

Effect of Different Sources of Settlings on Yield and Yield Parameters of Some Selected Sugarcane Varieties

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Received on 9.3.98

ABSTRACT

Four sugarcane varieties viz. Isd 2/54, Latari-Jaba-C, Isd 18 and Misrimala with three sources of settlings namely, poly bag, on eyed and two eyed soil bed settlings were examined for their suitability as planting materials at Sreepur under Agro-Ecological Zone -28 of Bangladesh. The experiment was carried out in RCB factorial design under rainfed condition during 1988-89 and 1989-90 cropping seasons. Two months old settlings were transplanted in the first week of May at 0.75 and 0.30m row and plant spacing respectively. Eight parameters viz. settling mortality, tiller, millable cane, weight, height, grith, percent brix and yield of cane were studied in both the years. Results revealed that the variety Isd 18 performed the best in respect of millable cane stalks, weight, height and cane yield other. The local variety Misrimala produced significantly lower tillers and cane stalks than over varieties but it produced significantly higher stalks grith and weight resulting it as second highest cane yielding variety. The polyethylene bag technique was found superior and suitable for all varieties. It enhanced plant stalk population, vigorous growth, and higher cane yield. This was followed by two eyed soil bed technique showing equally suitable with Isd 18 and Misrimala. Isd 18 showed least variation in most parameters in both the years. Sources of settlings showed no influence on brix percent. Year variation was shown to influence varietal responses in terms of sugar production.

Key words : Sources of settlings, sugarcane, cane yield, sugar yield.

INTRODUCTION

Sugarcane is one of the important cash-cum-food crops in Sreepur and Valuka of Gazipur & Mymensingh districts with more than 5000 hectares of land under cane cultivation. These areas are the important and largest gur-producing zones in Bangladesh. The planting technique of this area is quite different from rest of the country. Sugarcane farmers have been adapted this transplanting technique suitable to their-economic and climatic conditions. They raise two to four eyed soil bed settlings in the nursery from top cuttings during March to April. The settlings are then transplanted in main field at the onset of monsoon from late April to early May. The inter row and inter plant spacing are maintained at 0.45 and 0.30m, respectively. The crop is generally harvested for gur from February to April of the following year. The impacts of sources of settlings viz. soil bed and poly bag settlings accompanied with varieties should be examined to find out the best combinations planting source for sustainable sugarcane production.

Two exotic varieties imported during the late 60's locally name as Fatataty and Misrimala are cultivated in this region. The later one is more favorable and suitable for gur production. Misrimala is more favourable for its high yield and good quality gur. On the other hand, it is highly susceptible to white leaf/grassy shoot and red rot disease. A recent survey indicates that the area under Misrimala is decreasing due to diseases since 1985. Previously it covered about 95 percent of cultivated areas in this zone. Transplanting technique of these

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areas stated above is not enough suitable to meet the present need of the environment. The average cane yield is 40 tons per hectare which is not satisfactory adopting transplanting technique. It has been reported that spaced transplanting technique has some beneficial effects on tillering, millable cane production and its weight, height and girth that ultimately produces higher yield and quality of cane (Panjee, 1965). Williams (1951) and Srivastava *et al.* (1981) observed outstanding advantages in transplanting sugarcane seedlings. However, sources of seedlings itself also influence the yield and quality of cane.

The decline in cane yield of sugarcane varieties is well-documented (Barnes, 1954 and Humbert, 1968). This is mainly attributed to genetic erosion or natural mutation. To get high yield it is necessary to replace varieties every few years with new clones (Poehlman and Barthakur, 1969). This varietal replacement is a common feature of most crop production systems, for example wheat, barley and maize varieties are rarely recommended for more than six years. On the other hand, any technical changes in the planting technique have a great impact on crop yield and its yield contributing factors. Therefore, considering these points the experiment was undertaken to find the most suitable sugarcane variety and sources of seedlings for the red soil environment.

MATERIALS AND METHODS

The experiment was conducted at the Cotton Seed Multiplication Farm, Sreepur, Gazipur during 1988-89 and 1989-90 planting seasons. Three sources of seedlings namely poly bag, one eyed horizontal soil bed and two eyed horizontal soil bed were used. Four-sugarcane varieties viz. Id 2/54, LJC, Id 18 and Misrimala were included in this experiment. The experiment was laid out in RCB factorial design with three replications. All these varieties and sources of seedlings were tested in the second year experiment. Seedlings of individual sugarcane variety with different seedling raising techniques were raised separately during the first week of March 1989 and 1990. The canes were chopped into pieces of one and two eyed sets separately for different treatments. One-eyed sets consisting of 1.5 cm above and 3.0 cm. below from the node were placed vertically inside the 10 x 12 cm size poly bags containing 50:50 soil and cowdung mixture for poly bag technique. On the other hand, one eyed sets consisting 2.5 cm above and 2.5 cm below the node were placed horizontally side by side in 1.5 cm x 10 m nursery bed containing same proportion of soil and cowdung. Two eyed sets covering one full internode were chopped crossing 2.0 cm from the two nodes. These were placed horizontally side by side in such a way that eye buds lay by the side of individual sets in the nursery bed in the same manner as in one eyed soil bed technique. A little soil was spread over the sets and covered with a thin layer of straw. All these activities were done for individual treatment separately. Watering and other management of the seedlings were done in the nursery bed before transplanting to the main field. In the main field, the land was prepared in zone condition and trenches were made with 0.75 m row to row distance at a depth of 0.12 m in each plot. Recommended doses of fertilizers like NPKS were applied in the trenches before transplanting of seedlings. Finally, the seedlings were transplanted on first week of May for each successive year in the trench with 0.3 m plant spacing covering few soils near the base of seedlings. Normal cultural practices such as mulching, weeding, earthing up of soil and tying of canes were done for each 8 successive year more or less in the same time and in the same manner.

Data on different parameters viz. settling mortality, tiller and cane stalk population were recorded at 20, 120 and 190 days after transplanting respectively. Percent brix was measured strating from first week of January with intervals of 15 days up to harvest, using a hand Refractometer, Data on cane stalk weight, girth and height was taken in each plot at harvest. Yeild of cane was calculated separately for all treatments. The data were analyzed statistically using GENSTAT programme in the Main Frame Computer of Wye College, University of London.

RESULTS AND DISCUSSION

The different sources of settlings studied in this experiment showed significant differences on settling mortality, tillering behaviour, and cane stalk population, girth and cane yield. For all characters poly bag technique showed best performance (Table 1). Many workers (Imam *et al.* 1982 and Panjee *et al.* 1969) have reported a similar observation. Poly bag settling was found as the best source of settling because the establishment was found higher. Early establishment influenced early emergence of tillering that is essential for summer transplanted cane. The reason behind the lower mortality in the poly bag technique might be due to initial soil carried in poly bags and this results into less transplanting shock. The root systems of poly bag settlings are usually not disturbed during transplanting. As a result early growth and tillering commenced quicker in this technique than the other settling sources.

Table 1. Yield and yield contributing parameters of sugarcane as influenced by different transplanting techniques.

Parameters Studied	Sign	Transplanting techniques			LSD P = 0.05
		M ₁	M ₂	M ₃	
Settling mortality (%)	***	1.80	6.99	5.27	1.070
Tiller ('000/ha)	***	146.15	109.61	121.71	9.610
Stalk ('000/ha)	***	110.76	90.43	96.98	8.250
Weight (kg)	NS	0.772	0.751	0.777	0.038
Height (m)	NS	2.128	2.127	2.187	0.115
Girth (cm)	**	6.72	6.89	7.05	0.188
Brix (%)	NS	20.33	20.81	20.47	0.424
Yield (TCH)	***	85.60	66.85	74.65	8.070

M₁ = One eyed poly bag technique, M₂ = One eyed horizontal soil bed technique, M₃ = Two eyed horizontal soil bed technique

Among the soil bed techniques, two eyed soil bed performed better in all characters studied (Table 1). The length of one eyed soil bed sett was almost one third compared to the two-eyed soil bed sett. Photosynthate in two-eyed sett was more than that in one-eyed sett and as a result significantly less mortality was noted in two-eyed soil bed compared to one eyed soil bed technique. Consequently, improved establishment favored tillering and ultimately higher cane stalks, weight, height, girth and finally the cane yield.

The varieties studied in this experiment showed significant differences in stalk production, stalk weight, height, girth, and cane yield. It was observed that Isd 18 resulted the highest millable cane, height and cane yield with a significant difference from the other varieties (Table 2). The high yielding Isd 18 possessed all these traits. The second high yielding variety was Misrimala showed significantly lower number of tiller, millable cane

Figure : 1(a)

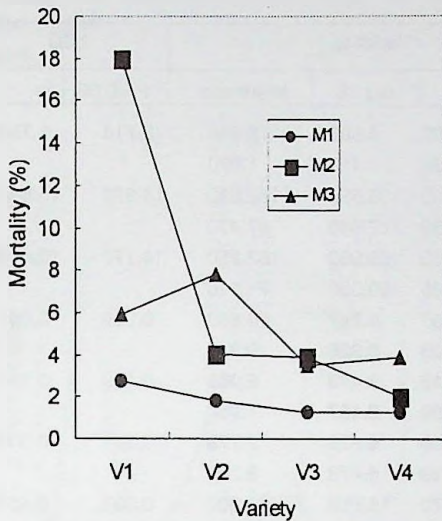
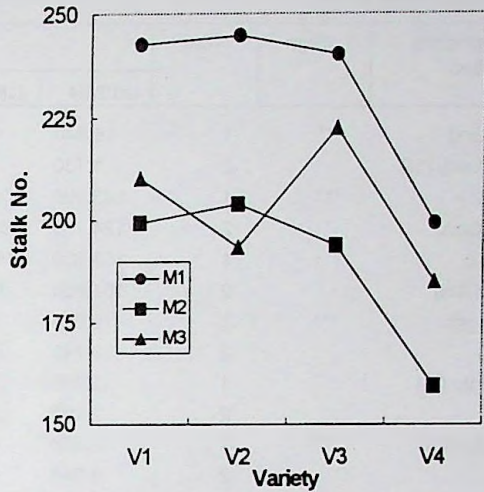


Figure : 1(b)



V₁ = Isd 2/54

V₂ = L.J.C.

V₃ = Isd 18

M₁ = One eyed poly bag technique

M₂ = One eyed horizontal soil bed technique

M₃ = Two eyed horizontal soil bed technique

Figure 1 (a & b). Mortality and stalk number of sugarcane as influenced by variety and technique.

Crop production is influenced by different environmental and agronomic factors. Yield can be manipulated by both factors. Interaction effects of any technical factor or factors can change the yield and yield contributing characters. Imam *et al.* (1982) reported that varietal potential was identical and the ecological zones had significant effects on the yield of the varieties as illustrated from the significant interaction between variety and location. Results of the experiment show that apart from the varietal influence significant interaction between year/variety was marked in all characters (Table 3).

Although all characters had shown interaction effects, it was observed that the Isd 18 variety showed least variation between the two years. This means that Isd 18 is the most stable variety. Similarly in the year/technique interactions (Table 4) the polythene bag technique produced the most stable performance that again confirms the superiority of the polythene bag technique.

stalks and plant weight than the other varieties (Table 2). These two characters placed this variety in the second position. In contrast, although the low yielding varieties Isd 2/54 and LJC that had higher tillers and cane stalk population but they produced lower stalk weight, height, and girth. They were significantly different from the two high yielding varieties and these traits are attributed to their poor performance.

Table 2. Yield and yield contributing parameters of sugarcane as influenced by different varieties.

Parameters studied	Sign	Varieties				LSD P = 0.05
		Isd 2/54	L.J.C	Isd-18	Misrimala	
Settlings mortality (%)	***	8.890	4.560	2.900	2.400	1.240
Tiller ('000/ha)	**	133.860	122.230	132.090	115.060	11.090
Stalk ('000/ha)	***	103.920	102.390	104.640	86.840	9.540
Weight (kg)	***	0.685	0.690	0.836	0.855	0.043
Height (m)	***	2.213	2.052	2.315	2.009	1.329
Girth (cm)	***	6.300	6.570	6.680	7.990	0.217
Brix (%)	*	20.130	20.620	20.390	21.010	0.610
Yield (TCH)	***	69.200	71.260	87.890	74.890	9.320

The results indicate that cane stalks are not the only determinant of yield. This is mainly the combined influence of number of cane stalks followed by stalk weight. However, the yield variation and yield contributing characters might be the result of inter plant competition or varietal characteristics. The local variety Misrimala was found to produce lower cane stalks and height has ability to compensate yield by the increased stalk weight and girth. Thus it can be postulated best Isd 18 possessed the better yield contributing characters that helped the variety to perform best whilst Misrimala had some yield compensating characters that influenced the variety to adapt in this environment.

An interaction effect between variety and techniques has also been observed. Settling mortality % and millable cane production were affected significantly due to variety and technique interaction. This means that variety and technique were not independent and influenced the establishment of settlings and to millable cane stalk production. Results for settling mortality (Fig. 1a) indicate that Isd 18 and Misrimala settlings raised in poly bag sowed the lowest mortality and differed significantly with other varieties and techniques except Isd 2/54 and L.J.C in poly bag and Misrimala in one eyed soil bed techniques. This result suggests that the poly bag technique has the ability to perform equally well irrespective of varieties. This showed the superiority of poly bag technique over other techniques. The reason of better performance of Misrimala with one-eyed soil bed might be the fact that this is a local cultivar and is being cultivated using soil bed technique interaction on millable cane stalk production (Fig. 1b) showed the same trend where all varieties with poly bag technique performed best and differed significantly from the other combinations of one eyed soil bed technique. This further confirms the superiority of polythene bag technique.

Table 3. Yield and yield contributing parameters of sugarcane as influenced by variety and year.

Parameters Studied	Sign	year	Varieties				LSD	
			Isd 2/54	LJC	Isd 18	Misrimala	P =0.05	+
Settling	***	1	16.040	7.400	4.690	2.840	2.718	1.750
mortality (%)		2	1.730	1.730	1.110	1.970		
Tiller	***	1	143.000	135.340	136.590	142.610	14.970	15.680
('000/ha)		2	124.770	109.130	127.640	87.470		
Stalk	*	1	105.830	115.350	109.950	102.250	14.170	13.480
('000/ha)		2	101.960	89.380	99.330	71.110		
Weight	***	1	0.624	0.657	0.747	0.863	0.059	0.061
(kg)		2	0.745	0.723	0.926	0.848		
Height (m)	*	1	2.233	2.016	2.473	2.069	0.169	0.187
		2	2.193	2.089	2.157	1.950		
Girth (cm)	***	1	6.556	6.600	6.878	7.778	0.301	0.306
		2	6.046	6.539	6.478	8.223		
Brix	***	1	18.190	18.770	18.510	20.300	0.893	0.855
(%)		2	22.070	22.480	22.270	21.710		
Yield	***	1	63.030	77.140	82.690	88.140	13.060	17.430
(TCH)		2	75.320	65.330	92.350	61.650		

+ when comparing means with same levels of year

Table 4 . Yield and yield contributing parameters of sugarcane as influenced by different transplanting techniques and year.

Parameters studied	Sing	Year	Transplanting techniques			LSD	
			M ₁	M ₂	M ₃	P = 0.05	+
Settling mortality	***	1	2.03	11.850	9.350	2.570	1.510
(%)		2		2.130	12.000		
Tiller ('000/ha)	ns	1	155.810	125.160	137.160	12.760	13.580
		2	136.490	94.070	106.220		
Stalk ('000/ha)	*	1	112.530	102.250	110.250	12.460	11.680
		2	108.990	78.670	83.640		
Weight (kg)	ns	1	0.722	0.728	0.720	0.051	0.053
		2	0.823	0.774	20.835		
Height (m)	ns	1	2.123	2.250	2.216	0.141	0.163
		2	2.133	41.159			
Girth (cm)		1	6.875	6.880	7.000	0.260	0.265
		2	6.561	36.801	7.095		
Brix (%)	ns	1	18.610	19.320	19.890	0.784	0.740
		2	22.290	22.050			
Yield (TCH)	*	1	81.350	71.830	80.110	11.310	15.100
		2	89.860	61.880	69.250		

+ When comparing means with same levels of year

M₁ = Poly bag technique; M₂ = One eyed horizontal soil bed technique; M₃ = Two eyed horizontal soil bed technique.

The variety, technique and year interaction effects had only a significant influence on mortality and height against all characters studied (Fig. 2a & 2b). This indicates that some of the variety, technique and year combinations had better or worse performance than the others.

Figure : 2(a)

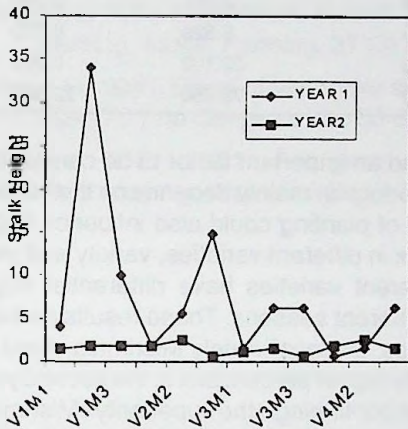
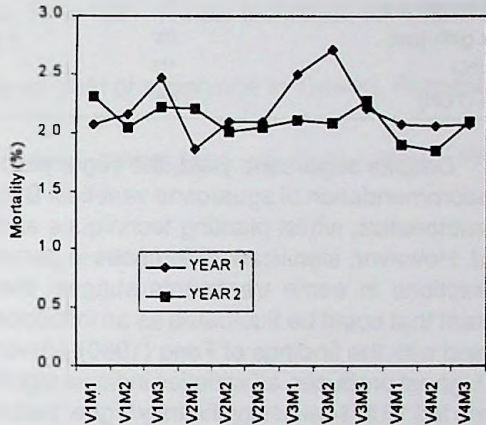


Figure : 2(b)



V₁ = Isd 2/54

M₁ = One eyed poly bag raised settling

V₂ = L.J.C

M₂ = One eyed horizontal soil bed settling

V₃ = Isd 18

M₃ = Two eyed horizontal soil bed settling

V₄ = Misrimala

Figure 2 (a & b). Mortality and stalk height of sugarcane as influenced by year, variety and technique.

The lowest percent mortality (fig. 2a) was observed in Isd 18, Misrimala and L.J.C settling raised in poly bag technique in both years. This also confirms the superiority of Isd 18 and Misrimala varieties whilst LJC variety is superior only in mortality with polythene bag technique but not from other characters studied. Similarly in stalk height Isd 18 with one eyed soil bed technique, produced the highest height (Fig. 2b) and differed significantly from the other varieties except from the same variety with poly bag technique in first year. This once again confirms the superiority of Isd 18.

Finally, significant differences between year interaction (Table 5) indicates that year 1 was the best which supports the findings of many investigators who found seasonal variation in yield and yield contributing characters between different years.

Table 5. Yield and yield contributing parameters of sugarcane as influenced by years.

Parameters studied	Sign	Year		LSD P = 0.05
		Year-1	Year-2	
Settlings mortality (%)	**	7.740	1.630	3.100
Tiller ('000/ha)	***	139.360	112.240	13.220
Stalk ('000/ha)	.	108.370	90.440	1.050
Stalk weight (kg)	**	0.723	0.811	0.374
Stalk height (m)	.	2.198	2.097	0.066
Stalk girth (cm)	ns	6.950	6.820	0.200
Brix (%)	***	18.940	22.130	0.680
Yield (TCH)	ns	77.760	73.650	22.620

Despite sugarcane yield, the sugar yield is also an important factor to be considered in recommendation of sugarcane varieties. Sugar production mainly depends on the varietal characteristics, whilst planting techniques and time of planting could also influence sugar yield. However, significant differences in percent brix in different varieties, variety and year interactions in some treatments suggest that different varieties have differential sugar content that could be fluctuated as an influence of different seasons. These results partially agreed with the findings of Teng (1980). Nevertheless, the local variety Misrimala stand as the highest producer, all varieties indicate significantly higher percent brix in the second year where *lsd* 18 indicated significantly higher percentage confirming its superiority. Misrimala fluctuated least between years and probably for that season the variety is well adopted in the environment.

In conclusion, we can suggested *lsd* 18 as the most suitable variety while the local variety Misrimala as an alternative for cultivation with poly bag as well as two eyed soil bed technique for Modhupur red soil environment.

ACKNOWLEDGEMENTS

The authors whole heartedly expresses their deepest sense of gratitude, sincere appreciation and profound regard to Mr. A.G. Clewer, Senior Lecturer, Department of Biological Statistics, Wye College, UK for his kind and generous help in analyzing the experimental data. Thanks also extended to Khondakar Aminul Kabir, PSO and Head GQN Division, BRRI for compiling and composing the manuscript.

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