

Performance of Time and Method of Planting for Sustainable Sugarcane Production

M. A. Rahman, M.A.Haque, M.A.Rahman, M.A. Islam and M.N.A. Miah
Bangladesh Sugarcane Research Institute,
Ishurdi, Pabna, Bangladesh.

ABSTRACT

An experiment was conducted in Old Himalayan Piedmont Plain soils at Regional Sugarcane Research Station farm, Thakurgaon during 2005-06 and 2006-07 cropping season with a view to find out the suitable time and methods of planting for sustainable sugarcane production and quality of cane in northern region of Bangladesh. There were two planting methods viz. transplanting of one budded soil bed settlings and planting of three budded fresh setts with five different planting times at one month interval starting from 15th November. STP (one budded settlings) method produced higher yield than conventional method at all dates of planting. In case of STP, yield level and yield contributing factors were found to decrease as the planting time proceeded. Both conventional and STP method of planting produced the highest yield in November and the lowest yield in March plantation. Planting methods and time had no significant effects on the sucrose content of sugarcane.

Key words: sugarcane, production, planting method, planting time, cane yield

INTRODUCTION

Sugarcane is a cash-cum-industrial crop plays a significant role in economy of Bangladesh. Amongst all sugarcane growing countries of the world the position of Bangladesh is sixteenth in respect of area and twenty- first in respect of cane production. Sugarcane occupies 2.03 percent of net cropped area (BBS, 2005). In Bangladesh the yield of cane per unit area is the lowest in the world (Hossain, 1991). Sugar industry is agro based and it is very important for creating employment opportunities for the rural people. Planting time and method is one of the main determinant of growth rate and yield of sugarcane. In Bangladesh, sugarcane growers follow two methods of cultivation viz. conventional and spaced Transplanting (STP). In conventional method sugarcane setts having three buds are directly planted in the trench, but in STP method sugarcane settlings are raised either in polythene bags or in soils bed and then transplanted in the main field at a desired spacing. Conventional method cannot ensure regular germination and very often gaps are found in the field. Such gappy and irregular germination in conventional planting results in to poor number of millable stalks per unit area and ultimately lower yield (Srivastava *et al.*, 1981; Rahman and Rahman, 1979). The average yield of cane in Bangladesh is very poor compared to other developed cane growing countries like Brazil, Hawaii, Mauritius, Japan, Australia etc. Temperature and soil moisture are the two important factors affect germination of sugarcane buds under field condition (Miah *et al.*, 1988; Hossain *et al.*, 1989; 1993). Both the factors (temperature and soil moisture) are fluctuate during planting period of sugarcane. Spaced Transplanting (STP) of sugarcane settlings received considerable research attention for increasing number of millable cane stalks (Rahman and Rahman, 1979; Srivastava *et al.*,

1985). Besides, planting method, planting time play an important role to increase stalk population. Therefore, the present investigation was undertaken to find out suitable planting method and appropriate time for sugarcane cultivation in Old Himalayan Piedmont plain soils.

MATERIALS AND METHOD

The experiment was carried out at Old Himalayan Piedmont plain soils at Regional Sugarcane Research Station farm, Thakurgaon during 2005-06 and 2006-07 cropping season to determine the appropriate planting time and methods on yield and quality of sugarcane. The experiment was laid out following factorial randomized complete block design with two planting methods and five planting times with three replications.

Factors A: Time of planting/transplanting

A₁=15th November

A₂=15th December

A₃=15th January

A₄=15th February

A₅=15th March

Factors B: Planting methods

B₁= Conventional 3 budded setts, end to end

B₂= Single budded soil bed settlings (STP)

The sugarcane variety Isd 32 was used as test crop and plot size was 8m x 6m. One budded soil bed settlings were used for spaced transplanting method and three budded fresh setts for conventional planting. The setts/settlings of each planting time were planted/transplanted on 15th of each month. In case of STP, plant to plant distance was maintained 45 cm in all dates of transplanting. In case of conventional planting, end to end method of sett placement was followed. Row to row distance was maintained 100 cm. Fertilizers @ 270kg N, 175kg P, 200kg K, 140kg S and 6kg Zn per hectare as urea, triple super phosphate, muriate of potash, gypsum and zinc sulphate respectively, were applied as per recommendation. Life irrigation immediately after transplanting of settlings and cultural practices were done properly for each treatment. The experiment was repeated for the second year having all the practices equal in the same time and same manner.

Data on germination, tiller at peak period, production of millable cane, cane yield and Brix percent were taken at harvest. Stalk weight of individual plot was measured by spring balance and finally, yield of cane was calculated and statistically analyzed and differences were determined through Duncan's New Multiple Range (DMR) Test.

RESULTS AND DISCUSSION

Different methods and time of planting studied in the experiment showed significant impact on different growth and yield contributing parameters. Germination% was found significantly higher in November plantation than other plantation times in both the years (Table 1). The average results of two year showed that the lowest germination was found in January plantation (Table1). In this month, germination of the setts were poor might be due to low temperature. Lower ambient temperature and soil moisture stress were identified among the causes of germination failure under field condition

(Mukerji, 1979; Yang and Chen, 1980; Hossain *et al.* 1989; 1993). Miah *et al.* (1988) pointed out that minimum and maximum temperature should not be below 22.5 and 32.5°C respectively for better germination of sugarcane under Bangladesh condition. They also observed that minimum temperature is more critical than maximum temperature which affects germination.

In both the years higher tiller production was found in November plantation which was significantly differed from other plantation times (Table 1). STP method produced higher tiller than conventional method of plantation in both the years. Production of tiller were sharply declined in late planted and transplanted but the lowest tiller production was found in January planted cane during 2005-2006 (1st year) cropping season (Table 1). This variation might be due to seasonal fluctuation of meteorological condition of the experimental site. Higher tiller mortality was found in earlier planted and transplanted cane during both of the years compared to later planted and transplanted sugarcane (Table 1). A significance difference was observed in millable cane production in first year. Higher number of millable cane was produced in November planted cane and differed with other planting times. Lower number of millable cane was found in March planting (Table 2). In 2006-2007 (2nd year) cropping season the highest number of millable cane was produced in November planting and the lowest number of millable cane was found in January planting cane. In case of STP method higher number of millable cane was produced in earlier transplanted cane and number of millable cane gradually decreased with the advancement of time i.e. the highest millable cane was found in November transplanted and the lowest was found in March transplanted cane in both the years (Table 2). This indicated that November planting is suitable than other time of planting. The results are in agreement with the findings of several authors (Sharma *et al.* 1991, Khan *et al.* 1982 Imam *et al.* 1988) and they recommended November planting is the best time for higher millable cane and yield of cane.

A significant difference in yield of cane was found in both the years with different planting time and methods. November planting produced significantly higher yield and differed with other planting times (Table 3). Higher cane yield was obtained by early transplanted cane and yield was sharply declined as the transplanting time delay. The main reason of low yield was identified as the insufficient number of millable stalks in conventional sugarcane compared to transplanted sugarcane. November planting and transplanting is the best among all planting times in respect of cane yield for the tested area. Khan *et al.* (1982) and Imam *et al.* (1988) also reported the same results and advocated early (November) planting.

In terms of Brix content, November planting and transplanting indicated higher percentage in both the year compared to other planting and transplanting times. Results (Table 3) revealed that statistically non significant but higher percentage of Brix was found in November planting cane in both the years. In second year Brix content was higher than first year (Table 3). This variation might be due to the environmental factors. November and December planting and transplanting indicated higher percentage of Brix but did not differ significantly with other planting times. On the other hand, a significant difference was observed in second year, where November and December planting indicated significantly higher percentage of Brix (Table 3). This clearly indicated that early planting is very important factor for harvesting sugar from sugarcane. This finding is in agreement with the finding of Imam *et al.* 1988.

It is seen from the different table that tiller, millable cane, yield of cane and Brix% were higher in transplanted sugarcane over conventionally planted cane as well as early

plantation is better than late plantation in both the years. These results confirmed the previous reports published elsewhere (Rahman and Rahman, 1979; Narasiman *et al.* 1981). From the results it could be concluded that sugarcane should be planted and transplanted during early November avoiding low temperature in late December to January in the northern region of Bangladesh.

REFERENCES

- BBS, 2005. Statistical year book of Bangladesh. Bangladesh Bureau of statistics, Dhaka. P. 254.
- Hossain, M.; Ali, S and Miah, M.A.S.1989. Germination response to ambient temperature in raising sugarcane settlings. *Bangladesh J. Sugarcane*, 11:21-26.
- Hossain, M. 1991. Agriculture in Bangladesh, performance, problems and prospects. University press limited, Dhaka.
- Hossain, M. A.; Miah, M. A. S. and Ali, S. 1993. Measures to enhance germination in sugarcane under field condition. *Bangladesh J. Sugarcane*, 12-15: 19-21.
- Imam, S.A.; Ali,M.; Hossain, A.H.M.D.; Matin, M.A. and Ali, M.Y. 1988. Effect of row and interplant spacing on the productivity of transplanted sugarcane. *Bangladesh J. Sugarcane*. 10: 5-8.
- Khan, M.N.U.; Ahmed, A.S.S. and Hossain, A.H.M.D. 1982. Effect of inter row spacing & planting time on the yield and yield contributing factors of Co 1158 at TSM Farm. *Bangladesh J. Sugarcane*, 4: 14-20.
- Miah, M. A. S.; Matin, M. A. and Hossain, M. A. 1988. Germination response of two sugarcane varieties to ambient temperature. *Bangladesh J. Sugarcane*, 10: 17-21.
- Mukerji, N. 1979. Effect of soil temperature and glucose content of theplanting material on the germination of periodically planted sugarcane. *Proc.Ann. Con.Sug. Techn. Asso. India*, 43:37-43.
- Narasiman, M.K.; Srivastava, K.K.; Shukla, R.K. and Singh, K. 1981. A technology for rapid multiplication of seedcane. *Indian Sugar*, 34 (5): 435-437.
- Rahman, A.B.M..M. and Rahman, M.M. 1979.Potential of spaced transplanting of sugarcane. *Bangladesh J. Sugarcane*, 1: 50-53.
- Sharma, A.; Sharma.S.C. and Tomar, S.S.1991. Response of sugarcane varieties to planting and harvesting time in Chambal command area of Rajasthan. *Indian Sugar*. 41: (7), 551-552.
- Srivastava, A.K.; Singh, K. and Saxena,Y.R. 1985. Production physiology of sugarcane cultivar Co. 1148. Tech. Bull. No. 15. Indian Institute of Sugarcane Research, Lucknow, India.
- Yang, S. J. and Chen, J.B.1980. Germination response of sugarcane cultivars to soil moisture and temperature. *Proc. ISSCT*, 17: 30-37.

Table 1. Effects of planting time and methods on germination and tiller production

Treatments	Conventional method						STP method					
	Germination (%)			Tillers (10^3 ha^{-1})			Germination (%)			Tillers (10^3 ha^{-1})		
	2005-2006	2006-2007	Average	2005-2006	2006-2007	Average	2005-2006	2006-2007	Average	2005-2006	2006-2007	Average
A ₁ =15 th November	46.56 a	45.37 a	45.97	197.91 a	139.83 ab	168.87	-	-	-	204.21 a	178.13 a	191.17
A ₂ =15 th December	34.52 b	33.74 b	34.13	172.68 ab	137.29 a	154.99	-	-	-	187.47 a	167.65 a	177.56
A ₃ =15 th January	30.61 b	19.03 c	24.82	145.39 b	61.59 b	103.49	-	-	-	148.31 ab	144.65 a	146.48
A ₄ =15 th February	39.97 ab	33.33 b	36.65	93.00 c	83.05 c	88.02	-	-	-	107.87 ab	101.10 b	104.49
A ₅ =15 th March	28.56 b	40.54 a	34.55	69.23 d	80.90 ab	75.07	-	-	-	65.64 b	100.27 ab	82.96
CV (%)	6.74	5.98	-	8.59	9.45	-	-	-	-	9.92	8.85	-

Figure with same letter (s) do not differ significantly at 5% level as per DMRT.

Table 2. Effects of planting time and methods on tiller mortality and millable cane

Treatments	Conventional method						STP method					
	Tiller mortality (%)			Millable cane (10^3 ha^{-1})			Tiller mortality (%)			Millable cane (10^3 ha^{-1})		
	2005-2006	2006-2007	Average	2005-2006	2006-2007	Average	2005-2006	2006-2007	Average	2005-2006	2006-2007	Average
A ₁ =15 th November	48.51 a	39.92 ab	44.2	101.92 a	81.60 a	91.7	44.10 a	48.42 a	46.2	114.10 a	91.88 a	102.99
A ₂ =15 th December	51.20 a	47.29 a	49.2	82.20 ab	72.36 ab	77.2	47.39 a	46.15 a	46.7	98.72 a	90.42 a	94.9
A ₃ =15 th January	54.00 a	32.34 b	43.1	66.91 b	41.67 c	54.2	37.33 ab	46.71 a	42.0	93.13 ab	77.08 b	85.1
A ₄ =15 th February	26.30 b	24.41 c	25.3	68.53 b	62.78 b	65.6	36.52 ab	33.79 b	35.1	90.12 b	66.94 bc	78.5
A ₅ =15 th March	24.00 b	38.45 ab	31.2	52.62 c	49.79 c	51.2	20.30 b	38.36 ab	29.3	52.32 c	61.81 c	57.0
CV (%)	12.45	13.32	-	9.35	10.74	-	10.11	9.98	-	9.13	11.53	-

Figure with same letter (s) do not differ significantly at 5% level as per DMRT.

Table 3. Effects of planting time and methods on cane yield and Brix%

Treatments	Conventional method						STP method					
	Cane yield (t ha ⁻¹)			Brix %			Cane yield (t ha ⁻¹)			Brix %		
	2005-2006	2006-2007	Average	2005-2006	2006-2007	Average	2005-2006	2006-2007	Average	2005-2006	2006-2007	Average
A ₁ =15 th November	61.49	70.48	65.9	18.51	20.67	19.5	71.13	74.38	72.7	18.75	21.61	20.1
A ₂ =15 th December	a	a	9	a	a	9	a	a	6	a	a	8
A ₃ =15 th January	51.52	61.81	56.6	18.38	20.75	19.5	58.12	72.57	65.3	17.76	20.72	19.2
A ₄ =15 th February	b	a	7	a	a	7	ab	a	5	a	a	4
A ₅ =15 th March	45.41	37.64	41.5	17.56	20.04	18.8	54.78	61.99	58.3	17.40	20.72	19.0
CV (%)	c	c	3	a	a	0	b	ab	9	a	a	8
	48.13	52.29	50.2	17.52	19.77	18.6	52.83	54.86	53.8	17.18	20.43	18.8
	c	b	1	a	ab	5	b	bc	5	a	ab	1
	40.79	37.15	38.9	16.11	19.43	17.7	33.92	45.07	39.5	16.18	19.82	18.0
	c	c	7	ab	b	7	c	c	0	ab	b	0
	7.54	6.89	-	7.63	7.21	-	6.75	7.45	-	6.78	6.31	-

Figure with same letter (s) do not differ significantly at 5% level as per DMRT.