



**INVESTIGATION OF HIGH VOLUME  
BID MATERIALS AS POTENTIAL COLOURANTS  
AND FINISH CHEMICALS FOR FIBROUS  
SUBSTRATES**

BY

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## Abstract

The modern consumer (1990 onwards) is aware of the toxic chemical residues on textiles/garments (resulting from dyes and chemicals used) which can have carcinogenic/ dermatological and allergic effects on the wearer, especially because textiles are in contact with human skin for 24 hours of the day. The second aspect deals with the 'pollution' (air/water) at each of all stages in production of textiles. The third concern is about the 'ecological' problems during disposal (of garbage / on incineration).

The aim of this research is to show feasibility of producing high quality natural dyes from plants, creating new opportunities for both farmers and the fabric / garment industry in line with the current consumer trends towards eco-friendly natural products. The direct national benefit is shown. Environmental and economical factors too need to be considered to make this viable in the long run.

Investigation of the traditional dyeing techniques and dye producing plants with special reference to Sri Lanka, and development of natural dyes and investigation of their suitability as textile dyes were the two major objectives of this research study.

Research investigations based on the comprehensive analysis of 10 best dye yielding plants which have been chosen from 47 dye yielding plants in Sri Lanka are presented. The available raw material spectrum had been reviewed. The ten (10) selected species are Kothala Himbutu (*Salacia reticulata*), Weniwal *tCosciniium fenestratum*), Rambutan (*Nephelium lappaceum*), Mangus *tGarcinia mangostana*), Big onion skin (*Allium cepa*) , Marigold (*Tegetus erecta*), Tea (*Camellia sinensis*), Jak (*Artocarpus heterophyllus*), Walmadata (*Rubia cordifolia*) and Turmeric (*Curcuma domestica*). Some of the above plant extracts have not been used before in textile dyeing.



Environmental performance was another aspect of the research. Results from effluent characteristics of best dyeing solutions reveal significant reduction in pollution potential. The concept of ready to use dye concentrates is also presented.

*Dedication*



to

My

*Parents, husband and children  
Who contributed in their own way*

*With*

*Love and Gratitude*

*'The Path to Knowledge is Awareness'*

## DECLARATION

I Samudrika Wijayapala , hereby certify that the work described in this dissertation was carried out by me in the Departments of Textile and Clothing Technology and Chemical and Process Engineering of the University of Moratuwa , Sri Lanka and Indian Institute of Technology , Kanpur , India between January 2004 and January 2010. This research project was carried out in partial fulfillment of the requirement for the degree of Doctor of Philosophy. This dissertation is the result of my own work and includes nothing which is the outcome of work done in collaboration, except where otherwise stated. Neither this thesis nor any part thereof has ever been submitted for any degree at this or any other University.

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We certify the statement above is true to best of our knowledge and that the dissertation is ready for submission.

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*“Authorship of any sort is a fantastic indulgence of the ego. It is well no doubt, to reflect on how much one owes to others- J.K.Galbraith”*

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Samudrika Wijayapala  
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## ABBREVIATIONS

AATCC	American Association of Textile Chemists and Colourists
AD	<i>Anno Domini</i> – After Death
BASF	Badische Anilin und Soda Fabrik ( <i>German chemical products company</i> )
BC	Before Christ
BOD	Biochemical Oxygen Demand
BMICH	Bandaranayake Memorial International Conference Hall
CD	Compact Disk
CI	Colour Index
CIELAB	<i>Commission Internationale d'Eclairage</i>
COD	Chemical Oxygen Demand
DNA	Deoxyribo Nucleic Acid
ESCAP	Economic and Social Commission for Asia and the Pacific
FTIR	Fourier Transform Infra Red spectroscopy
ICI	Imperial Chemical Industries
ICP	Inductively Coupled Plasma Optical Emission Spectrophotometer
IR	Infra-red
ISO	International Standard Organisation
K/S	Relationship between Absorption and Scattering Spectrum
LF	Light Fastness
MLR	Material to Liquor Ratio
MT	Metric tonnes
NA	Not Applicable
ND	Not Detected
owf	On Weight of Fabric
RTDC	Ready to Dye Concentrate
RF	Rubbing Fastness
TA	Tannic acid
UV-Vis	Ultra Violet Visible Spectroscopy
WF	Wash Fastness
WHO	World Health Organisation