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Influence of Sowing Time and Variety on Growth and Yield of Jute (*Corchorus capsularis* L) at Southern Region of Bangladesh

B. C. SAHA
A. S. M. IQBAL HOSSEN
Department of Agronomy
Patuakhali Science and Technology University
Dumki, Patuakhali, Bangladesh
T. RAHMAN
M. J. HOSSAIN[1]
Researcher
International Rice Research Institute, Bangladesh
K. M. ZAKARIA
Chief Scientific Officer
Bangladesh Jute Research Institute
Dhaka, Bangladesh

Abstract:

Effect of sowing time variation with different cultivars on growth and yield of jute (Corchorus capsularis L). The experiment was conducted at Regional Station of BJRI, Kalapara, Patuakhali from March 2013 to August 2013. To find out the prime time of sowing with promising variety and their interaction on the fiber yield of white jute. The research was two factors, which consisted of three Corchorus capsularis L. jute varieties and four sowing dates. The varieties were CVL-1, BJC-7370 and BJC-2142 and four sowing dates were viz. 15 March, 30 march, 15 April and 30 April. The study was followed in a randomized complete block design with three replications. The effects showed that the growth and fiber yield parameters were varied significantly among varieties, due to on different sowing dates and in their interactions. There was no significant variation among varieties

[1] Corresponding author: m.j.hossain@irri.org

in terms of plant height. Highest plant height (3.02 m) was found on 30 March sowing, which was statistically identical to 15 March (3.01 m) and 15 April (2.95 m). Fiber yield per hectare was highest (2.52 t ha^{-1}) in variety CVL-1, which was statistically similar to BJC-7370 (2.39 t ha^{-1}). Earlier sowing (15 March) produced highest (2.80 t ha^{-1}) fiber yield than late sowing (30 April) (1.74 t ha^{-1}) and cultivar CVL-1 with 15 March sowing produced highest fiber yield (2.99 t ha^{-1}) in Patuakhali, Bangladesh.

Key words: Fiber**;** Growth; Jute; Sowing Time; Variety; Yield

Introduction

Jute (*Corchorous* spp.), the golden fiber, belongs to the family Tiliaceae has been the main cash crop of Bangladesh and contribute in our national economy. Two species of jute *viz. Corchorus capsularis* L., which is known as white jute and *Corchorus olitorious* L., which is called Tossa jute are widely cultivated in Bangladesh. It is believed that as a cultivated plant white jute (*Corchorus capsularis* L.) came to Indian subcontinent from China or Cochin China (Sen Gupta, 1953).

About 80% of the total world jute is produced in Bangladesh and India. However, the major portion of the raw jute of international trade is still supplied by Bangladesh where the *Capsularis* jute covers about three-fourths of the total area under jute, and the remaining one-fourth is occupied by the *Olitorious* jute. Bangladesh earns about 6-7% foreign exchange through exporting raw jute and jute goods (BJRI, 2004a). Besides, jute fiber and jute sticks are largely used for different domestic purposes. In addition, jute plants improve soil productivity because of its massive leaf fall and root proliferation in the field.

High yielding and short duration variety is one of the effective mean for raising such production is important way to increase the jute yield. Besides, sowing period of jute has

important role in growth as well as jute yield. Late sowing of the crop produced poor vegetative growth as well as low yield and also affected by different diseases and insects. Singh *et al.,* (2013). Late sowing induces early flowering by shortening vegetative growth period. Thereby, fiber yield in late sowing jute is reduced. Choudhuri and Ali (1963) stated that jute crop planted in June or later induce early flowers with short vegetative period and lower fiber yield.

Above facts and findings indicate that photoperiodic effect of jute brings about lower fiber yield if cultivated in late season. Information about late sowing effect on white jute varieties in coastal region of Bangladesh, particularly in Patuakhali condition is meager. It can be noted that out of 30210 ha of jute growing area of Patuakhali Sadar about 21,557.7 ha land is suitable and 7591 ha is moderately. So, this research goal: To find out the promising cultivar with suitable time of sowing for higher fiber yield and expansion of jute cultivation in the southern region of Bangladesh.

Material and Methods

The experiment was conducted at experimental field of Regional Station of Bangladesh Jute Research Institute, Kalapara, Patuakhali with geographical location of 21.9861^0N latitude and 90.2422^0E longitude. Soil characteristics of the western coastal zone are silty loams or alluvium. Islam (2003) mentioned that mangrove dominated coastal areas have developed on soil formations of recent origin consisting of alluvium washed down from the Himalayas. The experimental area falls under the sub–tropical climate, which is characterized by high temperature and humidity, heavy rainfall with occasional gusty winds in the Kharif season (April–September) and less rainfall associated with moderately low temperature during the rabi season (October–March) (Biswas, 2007). CVL-1, BJC-7370 and BJC-2142 were used as study

material in the experiment. The seeds were collected from Capsularis Department, Breeding Division, Bangladesh Jute Research Institute, Dhaka. The experiment was laid out in a randomized complete block design (RCBD) with three replication**.** The size of each plot was 4m×2.5m.The plots were fertilized with N, P2O5, K2O, S. Seeds were sown on March 15, 30th March, 15th April and 30th April, 2013 in line sowing method. The seed rate was 4.0 kg ha^{-1}. Each plot was weeded three times on 15, 30 and 45 days after sowing (DAS). Thinning was also done simultaneously. Plants were harvested at maximum plant height stage. Ten sample plants (excluding border plants) were selected at random from each plot and harvested for recording of necessary data. Data on growth and fiber yield components were recorded on the different parameters. The collected data were analyzed statistically. Analysis of variance (ANOVA) and Least Significant Difference (LSD) test were doneto find out the significant difference among the treatment means (Zaman*et al.* 1982). The experimental data were analyzed by MSTAT-C software. Mean comparisons for treatment parameters were compared using Duncan's Multiple Range Test at 5% level of significance (Gomez and Gomez, 1984).

Results and Discussion

Effect of variety: The highest plant height was found in BJC-2142 (2.98m) and lowest BJC-7370(2.92 m) (Table 1) due to genetic nature. The highest base diameter (20.66 mm) was found in BJC-7370, the lowest base diameter (19.95 mm) was reported from the variety CVL-1(Table 1). It was found from (table 1) that that significantly the highest green weight (1309 g) was found from CVL-1, BJC-2142 gave the lowest green weight with leaf (1188 g). The highest green weight (1189 g) without leaf was found in CVL-1 and the lowest at BJC-2142 (1126 g). Fiber weight per 10 plants was significantly the

highest (123.3 g) in CVL-1 and the lowest BJC-2142 (108.3 g) which was statistically similar to BJC-7370 (115.0 g) (Table 1).Per hectare fiber yield was highest (2.52 t ha^{-1}) in CVL-1, which was statistically similar to BJC-7370 (2.39 t ha^{-1}) and lowest fiber yield obtained from BJC-2142 (1.82 t ha^{-1}). Per plant stick and stick weight per hectare was found significant variation among different white jute varieties (Table 1).

Table 1. Effect of variety on growth and yield of jute in Patuakhali

Variety	Plant height (m)	Base dia (mm)	Green wt. with leaf (g/ 10 plants)	Green wt. without leaf (g/10 plants)	Fibre wt. (g/10 plants)	Fibre yield (t/ha)	Stick wt. (g/10 plants)	Stick yield (t/ha)
CVL-1	2.97	19.95 b	1309 a	1189	115.0 b	2.52 a	303.3 b	7.61 a
BJC-7370	2.92	20.66 a	1246 ab	1135	123.3 a	2.39 a	337.5 a	7.38 a
BJC-2142	2.98	20.62 a	1188 b	1126	108.3 b	1.82 b	314.2 b	5.90 b
Level of significance	NS	*	**	NS	**	**	**	**
CV (%)	3.16	3.33	6.65	7.96	8.11	8.52	7.28	7.93

** = Significant at 1% level of probability,* = Significant at 5% level of probability, NS = Not significant

Significantly the highest stick weight per plant (337.5 g) was obtained from the variety CVL-1 followed by BJC-7370 (303.3 g) and BJC-2142 (314.2 g), respectively. Per hectare yield of stick was also highest (7.61 t ha^{-1}) in CVL-1, but it was statistically similar to BJC-7370 (7.78 t ha^{-1}). The variety BJC-2142 gave significantly the lowest stick yield than the other two varieties (5.90 t ha^{-1}).

Effect of date of sowing: Plant height was the highest (3.02 m) during 30 March sowing, the lowest (2.85 m) plant height was observed in 30 April sowing. The highest base diameter (21.61 mm) was reported from 15 March sowing and the lowest base diameter (19.79 mm) was from 15 April .The highest green weight with leaf weight (2458 g) was obtained from 15 March sowing and the lowest (1244 g) in 15 April . Sowing at 15 March gave the highest green weight without leaf (2304 g) whereas 30 April produced the lowest (977 g) green weight without leaf.

Sowing at 15 March yielded 148.9 g per 10 plants fiber and 2.80 t/ ha fiber and the lowest fiber yield per 10 Plants was recorded from 15 April sowing (93.33 g), which was statistically similar to 30 April sowing (95.56 g). Yield per hectare was the lowest (1.74 t ha^{-1}) at 30 April sowing. Sowing on March 15 gave significantly the highest stick yield per plant (7382.2 g) which was followed by 317.8 g when sown on 30 March. The lowest stick yield per plant (5.72 g) was reported from 30 April sowing, which again statistically similar to 15 April sowing (295.6 g).

Table 2. Effect of sowing time on plant growth and yield of jute in Patuakhali

Sowing time	Plant height (m)	Base dia (mm)	Green wt. with leaf (g/ 10 plants)	Green wt. without leaf (g/10 plants)	Fibre wt. (g/10 plants)	Fibre yield. (t/ha)	Stick wt. (g/ 10plants)	Stick yield (t/ha)
S_1 (15th March)	3.01 a	21.61 a	2458 a	2304 a	148.9 a	2.8 a	382.2 a	7.94 a
S_2 (30th March)	3.02 a	20.93 b	1993 b	1837 b	124.4 b	2.03 c	317.8 b	6.73 b
S_3 (15th April)	2.95 a	19.30 c	1244 c	1098 c	93.33 c	2.40 b	277.8 c	7.45 a
S_4 (30th April)	2.85 b	19.79 c	1120 c	977 c	95.56 c	1.74 d	295.6 bc	5.72 c
Level of significance	**	**	**	**	**	**	**	**
CV (%)	3.16	3.33	6.65	7.96	8.11	8.52	7.28	7.93

** = Significant at 1% level of probability

Interaction effect of sowing date and variety: The highest plant height (3.22 m) was observed in variety BJC-2142 sown on 30th March and the lowest plant height (2.68 m) was observed from variety BJC-2142 when sown on 30 April. The highest base diameter (22.83 mm) was observed from variety BJC-2142 when sown at 30 March, the lowest base diameter (17.79 mm) was counted from BJC-2142 when sown at 30 April. The highest green weight with leaf (2513 g) was found in variety CVL-1 at 15 sowing March and the lowest green weight (844 g) was found from CVL-1 at 30 April sowing.

Green weight without leaf was observed the highest (2353 g) in CVL-1 in combination with 15 March sowing date and the lowest green weight without leaf (688 g) was observed in CVL-1 at 30 April sowing. Fiber yield per 10 plants was the

highest (166.7 g) in CVL-1 at 15 March sowing and the lowest fiber yield per 10 plants (66.67 g) was found from BJC-2142 sown on 30 April which was statistically similar to CVL-1 sown on 30 April (80.00 g). The highest stick yield was found in variety CVL-1 (413.3 g) when sown on 15 March and the lowest stick weight (220.0 g) was found in BJC-2142 when sown on 30 April, which was statistically similar to BJC-7370 with 30 April (240 g) and CVL-1 with 30 April (260.0 g), respectively.

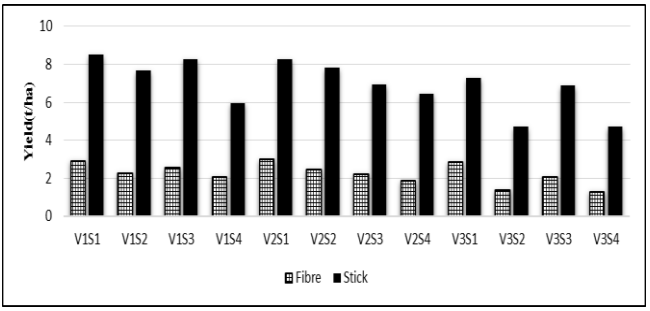

Fig.1 Combination effect of variety and sowing time on fibre and stick yield of jute

Note: V_1=CVL-1, V_2= BJC-7370,V_3= BJC-2142, S_1=15 March, S_2=30 March ,S_3=15 April andS_4=30 April

Fiber yield per hectare was found the highest (2.99 t ha^{-1}) in BJC-7370 with 15 March sowing (Fig.1), which was statistically similar to CVL-1 sown at 15 March (2.92 t ha^{-1}) and BJC-2142 sown at 15 March (2.85 t ha^{-1}) treatments, respectively. The lowest fiber yield was recorded from among the test varieties when they were sown on 30 April. The lowest yield of fiber was found in BJC-2142 with 30 April sowing (1.29 t ha^{-1}) (Fig.1) same result found Buddhadeb Bhattacharya (2012).He found fiber yield of *Capsularis* varieties was highest in mid-March to Mid-April. Similar results were found in the present study in southern condition. Per hectare stick yield was statistically the highest (8.52 t ha^{-1}) in CVL-1 sown with 15 March sowing, and lowest stick yield (4.72 t ha^{-1}) was found in BJC-2142 sown on 30 April (Fig.1).

Table 3. Interaction effect of variety and sowing time on plant growth and yield of jute in Patuakhali

Variety	Plant height (m)	Base dia (mm)	Green wt. with leaf (g)	Green wt. without leaf (g)	Fibre wt. (g)/10plants	Fibre yield. (t/ha)	Stick wt. (g)/10plants	Stick yield. (t/ha)
V_1S_1	3.07 ab	22.77 a	2513 a	2353 a	166.7 a	2.92 a	386.7 a	8.52 a
V_1S_2	2.90 bc	18.63 e	2220 b	1967 c	106.7 bc	2.25 cd	260.0 ef	7.67 abc
V_1S_3	2.98 bc	18.53 e	1122 e	927 e	80.00 de	2.55 bc	240.0 f	8.27 ab
V_1S_4	2.93 bc	19.85cd	844 f	688 f	106.7 bc	2.08 de	326.7 bcd	5.98 e
V_2S_1	2.92 bc	20.74bc	2473 a	2127 b	160.0 a	2.99 a	413.3 a	8.26 ab
V_2S_2	2.94 bc	21.33b	2027 c	2003 bc	113.3 b	2.47 c	296.7 de	7.82 abc
V_2S_3	2.88 c	18.83 de	1135 e	943 e	106.7 bc	2.23 cd	300.0 cde	6.96 cde
V_2S_4	2.92 bc	21.72 ab	917 f	709 f	113.3 b	1.87 e	340.0 bc	6.47 de
V_3S_1	3.03 bc	21.34 b	2487 a	2213 a	120.0 b	2.85 ab	346.7 b	7.28 bcd
V_3S_2	3.22 a	22.83 a	1733 d	1540 d	153.3 a	1.37 f	396.7 a	4.72 f
V_3S_3	2.98 bc	20.53bc	1158 e	965 e	93.33 cd	2.05 de	293.3 de	6.88 cde
V_3S_4	2.68 d	17.79e	860 f	697 f	66.67 e	1.29 f	220.0 f	4.72 f
Level of significance	**	**	**	**	**	**	**	**
CV (%)	3.16	3.33	6.65	7.96	8.11	8.52	7.28	7.93

** = Significant at 1% level of probability,* = Significant at 5% level of probability, NS = Not significant

Note: V_1=CVL-1,V_2= BJC-7370,V_3= BJC-2142, S_1=15 March, S_2=30 March ,S_3=15 April andS_4=30 April

Soil moisture (%) in experimental field

Soil moisture (%)	Depth of soil	Month		
		March,13	April,13	May,13
	0-10 cm	22-25	20-22	18-20
	10-20 cm	25-28	22-26.4	20-23.5

Weather information (March 2013 to August 2013) during experiment period

Month	Temperature (^{0}C)		Relative Humidity (%)		Rainfall (mm)	Length of day (hours)
	Max	Min	Max	Min		
March, 2013	33.00	22.00	93.89	51.45	0.00	11.42
April, 2013	34.00	25.00	94.78	59.50	6 .00	12.22
May ,2013	31.00	26.00	89.47	45.36	42.00	12.58
June, 2013	32.00	28.00	85.87	42.48	20.00	13.24
July, 2013	31.00	27.00	92.18	47.67	85.00	13.28
August ,2013	31.00	27.00	94.33	54.76	28.00	13.08
September, 2013	31.00	27.00	93.77	52.65	28.00	13.08

Area and production of jute in Bangladesh in last 10 years

	Year									
	2002-03	**2003-04**	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**
Acreage '000' acres	1097	1008	965	993	1034	1089	1039	1029	1751	1878

Production '000'M.tons	800	794	732	838	886	839	--	924	1523	1452

Conclusion

From the above results it should be concluded that fiber yield of *Capsularis* varieties differed among one another, variations were also observed at different days of sowing and their interaction. Variety CVL-1 was the superior variety in terms of fiber yield (2.52 t ha^{-1} and suitable time of sowing was 15 March for the highest production (2.80 t ha^{-1}) of fiber yield. All the varieties gave highest stick yield when sown earlier. Finally, it can be recommended that CVL-1 is the best variety for fiber yield (2.99 t ha^{-1}) when sown on 15 March) in southern region of Bangladesh.

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