DETERMINATION OF OPTIMUM DEBARK TIME IN RETTING PROCESS OF KENAF FIBER PRODUCTION

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ABSTRACT

Water retting is one of the important steps in fiber production from kenaf. It is a wet process where the outer layers of stalk are separated from non-fibrous matter through soaking the kenaf in water for a certain period of time. The length of retting time will determine the efficiency rate of fiber production in kenaf industry. Many factors influenced the debark time and hence the retting time in kenaf fiber production. This research was conducted to investigate the optimum debark time for kenaf in retting process for fiber production. Water quality before and after retting process were characterized. Observations on kenaf stalk for debarking were also monitored throughout this process. Results show that water quality used for retting affect kenaf retting time and kenaf effluent quality. Hence the best water quality, optimum debark and retting time were determined.

Keywords: *kenaf, trend, water retting, debark, fiber*

INTRODUCTION

Water retting is a wet process by which the bundles of cells in the outer layers of the stalk are separated from nonfibrous matter by the removal of pectins and other gummy substances (Zhang, 2003). There is few retting process such as microbe retting, enzyme retting, dew retting, water retting and chemical retting (Banik et al, 1993; Henriksson et al, 1999; Akin et al, 2007; Chen et al, 2007; Sharma, 1987) but the most common method is water retting. This practice is highly suitable for the economy because it cost extremely low (Banik et al, 1993). In addition, fiber which is produced during chemical retting is weaker due to the extreme processing condition (Hong, 2004; Morrison et al., 1999).

In retting process, a large amount of water is used. According to Mondal and Kaviraj, 2008, they reported that to ret the 10,000kg of jute, almost 432m^3 of water is use. Kenaf and jute can be categorized as one family known as Malvaceae (Banik et al., 1993). Therefore, their water retting process is the same. Besides using a large amount of water, retting process consume a lot of time which caused the deterioration in water (Mondal and Kaviraj, 2008).

Currently wastewater generated from retting process is being discharge to the natural water without treatment. Kenaf stalks were immersed in slow moving water for a long time in stream retting. Effluent from this process deterioriate the water quality of the stream and hence affects the users at downstream (textileschool, 2011). Organic matters can undergo decompositions in the water which will accelerate the degumming process of pectin in kenaf bark (Banik et al., 1993). Hence, attempts were made to evaluate and determine optimum retting time for kenaf fiber processing using different water quality taken from different water sources were performed.

MATERIALS

This research was conducted at Hydrology Laboratory in Faculty of Civil Engineering, Universiti Teknologi MARA (UiTM), Shah Alam, Selangor.

Matured kenaf plants were used as main material for this research. Mostly at the age of 120 days after seed, kenaf plants can be classified as matured. In this research Kenaf was taken from National Kenaf and Tobacco Broad, Malaysia farm at Tok Bali, Macang, Kelantan.

While, chemical materials for water quality analysis such as Chemical Oxygen Demand (COD), Chlorine Free, Suspended Solid (SS) and Ammonical-Nitrogen (NH3-N) were used. For the equipments that were used for measured and testing analyses is HACH Spectrophotometer series 5000, Dissolved Oxygen and pH meter. Equipments for kenaf retting are retting container and PVC net.

METHODS

Water retting of Kenaf

Laboratory scale was used for this research. Kenaf stems were measured about 30 cm lengths and then it was cut off to make suitable to place in the laboratory retting container. Kenaf stem than been classified by following range of diameter (see Figure 1). Then, stems of kenaf were tied about four (4) or five (5) pieces with the average weight is about 50g per tied. About 24 tied of stems are prepared, then half of that tied were crushed using crusher machine. Water from tap water was used in this research for retting the kenaf. Six (6) units of tied were placed in retting container (see Figure 2). Kenaf was given retted in the tap water about 50 liters for 14 days at room temperature.

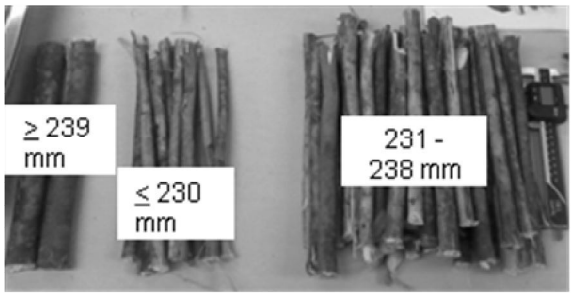

Figure 1: Kenaf is classified according to range of diameters.

Figure 2: Kenaf water retting process.

Evaluation of water quality parameters

Samples of water were collected from the retting container on the morning during retting time starting with day zero (0), day 1, day 5, day 7, day 11 and day 14. Day zero (0) mean the starting day when water is placed in the retting container. While, day 1 is the day after kenaf was retting after 24 hours. Day 14 is the last day of the retting process for this research. The effluent from the water retting trial were analysed for the following:

Chemical Oxygen Demand (COD) was determined by using Reactor Digestion Method Low Range. This method was approved by USEPA.

Ammonical-Nitrogen (NH_3-N) was determined using Nessler Method. This method was adapted from Standard Methods for the Examination of Water and Wastewater.

Analysis of the physicochemical components such as Dissolved Oxygen (DO), pH and temperature were determined by using standard method (APHA, 1998).

RESULTS AND DISCUSSION

During water retting of kenaf, the temperature was maintained at room temperature (27˚C). The physicochemical analysis data of effluent for 7 days of water retting can be referred in Table 1. The result showed deterioration of water quality in tap and river water showed that retting process does pollute the water source. It was seen that even the source of water is from treated water (tap water), its final effluent quality is not much different from untreated water (river water). The differences in BOD concentration at 7 days is only 33.6 mg/L at day 7. However from observation, it can be seen that debark of kenaf stalk had took place on day 3 in retting process using river water. This shows that river water can reduce the retting time of kenaf. It also shows that clean water is not suitable for kenaf retting process.

CONCLUSION

From this research it can be concluded that water quality plays an important role in retting process. Untreated water was favoured in retting process for reduction of time for debark time of kenaf and hence the kenaf retting time. It was also found that the optimum kenaf debark time using river water as the retting water is 3 days.

RECOMMENDATIONS

It is recommended that further research should be conducted to determine and identify the agents presence in river water that are responsible for accelerating the debark time in retting process.

Table1: Physical and chemical characteristics of water quality and kenaf stalk for 7 days retting period.

Type of water	Water Quality Parameter	Retting Days			
		1	3	5	7
Tap water (TW)	BOD (mg/L)	454.20	460.20	468.60	490.20
	DO (mg/L)	0.09	0.08	0.06	0.04
	COD (mg/L)	654.00	980.00	999.00	1125.00
	SS (mg/L)	42.00	108.00	144.00	164.00
	NH_3-N (mg/L)	4.86	7.29	6.48	8.46
	pH	5.81	5.51	5.43	5.34
River water (RW)	BOD (mg/L)	476.40	482.40	489.50	523.80
	DO (mg/L)	0.07	0.07	0.05	0.03
	COD (mg/L)	1093.00	1528.00	1665.00	1953.00
	SS (mg/L)	120.00	155.00	182.00	216.00
	NH_3-N (mg/L)	10.26	12.96	9.90	14.76
	pH	6.12	5.61	5.70	5.65
Tap water	Observation (debark)				
River water					

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