Optimization of wool dyeing conditions and procedure for some natural dyes

The conditions for dyeing of wool with the dye obtained from Madder roots (Rubia cordifolia Linn.) have been optimized. The conditions include concentration of dye, the extraction time, dyeing time, concentration of mordants and the method of mordanting for wool fibers. The dyed samples were subjected to tests for fastness to light and washing. The optimum concentration of the dye was found to be 5g per 100 ml of water, while the optimum extraction and dyeing time were found to be 120 minutes and 90 minutes, respectively. The simultaneous method of mordanting was observed to give the best results in terms of lustre, depth of shade, evenness of the dye and the overall appearance.

The optimization of wool dyeing procedure, using dye from Rhododendron arboreum Sm. has also been done by scientists. The results of the study revealed that 8g of shade dried flowers are optimum to give maximum optical density of dye solution, 30 minutes being the optimum time for both dye extraction and dyeing [Agarwal & Gupta, Colourage, 2003, 50(10), 43-46; Sati et al, Ibid, 2003, 50 (12), 43-44].

Dyeing wool with Semal bark

The advent of natural dyes has necessitated search of new dye sources and natural mordants. Keeping this into consideration, researchers conducted study to optimize the process of dyeing wool with gum from Semal, Bombax ceiba Linn. syn. Bombax malabaricum DC. and application of natural mordants. During experiment natural dye was obtained by boiling 1g powder of the Semal bark in 50 ml water at seven different pH values, i.e. 4, 5, 6, 7, 8, 9 and 10 for 45 minutes. Natural mordants used for study were barks of Arjun, Babool, Eucalyptus, Indian Blackberry, Mango tree, fruits of Chebulic myrobalan and Indian gooseberry and Pomegranate fruit rind. These were used in dried and powdered form. The results showed that Semal dye could be used on wool in combination with different natural mordants to produce different shades of pink (greyish pale red to light maderia). All natural mordants helped in increasing the colour strength of the dye on wool [Gill & Singh, Man-Made Text India, 2002, 45(8), 329-334].

Dyeing of polyester fibre using indigo

The scientists at Department of Textile Engineering, Chungnam National University, Daejeon and Dyeing Technology Center, Daegu, South Korea studied on dyeing of polyester fibre using indigo and its extended wash fastness properties. Besides, HPLC analysis of indigo moieties extracted from indigo dyed samples was investigated to determine the spectral adsorption changes. It is found that the deep shade of indigo dyeing was achieved. The effects of indigo dyeing conditions such as temperature, time and wash fastness to the polyester fibres are also investigated.

Polyester fibre was dyed with indigo vat dye to examine the practical dyeing feasibilities and behaviours. Vat dyes, which commonly applied to the cellulosic fibres, could be considerable colourants to dye polyester substrate, especially focusing on fastness aspect in terms of washing test. In this work, the optimized dyeing conditions and behaviours were investigated. In addition, extended multiple washings of indigo dyeing, which were compared with the results of disperse dyeing, were carried out to determine the fastness properties. HPLC analysis showed that when dyeing time increased, structural changes of indigo components were attributed to the decreasing colour strength of dyeings. From the comparison of indigo disperse system and leuco system, it was found that disperse system of indigo had little effect to achieve dye uptakes [Son et al, Dyes Pigments, 2004, 61(3), 263-272].
Natural silk dye from *Bhringraj* and Congress grass

Scientists have been exploring the utilization of weeds for various purposes including the extraction of natural dye. *Eclipta alba* (Linn.) Hassk. (Hindi – *Bhringraj*) is a common weed, famous for hair dye. Researchers have extracted green dye from the plant and dyed silk with yellowish green shades. Four mordants namely Alum, Chrome, Copper sulphate and Ferrous sulphate were found to be suitable for application. However, loss of colour was found with acidic perspiration. Excellent to outstanding fastness to sunlight was observed in all mordanted samples.

Congress grass, *Parthenium hysterophorus* Linn. is a well known weed, which has covered a vast area throughout India. Researchers have extracted dye from its leaves and found that it gives a range of bright, soft and lustrous colour on silk. The dye can be effectively used on commercial level without any allergic effects [Devi *et al*, *Man-Made Text India*, 2002, 45(5), 181-188; Suneeta & Mahale, *ibid*, 2002, 45(5), 198-200].

Dyeing of cotton with some single and mixture of natural dyes

Application of single and mixture of selected natural dyes on cotton fabric has also been evaluated scientifically. During experiment cotton fabric was dyed with four different natural dyes, viz. turmeric, myrobalan, madder and red sandalwood using pre-, post- and simultaneous mordanting techniques. Aluminium sulphate was used as a mordant. Some samples were also dyed with a combination of turmeric with madder or red sandalwood and a combination of myrobalan with madder or red sandalwood in different proportions. Selected, mordanted and dyed samples were after-treated with a cationic dye-fixing agent. Turmeric being a direct dye type gave maximum colour strength when applied by the simultaneous-mordanting method, either singly or in combination with other dyes. Turmeric also showed poor wash fastness, which was improved to some extent by after-treatment with a cationic dye-fixing agent and on combination of turmeric with other dyes of better fastness. Combined dye application of turmeric with the other dyes by the simultaneous mordanting method resulted in a better shade development, as the observed colour strength values were always higher than the calculated or the expected values. However, myrobalan on combination with other dyes gave higher colour strength when applied by the post mordanting method. In the case of the simultaneous mordanting method, myrobalan did not show a synergistic effect in terms of the observed and calculated K/S values [Samantha *et al*, *Colourage*, 2003, 50(10), 29-42].