessore

Table 2. Economic analysis of the tested sugarcane varieties at Chuadanga and Jessore site

Treatments	Total production cost (Tk. ha^{-1})	Chuadanga site			Jessore site		
		Gross return (Tk. ha^{-1})	Gross margin (Tk. ha^{-1})	Benefit cost ratio (BCR)	Gross return (Tk. ha^{-1})	Gross margin (Tk. ha^{-1})	Benefit cost ratio (BCR)
Isd 16	90,000	1,55,150	65,150	1.72	2,04,900	1,14,900	2.28
Isd 34	90,000	1,57,875	67,875	1.75	1,92,825	1,02,825	2.14
Isd 36	90,000	1,16,525	26,525	1.29	1,12,575	22,575	1.25
Isd 37	90,000	2,27,400	1,37,400	2.53	2,09,400	1,19,400	2.33
Isd 38	90,000	1,36,825	46,825	1.52	1,45,900	55,900	1.62
Isd 39	90,000	2,23,325	1,33,325	2.48	2,35,900	1,45,900	2.62
Isd 40	90,000	1,65,950	75,950	1.84	2,05,000	1,15,000	2.28

Note: Price of sugarcane: 2500.00 Tk. t^{-1}

However at Jessore site, the highest gross return (Tk. 2,35,900 ha^{-1}), gross margin (Tk. 1,45,900 ha^{-1}) and BCR (2.62) was achieved from Isd 39 followed by Isd 37, Isd 40 and Isd 16. Therefore, Isd 37, Isd 39 and Isd 40 were found economically superior varieties compared to Isd 16 at both locations.

Conclusion

From the above results and discussions, it is evident that the ratoon of newly released sugarcane varieties Isd 37, Isd 39 and Isd 40 showed better performance regarding yield and economic return compared to standard one in High Ganges River Floodplain (AEZ-11) of Bangladesh. Therefore, ratoon cultivation of these three sugarcane varieties with recommended management practices can be followed in this area for acquiring higher yield and economic benefit.

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