

UNIVERSITI TEKNOLOGI MARA

**A STUDY ON EXTRACTION
METHODS AND ULTRASOUND
DYEING OF NATURAL DYES FROM
Dirinaria picta AND *Chrysothrix
xanthina* LICHENS**

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ABSTRACT

Natural dyes are particularly well known as biodegradable and less pollution contributor as compared to synthetic dyes. Research and production of natural dyes have gained interest due to the growing awareness to safeguard the environment and improve health care. In this study, lichens were selected as the natural dye source for their potential to produce colours on fabrics without any mordants since they are substantive dyes. *Dirinaria picta* and *Chrysothrix xanthina* lichens were collected and extracted using boiling water method (BWM), ammonia fermentation method (AFM) and solvent extraction method (SEM). The *Dirinaria picta* species produced darker and various colour shades as compared to *Chrysothrix xanthina*. On silk fabric, the shades from *Dirinaria picta* were dark brown, pale brown, beige, purplish and light yellow while *Chrysothrix xanthina* exhibited light yellow shade. In the case of cotton, most samples only showed some tinting indicating the absence of dye affinity except for *Dirinaria picta* extracted by AFM that gave light brown shade. The effect of different extractions and dyeing methods on silk and cotton dyed fabrics were investigated for colour properties and colour fastness to washing, perspiration, rubbing and light. Out of the three extraction methods, AFM produced higher colour strength (K/S) values. The overall colour fastness results for silk fabrics gave ratings from moderate to fairly good (3/4 to 4) and fairly good for cotton. The light fastness results were from 2 to 4 indicating poor to moderate rating.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

The textile industry has been condemned as one of the world's worst toxic pollution offenders in 2011 (Harris, 2011). This is because in textile dyeing manufacturing, synthetic dyes are extensively used to dye major products. The process of dyeing requires a great amount of two components which are chemicals and water. There are as many as 2000 different chemicals used in the textile production from dyes to transfer agents. These constituents' chemicals when evaporate in air caused carcinogenic and also trigger allergic reaction to some people when breathe or absorbed through skin. According to a June 5, 2005 article in Business Week, the population for chemicals allergic will increase to 60 percent by the year 2020 (Business Week, 2005 & Pinheiroa et al. 2004). Apart from that, water is a finite resource that is quickly becoming inadequate and being used at every single step of the process. The wastewater with its saturated synthetic dyes and many other chemicals additives when discharged into the water system afterward will contribute to environmental pollution.

As opposed to synthetic dyes, natural dyes are not dependent on non-renewable resources. Furthermore, natural dyes are considered as sustainable and eco-friendly dyes as they are directly derived from vegetations (extracted from root, leaf, bark, fruit and flower), animals (derived from shellfish and cochineal) and minerals (derived from soils, and clay) (Manhita et al. 2011 and Ali et al. 2009). Lichens and mushrooms have been used as sources of colorants in Europe and in some other parts of the world (Saxena & Raja, 2014). The first documented record on lichen dyes was during colonial America through ammonia fermentation method used in extraction to produce a red dye (Casselmann, 2001). Lichen is a very unique species which exists in a symbiotic relationship. All lichens are made up either of a fungal partner or an algal partner or a cyanobacterium partner, or both (Temina et al. 2010). Lichens are commonly seen on the older buildings, tree barks, stone walls and on the ground. Lichens contain acids that are dye precursors and also substantive dyes which do not require mordant to assist them adhere to the fibres (Casselmann, 2001).