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INFLUENCE OF VARIOUS MOISTURE LEVELS AND BACTERIAL INOCULUM ON RETTING OF JUTE

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Retting of green and dry jute ribbon and seed cut plants in presence of various ribbon : water ratios (1:1 to 1:10) alone and in association with bacterial inoculum collected from retting effluent of jute has been assessed. Both the factors showed significant impact in reducing the retting period and improving the grade and quality of fibre. Generally retting period increased with the decrease in water ratio. The time required for retting of dry ribbon was double than that of green ribbon with an intermediate period for seed cut plants. However, presence of bacterial inoculum acclerated the retting process at all water ratios reducing the retting period upto 5.7 to 50.0, 8.3 to 15.0 and 2.7 to 11.8% from lowest to highest water content for green, dry and seed cut plants respectively. Bacterial inoculum helped to stimulate the retting process at lower water ratio too. This possibly suggests that use of bacterial inoculum is effective during scarcity of water and for early retting of jute.

Keywords :Bacterial inoculum; Jute; Moisture; Retting.

Introduction

Jute, the golden fibre, is one of the major cash crop of Bangladesh. Necessity of water for cultivation as well as extraction of jute fibre is now a burning question to the farmers of the northern part of Bangladesh where water scarcity hindering the traditional jute retting practices. Therefore, for holding the bright prospect of jute fibre, an alternative way for retting should be introduced with minimum water requirement. One of the approach is, dry ribbon retting technology where during harvest season, jute plants are being ribboning, sun dried and stored, and should be retted when water will be available. Secondly, optimization of water where retting can be accomplished with absolutely lower amount of water. Moreover, the positive and stimulative role of some strains of aerobic and anaerobic bacteria[1-3] and fungi[4-6] in the decomposition of jute and thereby enhancing the retting period can not be over ruled. However, no such work has yet been done in Bangladesh. So, this study was undertaken to find out the lowest water ratio and suitability of using some indigenous bacterial inoculum for retting of jute.

Material and Methods

Samples of jute (CVL-I) was collected from the field and half of them was sun dried, cut into small pieces (7.5 cm) and stored.

Five different types of bacteria namely *Coccus, Diplococcus* and three short rod were isolated from jute retting effluent and were grown in potato dextrose and agar medium at pH 7.2. One loopful of each bacterial culture was taken into 500 ml of sterile water and the bacterial mixture was shaken well by shaking machine. One ml of this bacterial suspension was added to 8g of green ribbon and 2g of each of dry ribbon and seed cut plants separately. The plant samples were taken into a series of clean-dry 250 ml conical flask containing water ranging from 1:1 to 1:10 ratio of ribbon and water. The flasks were closed with cotton plug and covered with a polyethene sheet to avoid light. The experiment was conducted at BJRI central station, Dhaka at room temperature (32°C±0.5°C). Moisture level was maintained constant gravimetrically all through. Retting was checked every alternate day. Samples of green ribbon, dry ribbon and seed cut plants were allowed to rett separately.

Each treatment of water alone and in combination with bacterial inoculum was replicated thrice and arranged in a completely randomized block design. Retting period, grade and quality of fibre were recorded.

Results and Discussion

The retting period of green jute ribbon due to addition of various levels of moisture alone and incombination with bacterial inoculum varied significantly (Table 1). Variation in water ratio showed significant impact on retting period. The period of retting ranged from 35 to 27 days with the increase of ribbon : water ratio of 1:1 to 1:10 in control treatment i.e. where no bacterial inoculum was added. However, retting period reduced from 33 to 18 days when bacterial inoculum was added under the same range of moisture levels. Moreover, the addition of bacterial inoculum collected from retting effluent of jute showed stimulative impact on retting of green jute ribbon in all levels of moisture.

It has been shown that increase in ribbon : water ratio significantly reduced the retting period upto 22.9% at the highest ratio of 1:10. Results further reveals that increase in amount of water gradually reduced the retting period from 2.8 to 22.9% when the ribbon : water ratio increased from 1:3 to 1:10. This obviously signifies the importance of water in the retting of green jute ribbon. It is also apparent from the results that the reduction in retting period was more pronounced when water was added alone at a ratio of 1:7 and on wards. However, it is more interesting to note when the bacterial inoculum was added. The inoculum played a significant role even at lower ratio of ribbon : water. The inoculum showed its efficiency in retting of green jute ribbon even at 1:3 ratio of ribbon : water causing a reduction in 23.5% of retting period. Bacterial inoculum enhanced the retting period of green jute ribbon reduing the retting time upto 50% at ribbon : water of 1:10.

The retting of dry jute ribbon as influenced by various ribbon : water ratio and bacterial inoculum has been recorded (Table 2). Addition of water upto 1:3 ratio of ribbon and water either alone and in presence of bacterial inoculum showed vertually no retting except a negligible sign of decomposition of ribbon. However, retting of ribbon started from ribbon: water ratio of 1:4 and on wards. Addition of water alone showed no change in retting period from 1:4 to 1:6 ratio of ribbon and water covering a period of 48 days. However, the retting period reduced from 44 to 40 days when the ratio of ribbon : water increased from 1:7 to 1:10. Inoculum also played a vital role in retting of dry ribbon. Inoculum helped to reduce the retting period from 44 to 34 days. The efficiency of the inoculum increased with increasing amount of water resulting a decrease in retting period from 8.3 to 15.0%. Results showed that no significant change in retting period was observed between ribbon : water ratio of 1:9 and 1:10 either alone or in conjunction with bacterial inoculum.

It could be noted that time required for retting of dry jute ribbon was almost double than that of green jute ribbon. The positive behaviour of inoculum was also evident in case of retting of dry jute ribbon but the efficiency was less than that of green ribbon.

Retting of seed cut jute plants was also significantly influenced by various moisture levels alone and in combination with bacterial inoculum (Table 3). Complete decomposition of seed cut jute plants due to water alone ranged from 37 to 34 days at ribbon : water ratio of 1:3 to 1:10. Like dry jute ribbon, seed cut plants showed no retting at 1:1 and 1:2 ratio of

Table 1. Effect of various moisture levels and bacterial inoculum on retting of green jute ribbon.

Treatments	Ribbon : Water ratio	Retting period (days)	Percentage reduction in retting period	Fibre grade	Remarks
Control	1:1	35	-	C	Fibre brittle and
Inoculum		33	5.7	C	dark
Control	1:2	35	0.0	C	Fibre dark and
Inoculum		33	5.7	C	hard
Control	1:3	34	2.8	C	Fibre dark and
Inoculum		26	23.5	B	hard
Control	1:4	34	2.8	C	Fibre light
Inoculum		25	26.4	B	cream
Control	1:5	33	5.7	C	Fibre light
Inoculum		25	24.2	B	cream
Control	1:6	33	5.7	C	Bright cream
Inoculum		24	27.2	B	colour, soft
Control	1:7	30	14.2	C	Bright cream
Inoculum		23	23.3	B	colour, soft
Control	1:8	30	14.2	C	Bright cream
Inoculum		22	26.6	B	colour, soft
Control	1:9	28	20.0	B	Fibre soft and
Inoculum		22	21.4	B	creamy colour
Control	1:10	27	22.9	B	Fibre soft and
Inoculum		18	50.0	A	bright creamy colour
LSD at 5% level.		0.66			

A = Top grade; B = Middle grade; C= Cross bottom.
Percent reduction in retting period was calculated for control treatments with control of 1:1 ratio of ribbon : water and that for inoculum was with in the treatments.

Table 2. Effect of various moisture levels and bacterial inoculum on retting of dry jute ribbon.

Treatments	Ribbon : Water ratio	Retting period (days)	Percentage reduction in retting period	Fibre grade	Remarks
Control	1:1	No retting	-	-	-
Inoculum		No retting			
Control	1:2	No retting	-	-	-
Inoculum		No retting			
Control	1:3	No retting	-	-	-
Inoculum		No retting			
Control	1:4	48	-	C	Cream with
Inoculum		44	8.3	C	cutting
Control	1:5	48	0.0	C	Creame with
Inoculum		43	10.4	C	cutting
Control	1:6	48	0.0	C	Whitish cream
Inoculum		40	16.7	B	
Control	1:7	44	8.3	C	Cream
Inoculum		38	13.6	B	
Control	1:8	40	16.6	C	Cream
Inoculum		35	12.5	B	
Control	1:9	40	16.6	C	Bright cream
Inoculum		34	15.0	B	
Control	1:10	40	16.6	C	Bright cream
Inoculum		34	15.0	B+	
LSD at 5% level.		0.83			

B+ = Middle grade plus; B= Middle grade; C = Cross bottom.
Percent reduction in retting period was calculated for control treatments with control of 1:4 ratio of ribbon : water and that for inoculum was with in the treatments.

Table 3. Effect of various moisture levels and bacterial inoculum on retting of seed cut jute plants.

Treatments	Ribbon : Water ratio	Retting period (days)	Percentage reduction in retting period	Fibre grade	Remarks
Control	1:1	No retting	-	-	-
Inoculum		No retting			
Control	1:2	No retting	-	-	-
Inoculum		No retting			
Control	1:3	37	-	C	Reddish brown
Inoculum		35	2.7	B	
Control	1:4	37	0.0	C	Reddish brown
Inoculum		34	8.1	B	
Control	1:5	37	0.0	C	Bright cream
Inoculum		33	10.8	B	
Control	1:6	36	2.7	C	Bright cream
Inoculum		32	11.1	B	
Control	1:7	36	2.7	C	Bright cream
Inoculum		32	11.1	B	
Control	1:8	35	5.4	C	Creamy white
Inoculum		31	11.4	A+	(best qualtiy)
Control	1:9	34	8.1	C	Creamy white
Inoculum		30	11.8	A+	(best qualtiy)
Control	1:10	34	8.1	C	Creamy white
Inoculum		30	11.8	A+	(best quality)

A+ = Best quality; B= Middle grade; C = Cross bottom.
Percent reduction in retting period was calculated for control treatments with control of 1:3 ratio of ribbon : water and that for inoculum was with in the treatments.

seed cut plant and water. However, addition of bacterial inoculum promoted the retting of seed cut plants resulting a reduction in decomposition period from 8.1 to 11.8%. Practically no change in retting period was observed at seed cut plant : water of 1:9 and 1:10. Fibre grade has also been modified by water ratio (Tables 1-3). Fibre grade becomes improved at higher water ratio. Bacterial inoculum showed positive role to improve the fibre grade particularly at lower ratio of ribbon : water in case of green jute plants. The grade of the fibre was cross bottom where only water was added in all ratios of green and dry ribbon and seed cut plants except two higher levels of water in green ribbon yielding middle grade of fibre.

Quality of the fibre could also be improved through inoculation of bacterial inoculum colleted from retting effluent of jute (Table 1-3). Generally quality of the fibre was poor at lower water content. However, the quality of the fibre could be made soft, bright and creamy to creamy white provided retting is allowed at adequate water. The extent of quality could be improved further provided retting is associated with bacterial inoculum.

Variation in ribbon : water ratio in the retting of green, dry and seed cut jute palnts showed a significant change in retting period. Retting period generally enhanced with the increase in amount of water. The reason is quite obvious because for softenning of jute fibre optimization of water is essential. Inadequate moisture generally affects the decomposition process and thus requires longer period for retting. The rate of decrease in retting period showed a gradual increase with water content. However, at the higher levels of water (1:9 and 1:10) no change in retting period was

observed in dry ribbon and seed cut plants. Green ribbon showed earlier retting than dry ribbon. The reason might be due to the fact that fresh tissues could be easily attacked by the microorganisms. Similarly, delay in retting of seed cut plants in comparison to green plants could possibly be due to degree in maturity of the tissues. Older tissues generally take more time than younger tissues to rett.

Addition of bacterial inoculum from retting effluent of jute showed stimulative effect resulting an early retting of the jute plants. Ready supply of the bacterial inoculum instantly became active to decompose the jute fibres. Similar views were reported by other investigators too[7-11]. The authors proposed that existance of bacterial strains in the medium could substantially promoted the retting process thereby reducing the retting period. The stimulative impact of fungal strains in retting process of jute was also demonstrated by some workers[5,6,12].

Best grade and quality of jute fibre was found to be related to optimization of water during retting. Inadequate water in absence of bacterial inoculum results in the production of cross bottom grade and poor quality of fibre.

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