

UNIVERSITI TEKNOLOGI MARA

**COLOUR PROPERTIES OF
TARGETES ERECTA DYED FABRICS
USING DIFFERENT EXTRACTION
AND DYEING TECHNIQUES**

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ABSTRACT

Malaysia has a remarkably broad range of plants, making it a veritable treasure trove of many natural goods. The dye is one such natural product. In this study, natural colourants from the marigold flower (*Tagetes erecta*), namely flavonoid and carotenoid, were extracted under various operating conditions. Through the course of the extraction process on orange petals of *Tagetes erecta*, dark and light yellow-brown dye extracts were produced. UV-Visible spectroscopy was used to perform chemical characterisation analysis on the dyes, demonstrating that the colour pigment was existing in aqueous (distilled water) and solvent (methanol) extracts, also yielding crude yields of 7.9% and 8.5%, respectively. Infrared and exhaustion dyeing with simultaneous mordanting using iron and lemon was carried out on 100% plain silk and cotton fabrics. Both dyeing processes were conducted for 60 minutes at 90°C. The dyed fabrics were then evaluated for colour shades, colour properties such colour coordinates, 2D colour plot, colour reflectance, and colour strength, as well as fastness qualities to washing, perspiration, rubbing and light. The findings were assessed and compared. When fabrics were dyed with mordants, dye absorption increased. Consequently, their dyeability and colour strength improve, as do their fastness properties. Despite the fact that silk and cotton fabrics dyed with infrared and exhaustion dyeing showed slightly similar shades of dark or light yellow-brown, cotton-dyed fabrics have better colour strength than silk-dyed fabrics. However, most IR-dyed fabrics received good to excellent ratings because there is no staining, less wash off colourant on dyed fabrics, and dye molecules penetrate deeply into the fibres. The colour properties of fabrics dyed with methanol extracts also yielded good results without staining. Natural fibres have a high dye adsorption rate, which results in a more vibrant colour on dyed fabrics. Thus, natural dyes derived from *Tagetes erecta* petal extracts, as well as the use of infrared dyeing methods on natural fabrics such as silk and cotton, appear to be ideal for textile dyeing colouration.

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CHAPTER ONE

INTRODUCTION

1.1 Research Background

Colourants are used in a variety of industries such as apparel, paints, plastics, photographs, prints, food, and ceramics. Colourants are also being used in novel applications and for aesthetic purposes. Colour comes in the form of dyes or pigments. Dyes are coloured substances that chemically bond with the applied substrate (Gürses et. al, 2016). It can be characterised as a natural or synthetic substance used to alter or add colour to textile materials. Natural colour on cloth is achieved through the use of raw materials derived from plants, animals, and minerals (Vankar, 2000). Most colourants are derived from plants via the stem, root, leaves, or flowers, with only a few from natural resources such as lichens (Samanta & Agarwal, 2009). They are well known as eco-friendly dyestuff as compared to synthetic dyes. The benefits of using a natural colour or known as a natural dye, are because of less pollution for the environment and very economical (Campbell, 2009). According to Bell (2021), natural dyes have the advantages of being self-biodegradable and non-toxic, as opposed to synthetic dyes, which are manufactured from chemicals that can harm animals, plants, and humans. Not only that, according to Christie (2014), natural dyes, in general, can produce a wide range of colours through a mix and match system. Since natural dyes are substantial, a mordant is needed to adhere to the fabric and keep the colour from fading or washing out when exposed to elements like light or air (Siva, 2007).

Some mordants are commonly used in natural dyeing as a fixative agent. Mordant can act as a catalyst between the dye and fibre, allowing it to be absorbed (Samanta & Konar, 2011). Synthetic mordants such as alum, tin, iron, chrome, copper, stannous chloride, and ferrous sulphate were frequently used for the purpose of enhancing the deeper colour of dyed fabrics in earlier studies on natural dyes (Jothi, 2008; Kandasamy, Kaliappan, & Palanisamy, 2021; Rashdi et al., 2019; Sanjeeda & Taiyaba, 2014). Sadly, some studies claimed that some mordants made from synthetic sources are harmful to both environment and people (Chavan, 2013; Choudhury, 2018; Elshahida et. al, 2019; Nambela et. al, 2020). According to Chavan (2013), chrome