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Performance of Budchip as Planting Materials for Sugarcane

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ABSTRACT

An experiment was conducted in Bangladesh Sugarcane Research Institute (BSRI) farm at Ishurdi during 2003-04 & 2004-05 cropping seasons to examine the suitability of budchips of six sugarcane varieties (Isd 16, Isd 30, Isd 31, Isd 32, Isd 33 and Isd 34) as planting material in irrigated condition. The experiment was laid up in RCBD with six varieties as treatment and replicated thrice. All of the six varieties showed satisfactory germination ranging from 69 to 96 percent while variety Isd 32, Isd 33 and Isd 34 showed more than 85% germination. Except Isd 30 all other varieties showed more than 90% establishment of budchip settlings in the main field. Variety Isd 34, Isd 33, Isd 31 and Isd 32 produced significantly higher average yield (119.57, 118.00, 117.37 & 105.67 t ha^{-1} during 2003-04 and 104.42, 91.65, 97.39, & 93.76 t ha^{-1} during 2004-05 respectively) over variety Isd 16 and Isd 30. Considering all aspects of performance, variety Isd 32, Isd 33 and Isd 34 were found potential to be cultivated in Ishurdi area using budchip as planting material.

Key words : Budchip, sugarcane, budchip settling, planting material.

INTRODUCTION

Planting sugarcane using spaced transplanting (STP) method is getting popularity among sugarcane growers in Bangladesh because of its reduced seed rate and higher yield. In conventional method, where cane stalks are directly planted in the main field, it needs about 6 to 6.50 t ha^{-1} of seed cane. But in spaced transplanting (STP) method, where pregerminated one eyed or two eyed soil bed settlings of 45-60 days old are transplanted in the main field, it needs about 1.50-2.00 t ha^{-1} of seed cane (Anon., 1989). The amount of seed material was further reduced to 116 kg when settlings were raised using budchip of sugarcane (Eusufzai *et al.*, 1993). In the past budchip polybag settlings were raised successfully and budchip polybag settlings were found equally good as polybag one-eyed settlings (Imam *et al.*, 1988 and Anon., 1989). Budchips stored for even 13 days could give better survival rates when raised in poly bags (Prasad and Screenivasan,1996). However, budchip settlings were so far not raised in soil bed in Bangladesh.

Assuming 80% germination, the amount of budchip required for raising settlings for one hectare of land area is about 150 kg which costs about Tk.192.00. Thus, it can save an amount of more than Tk.7,000.00 per hectare for seed material. After removal of budchip from the cane stalk, the remaining parts can be used for sugar or gur production. 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 bud chip 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. Therefore, a study was conducted to examine the (i) germination potential of budchip in soil bed; and (ii) yield potential of budchip settlings in field under irrigated condition.

MATERIALS AND METHODS

The study was carried out in Bangladesh Sugarcane Research Institute (BSRI) farm at Ishurdi with six sugarcane varieties viz. Isd 16, Isd 30, Isd 31, Isd 32, Isd 33 and Isd 34 during 2003-2004 and 2004-2005 cropping seasons. Budchips of these varieties were collected from sugarcane stalks using BSRI developed Bud chip cutting machine that can cut about 8,000 bud chips per day-labour (Eusufzai *et al.*, 1993). Settlings were raised from these collected bud chips in soil bed. At the age of 60 to 69 days the settlings were transplanted in the main field. The experiment was laid up in Randomized Complete Block Design (RCBD) with six treatments (variety) and three replications. The selected varieties used as treatment were as follows:

V_1 = Variety Isd 16
V_2 = Variety Isd 30
V_3 = Variety Isd 31
V_4 = Variety Isd 32
V_5 = Variety Isd 33
V_6 = Variety Isd 34

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 loamy to clay loam with pH value ranged from 7.57 to 7.70. Chemical fertilizers were applied as per recommendation. (Rahman *et al.*, 1998) and intercultural operations were done as per BSRI recommendation. Number of tillers produced by different varieties were counted after six months of transplantation. Number of millable canes were counted just one week before harvesting. Chemical analyses of canes were done during the mature stage in the month of December to find the pol percent of the cane (pol % cane).

The experiment was conducted in irrigated condition. Two live irrigations were applied in the field at 0 and 14 days after plantation. Later irrigation was applied at 28 days intervals.

RESULTS AND DISCUSSION

The results obtained from the experiment in respect of raising budchip settlings of six sugarcane varieties and their performance in the main field are discussed below.

Germination of Budchip in Soil Bed

Germination percentages of bud chips obtained from different varieties of sugarcane are given in Table 1. Number of budchip placed for raising settlings for

different varieties were 100 each. For minimizing the error, placement of budchips of each variety was replicated thrice. During 2003-04 the highest germination of bud chip was found for variety Isd 34 (96%) followed by variety Isd 32 (92%), Isd 33 (91%) and the lowest germination was found for variety Isd 31 (69%).

Almost similar germination percentages were also found during 2004-05. The highest germination of budchip was found for variety Isd 34 (95%) followed by variety Isd 33 (87%), Isd 31 (85%) and Isd 32 (80%). Similar germination of budchip (95%) was also reported by Prasad and Screenivasan (1996) in India. The lowest germination was found in variety Isd 16 (77%) during 2004-05.

However, on the basis of the average germination of budchip during 2003-04 and 2004-05, the selected varieties can be ranked as: Isd 34 > Isd 33 > Isd 32 > Isd 30 > Isd 16 > Isd 31. It is evident from the rank list that on an average, three varieties: Isd 34, Isd 33 and Isd 32 that occupied 1st, 2nd and 3rd positions produced more than 85% germination. Thus, these three varieties may be termed as the most suitable varieties for raising settling from budchip.

Establishment of bud chip settling

Establishment of bud chip settlings of different varieties are given in Table 2 and Table 3. 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 soil bed budchip settlings (Hossain, 2005).

During 2003-04, the statistically significant higher and similar establishment was found for varieties V_4 ($24.33x10^3$ ha^{-1}), V5 ($24.11x10^3$ ha^{-1}) and V3 ($24.11x10^3$ ha^{-1}) over varieties V_1 ($23.22x10^3$ ha^{-1}), V_2 ($20.33x10^3$ ha^{-1}) and V_6 ($23.44x10^3$ ha^{-1}). However, statistically similar establishment was also found for varieties V_3, V_5 and V_6. The highest establishment was found for variety V_4 ($24.33x10^3$ ha^{-1}) and the lowest establishment was found for variety V_2. Therefore, on the basis of the establishment potential, the selected varieties can be ranked as: Isd 32 > Isd 31 > Isd 33 > Isd 34 > Isd 16 >Isd 30.

Similarly the highest establishment was also found for variety V4 ($24.17x10^3$ ha^{-1}) during 2004-05. However, it was not statistically similar to variety V5 ($23.61x10^3$ ha^{-1}) and V_3 ($23.42x10^3$ ha^{-1}), as it was in the previous year. Similar to the previous year, the lowest establishment was also found for variety V_2 ($17.87x10^3$ ha^{-1}) Thus on the basis of the establishment found during 2004-05, the selected varieties can be ranked as Isd 32 > Isd 33 > Isd 31 > Isd 34 > Isd 16 > Isd 30.

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 2 it is evident that variety V_3 ($157.11x10^3$ ha^{-1}), V_5 ($165.00x10^3$ ha^{-1}) and V_6 ($157.89x10^3$ ha^{-1}) produced significantly higher number of tiller over variety V_1 ($124.55x10^3$ ha^{-1}), V2 ($99.22x10^3$ ha^{-1}) and V_4 ($124.00x10^3$ ha^{-1}) during 2003-04. On the basis of the tiller production potential the selected varieties can be ranked as: Isd 33 > Isd 34> Isd 31 > Isd 16 > Isd 32 > Isd 30.

However, during 2004-05, the higher and statistically similar tillers were produced by variety V_3, V_4, V_5 & V_6 over others although the highest number of tillers was produced by variety V_3 (123.70×10^3 ha^{-1}). On the basis of the tiller production potential the selected varieties can be ranked as Isd 31 > Isd 34 > Isd33 > Isd32 > Isd16 > Isd 30.

Millable Cane

Millable cane is the number of canes that are available for harvesting for the purpose of milling or crushing. It is the number of tillers that survive and become matured in competition with others. From the data given in Table 2, it is evident that variety V_3 ($143.78x10^3$ ha^{-1}), V_5 ($150.56x10^3$ ha^{-1}) and V6 ($146.67x10^3$ ha^{-1}) produced statistically significant higher number of millable cane over variety V_1 ($117.33x10^3$ ha^{-1}), V_2 ($80.22x10^3$ ha^{-1}) and V4 ($116.56x10^3$ ha^{-1}) during 2003-04. It is also evident that variety that produced higher number of tillers also produced higher number of millable canes. On the basis of the millable cane production potential, the selected varieties can be ranked as: Isd 33 > Isd 34 > Isd 31 > Isd 16 > Isd 32 > Isd 30.

During 2004-05, the statistically significant highest number of millable cane was produced by variety V_6 ($113.89x10^3$ ha^{-1}) which was statistically similar to treatment V_5 ($104.54x10^3$ ha^{-1}). It is also revealed from Table 3 that the mortality of tiller in variety V_4 was less than that of in other varieties. Thus, for 2004-05 the selected varieties can be ranked as: Isd 34 > Isd 33 > Isd 31 > Isd 32 > Isd 16 > Isd 30. From the average number of millable cane production potential during 2003-04 and 2004-05, the selected varieties can be ranked as Isd 34 > Isd 31 > Isd 33 > Isd 32 > Isd 16 > Isd 30.

Cane Yield

Yield of sugarcane is the final output for the farmers from the field after harvesting. The average cane yield of the selected varieties Isd 16, Isd 30, Isd 31, Isd 32, Isd 33 and Isd 34 when planted in conventional method were found to be 92.0, 78.0, 90.0, 104.0, 99.0, and 93.0 t ha^{-1} respectively (Rahman and Pal, 2003). In this experiment, all other varieties except Isd 16 and Isd 30 produced significantly higher or similar yield to the conventional method. It is evident from Table 2 that the highest yield of sugarcane (119.57 t ha^{-1}) was produced by variety V_6 which is statistically similar to variety V_5 (118.00 t ha^{-1}) and V3 (117.37 t ha^{-1}) and higher than variety V_1 (86.43 t ha^{-1}), V2 (52.77 t ha^{-1}) and V_4 (105.67 t ha^{-1}). The lowest yield was produced by variety V_2 (52.77 t ha^{-1}). On the basis of the yield performance, the selected varieties can be ranked as: Isd34 > Isd 33 > Isd 31 > Isd 32 > Isd 16 > Isd 30. However, considering sugar content, it is evident from Table 2 that the highest total sugar content (15.73 t ha^{-1}) was obtained from variety V_5 which produced the second highest cane yield (118.00 t ha^{-1}). Thus on the basis of the total sugar content, the selected varieties can be ranked as: Isd 33 > Isd 34 > Isd 31 > Isd 32 > Isd 16 > Isd 30.During 2004-05, the highest yield was produced by treatment V_6 (104.42 t ha^{-1}) which is statistically similar to treatment V3 (97.39 t ha^{-1}) and V4 (93.76 t ha^{-1}). The lowest yield was produced by treatment V_2 (36.04 t ha^{-1}). Thus on the basis of the yield production potential the selected varieties can be ranked as: Isd 34 > Isd 31 > Isd 32 > Isd 33 > Isd 16 > Isd 30. However, the highest total sugar content was found for variety Isd 31 (12.388 t ha^{-1}) which produced the second highest yield during 2004-05. Almost same quantity of sugar content was obtained from variety Isd 34 (12.342 t ha^{-1}) which also produced the highest sugarcane yield. Therefore, on the basis of total sugar content the selected sugarcane varieties can be ranked as: Isd 31> Isd 34> Isd 32> Isd 33> Isd 16>Isd 30.

Pol Percent Cane (Pol % Cane)

Pol percent of cane is the inherent characteristics of variety and is varied from one variety to others. The variation in pol percent produced by different varieties was not

statistically significant during 2003-04 (Table 2). However, it was statistically significant during 2004-05 (Table 3). Nevertheless, a very similar trend of pol percent of cane was found in both years. The highest pol percent of cane was found for variety V_1 during both years. The lowest pol percent of cane was found for variety V_4 and V_6 during 2003-04 and 2004-05 respectively. On the basis of pol percent of cane the selected varieties can be ranked as: Isd 16 > Isd 30 > Isd 33 > Isd 34 > Isd 31 > Isd 32 and Isd 16 > Isd 30 > Isd 31 > Isd 33 > Isd 32 > Isd 34 for 2003-04 and 2004-05 respectively.

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, millable cane and yield and pol percent of cane which were eventually influenced by varietal 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 69 to 96 percent. Variety Isd 34, Isd 33 and Isd 32 among others showed germination above 85 percent.
- Establishment of budchip settlings was also found satisfactory for variety Isd 16, Isd 31, Isd 32, Isd 33 and Isd 34 which showed establishment above 90 percent.
- Tiller and millable cane production from budchip settlings were found satisfactory.
- Yield of sugarcane produced from budchip settlings were satisfactory for all selected varieties (91.65 - 119.52 t ha^{-1}) except variety Isd 16 (61.67 - 86.43 t ha^{-1}) and Isd 30 (36.05 - 52.77 t ha^{-1}).

Therefore, it may be concluded that the budchips of the variety Isd 32, Isd 33 and Isd 34 among the selected varieties (Isd 16 Isd 30 and Isd 31 Isd 32, Isd 33 and Isd 34) can be used as potential source of seed material for sugarcane from both yield and economic point of views.

Table 1. Germination percentage of budchip on soil bed (Planted on 8-15 Sept), 2003-2005.

Variety	2003-2004		2004-2005		Average	
	Germination (%)	Rank	Germination (%)	Rank	Germination (%)	Rank
Isd 16 (V_1)	79	5	77	6	78	5
Isd 30 (V_2)	80	4	78	5	79	4
Isd 31 (V_3)	69	6	85	3	77	6
Isd 32 (V_4)	92	2	80	4	86	3
Isd 33 (V_5)	91	3	87	2	89	2
Isd 34 (V_6)	96	1	95	1	96	1

Table 2. Performance of budchip of six varieties on their establishment of settlings, tillers, millable canes and yield during 2003-2004.

Treatment	Establishment of settlings ($x10^3$ ha^{-1})*	Tillers ($x10^3$ ha^{-1})	Millable canes ($x10^3$ ha^{-1})	Yield (t ha^{-1})	Pole % Cane	Total Sugar content (t ha^{-1})
Isd 16 (V_1)	23.22 (92.88) c	124.55 c	117.33 b	86.43 c	13.79	11.92
Isd 30 (V_2)	20.33 (81.32) d	99.22 d	80.22 c	52.77 d	13.39	7.07
Isd 31 (V_3)	24.11 (96.44) ab	157.11 b	143.78 a	117.37 a	11.61	13.63
Isd 32 (V_4)	24.33 (97.32) a	124.00 c	116.56 b	105.67 b	11.28	11.92
Isd 33 (V_5)	24.11 (96.44) ab	165.00 a	150.56 a	118.00 a	13.33	15.73
Isd 34 (V_6)	23.44 (93.76) b	157.89 ab	146.67 a	119.57 a	11.92	14.25
LSD at 5%	0.78	7.13	11.13	6.03	NS	-

* Value within the parenthesis indicates the percentage

Table 3. Performance of budchip of six varieties on their establishment of settlings, tillers, millable canes and yield during 2004-2005.

Treatment	Establishment of settlings ($x10^3$ ha^{-1})*	Tillers ($x10^3$ ha^{-1})	Millable canes ($x10^3$ ha^{-1})	Yield (t ha^{-1})	Pole % Cane	Total Sugar content (t ha^{-1})
Isd 16 (V_1)	22.68 (90.72) d	88.05 b	66.05 c	61.67 c	14.01 a	8.640
Isq 30 (V_2)	17.87 (71.48) e	42.50 c	40.00 d	36.05 d	13.58 a	4.896
Isd 31 (V_3)	23.42 (93.68) bc	123.70 a	95.28 b	97.39 ab	12.72 b	12.388
Isd 32 (V_4)	24.17 (96.68) a	111.57 a	91.39 b	93.76 ab	11.93 c	11.186
Isd 33 (V_5)	23.61 (94.44) b	117.96 a	104.54 ab	91.65 b	11.97 c	10.971
Isd 34 (V_6)	22.96 (91.84) c	121.02 a	113.89 a	104.42 a	11.82 c	12.342
LSD at 5%	0.48	15.77	14.25	11.70	0.66	-

* Value within the parenthesis indicates the percentage

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