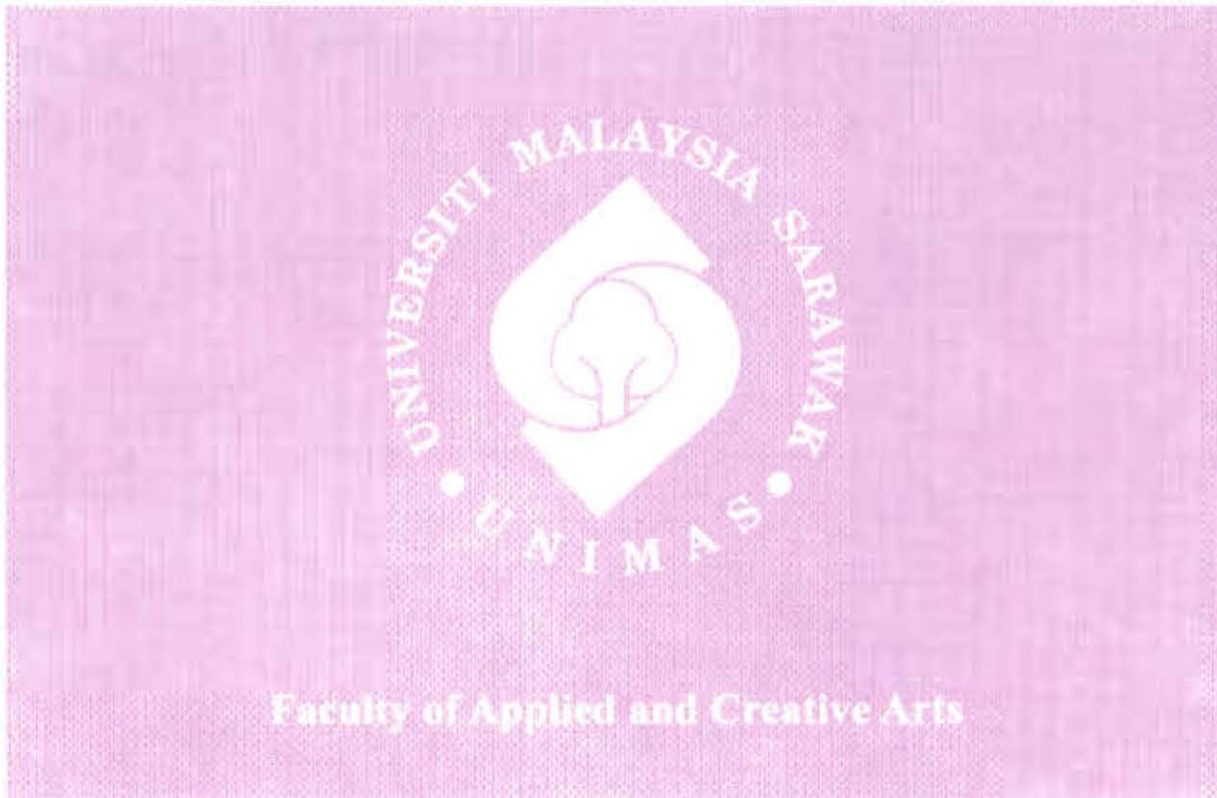

EXPERIMENT DYEING USING NATURAL INDIGO ON COTTON AND SILK FABRICS

Mok Chin Yaw

Bachelor of Applied Arts with Honors
(Design Technology)
2017

EXPERIMENT DYEING USING NATURAL INDIGO ON COTTON AND SILK FABRICS

MOK CHIN YAW

This project is submitted in partial fulfillment of the requirements for the degree of

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Final Year Project Report	√
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PENGESAHAN

Projek bertajuk **Experimentasi Menggunakan Fuktos Semulajadi Daripada Buah-buahan Tempatan Dan Indigo** telah disediakan oleh **Mok Chin Yaw** dan telah diserahkan kepada Fakulti Seni Gunaan dan Kreatif sebagai memenuhi syarat untuk Ijazah Sarjana Muda Seni Gunaan dengan Kepujian (**Teknologi Seni reka).**

Diterima untuk diperiksa oleh:

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PENGAKUAN

Saya mengaku bahawa tiada bahagian daripada penyelidikan dalam disertai ini telah digunakan sebagai bahan sokongan untuk sesuatu ijazah atau kelulusan sama ada kepada universiti ini atau institusi pengajian tinggi lain.

(Mok Chin Yaw)

No.matrik : 49812

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ABSTRAK

Dalam kajian ini, indigo semulajadi, limau dan buah-buahan tempatan telah dieksperimentasikan ke atas kain sutera dan kapas. Pengkaji menghasilkan satu koleksi kain dengan menggabungkan teknik celupan menggunakan indigo dan pelbagai teknik resis untuk menghasilkan seni reka tekstil yang berasaskan tema Orang Ulu.

Kata kunci: semulajadi, indigo, buah-buahan tempatan, orang ulu

ABSTRACT

In this research, the natural indigo, lime and local fruits are experimented together on natural fiber fabrics such as cotton and silk. The researcher created a range of fabrics by combining indigo dyeing and various resists techniques to create textile designs based on the Orang Ulu motif.

Keywords: natural, indigo, local fruit, orang ulu

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CHAPTER 1

INTRODUCTION

1.0 Introduction

According to Saxena and Raja (2014), natural dyes are obtained from the natural materials such as plant leaves, roots, bark, bug discharges and minerals. These natural colouring are accessible to humankind for the shading of materials until the revelation of the principal engineered synthetic dye in 1856. According to Roberts (2016), said that indigo has been use for a long time ago from the third millennium BC for the use of indigo from woad or Indigofera. Natural dye is come from plants animals and minerals, natural indigo dye is come from the plants and it obtained from the leaves which give the blue colour. According to Antonucci (2016), indigo plant can help to recover degraded lands, they have promoting to plan for plant indigo plant because it can improve the livelihoods of rural communities in the region. In this research, the researcher experiment using different types of fabrics, which are included silk, rayon, chiffon, and cotton with different type of indigo, oxidizing agent and natural fructose. Researcher will experiment using the organic indigo vat dye with local fruits and lime. This research also explore using different quantity of natural indigo dye observe the shades of indigo produced from the experiments and also test the colour fastness of the samples of experiments to achieve the true blue indigo shade.

1.2 Objective of the study

The objectives of the research are to:

i. To explore the natural indigo dye powder form and leaves.

ii. To experiment using natural indigo, lime and local fruits on natural fiber fabrics.

iii. To produce a collection of indigo dyed fabrics suitable for apparel.

1.3 Research Questions

i. What are the suitable local fruit that can be used to dye with indigo and lime?

ii. What are the type of fabrics that can be used in indigo dyeing?

iii. What is the recipe for dyeing using natural indigo?

1.4 Significance of Study

Experiment will be one of the important part in this research. The researcher used natural indigo, lime and local fruits to experiment the shade on natural fabrics. Besides that, also experiment what are the types of fabrics can be used in indigo dyeing. In this researcher, the researcher are going to produce a collection of indigo dye product. The researcher used

natural indigo dye because it safer, cleaner and is an ecological choice compared with synthetic dye. According to Emma (2015), said that natural indigo dye do not pollute the earth, and also provide work for unemployment in rural areas.

1.5 Problem Statement

Basically this research is to substitute chemicals into natural ingredients, natural indigo, lime and local fruits. So that, the researcher will create the organic natural indigo dye vat.

1.6 Scope of Study

This research will be carried out the natural indigo dye at workshop located at Faculty of Applied and Creative Arts, University Malaysia Sarawak (UNIMAS). The researcher will be carried out the experiment using the natural indigo dye, lime and local fruits on cotton and silk fabrics.

1.7 Limitation

The researcher focus on natural indigo dye on cotton and silk fabrics. The researcher also created an organic vat with the natural ingredients, which are indigo powder, lime and local fruits.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter the researcher will discusses the relevant literature related to the natural indigo dye. Natural indigo dye is one of the important and unique natural dye that can create shade of blue color. Indigo dye can be obtained from the indigo plant called Indigofera. The indigo dye can produce a really beautiful and eye-catching blue color on the fabric. According to the Sandberg (1989), the word "blue" in the traditional Indian known as "Nil". Subsequently, the name "Nil" has took over changed to "*Anil*" by Arabs and Egyptians. Natural indigo has been used since ancient times before the Christian era started. Until today many of the textile designers are still using it. Natural indigo is not only oldest dyestuff, it is also one of the most important dye stuff in textiles. Indigo dyeing process known as a substantive dye or fermentation bath dyeing. This is because indigo dye needs to go through a fermentation process when using indigo leaves to dye and it needs to be oxidized to produce the blue colour. Indigo is also called vat dye. According to Albert et al. (2001), explained that vat dye is implies the indigo colour has to change to its water solvent leuco-frame before colouring. The lessened frame is ingested into the filaments, and oxidized back to the blue form and stays with fibre.

2.1 Dyes

Fabrics dyes are being used for colouring fabrics. In generally, dye are molecules or elements which absorb into the fabrics and reflect light at specific wavelengths to give human sight the sense of colour. There are two type of dyes which is synthetic and natural dyes. Natural dyes are extracted from natural substances. Which included plants, animals and minerals. As for synthetic dyes, they are made in a lab and chemicals are synthesized to make synthetic dyes.

2.2 History of Natural Dyes

Natural dyes are very old dye in textile and has been used since ancient times. According to the article by Driessen (n. d.), the usage of natural dyes was found in China dated 2600 BC by the earliest written records and the chemical tests of the red fabric found in burial place of King Tutankhamen in Egypt showed the occurrence of alizarin, a colour extracted from madder. Madder has been used for thousands years is to make the most light-fast of natural dyes, also known as Rubia tinctoria. Madder is one of the red dye made from the roots, indigo obtained from the leaves of Indigofera tinctoria, yellowish obtained from the Stigmas of the Saffron plant and dogwood tree.

Protein fibres are also known as natural fibres and they are the easiest fibres to dye using natural dyes. Natural dye are obtained from the plant source. John, Cannon and Quenet (1994) write that, common colours come from blossoming plants and they are renewrable. Dyestuffs can be obtained during most times of the years: youthful leaves and blossoms in spring, develop leaves and blooms in summer, natural products in fall and bark and roots in winter.

According to NicDhuinnshieibhe (2000), natural dyes can be divided into two categories which are substantive and adjective. As the colours of natural dyes are obtained from natural sources, they are one of the most eco-friendly dyes in textiles. Besides that, natural dyes have no disposal problem because they are biodegradable and obtained from the alternative source. It also has pharmacological effects and health benefits. Due to these reason, natural dyes is one of the best choice of dyes used in textile industry. Hence, until today natural dyes are still being used. Samanta and Agarwal (2009) write that, natural dyes are non-allergic, non-toxic and eco-friendly on textile as hazardous synthetic dyes are not used. According to Rossi et. at. (n.d.) said the generally natural dyes in dyeing textiles have three types which are substantive dyes, the dyeing process without adding any mordant and it can be bond directly to fibres. Adjective dyes are requires for mordant as fixation and vat dyes are insoluble in water before use. The wash fastness in textile dyeing is very important, the fastness will affected the quality of the fabric in textiles. According to the journal written by Taylor (1986), the wash fastness is reliant of the methods that use for dyeing and application.

2.2.1 Substantive and Adjective Dyes

Natural dyes can be classified into two categories which are substantive and adjective dyes. Adjective dyes require a mordant to help to fix the colour to the fibers. Substantive dyes do not require a mordant to fix the colour on fiber, such as indigo or certain lichens. According to Centenp (2010), during the dyeing process, substantive dyes are bond directly to textile fibers without any mordant.

2.2.2 Indigo Dye

Indigo dye is a natural dye which obtained from indigo plant. The colour of indigo dye is blue. Indigo dyeing is classified in vat dyeing. John, Cannon and Quenet (1994) mentioned that the most critical colour substance in the leaves is a dreary compound of *indoxyl* called *indican*, and it is removed with heated water..Oxygen from the air and changes over this to *indigotin* which is blue and insoluble. According to Saxena and Raja (2014), indigo is an important dye that produces natural blue dye from the leaves of the plant called Indigofera tinctoria. This plant is one of the best plant that can provide best source of blue colour. Indigo dye has been used since traditional times until now, people are still using it to produce blue colour for the most popular fashion wear, which is denim fabric.

2.2.3 Indigo Plant (Pea family- Leguminosea)

Indigofera tinctoria (grown in India), is also known as true indigo, which is one of the indigo plant that produce the original sources of indigo dye. The dyes are obtained from the plant leaves. According to Paul (1998), Indigofera is the third largest in the Pea family -Leguminosae, there are almost 800 species. In Africa, more than 600 can be found, approximetely 200 in Asia, in America have about 80. Indigofera can grow up to two meters high. The main use of Indigoferas in African Sumatrana Gaertn is for dyeing. *Indigofera suffruticosa* is one of the useful tropical plant, also known as Anil indigo. According to Standly and Steyermark (1946-1976), *Indigofera Suffruticasa* is a meagrely spread, solidly erect, enduring plant and is approximately 45-20cm tall. John, Cannon and Quenet

(1994) said that, *Indigofera suffruticasa* is a local of tropical America brought into Asia and tropical West Africa. *Indigofera arrecta* is an indigo plant that look woody, erect and large shrub to 3m tall. *Indigofera argentea* is one of the indigofera species that look hairy and has red-orange flower. John, Cannon and Quenet (1994) also stated that, *Indigofera argentea* is a local of Egypt and Ethiopia and developed all through.North Africa.

2.2.4 Vat Dyes

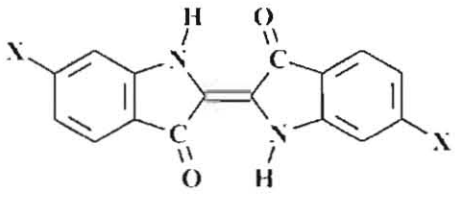
The process of vat dye is dyeing in a bucket or vat. In vatting process, the dye are insoluble in water before use. Natural indigo vat dye are used to colour natural or cellulosic fibers. Aspland (n. d.) write, indigo was initially recouped from the water solvent glucoside of indoxyl (indican) show in the plants, which are Indiofera and Zsati tinctoria, and after that the insoluble blue item was disintegrated in wooden vats by a characteristic maturation prepare known as vatting. When during the process of indigo vat dyes, sodium hydroxide is required to use as a reduce agents it help to remove the oxygen from dye vat. Sodium hydroxide is needed to reduce agents in indigo vat, when the oxygen has been removed, the indigo is to be dissolve in water at room temperature. Not only that, calcium hydroxide is also needed in an indigo vat. Calcium hydroxide is also known as lime, which is a common base to use for making indigo vat. The function of calcium hydroxide is used to reduce oxygen in indigo vat and to help to make the indigo vat more alkaline. Miawa (2013) have mentioned that tbe prescribed base for an indigo vat is conventional lime (calcium hydroxide) which also be called "calx" or hydrated lime.

2.3 Past Research

According to Dean (2012), he has tried using the organic vat which using indigo, slaked lime known as calcium hydroxide and fructose. The ingredients are 1 part indigo, 2 part slaked lime and 3 parts fructose which are 10gm indigo, 20gm calcium, 30gm fructose. For 20gm indigo, it will need 40gm calcium hydroxide and 60gm for fructose as shown in figure 2.1. Dean also recommended using cotton and silk fabrics only. Its discovered approach for indigo dyeing is simple and effective.

Figure 2.1 Wool Sakein Dyed

From the information given by Cordy and Yeh (1984), colourants from that of natural sources can be composed by their concoction structure, in particular indigoid (figure 2.2) , which happen as colour less precursors and will changed from into purple to blue dyes through a maturation and oxidation process.



(X = H, Br)

Figure 2.2 Representative molecular structure of natural dyes, indigoid

From the organic sugar vat experiment carried out by Garcia (2013), he had explained the way of using indigo (Table 2.1) and the ingredients for organic vat dye which is 1 part powdered natural indigo, 2 parts calcium hydroxide and about 3 parts fructose crystals for 2 quart Mason jar.

Table 2.1 Recipe for indigo dyeing

Indigo Powder (grams)	Fiber (kg)	Reaction
25 grams	1kg (2.2lbs)	Medium shade of blue
50 grams	1kg (2.2lbs)	Medium dark blue shade of blue
100 grams	1kg (2.2lbs)	Dark blue

2.4 Conclusion

Brief information about natural indigo dye, their ingredients and various advantages of using them was discussed in this chapter. Through the research founded that indigo is one of the important dye stuff in textile because it can produce the nice blue colour that smoothing to human eyes. Besides that, indigo dye is the one natural dye that without adding the mordant, it can be dye directly and bound with the fabrics. The recipe of natural Indigo dyes still need to be investigated, because natural dye are hard to reproduce the same shade. When during natural dye, the colour fastness is important too.