

EXTRACTION OF BETACYANIN FROM *Bougainvillea glabra* BRACT AND THE  
ADSORPTION ONTO FIBRES

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Thesis submitted in fulfillment of the requirements  
for the award of the degree of  
Master of Science

Faculty of Engineering Technology  
UNIVERSITI MALAYSIA PAHANG

2018

## ABSTRAK

Kepentingan terhadap penggunaan pewarna asli semakin meningkat di seluruh dunia. Ini disebabkan oleh persepsi terhadap peningkatan risiko kepada alam sekitar dan kesihatan yang berkait dengan pemprosesan dan penggunaan pewarna sintetik. Bunga kertas merupakan bunga taman yang berwarna merah-ungu mengandungi betacyanin, iaitu pigmen betalain. Walau bagaimanapun, penggunaan bunga kertas sebagai pewarna semula jadi tekstil masih belum diketahui kerana kekurangan maklumat mengenai keserasian dalam pencelupan tekstil. Kajian ini dijalankan untuk mengkaji proses pengekstrakan betacyanin dari kelopak bunga kertas dan penjerapan pewarna pada benang. Fokus kajian ini adalah untuk mencari keadaan pengekstrakan pigmen yang terbaik menggunakan Metodologi Gerak Balas Permukaan (RSM) dan menentukan isoterma penjerapan pewarna pada benang. Dalam usaha untuk menentukan keadaan proses pengekstrakan yang terbaik, faktor pada satu masa (OFAT) telah dikaji iaitu pH (1.0, 4.0, 7.0, dan 10.0), nisbah pepejal-cecair (5:100, 7:100, 9:100, 11:100, 13:100, dan 15:100) dan masa pengekstrakan (0-180 min) menggunakan proses pengekstrakan pepejal-cecair. Keamatan warna pewarna dan kumpulan berfungsi bagi sampel telah dianalisis menggunakan Spektrofotometer UV-Vis dan Spektroskopi Infra-Merah Transformasi Fourier (FTIR). Kajian terhadap kesan kepekatan awal pewarna dan masa keseimbangan untuk proses penjerapan juga telah dijalankan. Hasil kajian mendedahkan bahawa keadaan terbaik bagi proses pengekstrakan adalah dalam keadaan berasid pada pH 4.0 berbanding dengan alkali, dengan nisbah pepejal-cecair 11:100. Masa keseimbangan dicapai selepas 60 minit proses pengekstrakan bermula. Penemuan mendapati 100 gram kelopak bunga dapat menghasilkan sekitar 68.12 g betacyanin. Bagi proses penjerapan, benang sutera mempunyai kecenderungan yang tinggi dalam mengekalkan warna berbanding dengan kapas polyester dan rayon. Proses penjerapan memberitahu bahawa benang sutera adalah lebih sesuai dicelup dengan pewarna semula jadi berbanding dengan benang sintetik. Penerapan model isoterma dalam meramalkan kapasiti penjerapan pewarna semula jadi menunjukkan bahawa model Freundlich menunjukkan padanan yang lebih baik berbanding model Langmuir untuk menggambarkan interaksi antara pewarna dan benang.

## ABSTRACT

The importance of using natural dyes is increasing worldwide. This is due to the perception of increased environmental and health risks associated with the processing and use of synthetic dyes. *Bougainville glabra* is known as a red-violet flower garden that contains betacyanin, a betalain pigment. However, the use of *Bougainvillea glabra* as a natural colouring of textiles is still unknown because of the lack of information on the compatibility in textile dyeing. This research carried out the extraction process of betacyanin from *Bougainvillea glabra* bracts and the adsorption of the dyes on the fibres. The focus of this study was to find the best dye extraction condition using Response Surface Methodology (RSM) and to determine the adsorption isotherm of dyes on the fibres. In order to determine the best condition of extraction process, one factor at time (OFAT) was studied that is pH (1.0, 4.0, 7.0, and 10.0), solid-liquid ratio (5:100, 7:100, 9:100, 11:100, 13:100, and 15:100) and extraction time (0-180 min) using solid-liquid extraction process. Colour intensity of the dyes and the functional groups of the samples were analyzed using UV-Vis Spectrophotometer and Fourier Transform Infra-Red Spectroscopy (FTIR). The determination of the effects initial concentration of dye and contact time for the adsorption process was studied. The findings have shown that extraction process was better in acidic condition at pH 4.0 than in alkaline, with solid-liquid ratio (SLR) of 11:100. The equilibrium time was achieved after 60 min of extraction process begins. The optimization process revealed that the best condition for betacyanin dye extraction was at 10:100 solid-liquid ratio (SLR) and extraction time of 60 min. From the results, it was estimated that 100 gram of bract can produce about 68.12 g of betacyanin. For adsorption process, spun silk has the highest affinity in retaining the dye compared to rayon and polyester-cotton. The adsorption process tells that spun silk is favourable to be dyed with natural dye compared to the synthetic fibre. The application of the isotherm model in predicting the adsorption capacity of natural dye shows that Freundlich model was fitted better than Langmuir model for describing the interaction between the dye and the fibres.