ANALYSIS OF CONSTRUCTIONAL AND PHYSICAL PROPERTIES OF HANDLOOM CORN HUSK UNION FABRICS

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ABSTRACT

The present work aimed at the development of union fabrics from corn husks, an agro-waste. Samples of union fabrics were developed in twill weave from 100% cotton warp and blended corn husk weft yarns. Different ratios of constituent fibres 70CH:30VR and 30CH:70HA were selected as per the spinning considerations. Both textile textures were tested for different physical and constructional properties. The experimental results indicated that the corn husk/hemp 30:70 blended CH₂ yarn exhibited higher count 1.31s compared to CH₁ corn husk/viscose rayon 70:30(0.74s). The thread count of the fabrics from blended CH₁ and CH₂ yarns was 165×47 per sq inch and 160×55 per sq inch, respectively. Higher weftwise breaking strength was observed in the case of CH₁ blended yarn fabric (230.10 g) as compared to CH₂ blended fabric, whereas 10.72%±1.64 elongation at break was higher in CH₂ blended yarn union fabric than CH₁(6.78%±0.07). Thickness (2.74 mm) of CH₁ fabric was more compared to 1.05 mm thickness of CH₂ blended union fabric. The stiffness (36.25 mm) of CH₁ blended union fabric were found higher than CH₂ blended yarn fabric, i.e. 33.52mm. Drap co-efficient of CH₁(68.33%) was higher than CH₂ blended union fabric. The result showed that both corn husk union fabrics were suitable for home-textiles and apparel such as blazer, coats, stoles, etc.

KEYWORDS: Corn Husks, Viscose Rayon, Hemp, Blend & Union Fabrics.

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INTRODUCTION

The characteristics of fibers or their ratio or process sequence ultimately influence the characteristics of blended yarns or fabric. Blending is an art which develops an intimacy of fibers of different nature in the yarn (Gill and Singh 2002). Surface look and the feel of textile material involve two characteristic groups of visible appearance and performance as the basic elements of fabric texture. Performance characteristics indicate the properties and functions of a material that must be tested by manipulating the fabric (Brannon 2011). The comprising fibers, weight and twist of yarn, weave and finish affect the woven textile textures, though for some other textures, size of stitches and size or weight of applied material and technique needs to be considered. All these variables affect the appearance of silhouette by the roughness or smoothness, bulkiness or stiffness and hardness or softness of a material, and also the color by either reflecting or absorbing light from the surface (Stone 2004). Fibers blending can achieve quality products that cannot be realized using one fiber type alone, and it can also reduce the cost by substituting less expensive fibers for more costly ones (Das *et al* 2009).

Corn husk bundle fiber has a natural golden yellow tinge, dry and lumpy look and good strength. The bundle strength of corn husk fibers was lower than other natural fibers which could be compensated by blending with suitable fibers (Archana *et al* 2017). Corn husk fibers can need innovative blending with other fibers. Since viscose fiber is considered a blend friendly fiber for being highly absorbent, soft, comfortable along with high affinity towards dye and good drapability (Jangala 2006), it was found suitable blend option for corn husk. According to Stout (1970), rayon is frequently preferred to make the fabric cost competitive, improve absorbency and affinity towards dye stuff, enhance comfort and decrease accumulation of static electric charge. Hemp (*Cannabis sativa L.*) is bast fiber, which is of considerable interest as it is strong, thick and durable (Kymalainen 2004). Mirjana *et al* (2008) reported that in recent years, hemp fiber has attracted considerable attention because of its good antibacterial properties along with unique appearance and feel. Blended fabrics can be created with the variegated novelty effect that caters to the fashion world today. Hence, the present study was planned with the below-mentioned objective.

To study the constructional and physical parameters of corn husk blended yarn union fabrics.

MATERIAL AND METHODS

Procurement of Material

Viscose rayon fibers were procured from the Dev Woollen Mills, Ludhiana and hemp fibers from the Uttarakhand Bamboo and Fiber Development Board (UBFDB) Dehradun, Uttarakhand. The corn husk fibers were extracted by a chemical process. Cotton yarn of 2/20s yarn count was procured from the Dehradun.

Testing Physical Properties of Blended Union Fabrics

To compare the performance of handloom union fabrics were developed. These fabrics were comprised of 100% cotton warp and 70:30 corn husk/viscose weft; and 100% cotton warp and 30:70 corn husk/hemp blended handspun weft. The testing of physical properties of corn husk union fabrics was done by the North Indian Textile and Research Association (NITRA), Ghaziabad using standard testing methods. The union fabrics were tested for their physical properties such as breaking strength, elongation at break, thread density, thickness, stiffness and drapability etc. and constructional properties according to IS methods.

Physical Properties of Blended Union Fabric

Breaking strength (IS: 1969-1985), elongation at break (IS: 1969-1985), thickness (IS: 7702-1985), stiffness (IS: 6490) and drapability (IS: 8357).

Constructional Properties of the Blended Union Fabric

Yarn count (IS: 1315-1977 (Reaffirmed-1999) and thread density (IS: 1963-1981).

RESULTS

The results of the work done are explained below

A blending of corn husk/viscose rayon (70CH:30VR) and corn husk /hemp (30CH:30HA) in blending ratios was not explored earlier. Both union fabrics were assessed for the following properties to find out their suitability for apparel and home textiles manufacturing. So, the results of the efforts made in this direction have been presented in this section.

Analysis of Constructional Properties of the Blended Union Fabrics Developed from Corn Husk Fibers

This section included constructional properties of the developed blended union fabrics. The constructional properties examined were thread density, yarn count, the weave and fabric structure of the blended union fabric from corn husk fibers (NITRA 2016).

Table 1: Constructional Properties of the Blended Union Fabrics from Corn Husk Fibers

Constructional Properties		Corn Husk Blended Union Fabrics (CH ₁ and CH ₂)	
Fiber content	(warp)	Cotton	Cotton
	(Weft)	Corn husk/viscose rayon (70:30)	Corn husk/hemp (30:70)
Yarn count (Ne)	(Warp)	2/20s	2/20s
	(Weft)	0.74s	1.31s
Fabric structure	EPI	165	160
	PPI	47	55
	Fabric count (per sqinch)	165 x 47	160 x 55
Weave		Twill	Twill
Cloth width		29"	29"

EPI=End per inch, PPI= Picks per inch

The union fabrics were comprised of (2/20s C×CH₁70:30) of yarn count 0.74s, and 2/30s C×CH₂ 30:70 of yarn count 1.31s (Table 1). The twill woven union fabrics were observed for ends per inch and pick per inch. The thread count was 165 x 47 per sq inch for CH₁ (70:30), whereas total thread counts for CH₂ (30:70) was found 160x55 per sq inch. There was difficulty in the spinning of CH₂fibres in 50:50 ratios. Thus, a ratio of 30:70 was selected for CH₂.

Analysis of Physical Properties of the Blended Union Fabrics from Corn Husk Fibers

The physical properties examined were mass weight (GSM), breaking strength, elongation, stiffness, thickness, abrasion resistance and drapability of the union fabrics developed from corn husk fibers (NITRA 2016).

Figure 1: Physical Properties of Corn Husk Blended Union Fabric

Table 2: Physical Properties of the Corn Husk Blended Union Fabrics

Test Parameters	Corn Husk/Viscose Rayon (70:30) Union Fabric CH ₁	Corn Husk/Hemp (30:70) Union Fabric CH ₂
Breaking strength (kg/sq. cm)		
Warp (100% cotton yarn)	308.00 ± 2.500	390.70 ± 67.08
Weft (blended yarns)	230.10 ± 27.30	130.85 ± 0.687
Elongation at break (%)		
Warp (100% cotton yarn)	20.03 ± 2.06	16.16 ± 0.21
Weft (blended yarns)	6.78 ± 0.07	10.72 ± 1.64
Thickness (mm)	2.74 ± 0.08	1.05 ± 0.03
Stiffness (mm)		
Warp (100% cotton yarn)	15.75 ± 0.08	16.17 ± 0.05
Weft (blended yarns)	36.25 ± 0.06	33.52 ± 0.09
Drape co-efficient (%)	68.43 ± 2.18	67.61 ± 0.64

CV%= Coefficient of variation

Note: *C=Cotton *CH=Corn husk *VR=Viscose rayon *HA=Hemp

CH₁= Corn husk/viscose rayon (70:30), CH₂= Corn husk/hemp (30:70)

The union fabric CH₂ (2/20C×CH/HA30:70) exhibited higher breaking strength in warp direction as compared to CH₁ fabric (2/20C×CH/VR70:30). But in the weft direction, CH₁ fabric (2/20C×CH/VR 70:30) was having the higher breaking strength in comparison to CH₂ fabric (CH/HA30:70weft). The observed mean value of breaking strength of CH₁ fabric (2/20C×CH/VR 70:30) in warp direction was 308.00±2.500 kg/cm², whereas in case of union fabric CH₂ (2/20C×CH/HA30:70) it was 390.40±67.078 kg/cm². The fabric weight of CH₁ was 451.92 g/m² and CH₂ was 474.88 g/m². The weight of sample CH₁ was much more than other fabric. The abrasion for CH₁ and CH₂ resulted in no thread break after up to 10,000 cycles (9kpa pressure).

Union fabric CH₁ (2/20C×CH/VR30:70) exhibited higher elongation (20.03%± 2.06) compared to union fabric CH₂ (2/20C×CH/HA70:30) which was 16.16%±0.21 in the warp direction. Elongation at break of CH₂ (10.72% ± 1.64) fabric (CH/HA30:70) was found to be higher in the weft direction (Table 2). The thickness of union fabric CH₁ and CH₂ was found 2.74 ± 0.08 mm and 1.05 ± 0.03 mm, respectively. In case of weft direction, the stiffness (36. 25 ± 0.06 mm) of union fabric CH₁ was observed higher than CH₂ fabric (33.52 ± 0.09 mm). The higher drape coefficient (68.43%± 2.18) of union CH₁ fabric (2/20C×CH/VR 70:30) was found than union fabric CH₂(2/20C×CH/HA70:30) (67.61%±0.064). The lower value of drape coefficient for CH₂ (30:70) was responsible for its better drapability. According to Angappan and Gopalkrishnan (1997), the drapability can be improved by providing more floats along the length by reducing the number of interfacing in the weave repeat.

CONCLUSIONS

Twill woven union fabrics 2/20cotton×corn husk/viscose rayon 70:30 and 2/20 cotton ×corn husk/hemp30:70had exclusive texture for a designers appeal. Thickness, thread count, the size of the yarn and drapability of the fabrics rendered both the union fabrics suitable for coats, jackets or tailored clothing, home textiles and technical applications. There is the potential for creating wealth from waste.

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