# COLOUR MEASUREMENT OF MESTA (*HIBISCUS SABDARIFFA*) FIBRE

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***Abstract:*** *Mesta variety AS73 CP 560 grown in Institute of Organic Farming, UAS, Dharwad was selected for the present investigation. Fibres were extracted using urea treatment with different steeping methods and were scoured, bleached. Colour of mesta fibre were measured for it K/S (colour strength), L*, a*, b* values to know the effect of urea treatments, methods of steeping and wet processing treatment. Results found that K/S values of the fibres extracted from urea treatment, stalks steeped by vertical+horizontally method was significantly higher. The L*,a*, b* values indicated that the fibre extracted without urea treatment was lighter, redder, yellower than the urea treated fibre. Scouring reduced the K/S (colour strength) value over control. The K/S value of scoured+bleached fibres obtained from urea treatment and steeped by horizontal were significantly higher. L*, a*, b* values of the fibres extracted by urea treatment and vertical-horizontal steeping were significantly higher than the other fibres*.

***Keywords:*** *Mesta fibre, steeping method, scouring, scouring+bleaching, K/S Value, L*, a*, b* value.*

## 1. Introduction

Colour communication is the utmost important in the textile and apparel industry. The first attribute a customer to select a piece of fabric or garment is its colour. Mesta, lignocellulosicfibre has jute like appearance, however, few varieties are known for their silk like luster.

In India, mesta stands next in importance to jute. Mesta is inferior and coarser than jute, yet it is substitute for jute contributing seven per by kenaf and five per cent by roselle [1]. The mesta fibres (obtained from commercially cultivated species such as *Hibiscus cannabinus* (Kenaf) and *Hibiscus sabdariffa* (Roselle), belongs to family Malvaceae. *Hibiscus sabdariffa* (Roselle) were selected for the present study to assess its colour value on different treatment.

Object colour can be measured by spectrophotometer, which will provide spectral reflectance or spectral transmittance value. Instrumental colour communication has its beginning when the first industrial spectrophotometer become available in 1929 and two years later the CIE (Commission International de lEclairage- International Commission on Illumination) system of colorimeter was born. Putting numbers on colours took over 30 years more for the first real electronic exchange of colour data in an industrial scale [2].

By today's standard we may smile at the level of the computer and communications technology available in early 1960's, but it was all there for electronic colour communication specifying colours in numerical terms and sending digital data across countries or continent. However, Spectrophotometer measures appearance and measuring appearance is a different aspect than measuring colour. Appearance includes both geometrical attributes and colour attributes, since the textile surface is textured where the geometrical attributes also contribute to the resultant colour, so this is the reason why coloured textiles are measured in spectrophotometer. Therefore in the present study colour of mesta fibre obtained by different treatments, steeping methods and on wet processing was measured for its colour strength (K/S) value.

## 2. Experimental

### 2.1 Fibre extraction process

Mesta stalks harvested at physiological maturity stage was treated with 2 per cent urea for fibre extraction Retting process was carried out in tanks filled with clean water and bundles of mesta stalks were steeped in water. Two steeping methods were followed for the present study. Horizontal and combination of vertical+horizontal steeping as the stalks are harder at the bottom end and require longer time to ret than ti inner parts and consequently, if

the butt (thicker) ends of the stems are fully retted, the top ends are over-retted and damaged. This can be avoided by stacking the bundles of stems upright with the butt ends in water for few days, before immersing the whole stem.

### 2.2 Scouring

Scouring was carried out in conventional non corrosive steel vats. The fibres were treated with 5% caustic soda, turkey red oil (0.50 %), soap oil (0.50 %), in MLR 1:30 by maintaining the temperature at 40 to 50°C for 12 hours.

### 2.3 Bleaching

Bleaching of scoured mestafibre was done in a closed vessel for 60 minutes at 100'C with (2%) hydrogen peroxide, (1. 5%) sodium silicate, (0.5%) turkey red oil in 2 to 3 litres of water. Material-to-liquor ratio was maintained at 1:30. After bleaching, the fibre samples were washed thoroughly twice with cold water and were air dried.

### 2.5 Colour measurement

The colour difference of the mestafibres extracted with and without urea treatment, horizontal and vertical+horizontal steeping methods were elicited using the JAYPAK 4808 QC Software. Colour difference of the wet processed mestafibres with control was also assessed. The colourdifference is generally calculated as the square root of the combined squares of the chromaticity differences (a*, b* and 'lightness difference L*)

### 2.5.1 K/S value

K/S value defines a relationship between spectral reflectance (R in %) of sample and its absorption (K) and scattering S) characteristics, and can be calculated by using the Kubelka-Monk equation as below

$$K/S = \frac{(1 - 0.01R)2}{2(0.01R)}$$

### 2.5.2 CIELAB (or CIE L* a* b*)

Colour space in whichL* a* and b* values are plotted at right angles to one another to form a three dimensional coordinate system. Equal distance in the space approximately represent equal colour differences. Value L* represents lightness/ darkness; value a* represents the redness/ greeness while b* is indicative of yellowness or blueness of the samples.Thus, the colour of wet processed mestafibre i.e., control, scoured, scoured+bleached.

## 3. Experimental Results

### 3.1 Colour measurement of control mestafibre

It is evident from the Table l that mesta the fibres extracted from untreated mesta stalks by vertical+horizontal steeping had significantly higher K/S values (2.05) than the fibre obtained from horizontal steeping method O 621) Contranly, the L*,a* b* values was found to be higher 1* '(81.74),, a* (8 100), b*(20 68) in fibre obtained by horizontal steeped method. Similarly,Among the urea treatment the fibres produced by , vertical+horizontalsteeped mesta stalks was found to have higher K/S Value (2.12) than the fibre obtained by horizontal steeping (1.74). It means,verticai+horizontal steeped method had significant influence on K/S Value of mestafibre. Moreover,a*,b* values of mestafibre obtained by horizontal steeping method was found tobe on par with mestafibre obtained by horizontal steeping method.

**Table 1:** Effect of urea treatment and steeping method on colour mea surement of scoured, scoured+bleachedmestafibre.

| Treatment | Control | | | | Scoured | | | | Scoured + Bleached | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | K/S | L* | a* | b* | K/S | L* | a* | b* | K/S | L* | a* | b* |
| **Control(without urea treatment)** | | | | | | | | | | | | |
| **H** | 0.621 | 81.74** | 8.100** | 20.68** | 0.62 | 80.52** | 03.89** | 10.10** | 1.31 | 90.52 | 2.570** | 19.93** |
| | | | | | (0.05) | (6.58) | (0) | (-0.02) | (10.59) | (11.81) | (-5.25) | (-0.16) |
| **V+H** | 2.05** | 79.47 | 3.390 | 13.78 | 1.02** | 73.98 | 3.76 | 19.41 | 1.657** | 89.32 | 1.140 | 17.28 |
| | | | | | (13.75) | (0.05) | (-4.34) | (-11.27) | (12.16) | (10.81) | (-2.53) | (10.16) |
| **S.Em±** | 0.82 | 0.361 | 22.19 | 23.97 | 0.005 | 6.79 | 0.087 | 3.214 | 0.552 | 13.86 | 14.06 | 16.28 |
| **CD (0.5)** | 0.60 | 0.589 | 0.25 | 0.69 | 0.39 | 0.071 | 0.05 | 0.71 | 0.02 | 0.02 | 0.05 | 0.20 |
| **CV (%)** | 0.23 | 0.41 | 0.72 | 16.03 | 0.37 | 0.048 | 1.081 | 0.137 | 0.35 | 0.086 | 0.266 | 0.27 |
| **Urea treatment** | | | | | | | | | | | | |
| **H** | 1.74 | 69.98 | 5.90 | 19.39** | 1.66 | 72.72 | 6.7** | 19.87** | 2.06** | 76.27 | 1.040 | 15.74 |
| | | | | | 3.14 | 2.76 | -0.14 | 1.5 | 8.19 | 7.29 | -4.16 | -3.65 |
| **V+H** | 2.12** | 69.96 | 5.90 | 18.35 | 1.99** | 72.19 | 5.5 | 19.67 | 1.54 | 77.22** | 3.940** | 23.05** |
| | | | | | 1.40 | 1.21 | 1.3 | 0.48 | 8.15 | 6.29 | -1.16 | -4.65 |
| **S.Em±** | 0.82 | 0.361 | 22.95 | 23.97 | 0.005 | 6.79 | 0.087 | 3.214 | 0.552 | 13.86 | 14.063 | 16.28 |
| **CD (0.5)** | 0.13 | 0.589 | 0.14 | 0.21 | 0.51 | 0.071 | 0.41 | 0.01 | 0.32 | 0.135 | 0.25 | 0.53 |
| **CV (%)** | 0.23 | 0.72 | 0.059 | 16.03 | 0.37 | 0.048 | 1.081 | 0.137 | 2.06 | 0.084 | 0.266 | 0.27 |

Note : K/S: Colour strength L* : Lightness a*: Redness/Greeness b*: Yellowness
C: Control U: Urea treatment H: Horizontal Steeping V+H :Vertical+Horizontal
Figure in the parenthesis the ΔE, ΔL, Δa and Δb values on the wet processing

### 3.2 Effect of scouring on colour of mesta fibre

K/S Value of scoured mestafibre obtained vertical+horizontal steeping method without urea treatment exhibited higher (1.02) than K/S Value of mesta fibre by horizontal steeping method (0.62). However, the L* (80.52), a*(03.89), b* (10.10) values of horizontal steeping method denoted that the fibres lighter, redder and yellower than the fibre from untreated vertical+horizontal steeping method.

On the other hand, a glance at the colour values of fibres obtained from urea treated, vertical+horizontally steped stalks exhibited significantly higher K/S values (1.99) than horizontal steeped stalks (1.66). Although L*, a*, b* values of vertical+horizontally were found to be on parwith the L*, a*, b* values of fibres obtained from horizontally steeped method.

The $\Delta$E values denoted the change in colour strength of untreated (standard) sample over the scoured was highly significant thus making the fibres darker in colour. Therefore, the negative $\Delta$L, values indicate that the fibres has became darker. The $\Delta$a and $\Delta$b values were positive indicating that the fibres were more redder and yellower than the standard (control) sample.Scouring removes impurities and other vegetable matter from the fibres. Hence, the fibres have exhibited higher L*, a*, b* values. The $\Delta$b value was almost zero implying that there is insignificant colour change over the standard.

### 3.3 Effect of scouring+bleaching on colour of mestafibre

The fibre extracted without urea treatment by vertical+horizontal steeping method exhibited higher K/S Value (1.657) than the mesta fibre produced by untreated horizontal steeping method (1 .31). Although, higher L* (90.52), a*(2.570) and b*(19.93) value was exhibited by of mesta fibre obtained through horizontal steeping method indicating that fibre are ligher, redder and yellower. Further, the $\Delta$L values of the scoured+bleached fibres extracted without urea treatment by vertical+horizontal steeping was indicating that the samples had became significantly whiter and $\Delta$a, value was negative indicated that fibres had greener, whereas $\Delta$b values indicated that fibres had yellower than the control or the standard sample.
On the other hand colour values of fibres obtained from urea treated, horizontal steeped stalks exhibited significantly higher K/S values (2.12). Although, L*, a*, b* values of mesta fibre processed by horizontal+vertical were higher L*(77.22), a*(3.940), b*(23.05) than the L*(76.27), a*(1 .040), b*(1 5.74) value of mesta fibre processed by horizontal steeping method. The $\Delta$E values denoted the change in colour strength of scoured+bleached over untreated (standard) sample was highly significant thus making the fibres whiter in colour.

## 4. Conclusion

It is concluded from the present study that irrespective of the stage of harvesting, the K/S values of the fibres extracted from urea treated, vertical horizontally steeped stalks was significantly higher. The L*, a*, b* values explained that, the fibre extracted without urea treatment by horizontal steeping was found to be lighter, redder, yellower than the urea treated withvertical+horizontal steeped ones. Scouring reduced the K/S values significantly over the control and the $\Delta$E indicated the change in colour strength of the scoured fibres over control. Thus scouring darkened the fibre colour. There is a significant colour change of the mesta fibres on scoured+bleached making them more white than the control as well as the scoured samples. Therefore, commercialization of such fibre for different technical applications and production of value added articles could be made for the consumers looking for biodegradable and eco-friendly textiles to preserve their natural environment flora and fauna.

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