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REVIEW ARTICLE

EVALUATION OF COLOUR FASTNESS TO WASHING STUDIED ON HIMALAYAN NETTLE, COTTON AND COTTON/NETTLE FABRIC BLENDS

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ABSTRACT

This research work aims towards study effect of washing on dyed Himalayan Nettle, Cotton and their blends. For this 100% Himalayan Nettle, 100% Cotton and Cotton X Nettle (60 X 40) blends in counts of 3s, 5s, 6s, 7s and 8s are developed. The results obtained are critically analysed.

Key words:

Nettle, Cotton, Yarn,
Dyeing, Washing.

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INTRODUCTION

Himalayan nettle (*Girardinia diversifolia*), is a weed and traditional fiber craft of Uttarakhand. It is a natural cellulosic fibre that can be handled in the same way as other cellulosic fibres. The fibre has natural functional characteristics of shrink resistance, degree of pathogen and fire resistance and can blend nicely with other fibres. Most importantly it can be disposed of using all ends of life opportunities. The fabrics may potentially be reused or re-manufactured and can also be used as a source of cellulose feedstock for regenerated cellulosic products. With the growing importance and popularity of concepts like green, eco-friendly, sustainability, etc. natural fibres seem to have become an obvious choice for enlightened producers and consumers of textiles. Development in nettle fibre can not only make India contribute in sustainable development in the field of textiles, but can also help the rural hill population in terms of income generation, providing sustainable livelihood to many people. Cotton is most used natural fibre today. The reasons for that is that they are comfortable, hypoallergenic, soft hand, absorbent, good strength, drapes well, easy to care, durable and dyes well. Cotton fibre is amazingly versatile, whether alone or blended, it outsells all other fibres combined. Today exponential growth in world population has created burden on fibre production resulting in enhancing production capacity of fibres.

Therefore producers are using unsustainable ways to improve cotton production like blending with synthetic fibres or using chemical functional finishes. Therefore now the manufacturers and producers are moving towards new source of fibre. Few unusual fibres growing naturally are having in-built functional properties and are gaining popularity as these are considered sustainable to environment and human beings. Himalayan Nettle is one such natural fibre growing wild in Uttarakhand forests. This research paper thus focuses on testing of colour fastness to washing of fabric samples made of 100% Nettle, 100% cotton and Cotton/ Nettle fabric blends.

MATERIALS AND METHODS

The Cotton and Nettle mix yarn were spun in Open end spinning mill in yarn count 3s, 5s, 6s, 7s and 8s. 100% Nettle is hand spun yarn made on Bageshwari charkaha, especially used for spinning Nettle fibres in remote village clusters of Uttarakhand. Table 1 and 2 shows properties of Cotton Nettle mix, cotton and Nettle yarn spun.

Methods

The methods consist of Research Methodology and Testing Methodology.

There are two processes involved in the research namely,

- Spinning for the development of cotton and Nettle yarn and their blends.

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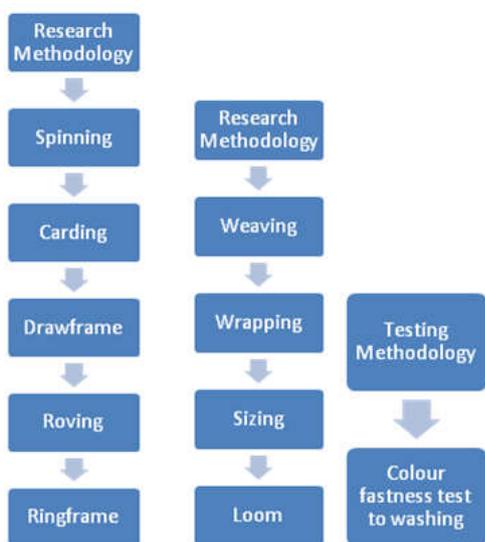
- Weaving for the development of plain and twill structure of Cotton/Nettle fabrics.
- The following flowchart shows the steps involved in reaching to research and test methodology.

Table 1. Fiber material properties

Sno	Material Properties	Nettle	Cotton
1	Fiber length	74mm	32mm
2	Fiber denier	1.10	1.37
3	Fiber strength (cN tex-1)	30-35	15-50
4	Fiber elongation%	2.5	10

Table 2. Fiber blend ratio and twist

Sno	Fibers	Blend ratio	Twist
1	Nettle	100%	Hand spun
2	Cotton	100%	8s
3	Cotton X Nettle	60%X40%	3s, 5s,6s,7s,8s



The Nettle and Cotton fibre, which are used for this research, properties have been studied using standard testing method using appropriate testing instrument as shown in Table 3.

Table 3. Fibre Properties testing method

Sno	Fibre Properties	Instrument for testing	Standards
1	Length	Comb sorter	ASTM D1440
2	Strength	Stelometer	ASTM D1445
3	Elongation	Stelometer	ASTM D1445
4	Fineness	Micronaire instrument	

The Nettle, Cotton and their blended yarns used for this research, were tested using standard testing method using appropriate testing instrument as shown in Table 4.

Table 4. Yarn properties Testing Method

Sno	Yarn Properties	Instrument Used	Standards
1	Yarn Strength	Lea strength tester	ASTM D1578

The woven samples of Nettle, Cotton and their blended yarns were made on handloom and their properties have been studied using standard testing method using appropriate testing instrument as shown in Table 5.

Table 5. Fabric geometrical testing methods

Sno	Fabric Properties	Instrument for testing
1	EPI	Manual
2	PPI	Manual
3	Cover Factor (EPI X PPI)	Manual
4	Fabric GSM	Manual

Method of Dyeing

The woven samples of Nettle, Cotton and their blended yarns were dyed using hot reactive dye. In this process eight samples were first dyed in reactive dye bath heating for 45 minutes with NaCl and Na₂CO₃. After dyeing, samples were rinsed in cold water to remove excess dye followed by drying.

Method of Wash Fastness

Colour fastness to washing is the common quality parameter, which is considered very important from the point of view of consumers. This test determines the loss and changes of colour and staining of colour during the washing process. As the sample to be tested is in fabric form a piece measuring 10cm by 4cm was cut from each of the printed fabrics. The specimen to be tested was placed between two specified pieces of undyed cloth measuring 5cm by 4cm, and the three pieces were held together by stitching round the edges, leaving 5cm by 4cm of the printed sample exposed. The pieces of the undyed cloth enable the degree of staining during test to be assessed. The ISO currently recommended five (5) tests intended to provide information over the whole range of domestic and commercial washing conditions. These test increase in severity from No1 – No5, but in the case of this study the sample were subjected to ISO2 tests conditions. For ISO2, the sample was washed with 5g/l of soap in a solution with liquor ratio 50:1, at a temperature of 50°C, for 45mins, then rinsed properly with water and dried. The change in colour of the tested specimen and the staining of the adjacent undyed cloths were assessed with the appropriate grey scales.

RESULT AND DISCUSSION

The detail of the woven samples of Nettle, Cotton and their blended yarns for geometric details is shown in Table 6.

Table 6. Fabric geometrical details

Fabric	Yarn Count	Ends Per Inch	Pick Per Inch
100% cotton	3s	30	28
Cotton x Nettle	3s	24	24
Cotton x Nettle	5s	24	24
Cotton x Nettle	6s	26	22
Cotton x Nettle	7s	26	22
Cotton x Nettle	8s	26	24
100% Nettle	8s	24	24

Colour Fastness Test to Washing

The eight varieties of woven samples including 100% cotton, 100% nettle and nettle cotton blended samples were made in plain and twill weave on handloom machine. The eight varieties developed were tested for colour fastness to washing under the ISO2 wash fastness test. It was found that the 100% Nettle fabrics show excellent wash fastness property which may be probably due to the excellent uptake of the dyes by 100% nettle fabric sample. However the blended fabrics show

very good to excellent wash fastness rating in the ISO2 wash fastness test as compared to the 100% cotton which has a good to very good wash fastness rating. The results are shown in Table 7

Table 7. The ISO2 Wash Fastness test

Samples	Yarn Count	Change in shade	Staining on cotton
100% cotton	8s	4	4
Cotton x Nettle	3s	4-5	5
Cotton x Nettle	5s	4-5	5
Cotton x Nettle	6s	4-5	5
Cotton x Nettle	7s	4-5	5
Cotton x Nettle	8s	4-5	5
100% Nettle	8s	5	5

KEYS: 5 = EXCELLENT 4 = VERY GOOD 3 = GOOD 2 = MODERATE 1 = POOR

Assessment of staining

The degree of staining of the adjacent white (undyed) cloth during test is assessed for staining using the Grey Scale. The results are manually analysed and it was found that except cotton there was no staining observed in any of the blended and 100% nettle samples.

Conclusion

It can be concluded that the difference in fastness to washing properties between 100% Nettle and blended samples after evaluation was minimal.

They differ only slightly in both wash fastness and staining, when measured using a grey scale. However, the 100% nettle fabric shows a higher fastness property both to washing and staining.

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