

Flavonoid dye- *Eclipta alba*



Eclipta alba

Eclipta alba is an annual herb, with leaves which are rich source of natural dyes.

In continuation with our work using ultrasonic dyeing the present lecture investigates the dyeing and fastness

- properties of Eclipta for cotton fabrics. Different
- factors affecting dyeability and fastness properties were
- investigated to show the commercial viability of Eclipta
- and also to meet the ecofriendliness parameters.

Eclipta with different mordanting methods

- The dyeing of cotton fabric using Eclipta as natural dye has been studied in both conventional and sonicator methods. As eclipta is a source of flavonoid dye we tried to show results of dyeing with metal mordants and compared with biomordant and enzymes to evaluate the possibility of replacing metal mordanting method
- The effects of dyeings shown by all the three techniques were evaluated higher color strength values obtained by the latter. Dyeing kinetics of cotton fabrics were compared for both the methods. The time/dye uptake reveals the enhanced dye uptake showing sonicator efficiency.
- The results of fastness properties of the dyed fabrics were fair to good. CIELAB values have also been evaluated.

Eclipta

- Ease of growing the Eclipta plantation, abundance and ease of extraction of colorant make it very interesting source of natural dye.

The revival of natural dyes has prompted to screen newer natural dye sources, therefore, it is with this aim that the present paper is to investigate the dyeing property with Eclipta, a cheap and abundantly available plant, and develop methods to optimize its dyeing characteristics of natural dyes.

Flavonoids- Flavone-glycoside

- The methanolic extract is a dark green solution with a characteristic odor. Its principal constituent is the herb which contains wedelolactone and dimethyl wedelolactone which were isolated by column chromatography.
- The presence of flavones apigenin and luteolin, as the flavone-7-O-glycoside and the flavone-C-glucosides are the main colorant.

Use of other flavonoid dyes in dyeing

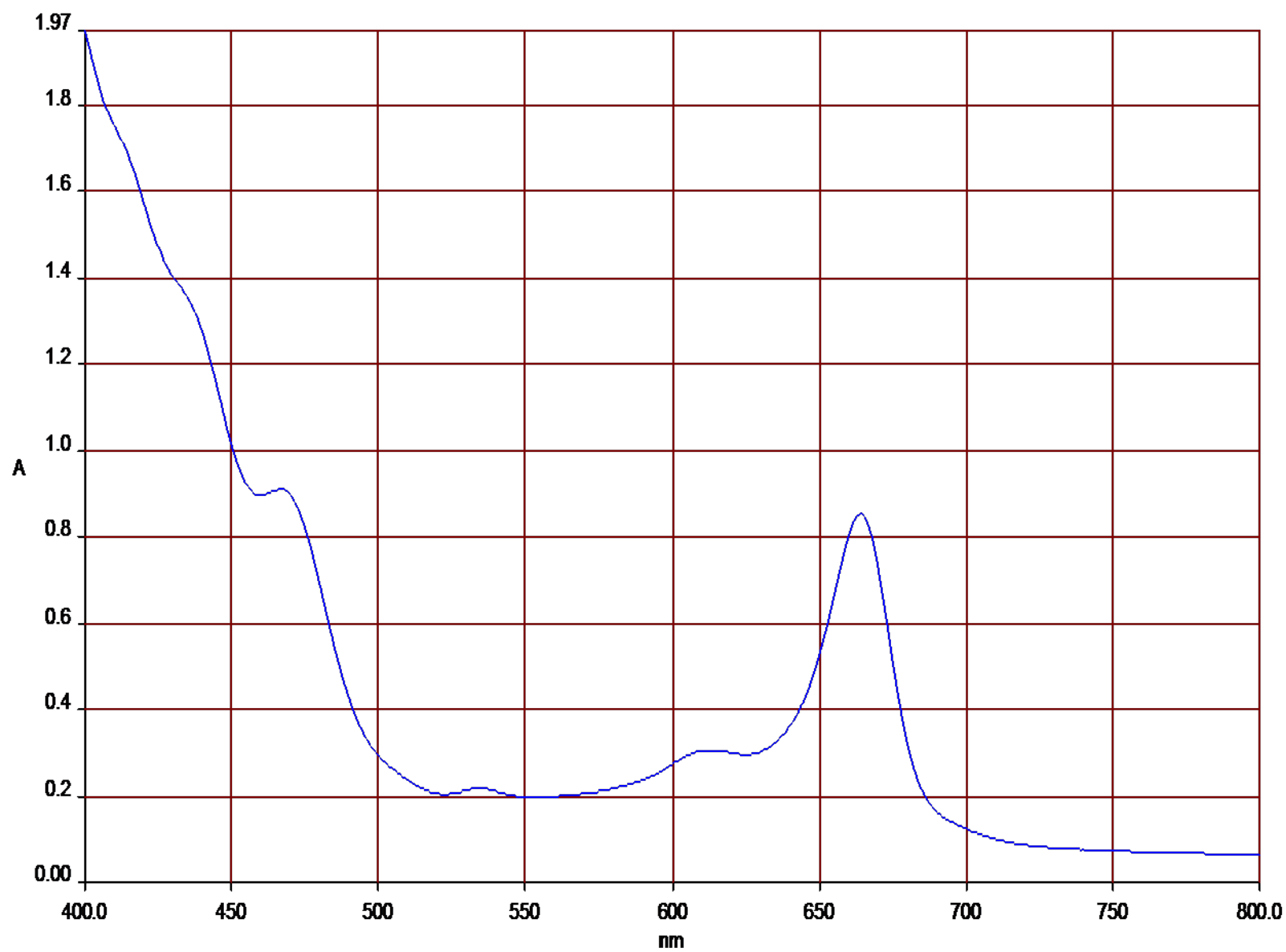
- Flavonoids extracted from marigold flowers were investigated for their dyeing potential. Patulitrin (1) and patuletin (2) were isolated and their structures established using NMR and HPLC-MS. These compounds were identified as the main flavonoids present in the dyeing bath. Following the dyeing process, it was demonstrated that aglycone 2 bound more strongly to wool fibres than its glucoside 1.

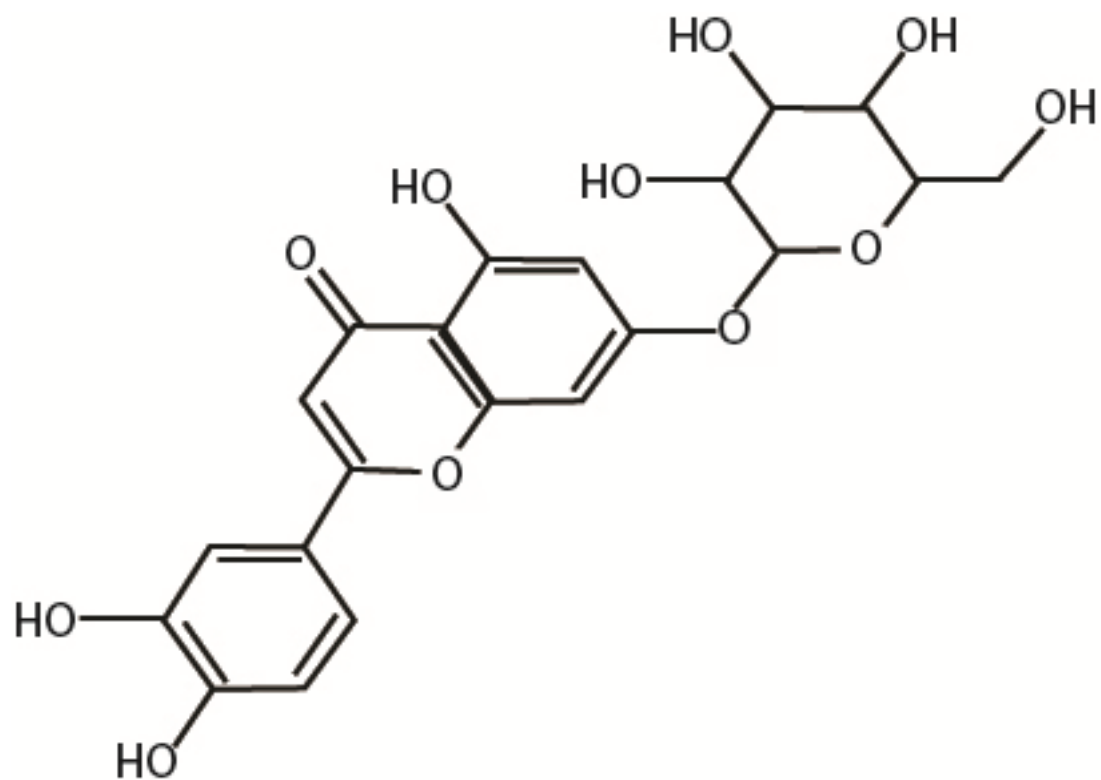
Other flavonoids

- Moreover, analysis focused on 1 and 2 dynamics during plant growth revealed that these components were only found in flowers during and after flowering. The influence of growing location was also investigated and it appeared that cultivation under Mediterranean conditions enhanced biosynthesis of 1 and 2 . Finally, several solvents were tested for their potential to extract the flavonoids: the use of a water-ethanol mixture gave a high extraction efficiency and allowed selective extraction of 1 and 2. The implications of these results are discussed in relation to the development of marigold as a potential dyeing plant.

UV-Visible spectrum of Eclipta extract

- In our case dye was extracted in aqueous medium by boiling in water for dyeing. The extraction was carried out for 3-4 h. The solution was then evaporated to half of the original volume and used for dyeing. The UV-VIS spectrum was recorded at wavelength 400-800 nm with the maximum absorbency of 1.300. The peak at 402 nm is characteristic peak for flavanoids while the peaks at 532, 608 and 665 nm is for chlorophyll pigment.





Luteolin 7-O-glucoside

Preparation of the fabric

The fabric was desized in a liquor containing 5 g of nonionic soap in a liter of water.

The material to liquor ratio was taken as 1:40. The fabric was boiled at 95 C for 1 h and rinsed thrice in cold water, and dried under shade. The desized cotton fabric was treated with tannic acid solution. The material to liquor ratio was 4% (owf).

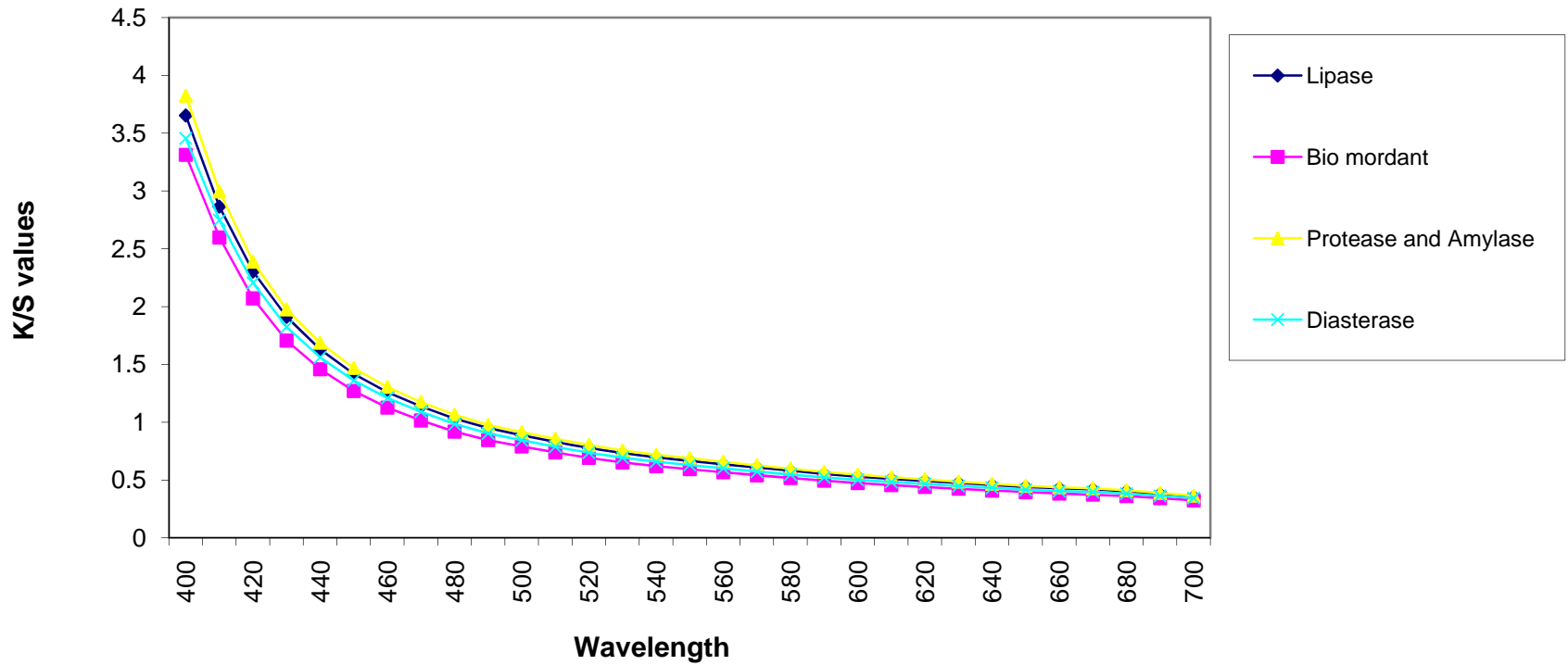
- The fabric was soaked in the tannic acid solution for 4-5 h and then air dried.

Dyeing cotton with Eclipta

- To fix the dye on the cotton fabric, the method of mordanting tried is pre-mordanting involving treatment of fabric with metal salts such as alum, stannic chloride, stannous chloride, ferrous sulphate, copper sulphate, potassium dichromate followed by dyeing.
- Biomordant used was *Eurya acuminata*
- Enzymes used were Lipase, Protease-amylase and Diasterease

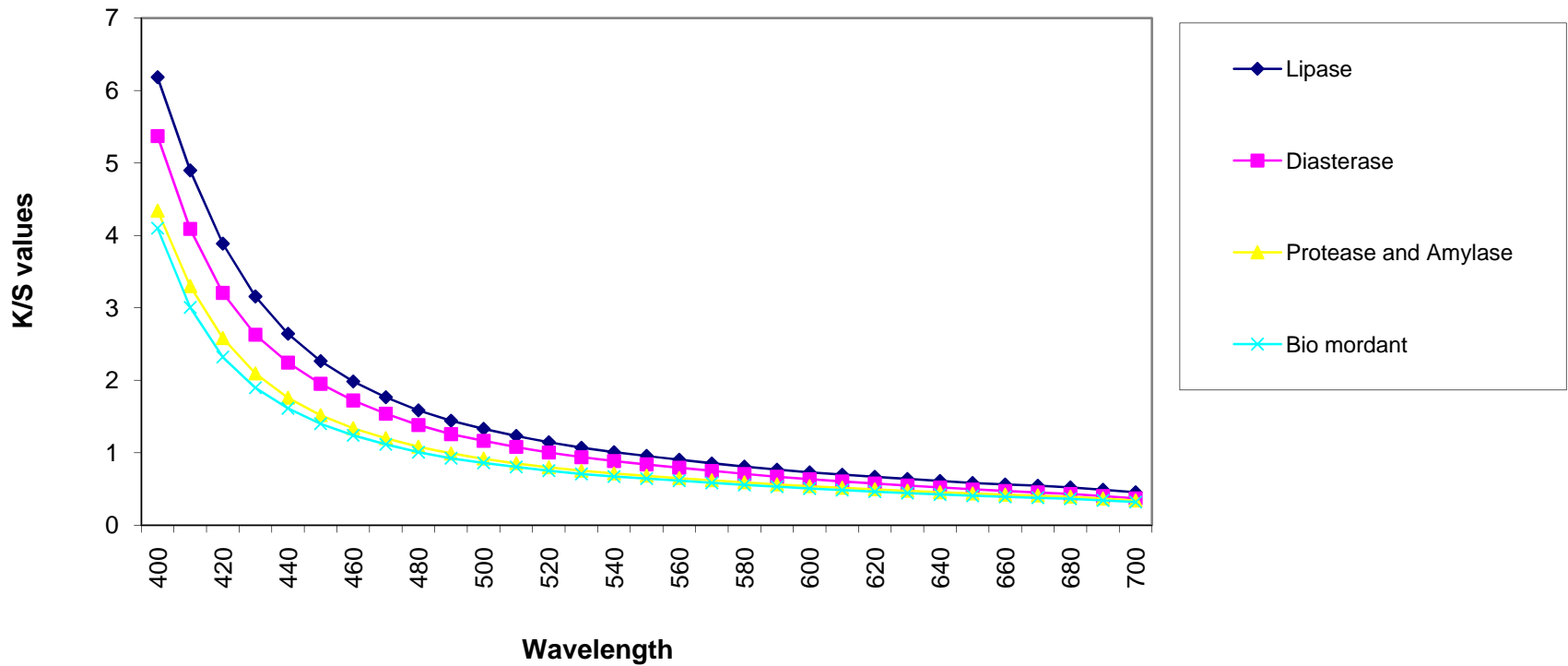
Two step dyeing

change in K/S values in different mordants



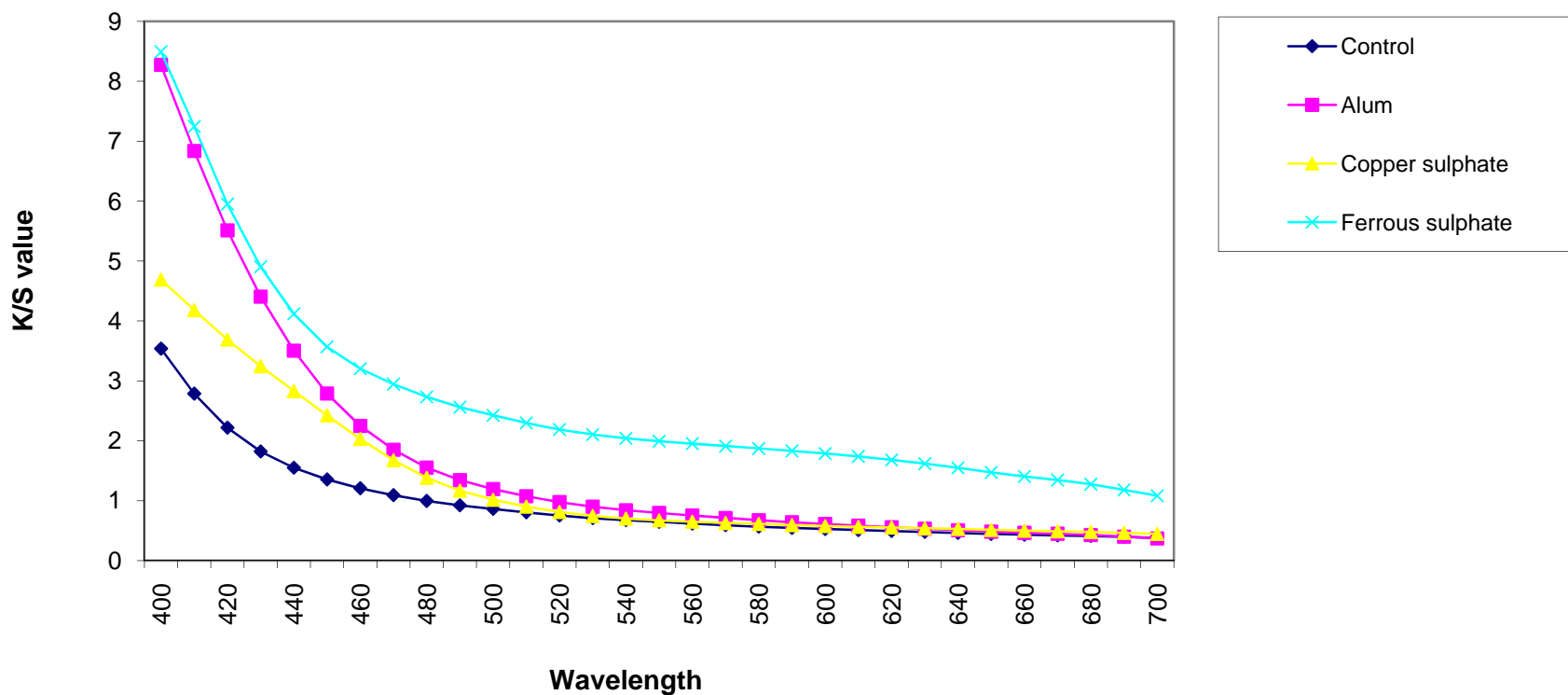
One step dyeing

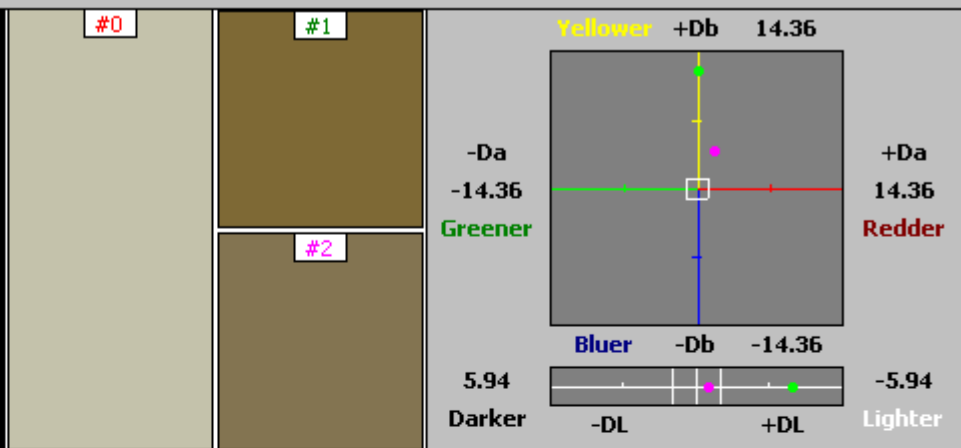
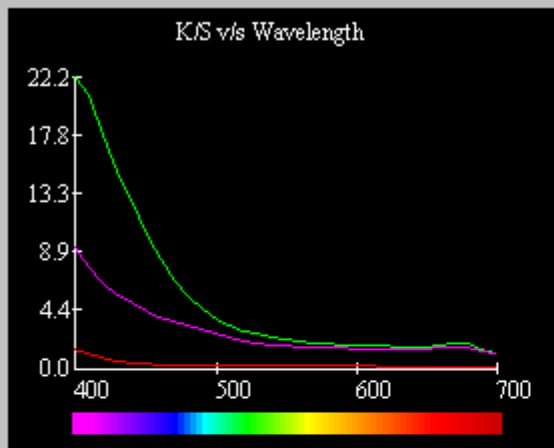
Change in K/S values in different medium



With metal mordants

Change in K/S values with different mordants





	Standard	Batch 1	Batch 2
L*	77.984	81.919	78.448
a*	-2.713	-2.606	-0.969
b*	10.968	23.323	15.063
C*	11.299	23.468	15.094
H*	103.924	96.409	93.715
dE*	-----	12.967	4.475
DL*	-----	3.935	0.464
Da*	-----	0.107	1.744
Db*	-----	12.355	4.095
DC*	-----	12.170	3.796
DH*	-----	-2.135	-2.325
K/S	5.1739	100.8892	51.0587
RFL	29.499	2.658	6.675
%	100.000	%1949.981	986.861

Illuminant

D65

Save to File...

Screen

Color

RFL Vs WL (F4)

Tab Output (F3)

Print (F7)

Measure (F9)

Close

Use of sonicator

- The sonicator used is of 20 kHz frequency which is found to be suitable for inducing cavitation. It is well known that cavitation which causes formation and collapse of microbubbles is most effective for better dye uptake. The microbubbles which are unstable slowly grow in the process of oscillation. Finally they implode violently, thereby generating momentary localized high pressures and temperature. This activated state causes chemical reaction between the fabric and the dye by forming shock waves and severe shear force capable of breaking chemical bonds.

- Dyeing with Eclipta leaf extract by sonicator gives better dye uptake as compared to conventional method, and it also does give some variation in color.
- The color adherence to fabric is good. Since the dyeing process involves a fast adsorption process and subsequently a slow diffusion process, the latter will determine the rate of dyeing with Eclipta extract.
- The absorbances are recorded at initial and final time to calculate the rate of the reaction as absorbance of the dye bath is directly related to concentration of dye bath.

Sonicator efficiency

- The efficiency of the sonicator was calculated by the extent of dye uptake over a period of time. The value of sonicator dyeing efficiency is higher than conventional dyeing which indicates that sonicator dyeing is more effective. As the use of sonicator is for more economical dye uptake it eventually works out to be cost effective too.

Sonicator's efficiency%=

Dye uptake by fabric by Son. /Dye uptake by fabric by Con/time

Conclusion

- The large scale production of textiles dyed with natural dyes is a new concept for the textile industries. We hope that Eclipta dye extract will definitely find great use in cotton industry especially in green, brown and yellow color range dyeings. The sonicator dyeing shows 7-9% efficiency higher than conventional, As the use of sonicator is for more economical dye uptake it eventually works out to be cost effective too.