

Performance of Jute Varieties for Seed Production as First and Mungbean as Second Intercrop under Transplanted Cane in Paired Row

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ABSTRACT

The experiment was conducted at the Bangladesh Sugarcane Research Institute (BSRI) farm under irrigated condition during 2005-2006 cropping season to study the performance of some jute varieties for seed production as first and mungbean as second intercrop in paired row planting system of sugarcane. Three jute varieties namely, OM-1, O-72 and O-9897 as first intercrops followed by mungbean as second intercrop were tested in paired row cane (PRC). No significant effect of intercropping on tiller, millable cane, cane yield and pol % cane was found in the experiment. It was found that total adjusted cane yield of sugarcane and intercropping practices were higher compared to sole sugarcane cultivation. Maximum benefit-cost ratio of 2.80 was found from PRC + jute (variety O-72)-mungbean combination. Growing mungbean as second intercrop with PRC earned an additional income and helped to improve soil health by fixing atmospheric nitrogen and adding organic matter in soil. The overall result revealed that all the jute varieties tested in the experiment were found suitable to grow for seed production with sugarcane in paired row planting system and may be recommended for large scale adoption in farmers field for quality jute seed production.

Key words: Transplanted sugarcane, intercropping, jute seed, mungbean

INTRODUCTION

Sugarcane (*Saccharum officinarum* L) is a long duration crop. From planting to harvest it requires 12 to 14 months. The growth of sugarcane is slow in earlier stages and it takes about 3 to 5 months to establish the full canopy of the crop (Yadava, 1991). During the early stage of sugarcane growth, some short duration crops can be grown as intercrop in the vacant spaces between two cane rows. To make intercropping more profitable per unit area and time with sugarcane, it is necessary to produce more than one intercrop (Hossain *et al.*, 1995 and Khan *et al.*, 1995). Ali *et al.* (1989) observed that there was no significant adverse effect of row arrangement on the growth, yield and sucrose content of sugarcane. Successfully intercropping of various crops with sugarcane has been reported by many researchers (Rathi *et al.*, 1974; Behhi and Narwal, 1977; Verma *et al.*, 1981 and Imam *et al.*, 1990). Potato, onion, garlic and cabbage were identified as most profitable intercrops with sugarcane, which might help to get an interim benefit for the poor farmers (Matin *et al.*, 2001 and Alam, 1999). Jute is one of the most important cash crops in Bangladesh. The soil and climate of Bangladesh are favourable for quality jute production. As natural and

environment friendly fibre, demand of jute in the world market is increasing. Bangladesh requires 4000 ton jute seed per year but only 46% seed is produced in the country. So more jute seed production is essential for fulfilling the demand. Jute is a short day crop and it might be cultivated for seed in winter. There is ample scope to produce jute seed in sugarcane field as intercrop. Paired row system of sugarcane planting has been designed to keep two rows of cane at 60 cm apart leaving 120-140 cm between two such paired rows for growing intercrops (Roach, 1977). The practice of intercropping may be more productive and economic through adoption of paired row systems following spaced transplanting of sugarcane which provides desired optimum plant population and facilitates higher space for intercropping. In view of this consideration an experiment was designed to find out the performance of some jute varieties for seed production with sugarcane as first and mungbean as second intercrop in paired row transplanted sugarcane.

MATERIALS AND METHODS

An experiment was conducted at the Bangladesh Sugarcane Research Institute (BSRI) farm, Ishurdi, Pabna during 2005-2006 cropping season under irrigated condition. The site represents High Ganges River Floodplain under Agro-ecological Zone-11 with medium high land of typical sandy loam soil having pH 7.6. Three jute varieties viz. OM-1, O-72 and O-9897 as first intercrop followed by mungbean (*Vigna radiata* L) variety Binamoog-5 as second intercrop were grown with sugarcane variety Isd 36 to find out the performance of jute varieties for seed production for sustainable sugarcane farming. The experiment was laid out in randomized complete block design with three replications. The unit plot size was 8m x 6m. The treatments were as follows:

- T₁ : Paired row cane (PRC) only
- T₂ : T₁ + Jute (Variety OM-1)-mungbean
- T₃ : T₁ + Jute (Variety O-72)-mungbean
- T₄ : T₁ + Jute (Variety O-9897)-mungbean
- T₅ : T₁ + 0-mungbean.

Previously raised single budded soil bed sugarcane seedlings were transplanted in each plot during mid October, 2005 with 30 cm interplant spacing in 60 cm apart paired rows. Spacing between two paired rows was 140 cm. For sugarcane Urea, TSP, MP and Gypsum were applied @ 347, 244, 184 and 222 kg ha⁻¹, respectively (BARC, 1997). All TSP, Gypsum and one-third of MP were applied in trench and mixed with soil prior to transplanting of seedlings. One-third of urea was applied at 21 days after transplanting (DAT) of seedlings. The second dose of (1/3rd) Urea and 1/3rd MP were applied as first top dressing at 90 DAT. Final top dressing of rest Urea and MP were applied at 150 DAT. Urea, TSP, MP and Gypsum @ 66, 45, 15 and 60 kg ha⁻¹ for jute and only TSP and MP were applied @ 47 and 30 kg ha⁻¹ for mungbean. To control insect pests, Furadan 5G was applied @ of 40 kg ha⁻¹ in three splits in December, 2005, March and May, 2006. Other intercultural operations like irrigation, gap filling, weeding, mulching, earthing-up and tying were done in-time. Collection of data on yield and various yield contributing parameters of cane and intercrops were done. The yields of first and second intercrops were recorded at

harvest. Tiller population of sugarcane was recorded at 90, 120, 150 and 180 DAT. Millable cane and yield were recorded at harvest. The cane equivalent yield for the intercropped plot were calculated by adding the cane yield with the equivalent cane yield obtained from the intercrops on the basis of sale value. Economic and statistical analysis on different parameters for sugarcane and intercrops were done following the standard procedures.



Fig. 1 : Sugarcane + Jute (green stage)



Fig. 2 : Sugarcane + Jute (mature stage)

RESULTS AND DISCUSSION

Tiller and millable cane production:

Tiller and millable cane production under different treatments are presented in Table 1. No significant effect on tiller production and millable cane production among the different treatment combinations was found. The highest tiller population of 123.75×10^3 and $123.38 \times 10^3 \text{ ha}^{-1}$ was found from treatments T_5 ($T_1 + 0$ -mungbean) and T_1 (PRC only) where jute was not intercropped. In the treatments T_2 , T_3 and T_4 tiller populations were identical where jute was cultivated as first intercrop. Similar results were also reported by Matin *et al.*, 2001 in case of cauliflower, potato, carrot and knolkhol intercropped with paired row sugarcane.

Table 1. Tiller, millable cane, cane yield, pol % cane, equivalent cane yield of intercrops and total adjusted cane yield

Treatments	Tiller ($\times 10^3 \text{ ha}^{-1}$) ($\times 10^3 \text{ ha}^{-1}$)	Millable cane (t ha^{-1})	Cane Yield (t ha^{-1})	Pol % cane (t ha^{-1})	Intercrop yield		Equivalent cane yield	Total adjusted cane yield (t ha^{-1})
					1st	2nd		
T_1 = PRC only	123.75	80.83	80.20	14.54	-	-	-	80.20
T_2 = T_1 + jute (variety OM-1)-MB	110.47	84.55	89.22	14.55	0.33	0.24	32.44	121.66
T_3 = T_1 + jute (variety O-72)-MB	111.40	79.79	88.43	14.57	0.44	0.23	40.26	128.67
T_4 = T_1 + jute (variety O-9897)-MB	113.49	84.22	90.47	14.51	0.41	0.26	39.04	129.51
T_5 = T_1 + 0 – MB	123.38	83.28	91.09	14.37	-	0.32	10.67	101.76
LSD 5 (%)	ns	ns	ns	ns	0.035	-	-	-

Price of crops : Sugarcane : 1350 Tk t^{-1} , Jute : 1,00,000.00 Tk t^{-1} and Mungbean : 45,000.00 Tk t^{-1} ,
MB= Mungbean

Yield of cane

There was no significant difference on cane yield among the different treatments (Table 1), which indicates intercropping of jute seed crop with sugarcane has no adverse effect on cane yield. Apparently the highest cane yield of 91.09 t ha^{-1} was obtained in the treatment (T_5) where jute was absent as first intercrop but mungbean was grown as second intercrop. On the other hand, the lowest cane yield 80.20 t ha^{-1} was recorded from T_1 where only sugarcane was produced.

Intercrop yield and adjusted cane yield

Significant effect on jute seed yield was obtained in different jute varieties-mungbean combinations. But yield of different jute varieties and mungbean were found satisfactory in all intercropped plots (Table 1). The highest jute seed yield of 0.44 t ha^{-1} was obtained from the variety O-72 followed by O-9897 (0.41 t ha^{-1}) and the lowest of 0.33 t ha^{-1} was recorded from the variety OM-1. Yield of second intercrop mungbean varied in small amount with different treatment combinations. The highest mungbean yield of 0.32 t ha^{-1} was obtained from T_5 treatment where first intercrop jute was not grown and the lowest one was obtained in T_3 . Adjusted cane yield is an important parameter for determining the total yield potential of the intercropped plots (cane + intercrop) over the sole cane plot (Table 1). The highest total adjusted cane yield of 129.51 t ha^{-1} was recorded from T_4 treatment (T_1 + jute (variety O-9897)-mungbean) followed by T_3 (128.67 t ha^{-1}), (T_1 + jute (variety O-72)-mungbean) and the lowest total adjusted cane yield of 80.20 t ha^{-1} was from the T_1 (Paired row cane only). The total adjusted cane yield indicated that all the intercropped plots with different jute varieties-mungbean combinations was superior to the sole cane plot.

Pol % cane

No significant effect on pol % cane was recorded among the different jute varieties-mungbean combinations (Fig. 1). The highest pol % cane of 14.57 was obtained from treatment T_3 (T_1 + jute (variety O-72)-mungbean) followed by treatment T_2 (T_1 + jute (variety OM-1)-mungbean) and the lowest pol % cane was recorded from treatment T_5 (T_1 + 0-mungbean). Intercropping different jute varieties with sugarcane under paired row system does not have any adverse effect on pol % cane as the intercrops were harvested before start of grand growth period of cane.

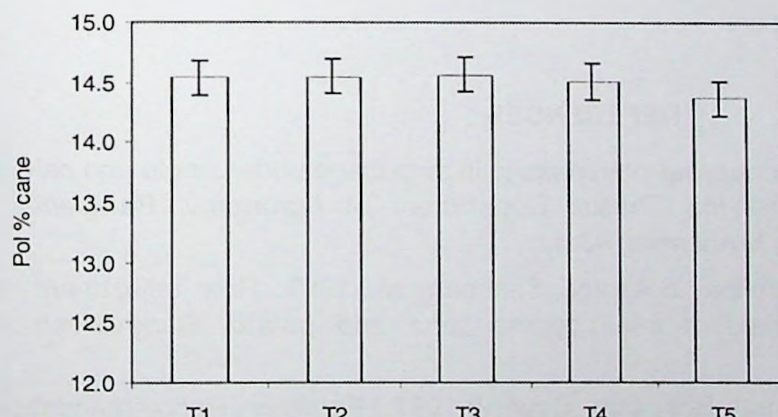


Figure 1. Pol % cane as affected by different jute variety-mungbean intercropping combinations

Economics

The economic analysis of the experiment under different treatment combinations was shown in Table 2. Among the intercrop combinations, the highest total production cost Tk. 63,400 was for treatment T_4 followed by Tk. 62,500 for treatment T_2 while the lowest Tk. 52,500 for treatment T_1 Paired row cane only. The total production costs were different due to variation of cost of production of sugarcane and intercrops.

Table 2. Economics and benefit-cost ratio (BCR) of different cane intercrops combinations at BSRI during cropping year 2005-2006

Treatments	Total production of	Gross return	Gross margin	BCR
	cost (Tk. ha ⁻¹)	(Tk. ha ⁻¹)	(Tk. ha ⁻¹)	
T_1 = PRC only	52,500.00	1,08,270.00	55,770.00	2.06
T_2 = T_1 + jute (variety OM-1)- mungbean	62,500.00	1,64,241.00	1,01,741.00	2.63
T_3 = T_1 + jute (variety O-72)- mungbean	61,900.00	1,73,704.50	1,11,804.00	2.80
T_4 = T_1 + jute (variety O-9897)- mungbean	63,400.00	1,74,838.50	1,11,438.50	2.76
T_5 = T_1 + 0 – mungbean	58,500.00	1,37,376.00	78,876.00	2.35

Price of crops: Sugarcane: 1,350.00 Tk t⁻¹, Jute seed: 1,00,000.00 Tk t⁻¹ and Mungbean: 45,000.00 Tk t⁻¹

The highest gross return (Tk. 1,74,838.50) was recorded from T_4 followed by T_3 and the lowest was from the sole sugarcane crop (T_1). In case of gross margin, the highest gross margin (Tk. 1,11,804.00) was obtained from T_3 followed by T_4 (Tk. 1,11,438.50) while the lowest (Tk. 55,770.00) was recorded from T_1 . The highest benefit-cost ratio (BCR) of 2.80 was recorded from the T_3 and the lowest BCR was from T_1 . The overall results suggest to adopt intercropping practice of jute seed production for higher economic return from sugarcane cultivation.

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