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Performances of Sugarcane Budchips : A Prospect of BSRI Budchip Cutting Machine

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ABSTRACT

An experiment was conducted in a farmer's field under Chuadanga Sub-Station of Bangladesh Sugarcane Research Institute during 2005-'06 & 2006-'07 cropping season to examine the suitability and potentiality of budchips of four sugarcane varieties (Isd 16, Isd 32, Isd 34 and Isd 35) in irrigated condition where budchips were used as planting material. All the varieties showed satisfactory germination ranging from 67 to 88 percent germination. All of the varieties showed more than 92% establishment of budchip settlings in the main field. Variety Isd 32 produced significantly higher average yield (111.56 t ha^{-1}) over variety Isd 34 (96.49 t ha^{-1}), Isd 35 (98.68 t ha^{-1}) and Isd 16 (91.73 t ha^{-1}) during 2005-'06 and the highest average yield was Isd 32 (90.47 t ha^{-1}) over all the selected varieties, Isd 35 (85.93), Isd 34 (85.13) and Isd 16 (86.63) t ha^{-1}but they produces statistically non significant and similar average yield during 2006-'07. Considering all aspects of performance, all the selected varieties can be cultivated in Chuadanga area using budchip as planting material.

Key words: Budchip, sugarcane, prospect, budchip cutting machine

INTRODUCTION

Usually three budded setts are used as seed in conventional method for sugarcane cultivation and seed rate is 6.0 to 6.5 t ha^{-1}. To reduce this seed rate, spaced transplanting methods is a popular and profitable technology for the sugarcane growers where it requires 1.5 to 2.0 t ha^{-1}as seed materials (Anon. 1989). In this method one eyed or two eyed pregerminated soil bed or poly bag settlings are transplanted in the main field of sugarcane. It is possible to increase the yield of sugarcane from 1.5 to 2.0 times in the space transplanting methods than that of conventional (Paul, S.K., 2005).

Further seed reduction can be done using sugarcane budchips as it requires only 116 to 150 kg per hectare as seed materials (Eusufzai, 1993). In this method sugarcane bud is just cut in the form of chip keeping the stalk intact. After removal of budchip from the cane stalk, the remaining parts can be used for sugar or gur production. The amount of budchip required for raising settlings for one hectare of land area is about 150 kg which costs about Tk.200.00. Thus, it can save an amount of Tk.7900.00 per hectare for seed material (Rahman, 2007) where cost of fabrication of budchip cutting machine is about Tk. 5000.00. (Table 1) Total area coverage for sugarcane production is 0.084 million hectare in the non mill zone area of Bangladesh (Paul, S.K., 2005). Budchip may be used

successfully specially in the non mill zone area where sugarcane is used for gur production. Thus it can save more than Tk.66 crore per year. Besides it was estimated that market value of the gur that might be produced from the remaining parts of the sugarcane stalks could be as high as Tk.12000.00 per hectare (Hossain, 2005). This amount of money can be used by the farmers for purchasing irrigation water, fertilizer, pesticide or other services required for increasing sugarcane yield.

For rapid propagation of new variety and easy transportation of seed material from one place to another budchip can play an important role for the scientist as well as farmers. Budchip if used as planting material ensure minimum amount of seed material, minimum transportation cost and provide extra-income from saved remaining parts of the sugarcane stalks that are usually buried in the field in conventional method. Apart from this, soil and weather for budchip sugarcane of all varieties do not show the same suitability in all the region of Bangladesh. Therefore, a study was conducted to examine the performances of sugarcane budchip of the selected varieties on (i) germination potential of budchip in soil bed; and (ii) establishment and yield potential of budchip settlings in the field under irrigated condition. in Chuadanga area.

MATERIALS AND METHODS

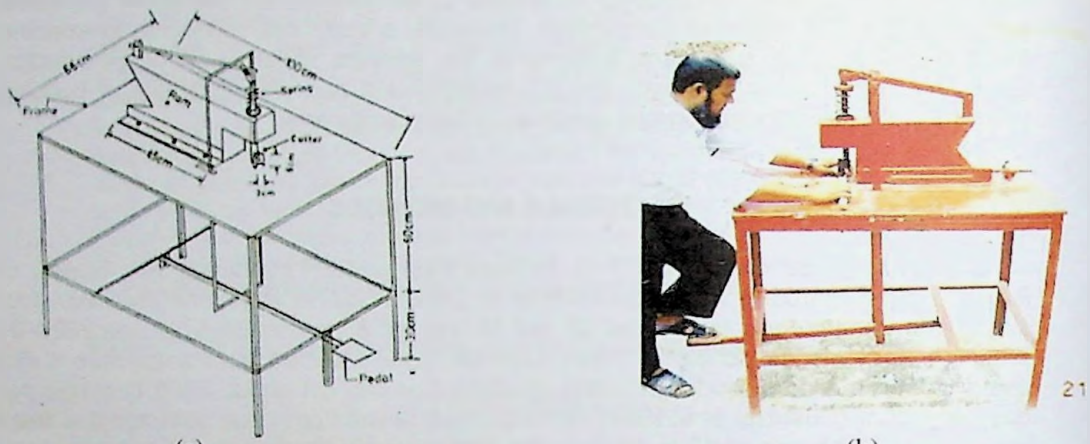
The study was carried out in a farmer's field under Chuadanga Sub-Station of Bangladesh Sugarcane Research Institute at Locknathpur in Darshona area with four sugarcane varieties viz. Isd 16, Isd 32, Isd 34 and Isd 35 during 2005-'06 and 2006-'07 cropping seasons. Budchips of these varieties were collected from sugarcane stalks using BSRI developed budchip cutting machine that can cut about 8,000 budchips per day per labour (Eusufzai *et al.*1993). Settlings were raised from these collected bud chips in soil bed. At the age of 42 to 49 days the settlings were transplanted in the main field. The experiment was laid up in RCBD with treatments of four (4) varieties and three (3) replications with irrigated conditions. The selected varieties were as follows:

V_1 = Variety Isd 16
V_2 = Variety Isd 32
V_3 = Variety Isd 34
V_4 = Variety Isd 35

The budchip settlings were transplanted in the main field at a rate of 25,000 settlings per hectare. The soil of the experimental field was sandy loam with P^H value ranged from 6.1 to 7.5. Chemical fertilizers were applied as per BARC recommendation 1997 (Rahman *et al.* 1998) and intercultural operations were done as per BSRI recommendation. Establishment percentage was counted from the number of live plants survived in the field. Number of tillers produced by different varieties was counted after six (6) months of transplantation. Two live irrigations were applied in the field at 0 and 14 days after plantation. Later irrigation was applied at depth of 10 cm water at 28 days intervals because irrigation required at field condition for the sandy-loam soil is 10 cm (Michael, 1991).

Feature of the Budchip Cutting Machine:

The budchip cutting machine was designed and fabricated in the Agricultural Engineering Workshop of BSRI with the materials and specification shown in Fig. 1 and Table 1. The machine consist of a ram of 450 mm x 255 mm x 95 mm size with an extended nose of 105 mm x 95 mm x 100 mm size to hold a spring operated shaft containing a half circular cutting blade at the lower end. the machine was fitted on a 1000 mmx 660 mm x 900 mm size table which is made of mild steel anglebar and wood (Eusufzai *et al.* 1993) Sugarcane stalk is placed on the table keeping the bud just below the cutting blade and pressing the blade through a pedal, the bud is then cut in the form of chip (Fig. 1 b).



(a) (b)

Figure 1. BSRI budchip cutting machine: (a) schematic view and (b) pictorial view in operation condition.

Table 1. Material requirements and cost involvement for fabrication of the budchip cutting machine.

Sl. No	Description	Specification	Quantity	Unit price, Tk.	Cost, Tk
1.	M. S angle	(35 x 35 x 5)mm	10 m	230.00	2300.00
2.	M.S. sheet	2 mm thick	1 x 0.5 m^2	960.00	480.00
3	M.S. flat bar	(25.4 x 3.0)mm	2.5 m	145.00	290.00
4.	M.S. flat bar	(25.4 x 6.4)mm	2.0 m	145.00	290.00
5.	Spring	(150 mm x 55 mm dia)	1.0 no.	180.00	180.00
6.	M.S. shaft	25.5 mm dia	0.4 m	200.00	80.00
7	Cutting knife	(50 mm x 6.4 mm dia)	1.0 no.	40.00	40.00
8.	Nut and bold	(32 mm x 6.4 mm dia)	42 no's.	12.50	500.00
9.	Flat wood	20 mm thick	0.02 m^3	2000.00	40.0
10	Making charge	-	-		800.00
Total cost involved					Tk. 5000.00

RESULTS AND DISCUSSION

The results obtained from the experiment in respect of raising budchip settlings of four sugarcane varieties and their yield and yield contributing characters in the main field are discussed below.

Germination of Budchip in Soil Bed

Germination percentages of budchips obtained from different varieties of sugarcane are given in Table 2. Number of budchip placed for raising settlings for different varieties were 2500 each. The highest germination of bud chip was found for variety Isd 35 (94%) followed by variety Isd 34 (74.16 %), Isd 16 (73%) and the lowest germination was found for variety Isd 32 (72.00 %) during 2005-'06 and the highest germination was for variety Isd 35 (81%) followed by Isd 34 (67 %), Isd 16 (63%) and the lowest germination was found for variety Isd 32 (61.00 %) during 2006-'07 cropping season. On the basis of the average germination of budchip, the selected varieties can be ranked as: Isd 35 > Isd 34 > Isd 16 > Isd 32. It is evident from the rank list that on an average, two varieties: Isd 35 (87.5%) and Isd 34 (70.5%) produced more than 70% germination. Thus, these varieties may be termed as the most suitable varieties for raising settling from budchip. On the other hand, all the varieties showed satisfactory level of germination (Table 2 & 3).

Establishment of Budchip Settling

Establishment of bud chip settlings of different varieties are given in Table 3 and Table 4. Two live irrigations were applied to all treatments at 0 and 14 days after transplantation. Because, it was essentially important to apply at least two irrigations at 0 and 10-14 days after transplantation for the survival of the soil bed budchip settlings (Hossain, 2005).

The establishments were found statistically non significant for the selected varieties (Table 3 and Table 4). During 2005-'06 statistically similar establishments were found for varieties V_1 (23.40 x 10^3 ha^{-1}), V_2 (23.42 x 10^3 ha^{-1}) and V_3 (23.53 x 10^3 ha^{-1}) The highest establishment was counted for variety V_3 (23.53 x 10^3 ha^{-1}) and the lowest establishment was counted for variety V_4 (23.19 x 10^3 ha^{-1}). During 2006-'07 the establishments were also found statistically similar for varieties V_1 (23.61 x 10^3 ha^{-1}), V_2 (23.61 x 10^3 ha^{-1}), V_3 (23.53 x 10^3 ha^{-1}) and V_4 (23.75 x 10^3 ha^{-1}) respectively.

Number of Tiller

The number of tiller usually depends on the varietal characteristics of a variety. At the same level of input and environmental condition all varieties do not produce same number of tiller. From Table 3 it is evident that variety V_4 (185.17x10^3 ha^{-1}) and V_3 (163.73 x 10^3 ha^{-1}) produced significantly higher number of tiller over variety V_1 (121.43 x 10^3 ha^{-1}), and V_3 (138.87 x 10^3 ha^{-1}) during 2005-'06 cropping season. Similarly from Table 4 variety V_3 (240.20 x10^3 ha^{-1}) and V_4 (206.47 x 10^3 ha^{-1}) produced significantly higher number of tiller over variety V_1 (178.03 x 10^3 ha^{-1}), and V_2 (193.30 x 10^3 ha^{-1}) during 2006-'07 cropping season.

Cane Yield

Yield of sugarcane is the final output from the field for the farmers after harvesting. The average cane yield of the selected varieties Isd 16, Isd 32, and Isd 34 when planted in conventional method were found to be 92.0, 104.0, and 93.0 t ha^{-1} respectively (Rahman and Pal, 2003). In this experiment, all other varieties except Isd 16 produced higher or similar yield to the conventional method during 2005-'06 cropping season . It is evident from Table 3 that the highest yield of sugarcane (111.60 t ha^{-1}) was produced by variety V_2(Isd 32) which is higher than variety V_1 (91.73 t ha^{-1}), V_3 (96.49 t ha^{-1}) and V_4 (98.68 t ha^{-1}). The lowest yield was produced by variety V_1 (91.73 t ha^{-1}. But pol percent as well as sugar content of variety Isd 16 showed the highest. On the basis of the yield performance, the selected varieties can be ranked as: Isd 32 > Isd 35 > Isd 34 > Isd 16. During 2006-'07 the yield of all varieties are statistically similar where the highest yield was V_2 (90.47) for variety Isd 32 and the lowest yield was V3 (85.13 t ha^{-1}) for variety Isd 34 (Table 4).Thus on the basis of the yield performance, the selected varieties can be ranked as: Isd 32 > Isd 16 > Isd 35 > Isd 34. Otherwise, all the varieties showed the satisfactory level of yield of sugarcane (Table 3 & Table 4).

CONCLUSION

On the basis of the aforesaid results and discussions it is apparent that budchips of the selected varieties have their individual potentiality on germination, establishment, number of tiller and yield of cane which were eventually influenced by characteristics of the selected varieties. The evidences obtained from the experiment lead to the following concise statements:

- Germination of budchip for all the varieties was satisfactory and ranged from 66 to 88 percent. Among of them variety Isd 35 showed germination above 80 percent.
- Establishment of budchip settlings was also found satisfactory for variety Isd 16, Isd 32, Isd 34 and Isd 35 for both the cropping season 2005-'06 and 2006-'07 which showed establishment above 92 percent.
- Tiller of cane production from budchip settlings were found satisfactory which was more than 100 x 10^3 ha^{-1} for cropping season 2005-'06 and about 100 x 10^3 ha^{-1} for cropping season 2006-'07.
- Yield of sugarcane produced from budchip settlings were satisfactory for all selected varieties. Among of them 111.60 t ha^{-1} (Isd 32) was the highest yield over other varieties and 85.13 t ha^{-1}(Isd 34) was the lowest yield of the selected varieties.

Therefore, it may be concluded that budchip cutting machine is technically feasible and could be extensively used for producing budchips as seed materials for sugarcane in the Chuadanga region in case of germination, establishment and yield and yield contributing parameters of sugarcane.

Table 2. Germination percentage of budchip on soil bed; during 2005-'06 and 2006-'07 cropping season.

Variety	2005-'06	2006-'07	Average	
	Germination (%)	Germination (%)	Germination (%)	Rank
Isd 16 (V_1)	73	63	68	3
Isd 32 (V_2)	72	61	66.5	4
Isd 34 (V_3)	74	67	70.5	2
Isd 35 (V_4)	94	81	87.5	1

Table 3. Performance of budchip of four varieties on their establishment of settlings, tiller, millable cane and yield during, 2005-'06 cropping season.

Treatment	Establishment of settlings ($x10^3$ ha^{-1})*	Tiller ($x10^3$ ha^{-1})	Yield (t ha^{-1})
Isd 16 (V_1)	23.40 (93.60)	121.43 d	91.73 b
Isd 32 (V_2)	23.42 (93.68)	138.87 c	111.60 a
Isd 34 (V_3)	23.53 (94.12)	163.73 b	96.49 a
Isd 35 (V_4)	23.19 (92.76)	185.17 a	98.68 a
LSD at 5%	ns	11.36	5.83

Table 4. Performance of budchip of four varieties on their establishment of settlings, tiller, millable cane and yield during, 2006-'07 cropping season.

Treatment	Establishment of settlings (x103 ha-1)*	Tiller (x103 ha-1)	Yield (t ha^{-1})
Isd16 (V1)	23.61 (94.44) ab	178.03 c	86.63
Isd32 (V2)	23.61 (94.44) ab	193.30 bc	
Isd34 (V3)	23.40 (93.72) b	240.20 a	90.47
Isd35 (V4)	23.75 (95.00) a	206.47 b	
			85.13
			85.93
LSD at 5%	0.23	17.29	ns

* Value within the parenthesis indicates the percentage

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