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# Mud-dyed Silk Fabric: Extension and Improvement of Knowledge Based on Isan Folk Wisdom

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**ABSTRACT-** It can be said that silk is a fabric that made famous for the Isan people, silk weaving was developed from the respective stakeholders. Therefore, this research was qualitative and experimental research with the aims of extending and improving the knowledge of mud-dyed silk production and design. This research was held at Kalasin and, Ubon Ratchathani province, Thailand. The research instrument was a survey, interview, observation form, focus group discussion, workshop, and experiment. The sample in this study was selected using the purposive sampling method which consisted of 4 groups: 1) Kut Wa Weaving Group, 2) Ban Uparee Weaving Community Enterprise, 3) Ban Phon Sawan Occupation Group, and Cooperative and 4) Ban Sompornrat where the fabric dyeing was performed. The study findings were presented by descriptive analysis and statistical analysis methods.
The results showed that natural dyes from plants and mud available in these communities were used in the silk dyeing process. There were different dyeing methods, cold dyeing was used in some villages and hot dyeing was used in other villages. However, there is no comparative study focusing on the rub fastness of the dyed fabrics. For the development of the knowledge of mud-dyed silk production in the communities in Northeastern Thailand, mud-dyeing experiments were conducted using 2 methods, hot dyeing, and cold dyeing. The results revealed that hot dyeing and cold dyeing had slightly different effects on lightfastness, color value, color intensity, rub fastness, wash fastness, and crease recovery and there was no heavy metal contamination at a dangerous level. These are considered the new innovations. Each type of mud resulted in different colors with unique beauty and can be used in designing women's wear and filing a patent application.

**Keywords: Silk Production, Mud-dyed Silk, Knowledge Extension**

## I. INTRODUCTION

Early humans dyed their fabrics with natural dyes. China, India, and Persia are believed to be the countries of high civilizations thriving in the world of textile crafts. Europeans were able to dye their fabrics using a dye from the Woad tree since 2500 BC. These dyed fabrics were very popular and generated substantial income for the dyers as well as the Woad farmers. Saffron is another plant that provides reddish-yellow color and is a European commodity. However, after a route from Europe to India was discovered, coloring plants were imported from India. Indigo dye from India is more popular than the blue dye from the Woad tree, causing serious loss to the Woad farmers and those who do business related to Woad dye. Thailand can also produce blue from the indigo tree (Chanan Wongwipak. 2014).

At present, textile and garment products are constantly changing with the world trend. Textiles and garments have long been an important part of the Thai economy and society. According to the situation of the textile and garment industry during the years 2010 - 2011 by the Textile Information Center, the Thailand Textile Institute, and the Office of Industrial Economics, the Ministry of Industry, the total export value in 2010 was US$3,165 million. The total export value expanded by 1.75%. According to the survey in 2011 by the National Statistical Office for the public opinion toward the selection of OTOP products among people aged 18 years and over from every province across the country, it was found that textiles and garments were the second most selected products, accounting for 26.60%, while processed food was ranked first, accounting for 52.90%. From the above data, there seem to be an opportunity for the Isan textile market to develop textiles and garments with local identities, especially natural dyed fabrics (Narongchai Akrasanee. 2009; Duangruethai Aksaeng and Wipawee Grisanaputi. 2000).

Natural dyes can be obtained from plants, animals, minerals, and soil, but most are derived from a wide variety of plants. Some dyes are obtained from the bark, staple, leaves, roots, and flowers. Each part of the

plant provides a different color. Even though they are collected from the same plant, they sometimes give different colors. The differences in time, month, and season of harvest may give different colors depending on the soil minerals and the climate of the location. In the past, the production of natural dyes from plants required expertise and observation. For example, if you want to know what kind of flower gives color, you can notice it by crushing the flower petal and if there is the color on your finger, it means that the flower can be used in dyeing. In the past, only a few plants were used as natural dyes such as indigo, ebony, shellac, etc. The dyes used by the villagers come from trial and error. By using various plants for color extraction, it was found that some plants can give color, while others don't, but can be used as an important ingredient in combination with other plants in order to provide beautiful color in the dyeing of silk threads

Nowadays there are many plants that can be used as dyes (Natthan Rungruangkitkrai. 2011; Panruthai Puttongsri. 2009). In addition to the plants used for dyeing, nowadays villagers in Northeastern Thailand have used mud to dye fabrics, especially silk. Mud can provide beautiful colors and is popular among both Thai and foreign tourists. Isan people have used the local wisdom in producing mud-dyed fabrics for at least 10 years. Hot dyeing is used in some villages which is to boil the fabric while cold dyeing is used in other villages using cold water in dyeing (Thiansak Mekphan Opas et al. 2000). However, there is no comparative study focusing on the rub fastness of dyed fabrics that can contribute to knowledge extension.

**RESEARCH OBJECTIVES**

This research aims to extend the knowledge on the production of mud-dyed silk of the communities in Northeastern Thailand.

## II. RESEARCH METHODOLOGY

This study is qualitative research focusing on participation processes based on local wisdom in the 5 communities of Kalasin and, Ubon Ratchathani. The data were collected from the related documents and field studies.

The Instruments: Survey, in-depth interview, structured interview, observation and focus group discussion, workshop, and dyeing experiment for the development of product identity. The data were analyzed in order to obtain concrete information. The purposive sampling method was used in this study, in which the communities in 2 Northeastern provinces, namely Kalasin and Ubon Ratchathani, were selected with the following criteria: (1) The community that locates in the red mud area in the foothills. This red soil is expected to be developed during the Jurassic ERA. (2) The community has a famous silk production group with the potential to develop and improve the fabric production process from its original wisdom. (3) The community that has continuous commercial production management. (4) The community that has knowledge and experience in bleaching and dyeing with natural dyes and mud dyeing for at least 5 years.

Based on the above criteria, 4 communities were selected which are: (1) Kut Wa Weaving Group, 63 Village No. 5, Ban Kok Kong, Kut Wa Sub-district, Kuchinarai District, Kalasin Province. (2) Ban Uparee Weaving Community Enterprise, 18 Village No. 3, Ban Uparee, Khai Nun Sub-district, Huai Phueng District, Kalasin Province. (3) Ban Phon Sawan Occupation Group and Cooperative, Village No. 6, Ban Phon Sawan, Kut Sim Khum Mai Sub-district, Huai Phueng District, Kalasin Province. (4) A group with knowledge and experience in dyeing where the dyeing experiment was performed: Ban Sompornrat, Nong Sano Subdistrict, Buntharik District, Ubon Ratchathani Province.

Data analysis: the study findings were presented by descriptive analysis and statistical analysis methods in order to explain the development process of mud-dyed silk in Northeastern Thailand. The analysis results were compared with the theoretical framework and related studies. The data were presented by descriptive analysis and statistical analysis methods with illustrations.

## III. RESEARCH RESULTS

1. Development of knowledge in mud-dyed silk production: according to the survey, it was found that most of the cotton threads used for weaving are cotton threads from factories and finished cotton threads. Natural dyeing is only performed to orders, in which it is very little or almost no order. If this is left without any further action, there is a chance that the local wisdom of the local dyeing may be lost. From visiting the area, it was found that Kalasin Province has red soil in the foothills and plateaus and was possibly the habitat of dinosaurs. This red soil can be used to make the product story more interesting and can develop and extend the knowledge of the production and design of mud-dyed silk in order to increase the commercial value of the communities in the Northeast.

For the wisdom of mud-dyeing, humans have been using dyes from natural materials such as plants, animals, and minerals since prehistoric times. Humans also know and are able to use natural colors in everyday life such as painting on objects and utensils, including using paint on the body, cave walls, cliffs, rocks to convey stories. In addition, natural colors are also used as body paint to stimulate excitement and power, and dyeing clothes with natural colors to cover the body and for the beauty. At present, the wisdom of mud-dyed fabric is constantly being developed in order to keep pace with the changing world. The process for developing knowledge of mud-dyed silk production is as follows:

Mud-dyeing of silk: the experiment was conducted at Ban Sompornrat, Nong Sano Sub-district, Buntharik District, Ubon Ratchathani Province. This is nowadays almost every household in Ban Sompornrat still does sericulture and is famous for its expertise in natural dyeing which can be used as a model for the development of knowledge in the production of mud-dyed silk in the Northeastern communities.

**Production process**

1. **Lye water**

Materials: 5 kg of mixed ash, 40 L of water

Equipment: plastic bucket, sticky rice steamer, basin, rope

Method: (1) Tie the rope at both handles of the sticky rice steamer and tie it to the upper beam. Put ash in the sticky rice steamer about ¾ of the steamer volume and then press the ash down with the hand. (2) Add water into the sticky rice steamer and let the water flow through ash into the basin below. (3) Collect lye water for further dyeing

**2. Bleaching**

Materials: 2 kg of Nang Noi silk threads, 2 bars of 60 g white Lux soap, 30 L of lye water

Equipment: Gas stove, aluminum basin, mesh bag, wooden rod

Method: (1) Soak the silk threads in lye water for at least 1 hour to 1 night to soften the threads, which makes bleaching easier. Remove the silk threads from lye water, wring it well and air-dry the silk threads for even color during bleaching. (2) Place the basin of lye water on the stove and boil. Grind and add soap into the lye water. (3) Put the silk threads in a mesh bag to prevent breaking during bleaching. (4) When the temperature of the lye water reaches 100 °C, prepared silk threads are bleached using a wooden stick to turn the threads over allowing the lye water to evenly penetrate through silk threads for about 30 minutes. (5) Remove the threads from the lye water, set them aside to cool and then rinse them with water. Washing it immediately can cause breaking of the threads. Twitch the bundle of silk threads to keep them aligned and dry in the shade.

**Figure 1 Nang Noi raw silk threads**

**Figure 2 Silk bleaching**

Muddy water preparation: Red mud in the foothills of Kalasin Province was collected using the folk wisdom. The process of muddy water preparation is as follows:

Materials: 5 kg of finely ground soil and 8 L of water

Equipment: Aluminum basin, plastic bucket, mesh cloth

Method: (1) Suspend the mud in the water. (2) Strain the mud suspended in water using a mesh cloth to remove unwanted plant debris.

**Figure 3 Strain to remove soil and sand debris.**

Natural dyeing: in this study, 2 methods of natural mud-dyeing were performed: hot dyeing and cold dyeing. The experiment consisted of 4 treatments: 1) cold dyeing, 1-time mud dyeing, 2) cold dyeing with 5-time mud dyeing, 3) cold dyeing with 10-time mud dyeing and 4) hot dye.

1. Cold dyeing with 1-time mud dyeing, to operate as follows (1) Put the bleached silk threads in muddy water. Crump the silk threads constantly so that the muddy water evenly seeps into the silk threads. This step takes about 20 minutes because the salinity in the muddy soil can cause the decay of silk threads. (2) Rinse the silk threads in water about 5 times. If the silk threads are not clean, it will cause tearing of the silk threads during weaving. Twitch the bundle of silk threads to keep them aligned and dry in the shade.

**Figure 4 Mud-dyed silk threads**

**Figure 5 Mud-dyed silk threads**

**Figure 6 Hanging the threads in high place**

2. Cold dyeing with 5 -time mud dyeing: (1) Put the bleached silk threads in muddy water. Crump the silk threads constantly so that the muddy water evenly seeps into the silk threads. This step takes about 20 minutes because the salinity in the muddy soil can cause the decay of silk threads. (2) Hang the silk thread

for air drying. This step takes about 30 minutes, then rinse with water once. (3) Repeat step 1 and 2 for 5 times. (4) Rinse the silk threads in water about 5 times. If the silk threads are not clean, it will cause tearing of the silk threads during weaving. Twitch the bundle of silk threads to keep them aligned and dry in the shade.

3. Cold dyeing with 10-time mud dyeing: (1) Put the bleached silk threads in muddy water. Crump the silk threads constantly so that the muddy water evenly seeps into the silk threads. This step takes about 20 minutes because the salinity in the muddy soil can cause the decay of silk threads. (2) Hang the silk thread for air drying. This step takes about 30 minutes, then rinse with water once. (3) Repeat step 1 and 2 for 10 times. (4) Rinse the silk threads in water about 5 times. If the silk threads are not clean, it will cause tearing of the silk threads during weaving. Twitch the bundle of silk threads to keep them aligned and dry in the shade.

**Figure 7 Sifting to collect fine soil particles**

4. Hot dyeing: (1) Warm the muddy water on the stove and soak the bleached silk threads in the muddy water for about 5 minutes. Constantly unfold the silk threads for even color, then hang the threads in the high place. (2) Increase the muddy water temperature to about 80 °C. Put the silk threads into the muddy water. For the first 5 minutes, constantly turn and flip the threads over so that the muddy water evenly seeps into the silk threads. Remove the silk threads from the boiling pot and place them along the basin so that hot water can flow through the silk evenly for 30 minutes. (3) Remove the threads from the lye water, set them aside to cool down, and rinse them with water. Washing it immediately can cause the breaking of the threads. Twitch the bundle of silk threads to keep them aligned and dry in the shade.

**Figure 8 Hot dyeing**

**Mud-dyed silk thread testing results**

Testing center: A laboratory of Faculty of Agriculture, Ubon Ratchatani University 5 tests were performed: (1) Color fastness: light fastness, color values, color intensity. (2) Rub fastness. (3) Wash fastness. (4) Crease recovery, and (5) Heavy metal contamination

| No. | Results | | | |
|---|---|---|---|---|
| | Test | Maximum Cold dyeing | Maximum Hot dyeing | Unit |
| 1 | Color fastness | | | |
| | 1.1 light fastness | 5-time mud dyeing 71.22 | 74.52* | Average |
| | 1.2 color values | 1-time mud dyeing 69.96 | 71.32* | |
| | 1.3 color intensity | 10 times mud dyeing 33.86 | 26.36 | |
| 2 | Rub fastness | All treatments ≥ 4 | ≥ 4 | Standard values 1-8 Acceptable values are 4-6 and above |
| 3. | Wash fastness | All treatments 4-5 | 4-5 | Standard values 1-5 Must be at least 4 |
| 4 | Crease recovery | 1-time mud dyeing 137.5* | 131 | Average |
| 5 | Heavy metal contamination | no heavy metal contamination at dangerous level. | no heavy metal contamination at dangerous level. | 1. Lead |
| | | | | 2. Iron |
| | | | | 3. Zinc |
| | | | | 4. Copper |

Mud-dyed silk threads were then woven and designed as scarf and shawl for women.



The soil was then processed into a fabric dye product and applied for a Petty Patent.

## IV. CONCLUSION

Currently, the products of Kalasin province are all made by hand. In the case where the machines are used, they are small machines that can work a little faster. From cultivating cotton trees and spinning cotton threads, these communities currently use the cotton threads from the factory which makes the work more convenient and faster. Nevertheless, the weaving process takes time, and most of the weavers are women.

Besides weaving, they have to take care of the whole family, they can weave only when they are free from these tasks. Another important thing is weaving in the Northeast is a second career, while their main career is rice farming. The problem is that the products are produced only for sale within the communities, so these products have not been developed into the products that would be preferred by the general public. Development of knowledge in mud-dyed silk production of communities in the Northeast.

For the development of knowledge in mud-dyed silk production of the communities in Northeastern Thailand, the mud-dyeing experiments were conducted using 2 methods, hot dyeing, and cold dyeing. The results revealed that hot dyeing and cold dyeing provided similar results with slight differences in the details. It was found that cold dyeing showed better results in terms of color intensity (average: 33.68) and crease recovery (average: 137.50), while hot dyeing showed better results in terms of lightfastness (average: 74.52) and color values (average: 71.32). It was also found that both dyeing methods were similar in terms of rub fastness and wash fastness. In addition, there was no heavy metal contamination at a dangerous level. Each type of mud resulted in different colors with unique beauty and can be used in designing women's wear and filing a patent application.

## V. DISCUSSION

From the study of mud dyeing silk with hot dyeing and cold dyeing, the results showed that hot dyeing resulted in optimum color intensity and rub fastness. The findings are particularly useful for the mud dyeing process of silk fabric, in which the related agencies, both public and private sectors, should apply these findings to the mud-dyed silk fabric production to help this business become more successful. This is in line with a study by Duangkamol Luemchan (2007) who found that the dyes used in the production of the products have an effect on the buying behavior of consumers who prefer products that use natural dyes. In addition, consumers can be confident in the product because it is patented and also free from toxins. This research can be considered as a discovery of new innovations that meet the needs of the country and benefit the economic development of the community, the private sector, and the nation.

In this study, we succeeded in developing the products from mud-dyed silk fabric which can be produced in practice. The results of this research have been agreed upon by all stakeholders, including community representatives, businessmen, designers, and government agencies. However, the products from this research are still the prototypes that must be developed and reproduced by the communities in order to add and create values, such as applying for intellectual property, getting a standard certification symbol from the government, marketing products through the Internet, etc. This is in line with the theory of cultural diffusion as clothing is one of the four requisites essential to human life, the diffusion of clothing culture from one society to another is considered normal. As a result of this behavior, social networks are emerged resulting in cultural exchange.

**RECOMMENDATIONS FOR UTILIZATION**

In this study, there are many interesting findings for the fabric business based on traditional folk wisdom. They are also useful to the academic circles, where these findings should be used as a basis for further development. The recommendations are as follows:

1. Entry into the ASEAN Economic Community of Thailand: Thailand's potential to compete with member countries is Thai culture. The wisdom of natural dyeing should be fully supported by the government in order to build a solid foundation for the communities for a sustainable move.

2. Trust should be created and standards should be established for environmentally friendly natural dyed cotton fabrics in order to increase the commercial value of communities in the Northeast.

3. Government agencies and educational institutions should educate the natural dye weaving groups on the patent application of the community products based on folk wisdom.

4. Local governments should promote and educate the communities on online sales of fabric and cloth products.

**RECOMMENDATIONS FOR FURTHER STUDIES**

1. There should be researches on fabric dyeing using soil from other sources with different colors such as red, white, black, blue, yellow.

2. There should be researches on the use of fabric dyes obtained from mountain rocks of different colors.

3. There should be researches on dyeing other types of fabric, such as hemp, cotton fabrics

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