

UNIVERSITI TEKNOLOGI MARA

**STUDIES ON MORPHOLOGICAL
STRUCTURE, PHYSICAL
PROPERTIES AND COLOUR
STRENGTH OF INFRARED DYED
PINEAPPLE LEAF FIBRE**

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ABSTRACT

Pineapple is one of the most widely grown crops in Malaysia. It is usually consumed in fresh fruit selling and juice drinks. However, the widespread use of pineapple resulted in large agricultural waste of pineapple leaves that are poorly maintained by the authorities in Malaysia. Therefore, this study was carried out to overcome that problem by extracting the pineapple leaves into fibre and dyeing the extracted fibre due to their unique characteristic and abundance availability in Malaysia. At the same time, conventional exhaustion dyeing systems, which use large quantities of water, chemical, and energy, cause a lot of effluent loads to the environment. This study focused on to analyse the physical and morphological properties of pineapple leaf fibre (PALF) obtained from different extraction methods and investigating the colour shade and dyeing performance of dyed pineapple leaf fibre using infrared (IR) dyeing in comparison with exhaustion (EX) dyeing techniques. Mainly, a few dyeing concentrations (0.25%, 1.0%, 2.0% and 4.0%) and three primary colours of reactive dye (C.I. Reactive red 11, C.I. Reactive blue 5 and C.I. Reactive yellow 86) were used as a parameter which response to the yield of PALF's colour shade towards dyeing. The extraction process of PALF was conducted using two methods, which involved manual and mechanical extraction methods. Different dyeing techniques were used to distinguish the dyeing performance of PALF. Characterization of PALF showed that the manual extraction process produces good-quality fibre. In addition, under optimized conditions of both extraction techniques, manual extraction presented lower breaking strength compared to the mechanical extraction method. Thus, the evaluation of the mechanical extraction method was more time-saving and easy handling as well as having comparable results to the manual extraction method. The colour performance of dyed PALF was specifically measured for colour coordinates, colour strength and fastness properties to washing, perspiration and light according to the MS ISO standards. Significantly, good to excellent fastness properties showed in both dyeing techniques. The application of IR radiation resulted in the parallel trend of colour strength (K/S) for all dyed samples due to the identical origin of the dyeing parameter for each dyeing technique. The highest K/S value goes to the IR dyeing technique in all three primary colours of reactive dyes. Dyed PALF has comparable results in colour strength and colourfastness properties of both dyeing techniques. By performing the evaluation process of colour strength, there was a noticeable difference between these two methods. The use of IR dyeing to dye pineapple leaves promotes green sustainable textile colouration. In summary, the IR dyeing technique can produce comparable and even better results than EX dyeing. It can also reduce electricity, water and glycerin consumption and save time spent during the dyeing process. This research has made a noteworthy influence to provide the latest revolution in new green dyeing technology at the same provide an alternative way to resolve abundantly agricultural residue.

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