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Research Paper

Study on the effect of acrylic/nettle union fabric

■ Neha Garg, Harinder Kaur Saggu **and** Kanwaljit Kaur Brar

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■ **ABSTRACT :** A study was performed on the acrylic/nettle union fabric to show the effect of physical and mechanical properties of union fabric. Here, the acrylic yarn was used in the warp direction and nettle yarn was used in the weft direction. Fabric weight of (AN_5) was 393.3 g/m^2, respectively. Fabric thickness of AN_5 fabric was 1.91 mm which was higher than the other union fabrics. It was concluded that fabrics with higher fabric weight and thickness were suitable 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 of AN_6, AN_1 fabric was more due to compact yarn and fabric structure in which less space was left for shrinkage. Less shrinkage was considered good for fitted textile products. AN_4 and AN_2 fabrics were found to be more durable as the breaking strength compared to other union fabric was considered good for textile products. Fabrics with codes AN_2 exhibited more abrasion resistance and were considered good for textile products for personal use and found to be durable.

■ **KEY WORDS:** Nettle, Acrylic, Union fabric, Properties

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See end of the paper for authors' affiliations

Neha Garg
Department of Apparel and Textile Science, College of Home Science, Punjab Agricultural University, Ludhiana (Punjab) India

India has been one developing nation where natural fibres have played an important role in generating income to a large number of rural farmers and artisans. The country is not only a major contributor to the world's output of natural fibres like cotton, wool and silk, but has also developed a niche in the production and exports of minor fibres like jute and coir. Apart from export, a lot of natural fibre production of India goes undocumented since it is mostly being grown and used at a local scale especially in villages. Traditional communities in Himalayas would extract fibre from locally available plants like *Bhang* (hemp) and *Kandali* (nettle) and used them for making ropes, cordages, sacks, etc. In India, the importance of these fibres- hemp and nettle have been realized in the recent past, when the global textile industry started looking at alternative fibres to substitute cotton (Bodros and Baley, 2008). Interest by Indian organizations in developing nettle fibre is a result of increased global awareness about the advantages associated with them and their possible commercial value. Since nettle plant is found in large quantity in the Himalayas, many organizations have come forward to search possibilities in nettle fibre and link it with rural development and livelihood generation in the hills (UBFDB, 2011 and Anonymous, 2005). Uttarakhand, became the 27th state of the Republic of India on November 9, 2000. The state can be divided into two political and cultural parts namely Kumaon and Garhwal. Being a new state, it was laden with the burden of establishing its local economy and development.

Licensed to its keen and diverse natural locales, and the presence of pilgrimage centres, the state predictably developed itself as place of tourist attraction (NHDC, 2011).

Acrylic fibres are produced by two basic methods of spinning (extrusion), dry and wet. In the dry spinning method, material to be spun is dissolved is a solvent. After extrusion through the spinneret, the solvent is evaporated, producing continuous filaments which later may be cut into staple, if desired. In wet spinning, the spinning solution is extruded into a liquid coagulating bath to form filaments, which are drawn, dried, and processed. The most of the acrylic fabric industries were established during the time period from 1960-1980. But acrylic production started between the years 1994-96. Most of the units brought the material in dyed form. All the units comprised of two types of looms, dobby loom and conventional looms with special draw box attachment. Plain, twill and dobby were the three types of weaves used for manufacturing acrylic fabrics. Plain, stripes and checks were three types of design woven by theses weavers. Most of the units produced width of 36", 38", 40", 48" and 52". Per loom production of acrylic fabric in one day was 30-35 meters which depended upon the type of fabric and condition of looms. The study was aimed at following objective:

– Preparation of nettle union fabrics in different weaves using selected yarns

– To analysis the physical mechanical properties of union fabric.

■ RESEARCH METHODS

The union fabric used in this experiment is made from acrylic and nettle. The acrylic and nettle yarns are used in the warp and weft direction, respectively. The acrylic yarn of 2/24 and 2/32 count were collected from the Ludhiana city (Punjab). Nettle yarn of 6 Nm was collected from the Chamoli (Uttarakhand). A normal hand loom was used to produce union fabric. The physical properties of the fabric through various treatments were tested in the Testing Northen Indian Textile Research Association Ghaziabad (NITRA).

The strength of the fabric was determined by the "Tensile Strength Tester" of SDL Atlas; UK (IS 1969-1985). The abrasion resistance of the fabric was determined by the "Martindale Abrasion Tester" of SDL Atlas; UK (IS 12673- 1999). The weight of the fabric is determined by the "Gram per square meter Electronic balance 200B" was tested Ramp tmpex; New Delhi (IS 1964-1970). The fabric thickness of the fabric was determined by "Thickness Tester" of Prolific Engineers; Noida (IS 7702-1985).

■ RESEARCH FINDINGS AND DISCUSSION

Total six samples of union fabrics were developed using above given yarns and weaves. Union samples in the selected plain, twill, basket weaves were also woven using acrylic (2/24)/nettle (6Nm). Acrylic (2/32)/nettle (6Nm) union fabric was woven in plain, twill, basket weaves.

Woven fabrics were physically and mechanically analyzed. The physical properties such as fabric thickness,

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

Physical parameters	Union fabric codes					
	AN_1	AN_2	AN_3	AN_4	AN_5	AN_6
Fabric weight (g/m^2)	297.05	331.65	330	306.7	393.3	350.65
Fabric thickness (mm)	1.685	1.47	1.735	1.275	1.91	1.855
Shrinkage (%)						
Warp	(+)0.4	(-)1.3	(+)0.6	(-)1.2	(-)1.8	(+)0.3
Weft	(-)0.3	(-)4.1	(-)4.1	(-)0.4	(-)1.1	(-)3.1
End per inch	40	42	31	36	65	36
Pick per inch	27	26	25	27	34	29
Mechanical properties						
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

*= [2/24x6= Plain (AN_1), Twill (AN_2), Basket (AN_3), 32/2x6= Plain (AN_4), Twill (AN_5), Basket (AN_6)]

fabric weight and dimensional stability and mechanical properties such as abrasion resistance and breaking strength were studied (Source: NITRA, 2015).

Physical/mechanical properties of developed union fabrics prepared with acrylic yarn (2/24, 2/32 count) in warp wise direction with the other yarns like nettle yarn of 6 Nm in the weft wise direction.

It was observed that in Table 1 AN_5 was 393.3 g/m^2 of the union fabric was higher than the AN_1, AN_2, AN_3, AN_4 and AN_6. Weighted gram/m^2 was gradually decreased with the different type of union fabrics. Fabric thickness of AN_5 was 1.91 mm the weight of sample AN_5 was considerably more than other union fabrics. It was concluded that fabrics with higher fabric weight and thickness were good for making home textile products. It was depicted that AN_1 and AN_6 were more dimensionally stable in warp and weft direction as compared to other union fabrics. The mean value of shrinkage of AN_6 fabric was (+) 0.3 whereas mean value of AN_1 was (-) 0.3. The reason for better dimensional stability of AN_6 was more 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. AN_5 EPI 65, PPI 34 was much higher than other union fabrics, respectively. Warp wise tensile strength of AN_6 (409.5 kg/sq.cm) was higher than other union fabrics and weft wise AN_2 (410.2 kg/sq.cm) was considerably more than other union fabrics. Warp and weft wise strength were gradually decreased by the different weaves. It was considered good for textile products like jacket, stole, carry bag, cushion cover, rug, table runner etc. Abrasion resistance AN_2 fabric persisted 1704 cycles. AN_2 exhibited more abrasion resistance as compared AN_1, AN_3, AN_4, AN_5 and AN_6 the abrasion was noted of the union fabric. Due to it had non-pilling quality.

Conclusion :

Nettle is a bio-degradable and environment friendly natural fibre. It is free from health hazard. Six sample of acrylic\nettle union fabric were made in different weave by using plain, twill and basket. Due to these good properties, nettle fabrics have considerable high price. At the same time, price of the 100% nettle fabric higher than the acrylic\nettle union fabric. That's why union fabric may be the replacement of 100% nettle fabric. Tensile strength of the union fabric was higher and Union fabric was cost effective than the 100% nettle fabric. That is why the demand of union fabric is increasing day by day instead of 100% nettle fabric. Hence the use of nettle is also increasing through diversified nettle products.

Authors' affiliations:
Harinder Kaur Saggu and Kanwaljit Kaur Brar, Department of Apparel and Textile Science, College of Home Science, Punjab Agricultural University, Ludhiana (Punjab) India

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