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Optimization of parameters for extraction of dye from *Swietenia macrophylla* (Mahogany) and adsorption isotherms on cotton fabric

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Natural dyes extracted from plants and animals were used for coloring textiles since ancient times. The dye extracted from *Swietenia macrophylla* (Mahogany) bark, which gives an intense maroon colour, is a popular natural dye used to colour fabrics from ancient times. The objective of the present study is to optimize the parameters for extraction, such as extraction time and on weight goods ratio for extraction of natural dye from Mahogany bark and to investigate their adsorption isotherms on cotton fabric. An aqueous 1% alkaline solution was used for the extraction of the dye from the bark at 90^oC. Optimum dye extraction was obtained at 2 hours and optimum on weight goods (owg) ratio for extraction was 1:6. Cotton fabric was scoured using 4% Na₂CO₃ solution for 1 hour prior to dyeing to remove stains in the fabric. Usually a salt of Mg, Al, Fe, Cr, Cu, or Ti has to be used as the mordant to enhance the affinity of the nature dye to the fabric. In order to test the best mordant for this dye, 4% on weigh fiber (owf) solution of Al₂(SO₄)₃, MgCl₂, FeSO₄ were applied. MgCl₂ showed the best uniform dyeing, thus it was used as the optimized mordant for dyeing experiments. Adsorption of extracted mahogany dye to the cotton fabric and adsorption capacities are significantly affected by pH, initial dye concentration and the temperature of the dye bath. The dye bath was maintained at pH=10 and 90^oC for 2 hours. Metal to liquor ratio of a mordant was 1:50. Data were satisfactorily fitted to a Langmuir isotherm (R² =0.9806). According to the Langmuir model, the calculated maximum monolayer coverage capacity was 13.5318 mg/g.

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