DEVELOPMENT OF PROCESSED PRODUCTS FORM LEMONGRASS FIBRE

Saowanee Areechongchareon; Nuchdow Texsamut

Rajamangala University of Technology Phra Nakhon, Faculty of Industrial Textile and Fashion Design, Department of Textile Technology, Bangkok, Thailand
E-mail : aree16@hotmail.com

Abstract: This research deals with paper production from lemongrass and producing a model product. The lemongrass was boiled in sodium hydroxide solution 400 grams per litre of water at 80 to 100 degrees Celsius for 3 hours. The separated fibre was then bleached with chlorine solution 20% per lemongrass fibre 1 kilogram per water 1 litre. Finally, paper pulp was scooped for paper formation and lemongrass fibre paper was soaked with flame retardant 10% for 10 minutes at room temperature. The physical properties of the paper were tested – mass per unit length, longitudinal and cross section, burn, tearing strength, absorption, and heat resistance.

This research was conducted by cutting lemongrass leaves to a uniform length and boiling them to separate the fibres for toughness with high strength: the longer the lemongrass leaves, the greater the strength. The dirt mixed was removed by boiling the separated fibre. To achieve quality standards the products should be designed, analyzed, evaluated, and modeled. Sampling group evaluation was used to help develop lemongrass fibre products for commercial production using natural resources with maximum cost benefit and technology transfer to the target group.

The result of this research was to develop and process home furnishing accessories and souvenirs such as lamps, photo frames, paper boxes, tissue boxes, and souvenirs.

The procedure for this research was to analyze the satisfaction level of trainees from Sridonpai, Dumnoen Saduak District, Ratchaburi community and interested groups and found that the service provided by officer, trainer, service processing, and accommodation were on average of high level ($\overline{X}$ = 4.45, 4.35, 4.22 and 4.42 ordering).

1. Introduction

Government policies stress research to create knowledge and country development based on the sufficiency economy philosophy with regard to environmental and natural resource conservation by using natural resources for local sustainability. Lemongrass is widely cultivated but lemongrass leaf has not been utilized for commercial purposes, we must find a way to get rid of lemongrass leaf by various methods. The research team has found a way to dispose of these wastes to create benefits for the economies and the environment. This research was conducted by making a fibre from lemongrass leaves into lemongrass fibre paper which could cling to the plate without any adhesion (cohesive) chemical and was added heat resistance for making products from lemongrass fibre paper for household decoration, utilities, and souvenirs to increase product value by thinking of natural resources, environmental protection, and use of natural resources for local sustainability.

2. Procedure (Processing)

To produce paper from lemongrass and a model product from lemongrass leaves abundant raw material was processed by boiling the lemongrass in sodium hydroxide 400 grams per litre of water at 80 to 100 degrees Celsius for 3 hours. The separated fibre was then bleached with 20% chlorine per lemongrass fibre 1 kilogram per water 1 litre. Finally, paper pulp was scooped for paper formation and lemongrass fibre paper was soaked with flame retardant 10% for 10 minutes at room temperature. The physical properties of the paper were tested – mass per unit length, longitudinal and cross section, burn, tearing strength, absorption, and heat resistance. Then process home furnishing accessories and souvenirs and lamps.

Processing lemongrass fibre

1 Clean lemongrass leaves with water for twice and let drain.

Picture 1: Cleaned lemongrass leaves and drained

2 Lemongrass leaves 1 kg. : Sodium hydroxide 400 g. : a litre of water.
3 Cut lemongrass leaves to uniform length approximately 2 – 3 inches.
4 Boil at 80 – 100 ºC for 3 hours resulting in lemongrass fibre.
5 Wash lemongrass fibre in cool water 2 – 3 times.
6 Mix 20% chlorine 200 g. per lemongrass fibre 1 kg. with water 1 litre. *[Caution: chemicals such as caustic soda or chlorine may be harmful to sensitive individuals]*
7 Soak lemongrass fibre in water with chlorine for 2 ½ hour.
8 Clean with pure water 2 – 3 times.

Picture 2: Boiled lemongrass fibre in water with chlorine

Picture 3: Bleached fibre

9 Place lemongrass fibre in a colander and sieve in water for fibre uniformly.

Picture 4: Sieved lemongrass fibre

10 Pass a 10% heat resistant chemical for 10 minutes at normal temperature.
11 Dry in shade.

Picture 5: lemongrass fibre paper

Fibre preparation producing paper

The process of making lemongrass fibre from lemongrass leaves involces passing chemicals to separate the fibres for toughness with high strength: the longer the lemongrass leaves, the greater the strength**.** The longer the lemongrass leaves will get stenght effect when making a sheet. In the process of fibre preparation to a sheet they should be cut to uniform lengths to facilitate the next step – beating lemongrass fibre to spreading consistency in the tub. For making a sheet process with special properties – put cohesive chemical, heat resistant chemical and toughness chemical.

3. Testing Lemongrass Fibre Paper Properties

Physical properties testing: Microscopic appearance

Length and cross-sectional shape by using the microscopic (MEIJI, S.Flat Field Model, 10 0.25 160/0.17 DIN) zoom 11.25x. For longitudinal sectional shape was stapled with twisted and cross sectional shape was bean with unevenness and unsmooth.

(A) Longitudinal sectional (B) Cross sectional

Picture 6: Microscopic appearance of longitudinal sectional and cross sectional shapes with 11.25x zoom

Shear force

The shear force result for lemongrass fibre paper was the mean 4.193 newton, 427.88 gram.

Table 1: Shear force testing result

Sample	Shear force (N)	Shear force (g)
1	4.194	427.95
2	4.194	427.95
3	4.076	415.91
4	4.076	415.91
5	4.194	427.95
6	4.542	463.42
7	4.370	445.92
8	4.076	415.91
9	4.135	421.94
10	4.076	415.91
$\bar{X}$	41.933/10 = 4.193	4278.81/10 = 427.88

Converting Newton value (N) to gram value (g) : weight 9.8 newton (N) = 1000 gram (g)

Heat resistance

The result of heat resistance testing by using 10% and 20% flame retardant solution at heat 3 – 5 watt and 40 watt was that assessed value was 4-5, showing low effect when exposed to high heat.

Table 2: Testing of 10% and 20% of flame-retardant solution at heat 3 – 5 and 40 watt (Spiral light bulbs)

Sample	Time (minutes)	Assessed value			
		10% of flame retardant solution		20% of flame retardant solution	
		heat 3 – 5 watt	heat 40 watt	heat 3 – 5 watt	heat 40 watt
1	15	4 – 5	4 – 5	4 – 5	4 – 5
2	30	4 – 5	4 – 5	4 – 5	4 – 5
3	60	4 – 5	4 – 5	4 – 5	4 – 5
4	90	4 – 5	4 – 5	4 – 5	4 – 5
5	120	4 – 5	4 – 5	4 – 5	4 – 5

Testing result was selected that lemongrass fibre paper with 10% of flame retardant solution because there are no different in color from percentage of flame retardant solution.

Lemongrass fibre paper-making summery

Lemongrass leaves can be used to make paper. We can also use other wood fibres to make paper. After boiling lemongrass leaves with sodium hydroxide (caustic soda) the result is a clear and beautiful fibre appearance with a better quality than other fibre papers such as pineapple leaves. Because lemongrass fibre has fibres over a shrinking tolerance is

homogeneous and well-suited for products such as tissue boxes, notebooks, photo frames, and artificial flowers.

Lemongrass fibre lamp production

1 Make resin structure.

2 Cover resin structure with lemongrass fibre paper.

Picture 7: Structure covered with lemongrass fibre paper

3 Glue latex to the surface.

Picture 8: Latex Gued to the surface

4 Tear a lemongrass fibre paper into small pieces, place them in water and cover at the structure, then wait until dry; repeat the same process two or three times but for each layer, wait until dry. The last layer must be covered by latex glue again.

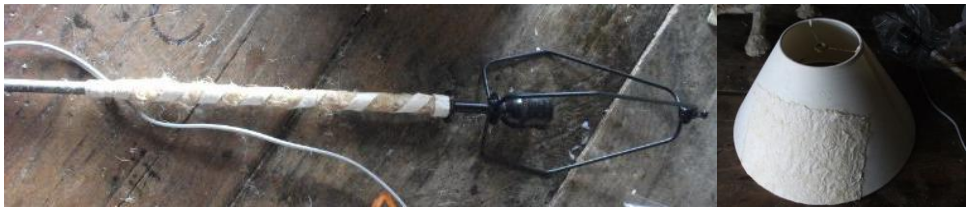
5 Wrap lemongrass fibre around a bird's nest made of rattan basket

Picture 9: Model of bird

6 To make a paper lamp structure with wire, roll in resin to a shape.

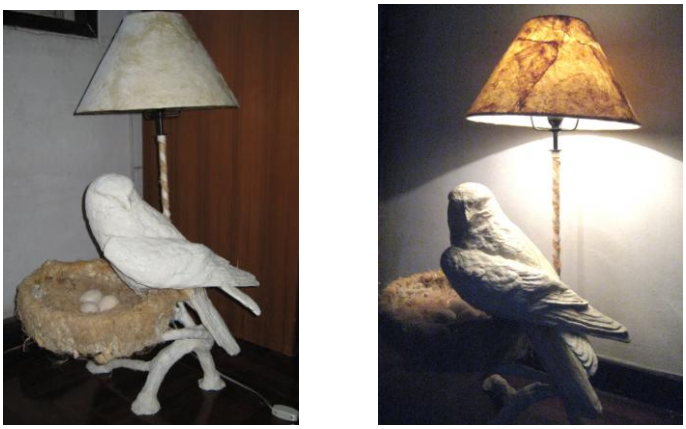
Picture 10: Lamp parts

7 Shred lemongrass fibre paper and smoothly wrapp on lamp structure.



Picture 11: Shredded lemongrass fibre paper smoothly wrapped on lamp structure and stand

8 Assemble all parts to a form.
9 Decorate detail of stake lamp with lemongrass fibre.
10 Install 40 watt spiral light bulb.
11 Turn on lamp.



Picture 12: Finished model

4. Research Conclusion

The fibre separating process was conducted by cutting lemongrass leaves to a uniform length about 2 to 3 inches. The lemongrass was boiled in sodium hydroxide solution 400 grams per litre of water at 80 – 100 degrees Celsius for 3 hours. The separated fibre was then bleached with 20% chlorine per lemongrass fibre 1 kilogram per water 1 litre**.** Finally, paper pulp was scooped for paper formation and lemongrass fibre paper was soaked with flame retardant 10%

for 10 minutes at room temperatures. The physical properties of the paper were tested – mass per unit length, longitudinal and cross section, burn, tearing strength, absorption, and heat resistance : the longer the lemongrass leaves, the greater the strength**.**

To improve product quality standards should be analysis, design, evaluation and the making of a model, followed by processing fibre from lemongrass leaves, applied for routine usage and development to commercial production and using the natural resource with maximum cost benefit. The result of this research was to develop and process a lamp and clock products.

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