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Research Paper

Physical and mechanical properties of cotton/nettle union fabrics

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■ **ABSTRACT :** The naturalism trend has established sectors in the textile and fashion industry also. Nettle fibres will take a major role in the emerging "green" economy based on energy efficiency, industrial processes that reduce carbon emissions and recyclable materials that minimize waste. Natural fibres are a kind of renewable resources. These are also carbon neutral; they absorb the equal amount of carbon dioxide they produce. These fibres are completely renewable, environmental friendly and bio-degradability. Also, this paper focused on different properties of cotton/nettle union fabrics. The cotton/nettle union fabrics were constructed to study the properties of fabric. To construct cotton/nettle union fabric, the cotton yarn was used as warp with nettle weft. In the study, the fabrics were prepared with three different weaves (plain, twill and basket weave). Union fabric was much cheaper in cost compared to pure nettle fabric. Those woven fabrics were tested for physical and mechanical properties. Further, data were evaluated to find out the influence of physical and mechanical properties.

■ **KEY WORDS:** Cotton/nettle union fabric, Physical, Mechanical properties

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The nettle plant was earlier used extensively in Europe for making clothes, until 16th century when cotton was brought to the country, probably through India. Organically produced fibres are in demand by the global green textile industry and show potential which is economically promising. Many researches and arguments led to a conclusion that cotton, despite being a natural fibre, is one of the most unsustainable crops owing to the extensive use of fertilizers and pesticides in its production. Nearly a quarter of all the pesticides used in the world are sprayed on the cotton plants. And the other important fibre of silk is engulfed in a moral war of being cruel. Even though concepts like 'organic cotton' and '*Ahimsa*' silk have well been established, the costs and labour involved in their production are quiet high. Global textile industry has been looking for alternative fibres which can reduce our heavy reliance on cotton. As a result, minor natural fibres like jute, hemp, linen, etc. have gained popularity in commercial textiles since last two decades. Nettle can be considered as one of the latest to be added in the list of possible commercial fibres (UBFDB, 2011). Many experiments have been conducted not only in developing commercial textiles using nettle, but also in the growth and propagation of the crop in the most sustainable manner. Significant progress has been made in the processes of farming and

Table A : Instruments used for fabric testing

Name of equipments	Make	Purpose	Test method
Electronic balance 200B	Ramp tmpex; New Delhi	Weight per unit area of fabric (GSM)	IS 1964-1970
Tensile Strength Tester	SDL Atlas; UK	Tensile Strength	IS 1969-1985
Thickness Tester	Prolific Engineers; Noida	Fabric Thickness	IS 7702-1985
Martindale Abrasion Tester	SDL Atlas; UK	Flat Abrasion Resistance Test	IS 12673- 1999

fibre extraction by many well known European organizations, institutes and companies. In the European countries, the high fashion houses are rediscovering the ecological and high quality textiles produced from nettle fibres. This new trend represents a relevant opportunity of green economy for the territories characterized by rainy weather. From the nettle, yarns of excellent quality are being produced which are thin, flexible and strong. Nettle fibre is soft, resistant and transpiring as the linen, and bright as silk. It is a natural hundred per cent biodegradable fibre. It owns antistatic and thermo-regulating properties. Depending on the kind of processing of the nettle fibre, light or heavy textiles can be obtained. Among the many qualities of the textiles obtained from the nettle fibres, the hypoallergenicity and the environmental sustainability are important. Nettle plants are resistant to any disease and vermin and therefore do not require any contaminating pesticides and herbicides. The plant just needs an excellent availability of water and an organized production can be realized only in the places characterized by rainy weather (Anonymous, 2005). The study was aimed at following objective:

– To prepare nettle union fabrics in different weaves using selected yarns.

– To analyse the physical and mechanical properties of the developed union fabrics.

■ RESEARCH METHODS

Cotton yarns were approved for nettle union fabric by the members of advisory committee. Cotton yarn of 2/20 and 2/24 counts were procured from Ludhiana city (Punjab) and nettle 6 Nm yarn was procured from Chamoli (Uttarakhand). For creation of three different types of textiles textures, plain, basket (variation of plain weave) and twill weaves were selected. A total of six samples using nettle yarn with cotton yarns in two different counts (given above) were prepared using selected weaves.

Developed fabrics were studied for physical and mechanical properties to analyse their suitability for product development. The physical properties studied were fabric weight, fabric thickness and dimensional stability. The mechanical properties analyzed were tensile strength and abrasion resistance.

■ RESEARCH FINDINGS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Details of developed union fabrics :

Six samples of union fabrics were developed using selected yarns. Cotton (2/20)/nettle (6Nm) was woven in plain (EPI=35, PPI=22), twill (EPI=48, PPI= 26) and basket (EPI=51, PPI=24) weaves. Samples in plain (EPI=39, PPI=26), twill (EPI=35, PPI=20) and basket (EPI=40, PPI=28) weaves were also woven using cotton (2/24)/nettle (6 Nm). Cotton (2/20) x nettle (6Nm) in plain, twill and basket weaves were coded as CN_1, CN_2 and CN_3, respectively; cotton (2/20) x nettle (6Nm) in plain, twill and basket weaves were assigned codes as CN_4, CN_5, CN_6, respectively.

Fabric weight and thickness :

The findings depicted in Table 1 revealed that fabric weight of CN_6 was 355.95 g/m^2, CN_3 was 335.35 g/m^2 and CN_2 was 298.55 g/m^2. The weight of sample CN_6 was considerably more than other fabrics. It was observed that fabric thickness of CN_3 was 1.81 mm, CN_6 was 1.75 mm and CN_2 fabric was 1.64 mm which was higher than the other union fabrics. It was concluded that fabrics with higher fabric weight and thickness were good for making home textile products *viz*: rug, table runner and cushion cover because these would retain shape well and, resist slippage and folds in use.

Dimensional stability :

CN_6 and CN_3 were more dimensionally stable in warp direction as compared to CN_4 (Table 1). The mean

Table 1 : Effect of yarn count on physical properties of union fabrics

Physical parameters	Union fabric codes*					
	CN_1	CN_2	CN_3	CN_4	CN_5	CN_6
Fabric weight (g/m^2)	286.5	298.55	335.35	286.7	283.45	355.95
Fabric thickness (mm)	1.395	1.645	1.81	1.26	1.53	1.755
Shrinkage (%)						
Warp	(-)4.1	(-)3.1	(-)1.0	(-)2.0	(-)2.3	(-)0.2
Weft	(-)1.2	(-)1.7	(-)1.7	(-)1.1	(-)2.1	(-)4.2

*Cotton (2/20) x Nettle (6Nm) = Plain (CN_1), Twill (CN_2), Basket (CN_3); Cotton (2/20) x Nettle (6Nm) = Plain (CN_4), Twill (CN_5), Basket (CN_6) weaves.

Table 2 : Effect of yarn count on mechanical properties of union fabrics

Mechanical parameters	Union fabric codes*					
	CN_1	CN_2	CN_3	CN_4	CN_5	CN_6
Breaking Strength (kg/sq.cm)						
Warp	310.97	266.7	295.3	323.9	346.9	409.5
Weft	298.5	410.2	353.5	279.6	212.2	248.9
Abrasion resistance (cycles)	1092	1060	1173	1242	1061	1311

*Cotton (2/20) x Nettle (6Nm) = Plain (CN_1), Twill (CN_2), Basket (CN_3); Cotton (2/20) x Nettle (6Nm)= Plain (CN_4), Twill (CN_5), Basket (CN_6) weaves.

value of shrinkage of CN_4 fabric was (-) 2.0%; whereas for CN_6 fabric, the mean value of shrinkage was (-) 0.2% and for CN_3 fabric it was (-) 1.0% in warp direction. Mean value of weft-wise shrinkage of CN_4 was (-) 1.1%, CN_1 was (-) 1.2% and mean value of shrinkage for CN_2 and CN_3 fabrics was (-) 1.7% each. The better weft-wise dimensional stability of CN_1, CN_4 fabric was due to compact yarn and fabric structure in which less space was left for shrinkage. Less shrinkage was considered good for fitted textile products like jackets, and cushion covers.

Breaking strength :

It was observed from the data in Table 2 that CN_6 exhibited more breaking strength in comparison to CN_5 and CN_4 for the warp direction. In terms of warp direction, the mean value for CN_6 was highest, *i.e.* 409.5 kg/sq.cm, whereas for CN_5 fabric it was 346.9 kg/sq.cm and for CN_4 fabric breaking strength was 323.9 kg/ sq.cm. Similarly, in weft direction also the higher mean value of CN_2 as compared to CN_1 and CN_3 meant higher breaking strength. It was considered good for textile products like jacket, stole, carry bag, cushion cover, rug, table runner, etc.

Abrasion resistance :

The abrasion for CN_3 was persisted at 1173 cycles and CN_4 fabric persisted 1242 cycles whereas for CN_6 the abrasion was noted with the value 1311 cycles. The results depicted that the CN_6 and CN_4 exhibited higher abrasion resistance as compared to CN_3 (Table 2). These were considered good due to durability and non-pilling quality for textile products of personal use like jackets, stoles, etc. besides rugs.

CN_6 and CN_3 were having more fabric weight and thickness compared to other fabrics. Dimensional stability of CN_3 was good as fabric was more compact due to yarn and fabric structure in which less space was left for shrinkage. CN_6 was having higher breaking strength in weft direction.

Bordros and Baley (2008) also found that nettle fibres have very good tensile properties and could also be suitable as reinforcing components in composite materials.

Conclusion :

The difference in the yarn count of the developed union fabrics led to difference in fabric weight, fabric thickness, and shrinkage in warp direction, breaking strength in warp as well as weft direction, and abrasion resistance. Union fabrics with higher fabric weight and thickness were good for making home textile products *viz*: rugs, table runners and cushion covers because these would retain shape well and, resist slippage and folds in use. CN_3 and CN_4 fabrics were more stable due to compact yarn and fabric structure in which less space was left for shrinkage. Less shrinkage was considered good for fitted textile products like jacket, and cushion cover. CN_6 was having higher breaking strength in weft direction.

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■ REFERENCES

Anonymous (2005). Fibres from nettle and hemp wild fibres natural fibres. *http://www.h:/Natural.htm* (retrieved on Oct 14, 2013).

Bodros, E. and Baley, C. (2008). Study the tensile properties of stinging nettle fibres (Uritica Diocia). *J. Composite Sci. Tech.*, **62** : 2143-2145

NITRA (2015). Northern India Textile Research Association *www.nitratextile.org* (retrieved on August 27, 2015).

UBFDB (2011). *Himalayan Nettle.* Uttarakhand Bamboo and Fibre Development Board. Uttarakhand, India.