Splendor of "Songket" in Freeze-Dried Mangosteen (Garcinia Mangostana L.) Dye

Basitah Taif*[1], Rahmah Bujang*[2]

*[1]Universiti Teknologi MARA, Malaysia, *[2]Universiti Malaya, Malaysia

0439

The Asian Conference on Arts & Humanities 2013

Official Conference Proceedings 2013

Abstract

In the past, dyeing *Songket* with natural dye was the traditional technique used among the Malay dyers in Peninsular Malaysia to express its brilliant colour, natural beauty and aesthetic value of the textile. The integral processes involved had contributed to the uniqueness of this traditional textile in the Malay culture. However, the activity slowly began to diminish due to its tedious process and the introduction of synthetic dyes into the country. This research was conducted to determine the suitability of simultaneous mordanting and dyeing silk yarns with mangosteen rind's extract obtained through the freeze-drying method. As a result, *songket* textile characteristically harmonious within the contemporary context of the Malay culture was successfully produced.

Key words: Natural dye, traditional textile, mangosteen, colour

1. INTRODUCTION

Prior to the introduction of synthetic dyes in 1926, dyeing textile yarns with natural dyes played an important role among the Malay dyers in Peninsular Malaysia (Barkeshli et al. 2003). The process starts with the gathering and selecting of raw materials which are then dried under the hot sun for many days before they are being processed further. Depending on the type of raw materials, some are processed immediately after collection so as to stabilize their dye content (Vankar n.d.). Parts of the raw materials (roots, barks, leaves, flower, fruits, seed or wood) are later sliced thinly, chopped, pounded, soaked and squeezed into smaller particles before they are boiled. This boiling process will result in the production of natural dyes for the *songket* textile.

Kain songket or *songket* as defined by Siti Zainon Ismail (1999) is a unique Malay textile that has originated from the process of *sungkit* or the art of embroidering gold thread. The gold thread as a weft is wound around a weaving needle and transverses alternately between the warp threads which are in an upright position. This thread acted only as the embroidery elements to enhance the base fabric which was coloured in natural dye. The beauty of the colour became the preference among the royals and aristocrats of the Malay sultanate in the past as it embodied strong natural aesthetics related to their status, dignity and pride (Siti Zainon Ismail 1999).

However, natural dyes today have lost their popularity mainly due to the complex, tedious and slow process of producing them. The traditional making of natural dyes that has to undergo the painstaking process of collecting raw materials (mainly from parts of plants) and then processing them to produce dyes is no longer in practiced by the local craftsmen. Their decision is influenced by the availability of synthetic dyes which can easily be bought at the local markets at any time.

The purpose of this study was to determine the suitability of mangosteen rind's extract invented through the freeze-drying method for simultaneous mordanting and dyeing *songket* yarns (silk). The fruit contained a high level of major and minor anthocyanin pigments which are Cyanidin-3-sophoroside and cyanidin-3-glucoside which responsible for colouring the rind red (Du and Francis 1977).

2. FREEZE-DRIED MANGOSTEEN EXTRACTS

The sole source for developing natural dye discovered from this research is anthocyanin, which is the name for the extract obtained from fresh mangosteen rind. The extract is proven to be a suitable choice for textile application since it contains abundant amounts of natural colourants. Selected mangosteens from and *Index Color 5* (Figure 1) are considered the most suitable to be adopted for the research (Ahmad Tarmizi Sapii and Pauziah Muda 2005).

Figure 1: Mangosteen *Index Color 5*.

After transforming and freezing of the aqueous solution of *Index Color 5* extract, the frozen extract samples were transformed into dyeing powder using the freeze-drying methodology. Freeze-drying, according to Mellor (1978) is a method to preserve biological materials without causing any injury to the subject by freezing the contained water and then removing the ice via the process of *sublimation* (transition of a substance from the solid phase to the gas phase without undergoing intermediate liquification) and continue in another stage of *desorption* process (the removal of excess moisture or bound water). Rey (1975) has described freeze-drying as the final goal to find ways and means of keeping the materials in their solid structure, where no interstitial or concentrated fluid shall remain. They would then remain solid during the whole process and drying can therefore be carried out from the solid state.

Karel (1975) and Mellor (1978) describe two successive procedures as part of the methodologies applied:

> a) Primary Drying: The ice crystals formed under the freezing state are sublimed by vigorous and then gentle heating under a vacuum.
>
> b.) Secondary Drying: With the disappearance of the ice, the residual moisture is desorbed at a temperature higher than the primary drying, under low vacuum pressure.

The operating conditions such as pressure, temperature and time for each step are carefully observed. At the primary drying phase, the pressure is lowered and temperature supplied is sufficient to remove the water from its solid state (ice) to a gaseous state (water vapour). Karel (1975) explains that under this initial drying phase, this operation can only achieved success when the vapour pressure and temperature of the surface of the ice at which the sublimation takes place are below those at the triple point (4.5 Torr and a temperature of approximately 32ºF or 0ºC). The primary drying process was slow so as to ensure that the material's structure was not altered because of overheating.

The Secondary Drying phase is a process where the temperature was higher than the primary drying temperature in order to break any physico-chemical interaction that

may develop between the water molecules and the frozen samples (Rothmayr 1975). Meanwhile, the pressure applied at this stage was lowered to encourage the *desorption* process. Mellor (1978) stated that this phase requires less time for the extract samples to completely dry and be ready for use (Figure 2).

Figure 2: Mangosteen rind extracts from *Index Color 5*.

3. MATERIAL AND METHOD

Three skeins of raw silk yarns at 100 gm each were utilized in this procedure. They were later immersed into 4500 ml of very hot (90 ºC – 95 ºC) soft water (distilled water pH 6) with a ratio of material to liquor of 1: 15 together with 60 gm olien soap flakes. The yarns were left to boil for 1½ hours to remove the sericin gum and other impurities (Cardon, 2007). The mixture was stirred from time to time to ensure that the soap was fully dissolved. At the same time, in a separate container, a mixture of 18 gm soda ash (weak soda) and soft water was prepared to rinse the skeins after the boiling process was completed.

Once the skeins were removed from the boiling water, they were taken to be rinsed and this procedure was carried out in two stages. First, they were rinsed in a mixture of soda ash and soft water which was then followed by only soft water. The process was repeated until the rinsed water remained neutral. Then, the excess moisture was gently squeezed out and the skeins were dried in an open area. Once the skeins were completely dried they were used in the next procedure where simultaneous mordanting and dyeing took place to fix the colour onto the yarns (Table 1).

Table 1:

The Formulation for Simultaneous Mordanting and Dyeing of the Silk Yarns

No.	Preparation	Condition
1.	Alum (Salt Mordant)	30% of the weight of the sample fabric.
2.	Material-to-liquor	1:10
3.	Temperature	Room temperature
4.	Weight of silk yarns (100 gm of each skein)	300 gm

After dyeing, the yarns were washed lightly in water to remove any unfixed dye and then were air dried. All the processes took place at room-temperature. The dyed yarns were later setting-up on the loom for the process of weaving and embellishing the surface of the textile, using the *songket* technique.

4. RESULTS

Visual evaluation from the colours and shades established, showed that the colours from the freeze-dried mangosteen rind *Index Colour 5* was sensitive to light. Variable such as light had caused the dye to fading significantly. The pink shades (Figure 3) established on the dry yarns after they were washed to remove unfixed dye had changed significantly upon constant exposure to light during weaving and embellishing process. The condition has affected the colour properties of the textile piece.

Figure 3: The pink shades of the dry yarns.

Nevertheless, the appearance of the soft and subdued colours had contributed to the "*natural*" beauty of the overall finished textile product (see Figure 4). The original colours and shades that were based on local traditional methods, potentially inspires

modern designers and perhaps allows some insights into the social structure, rituals and values of many others in various cultures. The experience of using the mangosteen dye extract in the making of a piece of textile creation in the *songket* technique significantly brought about the suitability of natural resources into a new dimension of dyeing process.

Figure 3: The overall finished *songket* product.

5. CONCLUSIONS

The dye extracts obtained from the freeze-dried mangosteen rinds have their intrinsic beauty of colours which contribute to the success of the finished textile product. The dried fine particles of the material with brilliant colour properties and fastness facilitated a unique and desirable effect on the dyed silk yarn. In spite of this, the process has shortened the time spent using traditional methods which require several time consuming stages of manually chopping, pounding and drying the materials prior to boiling them in an aqueous solution. The creative thought in utilizing the natural dyes, using the *songket* technique, will bring about a new form of textile creation that is characteristically harmonious with the contemporary context of the traditional Malay textile.

ACKNOWLEDGMENT

This work is supported by research funding from the Post Graduate Research Fund (UPDiT), Institute of Research Management and Consultancy, University of Malaya and MARA University of Technology. It was under the main project "*Fascination of Colors: Natural Dyes as an Experimental Approach*".

REFERENCES

Ahmad Tarmizi Sapii. and Fauziah Muda. 2005. Manggis. *Panduan Kematangan dan Penuaian Buah-buahan*. Serdang, Selangor: MARDI.

Barkeshli, M., Adeline Abdul Ghani., Shan, N. K. S., Meng, K. Y and Ahmad Rizal Shahari. 2003. Textile weaving techniques. *Culture Treasures: Textile of the Malay World*. New Delhi: National Museum.

Cardon, D. 2007. *Natural Dyes: Sources, Tradition, Technology and Science*. London: Archetype Publications Ltd.

Du, C. T. and Francis, F. J. 1977. Anthocyanins of mangosteen, Garcinia mangostana. *Journal of Food Science*, 42(6), pp.1667-1668.

Karel, M. 1975. Heat and mass transfer in freeze-drying. *IN* S. A, Goldblith, L. Rey and W. W. Rothmayr (eds.) *Freeze Drying and Advanced Food Technology*. London, New York, San Francisco: Academic Press, pp.51-60.

Mellor, J. D. 1978. *Fundamental of Freeze-drying*. London, New York, San Francisco: Academic Press.

Rey, L. 1975. Some basic facts about freeze drying. *IN* S. A, Goldblith, L. Rey and W. W. Rothmayr (eds.) *Freeze Drying and Advanced Food Technology*. London, New York, San Francisco: Academic Press, pp.xiii-xxxi.

Rothmayr, W. W. 1975. Basic knowledge of freeze drying. *IN* S. A, Goldblith, L. Rey and W. W. Rothmayr (eds.) *Freeze Drying and Advanced Food Technology*. London, New York, San Francisco: Academic Press, pp.51-60.

Siti Zainon Ismail. 1999. Songket kemilau benang emas. *IN* Mas Zeti Atan (ed.), *Songket: Satu Warisan Malaysia*. Kuala Lumpur: Petronas.

Vankar, P. S. no date. *Handbook on Natural Dyes for Industrial Applications*. New Delhi: National Institute of Industrial Research.

iafor

iafor