Environmentally friendly natural dyeing of organic cotton

In this study, organic cotton fabrics were dyed with different natural dye sources (madder root, walnut shell, henna, horse chestnut, pomegranate peel, berberis vulgaris root, thyme, and sage tea). The dyeing was carried out with different mordants (copper sulphate, potassium aluminum sulphate, potassium tartrate, and citric acid), using pre-mordanting dyeing methods. The color of the fabrics was investigated in terms of color strength (K/S) and fastness properties against light, washing, rubbing, and perspiration. The color and fastness properties obtained from the dyed organic cotton fabrics were between good to excellent [Tutak, M. and Ebru Korkmaz, N.* (Department of Textile Engineering, Erciyes University, Kayseri, Turkey), Journal of Natural Fibers, 2012, 9(1), 51-59].

Ecofriendly colouring of silk fabric with croton (Croton Species) leaves

The great appeal of textiles lies in their colours and the way that colour is used to create patterned effects. Colour is applied by the process of dyeing, which in its simplest form involves the immersion of a fabric in a solution of a dyestuff in water. The amount of dyestuff required is very small, but its production and application require considerable skill. Changes in the ways of producing dyes during the nineteenth century heralded modern science. The uses of natural dye on textile materials are now being popularised globally by the continuous efforts of nature lovers. The problems caused by synthetic dye in human lives and environments, since the introduction of synthetic dye more than a century ago, has come to an alarming level today. Hence there is an urgent need to for an alternative to the hazards of synthetic dyes. To explore the use of natural dyes is one such immediate solution. However, the limitations with the natural dye are their poor fastness properties, limited shades, low brilliancy, etc. To some extent, adding selected mordants/chemicals in natural dyeing is accepted, provided the character of the natural dye is unaltered and the eco-system is not damaged. The present study explored the development of a process for the extraction of natural dyes from abundantly occurring plants, flowers namely Croton (Croton species) leaves. The study showed that this source can produce different shades of brown and peach colour. A series of experiments was conducted to optimise the different variables for dyeing. Acidic medium was optimized for dye extraction. For Croton dye, 8% dye concentration, 60 minutes extraction time and 75 minutes dyeing time were optimized. Test of colour fastness to light, washing, perspiration and crocking were also carried out. The results concluded that the light fastness, washing, fastness, perspiration and crocking fastness of the Croton dye were good and samples that were mordanted showed better fastness properties as compared to control. This dye source is abundantly available throughout the year and does not cause environmental depletion. Experiments proved that the Croton dye is the good source for dyeing silk in shades of brown and peach. Thus it can be concluded that this dye has a lot of commercial potential [Tiwari, R. and Paul, S*. (Department of Clothing and Textiles, College of Home Science, GB Pant University of Agriculture and Technology, Pantnagar, India), International Dyer, 2012, 197(1), 35-38].

Eco-Dyeing of wool using aqueous extract of the roots of Indian madder (Rubia cordifolia) as natural dye

The aqueous extract obtained from the powdered roots of Indian madder (Rubia cordifolia) was used for dyeing of woolen yarns. The effect of pH, dye concentration, and mordants on the colorimetric and fastness properties has been studied. Brilliant shades of bright red to scarlet were obtained with
significant variation in hue and tone of shades depending on mordants and dye concentrations used. The color coordinates of the dyed samples were found to be in the red-yellow quadrant of the CIELab color space. It was found in all cases that mordanting with alum as well as ferrous sulfate has caused decrease in lightness (L*) values and increase in K/S values. All the dyed samples exhibited commercially acceptable fastness to light, washing, and rubbing. Scanning Electron Microscopy (SEM) morphological studies have also been performed on different woolen yarns [Yusuf, M*, Shahid, M., Khan, S.A., Khan, M.I., Islam, S.-U., Mohammad, F., Khan, M.A. (Natural Dyes Lab, Department of Chemistry, Jamia Millia Islamia, New Delhi, 110025, India), Journal of Natural Fibers, 2013, 10(1), 14-28].

**NPARR 4(2), 2013-0135 Antibacterial properties and color fastness of silk fabric dyed with turmeric extract**

The use of non-toxic and eco-friendly natural dyes on textiles has received much attention due to the increased environmental awareness in order to avoid some hazardous synthetic dyes. In the present study, an eco-friendly approach was developed to impart color and antibacterial properties to silk fabrics dyed with turmeric extract as a non-toxic natural colorant. The natural colorant was extracted from *Curcuma longa* rhizome. Copper sulfate, ferrous sulfate and potassium aluminium sulfate were applied in a pre-metallization process as mordanting agents. Antibacterial properties of treated fabrics were evaluated against common pathogenic bacteria, *Staphylococcus aureus* (Gram-positive) and *Escherichia coli* (Gram-negative). The effects of dye concentration and mordant types on the obtained color hues, antibacterial efficiency and color fastness of the fabrics were investigated. The results indicated that mordanted and dyed fabrics possessed desirable antibacterial properties. Complete antibacterial activity of the treated fabrics was obtained with 3 % wf (on weight of the fabric) copper sulfate. It was also shown that increasing the dye concentration could lead to a more efficient antibacterial activity on the mordanted dyed fabrics. An optimum level of the antibacterial activity was observed in the sample treated with 30 % wf of turmeric. Furthermore, the results of CIE L*, a*, b* values, FTIR, washing, light and rubbing fastnesses of the dyed fabrics were reported. The mordanted dyed silk fabrics exhibited desirable color fastness properties. These studies proved a direct relationship between the degree of antibacterial activity of the fabrics treated with turmeric and the metals ion concentration [Ghoreishian, S.M., Maleknia, L., Mirzapour, H. and Norouzi, M. (Young Researchers Club, South Tehran Branch, Islamic Azad University, Tehran, Iran), Fibers and Polymers, 2013, 14(2), 201-207].

**NPARR 4(2), 2013-0136 Studies on the dyeing processes of cassia seed**

In order to learn the influence of dyeing conditions on dyeing characteristics, cassia seed was used to dye cotton, wool, ramie and silk under the different temperature with different types and concentration of mordant. By testing color eigen value and color fastness, the conclusions were drawn that high temperature will cause the color darken. And different materials should be dyed under their proper temperature. The concentration and the types of mordant can change the dyed color by cassia seed. The anions of mordant have little influences on the dyeing results, however, metallic cations would play an important role in the color hue and color fastness. It is hoped that the results will give a reference in natural dyeing [Wang, F. Q. and Wang, Y. P. (Beijing Institute of Clothing Technology, Beijing 100029, China), Wool Textile Journal, 2013, 41(2), 49-53].

**NPARR 4(2), 2013-0137 The use of vanadium for dyeing technology**

Mordant technology is often required for dyeing by natural dyes. The major problem with natural dyes is deepness of black color. Authors
analyzed the characteristic chromaticness with four kinds of natural dyes and three metals to improve it. We focused on vanadium, which is a transition element in a same period with iron or copper. Effective methods were found for the improvements of the dyeings with tetravalent vanadium compounds, vanadyl sulfate and tannin. Especially, tannic acid and gallic acid were hypochromically and fastly dyed on wool for the first time in the history of dyeing [Uegaki Y.*, Watanabe M., Utada M., Sato T., Togawa, M., and Hasegawa T.(Yamanashi Prefectural Fuji Industrial Technology Center, 2095, Shimoyoshida, Fujiyoshida, Yamanashi 403-0004, Japan), Sen'i Gakkaishi, 2013, 69(3), 55-59].

NPARR 4(2), 2013-0138 Dyeing behaviour of γ-irradiated cotton using Amaltas (Cassia fistula) bark extracts

Amaltas bark (Cassia fistula) has been used as natural colourant for dyeing of un-irradiated and irradiated cotton fabric. Both cotton fabric and dye powder has been exposed to absorbed doses of 2, 4, 6, 8 and 10 kGy using Cs 137 γ-irradiator. Dyeing parameters such as temperature and time were optimized. To improve colour strength pre and post mordanting using copper and iron as mordants was carried out. Suggested ISO standard methods for colour, fastness to light, washing and rubbing were employed to observe fastness properties. It is observed that dyeing of irradiated fabric at 50 °C for 50 min using Cu as pre-mordant (4 %) has not only given good colour strength with darker shades but also acceptable fastness properties are obtained. It is concluded that γ-irradiation has a promising effect in improvement of colour strength and colourfastness properties and it can be applied on other fabrics dyed with other natural colourants [Adeel S.*, Fazal-Ur-Rehman, Gulzar, T., Bhatti, I.A., Qaiser, S. and Abid, A. (Department of Chemistry, Government College University, Faisalabad-38000, Pakistan), Asian Journal of Chemistry, 2013, 25(5), 2739-2741].