The Development of New Mixed Fiber from Waste Cocoon and Other Plant Fibers

Kittisak Ariyakuare [1*]
1) Textile Product Design, Faculty of Industrial Textile and Fashion Design, RMUTP
**Corresponding Author : a_amu_08@hotmail.com*

Abstract

The purpose of this research was to develop new mixed fiber from waste cocoon and other plant fibers. It was found that waste cocoon has qualitative properties to produce new mixed fiber when mixed with five kinds of plant fibers, namely cotton yarn, linen yarn, pineapple yarn, ramie yarn and hemp yarn. The processes included boiling waste cocoon in wetting agent water and Sodium Carbonate for 30 minutes at 90 ºC, and dehydrating it. After that, short cocoon yarn was obtained. Then mix it with the five kinds of plant fibers with the ratio of 50:50 in carding at silk card, and undergo mixing and spinning process. Qualitative test result of new mixed fiber from waste cocoon used as weft yarn, and five kinds of plant fibers used as warp yarn in industrial weaving showed that fiber from waste cocoon mixed with hemp yarn has the best breaking strength of 194 CN/tex, followed by waste cocoon mixed with ramie yarn of 149 CN/tex, waste cocoon mixed with linen yarn of 146 CN/tex, waste cocoon mixed with pineapple yarn of 145 CN/tex, and waste cocoon mixed with cotton yarn of 143 CN/tex. Meanwhile, fiber from waste cocoon mixed with heft yarn has the best mean elongation of 2.30 cm, followed by waste cocoon mixed with cotton yarn of 2.32 cm, waste cocoon mixed with ramie yarn of 2.77 cm, waste cocoon mixed with linen yarn of 3.42 cm., and waste cocoon mixed with pineapple yarn of 3.43 cm. Thus, the research results indicated that fiber from waste cocoon mixed with hemp yarn is good for producing home textile as it has the highest breaking strength while fiber from waste cocoon mixed with pineapple yarn is good for producing clothes.

Key words: waste cocoons, fiber crops, mixed fiber

1. Introduction

There were agriculturists whom planting mulberry silk cultivation in Thailand around 148,754 households. There were area for planting around 1,614,430 Mulberry Farm. Most around 80 percent were agriculturists in northeast area. The other were around another part such as north, east, central and south for generate cocoons to industry in 2003. The production in the country produced 4,000 tons

The silk production and product from silk were from households become to factory. There were modern machines to help for manufacture in some structure for expand production and distribution both within and outside the country. Thai silk has been popular in the world. From survey found there are small factory and large factory more than a thousand around the country. By the large and important one were in northeast area. Thai silk production were show about local arts and identity of region and the weaving process. Pattern and pattern of fabric were identity can used to Determine the source of production there were unuse waste cocoons from the products in Thailand around 317 tons. If sale them to be raw material the profit will be 41 – 95 million baht. But if take them to be many products the profit will high 5 – 10 times. It also increases the chance of cocoons or silk production increases income to agriculturists. Cocoon fragments remaining in agricultural planting mulberry silk in the Northeast each year, waste cocoons. Rest and be processed into various products that do not cost the farmers have to process a limited process various enabling waste cocoon of waste to a value that will bring waste cocoon mixed with fiber plants remaining. Agriculture to the new fiber.

Therefore, the development of waste cocoon fiber Chad to get the fiber to innovate. Through the process of manufacturing processes. Product design solution. Which is another way for farmers to grow mulberry silk. Development and application of innovative products. In addition to adding value to products. Local crafts and textiles made from waste products cocoon that is high potential. That can create a labor market revenue to the community must be developed from waste fiber cocoon. In the process of manufacturing and design processes. Development of fiber from waste cocoons to get the appropriate fiber design products that are appropriate to the times.

2. Materials and Methods

2.1 Materials and Chemicals

Cocoon fragments left from the regular spinning namely cotton yarn, linen yarn, pineapple yarn, ramie yarn and hemp yarn, cannabis sativa suds artificial sodium carbonate

2.2 Equipment and supplies

Spinner (Air Cart thread) Tester Tensile, Tensile Strenting Tester, Comb sorter machine MDTA 3 (Sdlatlas Textile Testing) Svessen company scale chemical decimal 4 position Pioneer company dryer Rapid Lapid Labontex Co., Ltd. Ping Pipette machine. Twist tester machine Mieroscope Nikon version DIGITAL SIGHT DS-

2.3 How to find the size of the cut waste cocoons suitable for spinning

2.3.1 Preparation of waste in the cocoon stage to make the cut by using the following three ways. How to boil 2 cocoons by cutting waste broken down into four equal sections of the nest, waste cocoons 3 ways to waste boiled cocoons the size of 0.2 x 0.2 cm.

2.3.2 Boiled cocoons by studying how the cocoons are boiled. How a fraction boiling cocoons without chemical input. A brand of self cocoon of waste (g:ml) was 1:100. Method 2 boiled cocoons waste by putting chemicals. Separate into fibers with glue on the silk cocoon waste through chemical processes is the artificial water, soap, 2 g / I sodium carbonate 5 g. per liter to the boiling pot for 30 minutes.

2.3.3 Sang fibers of the cocoon with comber waste fiber are MDTA 3. Prepare waste cocoons to be boiled and dried, and then the comb the weight and how to cut the difference between the three methods mentioned above, the weight of fiber (g) is 0.2, 0.3, 0.4, 0.6 and 0.7 gm. Respectively to the comber waste cocoon filament.

2.3.4 Spinning a yarn spinning machine cart by using the craft to spin cotton spinning below. The fibers to comb through the fibers to make enter spinning machine yarn cart plant fibers mixed with cotton yarn linen yarn 5 has a line in the mold of pineapple yarn and the lines of Cannabis sativa. Type is the ratio 50:50.

2.3.5 Determination of fiber length. Test standard BS 4044:1989 Identifier, Methods for Determination of fiber length by comb sort diagram prepared by the fibers to comb through the test by a line parallel to the same sort of fiber on the comb sorter and calculated results.

2.3.6 Find the number of threads per inch screw. The manual electronic twist tester SDL 220 B with a yarn of 10 lines with 5-inch length.

2.3.7 The retention of tensile test standard ASTM D2256 Standard test method for tensile properties of yarns by the single – stand method silk yarn through the fine state 24 hours to test the durability of the weight of the yarn tension (g.) is a 0.2, 0.3, 0.4, 0.6 and 0.7 grams respectively.

2.3.8 Weaving with a few hand woven textiles in the craft by bringing yarn mixed with plant fibers woven with the fifth type laikhed then test the resistance and tensile elongation (ISO.121 Vol. 9 – 2518).

2.3.9 Woven with the textile industry by bringing a machine from scrap yarn stand cocoon and fiber crops consolidation of five species mentioned above, the woven bone yard laisoong and then test the resistance and tear strength elongation (ISO.121 Vol. 9 – 2518).

3. The experiments and analysis

3.1 The results of sizing fraction boiling cocoons suitable for use with chemicals because of the distribution better. Fraud, waste cocoons with water also can be chemical deguming of silk, waste cocoons made incoherent.

3.2 The results for the third boiling cocoon to bring to the boil with the chemicals that post cocoon fragments were cut four sections will be distributed and the better sort.

3.3 The results to cut waste cocoons to be a power slide to the cocoon was not to cut when the comb fibers to make the most of mounting rollers. Fibers remaining after pruning a small amount of power slide. The way to cut cocoon office cut four of the lead to comb fibers that after pruning the a mount similar to before comb and parts to office cut cocoon advanced approximately 0.2 cm. when to comb fibers have the separation was to short to waste fiber left shaking rather than a power slide.

3.4 The results of spinning machine cart thread in handmade by bring fiber processed specter came to spin with mixed fiber plant

five types of these fibers self brand of 50 : 50 found that the fibers were mixed well with each other, respectively, waste cocoon is no one, including fibers such as cotton No.2 No.3 fiber linen fiber mold 4 has no fiber, pineapple fiber, and No.5 Cannabis sativa.

3.5 Determination of the study showed that fiber length. The length of the fiber from waste cocoons that does not cut a mean of 3.6 cm. length of waste cocoon office cut four of the mean was 4.46 cm. and length of the fiber from waste cocoons office cutting information cannot find long the fibers are. Because the fibers are too short

3.6 The results for finding number of thread and yarn were in tex yarn number when adding fiber increased the number of threads in the new size table.

Fiber comb weight before (g)	Rubber Thread (Tex)	Thread number (Ne)
0.2	192.02	3.08
0.3	293.79	2.46
0.4	414.57	1.42
0.5	512.98	1.15
0.6	612.02	0.96
0.7	692.98	0.85

3.7 The results of tensile test the durability of short fiber, silk fiber cutting process to separate the cocoons were cut 4 of the weight gain in the strength of yarn increases with the size of the table.

Times	Yarn Weight (g)													
	0.2		0.3		0.4		0.5		0.6		0.7			
	Strength (N)	The elongation (mm)	Strength (N)	The elongation (mm)	Strength (N)	The elongation (mm)	Strength (N)	The elongation (mm)	Strength (N)	The elongation (mm)	Strength (N)	The elongation (mm)		
1	15.67	67.89	18.09	78.90	24.01	90.20	29.34	105.90	34.51	113.90	36.77	119.20		
2	15.01	68.00	19.34	79.40	24.76	89.80	29.56	105.80	33.98	114.30	37.89	119.00		
3	15.08	66.09	19.97	79.30	24.87	89.30	29.45	105.30	33.99	115.00	37.34	118.80		
4	14.98	67.08	18.77	78.20	25.00	89.90	30.32	106.00	34.00	113.40	38.00	119.00		
5	15.01	66.98	20.00	79.40	24.63	89.00	29.63	106.70	34.56	114.50	37.34	118.20		
6	15.00	67.00	18.56	80.00	25.00	87.90	29.86	106.30	34.00	115.30	36.67	118.50		
7	14.78	66.98	19.07	78.90	24.99	88.00	29.83	107.20	34.52	114.50	36.97	119.00		
8	15.00	68.00	20.00	79.30	24.56	90.70	30.20	105.60	34.83	113.80	37.46	118.3		
9	14.76	67.12	19.76	79.60	25.03	90.00	30.12	106.50	33.98	113.00	38.00	119.30		
10	15.01	68.70	18.56	80.00	24.56	91.90	29.57	107.80	34.56	113.10	36.55	118.70		
Average	*15.03*	*63.38*	*19.21*	*79.30*	*24.74*	*89.67*	*29.78*	*106.31*	*34.29*	*114.08*	*37.30*	*118.80*		
S.D.	*0.25*	*0.75*	*0.71*	*0.54*	*0.32*	*1.20*	*0.33*	*0.76*	*0.33*	*0.78*	*0.55*	*0.37*		

3.8 The results of a few hand woven textiles in the crafts. Fibers were mixed with laikhed be woven. Then test the resistance forces tear to the following sequence of a waste cocoon mixed fiber linen No.2, waste cocoon mixed fiber cannabis sativa No.3, waste cocoon mixed fiber No.4, waste cocoons mixed fiber pineapple No.5 and cocoon fragments are mixed fiber mold.

Square test of strength, tear resistance

Fiber samples	Wages (Newton)	Note weaving craft system
Waste mixed linen cocoon	155	Fabric lack the remaining three in the fourth slip off.
Cannabis sativa mixed waste cocoons	149	Fabric lack two remaining in the third slip off
Mixed cotton waste cocoons	142	Fabric lack two remaining in the third slip off
Mixed pineapple waste cocoons	108	Yarn slip off a little
Waste cocoons mixed with mold	103	

Note: If the large amount of labor that is more durable, tear strength. If wages are low and show that there is less resistance, tear strength as well.

Test results of elongation to the follow sequence of a waste cocoon mixed fiber linen No.2 waste cocoon mixed fibers, pineapple and waste cocoon mixed fungi have and No.3 waste cocoons and cottons yarn to waste cocoon mixed fibers. Cannabis sativa.

Table test flexibility

Sample	From the bend (cm.)				
	1	2	3	4	Average
Waste mixed lined socoon	1.7	2.0	2.3	2.1	2.0
Cocoon fiber waste mixed with mold	2.7	2.1	3.1	2.2	2.5
Mixed pineapple waste cocoons	2.5	2.7	2.4	2.3	2.5
Mixed cotton waste cocoons	2.4	3.1	2.2	2.8	2.6
Mixed fiber waste cocoon cannabis sativa	2.8	2.4	2.3	2.8	2.6

Note: If the range of bending, there is very little tenderness. In contrast, if the range of bend less, there is very solf.

The results of resistance tension of the fiber mixture (yarn to spin in the craft) to experimental results as No.1 waste cocoon mixed fiber linen No.2 waste cocoon mixed fiber cannabis sativa No.3 waste cocoons No.4 mixed cotton fiber waste cocoon mix pineapple fibers and cocoon No.5 fraction mixed with mold.

Table shows results of tensile resistance of threads.

Sample	Wage (Newton)	From T (mm)	Note
Waste mixed linen cocoon	28.30	48.45	
Mixed fiber waste cocoon cannabis sativa	21.06	21.05	
Mixed cotton waste cocoons	14.30	41.20	
Mixed pineapple waste cocoon	2.44	22.15	
Cocoon fiber waste mixed with mold	1.95	27.85	

Note: - If the large amount of labor that is more durable tension. And if it shows that wages are less durable, too little tension.

- From T indicates the ability to extend the previous lack of yarn.

3.9 The results of the weaving machine with the standing yarn from cocoons and waste consolidation fiber plant 5 types of weaving laisoong and texture bone found that the resistance force tear (Breaking strength) No.1 is the fiber from waste cocoons with fiber cannabis sativa wages 194 CN/tex No.2 is the fiber from waste cocoons with travel is paid 149 CN/tex No.3 is the fiber from waste cocoons with linen wages 146 CN/tex No.4 is the fiber from waste cocoons with pineapple wages 145 CN/tex No.5 is a fiber mixture of broken cocoons with cotton wages 143 CN/tex average elongation (Mean Elogation) No.1 is the fiber from waste cocoons with fiber cannabis sativa 2.30 cm. No.2 is a fiber mixture of broken cocoons and cotton 2.32 cm. No.3 is the fiber of waste cocoon with 2.77 cm. mold No.4 is the fraction of fiber linen cocoon with 3.42 cm. and number 5 is the fraction of fiber cocoon fibers mixed with pineapples 3.43 cm.

4. Summarize

4.1 Summary of experiments

A new type of fiber and fiber from waste plant cocoon spinning process with industry weaving process with craft and cloth weaving machines that are soft. The physical properties of each type of plant fiber, weaving through two trails for the above. Found that fabrics woven from fibers of a new mixed waste cocoon and fiber crops are five types of potential applied to build housing products and textiles and clothing suitable for the production of apparel.

4.2 Recommendations

4.2.1 Should be implemented to the development of mew textile products for innovative medical and public health to medical care.

4.2.2 Should adjust the techniques used in Thai traditional medicine wisdom used in dyeing or drying the coated fibers will lead to more innovative new products.

5. Acknowledgment

This thesis was successfully completed with a visit by attention to

knowledge as a consultant for advice guidelines. As well as the duration of your study with Professor Dr. Prakob Wirojanakoot President of illuminating the test. Prof.Dr. Tada sutthitham president advisor. Provide advice and assistance amended recommendations. Thanks faculty of Textile and Fashion Design. Rajamangala University of Technology Phra Nakhon. Make this thesis with great success and favorable results from the fibers and Chi-Nano Ken Chi (Thailand) Co., Ltd. Thank you Premier Textile Industry Co., Ltd. To favor knitting machine.

6. References

1. Suchada Auch-chin and group. Pineapple yarn manufacturing and textile, Institute of output Agriculture and agro-industry. Kasetsart University, 2549. (Thai).

2. Suchada Auch-chin and Rungnapha Ratanaphahira. Pineapple yarn manufacturing for textile fibers by immersion laundering. Institute of Agricultural Research and Development Industry and Agriculture. Kasetsart University, 2549. (Thai).

3. Krishnaswami S. Sreiculture Manual 3-silk Reeling. Food and Agricuture organization of the United Nations.3 - 5 , et al 1972.

4. Schulz, G. The Cellulose Famil with its Junior Lyocell, Textile Colloquium Bangkok, 19th September 1995.

5. Sericulture Manual 3 – silk reeling. Foon and Agriculture Organization of the United Nations. Rome. 39 - 41 p., 49 – 53 p.,1972.

6. Subhas V. Studies on reeling. Part.I. Effect of cocoon cooking condition and reeling basin mater temperature on reeling performance of Indian multibiroltine cocoons. Sericolodia International Sericultural Commission. France.France.Naik et al. 2005.

7. Subhas V. Studies on reeling. Part.II. Effect of cocoon cooking condition and reeling basin mater temperature on quality Characteristics of raw silk of Indian Multibiroltine cocoons. International Sericultural Commission. France.France.Naik et al. 205.

8. Hahn,Susanne.1991. A Complete Guide to Silk Painting. Great Britain : Search Press.