Vol. 5 No. 2 page 7-10

RESEARCH & KNOWLEDGE

Research Article

Dye powder ability of broken bone tree bark on silk fibers with direct and mordant dye method.

Warunthip Chatjutamanee *

Department of Chemistry, Faculty of Engineering, Rajamangala University of Technology Isan, Khon kaen Campus, Khon Kaen 40000 Thailand

Abstract: This research aims to produce the natural dye powder from broken bone tree bark and study the adsorption of dye on silk fibers. Dye from broken bone tree bark was prepared by putting the part of these plants in boiling water for 60 minutes and filter the solution extract. The solvent was evaporated and solid dye was collected. The result yielded a light brown powder. An adsorption of dyes on silk fibers was studied by UV-Visible spectrophotometer. The absorption spectra of broken bone tree bark showed λ_{max} at 296 nm. The direct dye method suitable for broken bone tree bark was found that the conditions for silk fiber dyeing were dye concentration at 75 mg / L, 80 °C, 10 minutes, pH 6. The dye ability of broken bone tree bark of silk fibers showed the highest value about 3.93 mg /g silk. The mordant dye method suitable for broken bone tree bark demonstrated that the conditions for silk fiber dyeing were as follows dye concentration was 75 mg / L,80 °C,10 minutes by mordant from spinach ashes pH 9.9.The dye ability of broken bone tree bark on silk fibers showed the highest value about 8.54 mg / g silk.

Keywords: ability, natural dye powder, direct dye, mordant dye.

1. Introduction

Nowadays,the world is aware of environmental problems and toxicity from the use of synthetic dyes. More natural colors are local knowledge. The wisdom that comes from creating the way Art inherited from the past. The color used in dyeing is color. Derived from nature is a traditional knowledge inherited from ancestors. Natural color in raw material sources can be obtained from the leaves, stems, bark, head and roots of plants that give the colors as we want and can't find it easily included in the proceedings. People in society have turned their attention to preserve the environment and local wisdom. Interestingly, the more advantage is available in nature dyeing of fabrics or fibers with natural colors which is again popular because of the need of conserving, inheriting local wisdom, and aslo reducing the effect on the environment. Take into account the health of those who work, paying attention to the dangers of pesticide residues on textile products and reduction of foreign imports of synthetic colors have been actived for conservation of the environment and ecology. By using eco-friendly products or Green label products (Chairat et al., 2005) can increase a value of the products. Broken bone tree has Scientificname of *Oroxylum indicum(L.) Kurz.*(Family of BIGNONIACEAE, Genus of Oroxylum). Its common name is Broken bones tree , Damocles tree and Indian trumpet flower.The bark is used to extract dyes. Broken bones tree is classified as a popular medicinal plant that brings young shoots and soft flowers to be eaten together with chili paste. And food in various soups and spicy soup menus because the crispness is soft and slightly bitter Thus increasing the taste of food Help to remove excess food flavor. And provide medicinal value in relief. And treat various diseases well (Chatjutamanee et al., 2017).

Removing the color of the bark of the plant extract into natural color powder will make it easy for users. Moreover, it can easily well control the color intensity. At the same time, everyday is dyed in silk a dye called mordant. Additive or Mordant as a chemical or natural substances used in natural dyeing to help the fibers absorb color and adhesion to fibers even better. (Muhamad et al., 2016) Dye is added to make the dye quicker and more durable, which the folk wisdom will use alum stain assistant's tamarind paspe, acacia concinna, ashes and ashes from spinach leaves. Therefore, this study is to study the method of dye powder from broken bone tree bark, study the properties of the pigment and study on the amount of dye adherence on silk fibers and compare between dyeing with direct dye and mordant dye method.

2. Materials and Methods

2.1 Materials

2.1.1 The bark material was collected during October 2016 from a local area in Khon Kaen province, Thailand.

*corresponding author; e-mail: war1704@gmail.com

The bark of broken bones tree was collected.

2.1.2 The silk yarn used in this work was purchased from the villagers living in Chonnabot district, Khon Kaen, Thailand.

2.2 Methods

2.2.1 Preparation of silk yarn

The silk yarn used in this work was purchased from the villagers living in Chonnabot district Khon Kaen, Thailand. Wax and impurities have to be removed from the silk yarn. The 100 g of silk yarn was added to 2 L of boiling water with 0.3 M of sodium hydroxide. The mixture was then boiled for further 10 min. The silk yarn was removed, washed with hot water followed by cold water in order to avoid a breakdown of the emulsion and precipitation of the impurities on the silk yarn and rinsed with water until the water was neutral, then air dried at room temperature.

2.2.2 Preparation of dye powder

The bark of broken bones tree was cleaned with water and then air dried. The 500 g of sample was boiled at 100 ºC for 1 h in various ratios of plant bark with water 1:2. The aqueous solution was filtered and evaporated for dryness on a water bath to a volume of 50 mL, after that baked at 100 °C for 4 hours to obtain a dry crystal resulting in a powder with a strong.

2.2.3 Study the wavelength with maximum absorption of the dye solution. The concentration of dye solutions at 15, 30, 45, 60 and 75 mg/L was prepared from dye powder, broken bones tree barks. Evaluation of λ_{max} by using UV - Visible Spectrophotometer was carried out. Creation of a standard graph of the dye solution by plotting a relationship between the absorbance and the concentration was examined.

2.2.4 Study the adsorption of a dye solution based on silk yarn which uses a direct dye method.

2.2.4.1 Direct dyeing of silk yarns The experiments were performed by stirring silk yarns (0.5 g) with different dye concentrations of 45, 60 and 75 mg/L dye at 80º C for 10 minutes, shaking at 75 rpm for 5 minutes and then remove the silk. After staining, bring the dye solution to measure the absorbance and determine the concentration of the dye solution using UV-Visible Spectrophotometer. The amount of absorbent dye absorbed on the silk (q_t; mg/g silk) was calculated by the equation 1. [4]

$$q_t = (C_0 - C_t)\frac{V}{W} \qquad (1)$$

When C_0 and C_t are initial and variable contact time dye concentrations (mg/L) while V and W are volume of dye concentration (L) and weight of silk yarn (g). The dye concentrations were determined using a calibration curve.

2.2.4.2 There are four different types of mordants including tamarind pase, acacia concinna, ashes and spinach ashes. A mordant solution was prepared by weighing tamarind 100 grams dissolved and filtered. Mixed with a dye solution silk dyeing as well as direct silk dyeing. The amount of dye attachment on the silk was calculated by the equation 1.

2.2.5 Comparison the amount of dye that attaches the silk fiber during with mordant dye four type

2.2.6 The ability to absorb the dye solution of silk fibers at various concentrations directly dyed and dyed with Mordant Calculated from equation 2 [6]

$$\% \text{ Adsorptivity} = \frac{(C_o - C_t)}{C_o} \times 100 \qquad (2)$$

3. Results and Discussions

3.1 Natural dyes power

Natural bark dyes made from broken bone tree is light brown powder as shown in Figure 1

Figure 1 Dye powder from broken bone tree barks.

3.2. Wavelength study with maximum Absorbance of dye solution.

An absorption of dyes on silk fibers was studied by UV-Visible Spectrophotometer. The absorption spectra of broken bone tree bark showed λ_{max} at 296 nm as shown in Fig. 2.

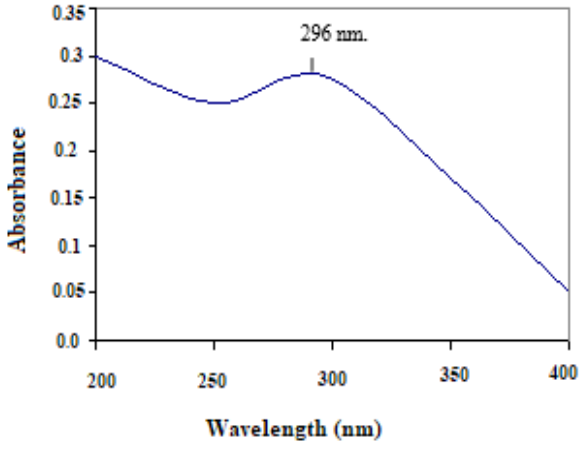

Figure 2 λ_{max} of dyes from broken bone tree bark

3.3 The results of the study on the amount of dye attached to the silk yarn from the dye solution with a direct dye method were shown in table 1. The dye ability from broken bone tree barks of silk fibers exhibited the highest value about 3.93 mg / g silk. At a concentration of 75 mg/L, pH 6. as shown in Figure 3

Figure 3 Dye attached to the silk yarn from the dye solution with a direct dye method.

Table 1 The attachment of natural dyes on silk fibers with direct dye method.

Dye powder	broken bone tree bark		
C_o (mg/L)	45	60	75
pH	6.2	6.1	6.0
V (L)	0.10	0.10	0.10
W (g silk)	0.51	0.51	0.50
C_t (mg/L)	40.87	53.29	55.32
C_o-C_t (mg/L)	4.13	6.71	19.68
$q_t = \frac{(C_0 - C_t)v}{w}$ (mg/g silk)	0.818	1.335	3.93

3.4 The results of the study on the amount of dye attached to the silk yarn from the dye solution with a mordant dye method. Mordant showed the highest value of dye adherence on silk yarn from broken bone tree barks was spinach ashes as 8.54 mg /g silk. For spinach ashes which are alkaline, pH 9.9. Comparison of the amount of dye on silk yarn during four mordant as shown in table 2 and Figure 4

Table 2 Comparison the amount of dye that attaches the silk fiber during four different types of mordants.

Dye power		broken bone tree bark		
Concentration of dye (mg/L)			45	60	75
Mordant dye	tamarind pase	pH	3.1	3.0	3.0
		q_t (mg/gsilk)	3.78	5.05	7.12
	acacia concinna	pH	3.1	3.1	3.1
		q_t (mg/gsilk)	3.08	4.50	5.90
	Ashes	pH	8.0	8.0	8.1
		q_t (mg/gsilk)	5.06	6.66	8.26
	Spinach Ashes	pH	9.8	9.8	9.9
		q_t (mg/gsilk)	5.30	7.03	8.54

Mordant dye		
	tamarind pase	
	acacia concinna	
	Ashes	
	Spinach Ashes	

Figure 4 Dye attached to the silk yarn from the dye solution with a mordant dye method.

3.5 The results of Percent Adsorptivity between dyeing with direct dye and mordant dye method were shown in Fig. 5

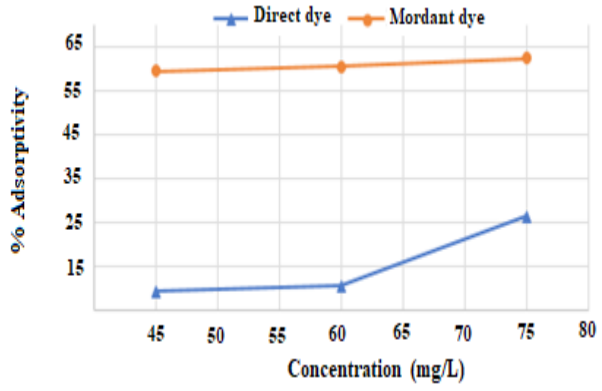

Figure 5 Percent Adsorptivity between dyeing with direct dye and mordant dye method of natural dye powder from broken bone tree barks.

4. Conclusions

Natural dye powder from broken bones tree barks can be done by rinsing the bark thoroughly and adding water at a ratio of bark to water of 1: 2, boiling at 100 °C for 1 hour. Evaporate until stiff and then bake at a temperature of 100°C for 4 hours to get the crystals and then grind to a fine powdered light brown from broken bones tree barks. The direct dyeing method showed that broken bones tree barks had the best amount of dye ability on silk yarn 3.93 mg /g silk pH 6. Mordant's dye method found that the dye helped the dye from broken bones tree barks attached to the silk fibers are good spinach ashes the best amount of dye ability on silk yarn 8.54 mg / g silk pH 9.9. The appropriate are acidic conditions. Ability to dye broken bones tree barks on silk fibers by direct dyeing. And how to dye mordant are different ways at type mordant. Dyed in silk a dye called mordant. Dye is added to make the dye quicker and more Percent Adsorptivity when compared between dyeing with direct dye and mordant dye method.

5. Acknowledgments (if applicable)

This work was acknowledged to Faculty of Engineering, Rajamangala University of Technology Isan, Khon Kaen campus for financial support. Institute of Research and Development, Rajamangala University of Technology Isan was also acknowledged for partially financial support.

6. References

Chairat M, Rattanaphani S, Bremner J.B. &RattanaphanV. (2005).Adsorption and kinetic study of lac dyeing on silk. Dyes and pigments.231-241. 63

Chatjutamanee, w. (2017). Dye ability of the bark on silk fibers with direct dye and mordant dye method. Paper presented in The9th International Conferenceon Sciences, Technology and Innovation for Sustainable Well - Being (STISWB 2017), Kunming University of Sciences and Technology, China, 26-28 June 2017.

Muhamad, N. Paothong, S. Tansom, U. and Soontornnon, P. (2016). Adsorptive Removal of Textile Dye by Spent Tea Leaves, Research report, Science Technology and Agriculture, Yala Rajabhat University.

Sakulborisut, K.Kraisuwan, S and Piromthamsiri,K.(2016). The effect of mordants on the color fastness of natural brown colored cotton fabric, Science and Technology Branch. Srinakharinwirot University Journal, vol.15(8), January - June 2016, pp.1–11.

The Botanical Garden Organization, BGO Plant Databases, http://www.qsbg.org, Searched on 24/04/2019