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COLOUR PROPERTIES AND COLOURFASTNESS OF SILK FABRICS DYED WITH LICHEN DYES EXTRACTED USING MICROWAVE, ULTRASOUND AND ENZYME-ASSISTED EXTRACTION METHODS

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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 9th March 2016 to conduct the final examination of Nor Atiqah Binti Mohamed on her Master of Science thesis entitled "Colour Properties and Colourfastness of Silk Fabrics Dyed with Lichen Dyes Extracted using Microwave, Ultrasound and Enzyme-Assisted Extraction Methods" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The panel of Examiners was as follows:

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ABSTRACT

Although the presence of widely available and cheaper synthetic dyes almost substituted the use of natural dyes, the use of natural dyes for dyeing textile materials has now become a greater interest because they are more ecofriendly than synthetic dye. There is awareness amongst consumers and the textile industry for the need to re-invert natural dyes to impart colour to textiles. Lichens have been the source for natural dyes to colour textiles in many parts of the world. In Malaysia, studies on lichens have so far focused on their distribution, chemistry and biological activities and there is no exact reference on textile dyes. Extraction of colour component from source natural dye material is important step for dyeing any textile substrates to maximize the colour yield. In this study, to explore the colouring potential of local lichen species, silk fabric, which is a very good base for natural dyes, was dyed with lichen dyes produced using different extraction methods. In the first phase, several species of lichens were extracted using boiling water, boiling seawater, solvent and ammonia fermentation methods. The colours were further altered using six different mordants with meta-mordanting technique. In the second phase, two lichens species were selected (*P. praesorediosum* and *H. leucomelos*) for colour extraction using microwave (MAE), ultrasound (UAE), microwave-enzyme-assisted (MEAE) and ultrasound-enzyme-assisted (UEAE). The predominant dye colours were soft shade of brownish and yellowish tones but pink were also produced by the addition of vinegar to the ammonia extract. The effect of the different extraction methods were investigated for colour properties and colour fastness on the silk dyed fabrics. It was found that the colour values were influenced by the addition of mordants. The results also indicate that percent yield, dye uptake and colour strength with the MAE, UAE and enzyme-assisted extraction methods increased compared to BWM method. The dyed silk samples which were tested for colour fastness to washing, perspiration, rubbing and light, gave good to excellent ratings. It is expected that the methods used in the research could be employed for extracting colouring from other natural materials in a faster and effective manner. Lichen dyes and colours are visually pleasing and have potential to be introduced in the textile dyeing or printing industries particularly batik manufacturers and natural product lovers.

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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Colour is one of the most fascinating things in the world. It is one of the first features sensed by consumers and everyone has their own favorite colour. Unquestionably, synthetic dyes offered greater variety and stability of colour as compared to natural dyes. They are less expensive, simple application process, give excellent fastness with reproducible colour shades (Tiwari et al. 2010). But today, the trend indicates that the society are demanding for ecofriendly and non-toxic products with issues such as green technology, sustainability and recycling being common themes of the modern life (Yolmeh et al. 2015).

The demand is particularly due to the increased environmental awareness to avoid the hazardous effects from synthetic dyes (Kumar & Agarwal, 2009). Synthetics dyes are at times reported to produce skin allergies, toxic wastes and other harms to the human body (Kulkarni et al. 2011). Countries such as Germany, the Netherlands and India have taken the initiative to ban numerous synthetics dyes in their manufacturing and applications of consumer products (Teli, Sheikh, & Shastrakar, 2013). Natural dyes are emerging globally due to fact that they are safer and more environmentally friendly and thus the application of natural dyes should be considered as better alternative to synthetic dyes (Kiumarsi et al. 2009).

Natural dyes can be obtained from various sources such as plants, animals and minerals (Siva, 2007). The majority of natural dyes are plant sources such as from the roots, bark, leaves and flowers (Kasiri & Safapour, 2015). The shades produced by natural dyes are usually soft, lustrous and soothing as compared to synthetic dyes. In most countries, natural dyeing is practiced only for handicraft items while synthetic dyes are being used in all commercial dyeing processes (Ngo et al. 2013).

There are two processes concerned when dyeing with natural dye; the first is mordanting and the second is applying the dye. The mordanting prepares the fabric to receive the dyes and allow dye molecules to bind to fibre (Sahoo et al. 2014). However, not all plant dyes need mordants to achieve good colour. Some plant dyes already contain qualities that will bind the colour to the fiber without any additives.