

UNIVERSITI TEKNOLOGI MARA

**AN EXAMINATION OF NATURAL
DYES OF MALAY TEXTILE
COLLECTION FROM THE
JABATAN MUZIUM MALAYSIA
(JMM)**

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ABSTRACT

This thesis aims to identify the natural dye's degree of fading on the *Malay* textile artefacts belonging to the Jabatan Muzium Malaysia (JMM) collection dated from the 19th century and by extending the application of multi-analytical techniques towards informed textile preservation in Malaysia. Studies have been conducted on *Malay* songket, which mainly emphasises the historical background, characteristics and influences, incorporating traditional techniques and modern technology through innovative approaches. There is insufficient documentation on traditional natural dye and a lack of knowledge on textile natural dye lightfastness behaviour and its characteristics. Textile preservation is an act of caring and improving the state of the textile to prolong its lifespan. Like most organic materials, dyed textiles are subject to rapid degradation due to their nature and preservation requires a depth understanding of the factors of degradation and conditions to conserve and slow the process of their destruction. Identifying the traditional natural red dyes from *Malay* songket artefact sources, material characteristics and their state of degradation is important when preserving the songket artefacts. Three particular approaches were used to identify the natural dye's songket artefact through phase 1: a preliminary study, phase 2: scientific analyses and phase 3: experimentation. The preliminary study was conducted through visual analysis of artefacts' characteristics and fading degradation of dye on 55 Songket and *Limar* Songket artefact samples. The songket artefacts are dyed silk fibres with metallic thread made from real gold or silver strips, tightly wrapped around a core yarn of cotton. The red appears in different shades and tones, ranging from bright red to dark red. The scientific analysis involves investigation using the Fourier Transform Infrared (FTIR), Scanning Electron Microscopy with Energy Dispersive X-Ray Analysis (SEM-EDX) and Ultra-high-performance liquid chromatographic-diode array (UHPLC-DAD). The instruments were selected to identify the natural dyes and characterise the 7 chosen artefact samples. The FTIR results revealed that the samples show similar characteristic peaks of protein structure and SEM-EDX indicates smooth and straight characteristics with three strong peaks of carbon, nitrogen and oxygen associated with elements in silk proteins. Other elements, such as calcium and aluminium, were detected with high weight percentages indicating a mordant component. Meanwhile, the CC37, CC40, CC46 and CC48 UHPLC-DAD chromatogram peaks at 13, 20.5 and 26 minutes show similar peaks to sappanwood and brasilin characteristics. However, the findings from multiple analyses revealed that the artefacts are prone to degradation, causing fibre breakage and fading. The FTIR silk degradation estimator of crystallinity bands arises and SEM's surface morphology revealed brittle and fragmented silk fibres. The experimentation phase has shown that the woven silk's red sepang dye for batches 1 and 2 are light-sensitive substances with a blue wool standard value of 3. Based on the colour change swatches for light fastness results, the batch 1 sample mordanted with 30% alum showed a slower fading rate than batch 2, which was mordanted with 20% and 4% calcium carbonate. Therefore, the results suggest that the JMM's songket artefacts dyed with sepang dye have retained their colour, probably because they have rarely been exhibited or exposed to light. Furthermore, the JMM's faded songket artefacts dyed with sepang dye suggest that the artefacts were exposed to light for more than 32 hours. Hence, the investigation of the *Malay* traditional natural dyes identification, the light colourfastness, fading parameters and the characterisation of cultural textile artefact degradation could help improve *Malay* textile preservation.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

Natural dye is a natural colourant or dyestuff based on natural sources. Throughout history, natural dyes have played a significant role and have been part of human development. The dyes were used to provide an identity and character to personal belongings and daily products. According to Vankar (2007), up until now, more than 500 natural dye sources are known and thousands of shades have been produced worldwide. In the *Malay* culture, natural colouring agents were widely used in their daily activities and products. The locals used natural sources to colour their everyday matters not only to beautify but also to give significant character and quality. In the past, *Malay* ancestors produced traditional dishes using natural sources that grew in abundance around their houses. Many *Malay* delicacies, especially desserts, use natural colouring extracted from natural sources such as *pandan* leaves, turmeric and Asian pigeonwings, also known as *bunga telang* (Basitah Taif, 2012; Salehan, 2009). These sources not only give colouring but also provide fragrance and flavouring to the food. The availability of these local sources allows the *Malays* to create flavourful, unique, delicious and authentic traditional recipes which are still passed down from one generation to another (Raji et al., 2017). Furthermore, these natural sources create beautiful colourful cuisine that provides health benefits to consumers. Turmeric, for instance, not only produces bright yellow colour but also acts as a health supplement (Subagiyo, 2008). Due to the excellent knowledge of natural colouring sources, the creativity of the *Malay* community in diversifying these local sources has spread to other applications. It is evident in their everyday belongings, such as baskets, textiles, furniture, household items and clothing.

In the past, the *Malays* were easily recognised through their appearance in clothing (Hassan et al., 2013). With such significance, colour became an indispensable element of official decrees in *Malay* society since the production of natural dyes in *Malay* culture. Traditionally, our local dyers and weavers explored natural dyestuff from their existing surroundings from local plants and minerals sources. Even though traders introduced some of the dyestuffs, this approach used by the local dyers was