World Journal of Advanced Engineering Technology and Sciences
eISSN: 2582-8266
Cross Ref DOI: 10.30574/wjaets
Journal homepage: https://wjaets.com/

(RESEARCH ARTICLE)

Check for updates

Mock leno weave design-preparation on jute cotton union fabric

Khaled Saifullah, Zakaria Ahmed * and Mohammad Maniruzzaman

Mechanical Processing Division, Technology Wing, Bangladesh Jute Research Institute, Manik Mia Avenue, Dhaka-1207.Bangladesh.

World Journal of Advanced Engineering Technology and Sciences, 2023, 10(02), 150–154

Publication history: Received on 28 October 2023; revised on 05December 2023; accepted on 08 December 2023

Article DOI: https://doi.org/10.30574/wjaets.2023.10.2.0299

Abstract

In the Weaving department of the Mechanical Processing Division of the Bangladesh Jute Research Institute, Dhaka, the characteristics of union fabric made of jute and cotton with a fancy weave design were investigated. The goal of this study is to create jute-cotton union fabric with a Mock leno weave pattern for a variety of applications. 10/2 cotton yarn was used for the warp, while 17 lbs/spy jute yarn was utilized by the weft. The elaborate union fabric was created using a Mock leno weave pattern with a repeat size of 12 by 12.

Keywords: Fancy Weave; Jute; Union Fabric; Mock leno

1. Introduction

Textile refers to any material made through weaving, knitting, crocheting, braiding, and other non-woven textiles. Development of textile involves complete cycle right from the development of fiber to fabric ranging from 100% natural fibers to 100% synthetic materials. Additionally, it entails a comprehensive plan for creating fresh design elements for fabric surfaces, textile goods, and other textile materials. It covers the designing of textiles for clothes, home goods, décor, and other uses. In addition to developing the finished product within the technical specifications and at the appropriate commercial value, it entails design intervention. (Yuhazri et al 2016). Jute is the crop with unique nature and singular importance among the various field crash crop of Bangladesh. A substantial amount of total foreign exchange is still carried with jute and jute based products (Chowdhury et al 2008). Jute is the cheapest natural textile fibre. It is mainly used in manufacturing packaging and coarse fabrics such as Hessian, Carpet backing and sacking etc. due to cheaper cost, high strength, flexural rigidity, bulkiness and non-elastic properties. It had practically enjoyed monopoly in these fields until the middle of sixties. Since last couple of decades the market prospect for the above traditional jute goods have declined due to stiff competition from synthetic substitutes (Shahabuddin et al 1994, Yang et al 2015). Mock leno Weaves form open structures with small gap. This Type of weave produces an imitation of leno effect, So it is called mock leno weave. There are many applications such as upholstery (coverlets, curtains) linens, garment fabrics. The distorted mock leno weaves are constructed in two styles - Warp way distorted mock leno weave and Weft way distorted mock leno weave. Mock leno is used in light dress fabrics, aprons, blouses, canvas fabrics, and inexpensive window curtain materials, among other things (Chu and Chen 2010, Saifullah 2011). The following are this weave's primary characteristics: It is made using standard procedures without the need for special leno shafts and has an open perforated weave similar to that of leno fabrics. This weave is quite similar to the huckaback weave, however the denting technique is different because thread grouping must be encouraged. Groups of the weave with varying sizes make up the arrangement. Threads floating on the face or back of the fabric alternate with threads operating in plain weave. When feasible, the ends of each individual group are dragged into the same dent, bunching the floating ends together and creating a tiny gap or opening in the fabric that resembles a gauze or leno weave—thus the term "mock leno." This weave can also be divided diagonally into two equal halves. Its smallest repeat size is 6X6. Even number repetition sizes are typically utilized to generate this pattern (Chu and Chen 2010). In order to save jute in competition

*Corresponding author: Khaled Saifullah, Zakaria Ahmed

with synthetics commercial exploitation the new jute products have become vitally important. Pilot scale production and development of new jute fabrics are needed to popularize them among the general people there by encouraging local entrepreneurs toward the use of new jute products. Ultimately it will increase the importance of jute. The main objective of this work was to produce diversified jute fabric as well as to assess its different physical properties i.e. Gram per Square Meter (GSM), Tensile Strength, Abrasion Resistance, Stiffness etc. for producing popular end products with this fabric.

2. Materials and methods

The experiment was conducted in the Weaving department of Mechanical Processing Division and in the Testing department of the Physics Division, Bangladesh Jute Research Institute (BJRI), Dhaka, Bangladesh.

2.1. Sample collection

Cotton yarn of $10/2^s$ as warp was collected from local market and jute yarn of 17 lbs/spy as weft sample was collected from Spinning department of Mechanical Processing Division, Bangladesh Jute Research Institute where the specification of the fabric is given in **Table 1**.

Table 1 Specification of the fabric

Jute yarn count(weft):	17 lbs/spy
Cotton yarn count(warp):	$10/2^s$
Weave design:	Mock leno
Ends/inch:	42
Picks/inch:	18
Fabric width:	70 inch
Loom speed:	270 rpm
Name of Loom:	Picanol GTX plus (double rapier)

2.2. Machineries

Various machineries of Mechanical Processing Division, Bangladesh Jute Research Institute were used in present research, such as- Softener, Breaker card, Finisher card, Draw frame, Spinning frame, Beaming Machine and Picanol double rapier loom.

2.2.1. Mock leno weave design

The experimental fabric was woven in the weaving department of BJRI. With beaming machine, a warp beam was produced with $10/2^s$ count 100% cotton yarn. Cotton yarn was collected from local market. Then with this warp beam drawing and denting is performed in 6 healed-shaft as per Mock leno weave design (Belal 2009) (**Fig. 1**).

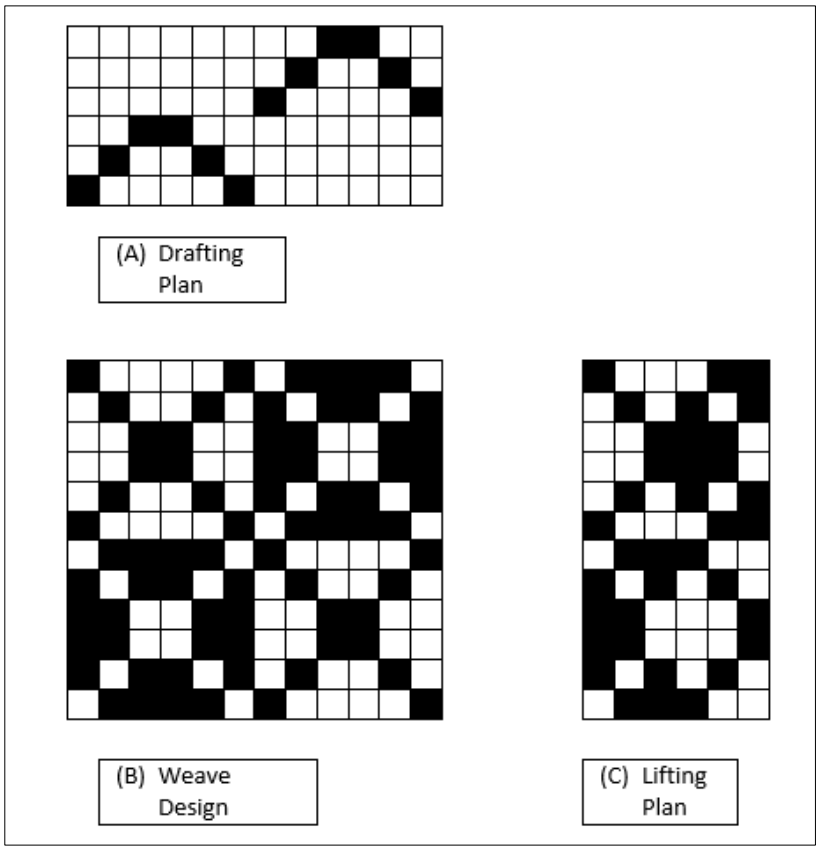

Figure 1 Mock leno weave fabric design- (A) Weave design, (B) Drafting plan, (C) Lifting plan

2.2.2. Steps of weaving

Sizing for warp yarn was omitted due to coarser warp yarn and density of ends/inch was not high. Number of ends per inch was 42. Then the beam is mounted on the loom. Fabric was woven on Picanol GTX-Plus double rapier loom. 17 lbs/spy jute yarn was used in weft way direction which was collected from experimental spinning mill of BJRI.

2.2.3. Physical properties of the fabric

The Physical properties of the fabric such as weight (GSM), stiffness, tensile strength, abrasion resistance etc. were tested in Textile Physics division of BJRI as per standard method.

3. Results and discussion

This was an experimental weave with a repeat size of 12 by 12. It is also possible to divide this weave diagonally into two equal pieces. It was made using standard procedures without the use of unique leno shafts (**Fig. 2**).

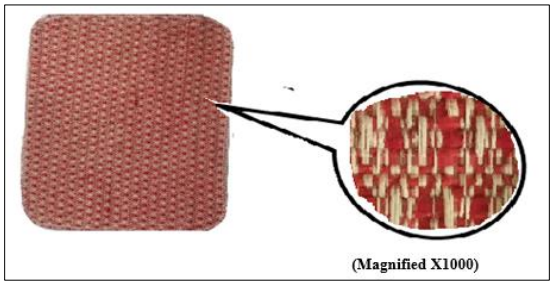

Figure 2 Prepared Mockleno weave fabric

Gram Per Square Meter (GSM) of the fabric is high due to coarser weft yarn (17 lbs/spy). For the same reason weft way tensile strength is higher than warp way tensile strength. Abrasion resistance of the fabric is more than 5000 (**Table 2**).

Table 2 Physico-mechanical properties of Mock leno fabric

Sample	**Weight (Gm/sq. m)**	**Tensile strength (kg)**		**Abrasion Resistance**	**Stiffness (cm)**	
Mock leno fabric	315	Warp way	Weft way	More than 5000	Warp way	Weft way
		49.13	138.64		2.51	5.92

The warp threads of a leno weave are twisted out of place both before and after they interlace with the filling yarn. This unique weaving architecture is known as a leno weave (Jawaid et al 2011, Yang et al 2015). This indicates that the filling yarn is effectively encircled by the warp strands, forming tiny figure eights around them. Leno weaves are created by twisting adjacent warp yarns around one another and then passing the filling yarn through the twisted warps. They are also created using a particular attachment and are typically lightweight and open, giving the appearance of lace. A cloth woven on the leno principle is significantly stronger than other fabrics with an equivalent number of ends and picks per inch of the same yarns because of the crossing of the warp threads, which gives the fabric a very rigid structure. According to Shaker (2017), the imitation leno weaves resemble real leno weaves in appearance. Some of the ends of a mock leno weave have long floats, while other ends are frequently interlaced. The thread groupings have left tiny holes in the fabric. A 12 by 12 repeat mock leno weave with drawing and lifting plan included. The mock leno weave is constructed in the combination of plain, twill and satin mostly. There two kinds of mock leno weave are produced-perforated mock leno weaves and distorted mock leno weaves (Yang et al 2015). Stiffness of the fabric is also high in weft way direction. Tensile strength of the fabric is good in both directions. Because of the decorative all over effects the end uses of the fabric range from curtains to table linen, car seat cover and sofa cushions.

4. Conclusion

A modern Rapier Loom (with 180 picks/min) can produce 15 yards per hour i.e. about 120 yards of jute-cotton union fabric per shift (8 hours). It is possible to make the fabric more attractive by using colored cotton yarn on the warp side and colored jute yarn on the weft side. Jute-cotton union Mock leno fabric which are biodegradable, non-toxic, non plastic, eco-friendly and easily disposable. Multi-fibers concept of blending Jute with other natural fibers, Jute has bright future for using them in the various textile areas. It is value added because the price of manufactured cloth increases several times compared to the required raw materials. Different designs of products can be made with this fabric including laptop bags, file covers, hot-pot bags, curtain fabrics, fashionable bags etc.

Compliance with ethical standards

Acknowledgments

This research was supported by Bangladesh Jute Research Institute. We thank our colleagues from Bangladesh Jute Research Institute for sharing their pearls of wisdom with us during the course of this research.

Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

References

[1] Belal S.A. (2009) Understanding Textile for a Merchandiser, p-211.

[2] Chowdhury N., Miazi M.O.G., Saifullah K. and Khan M.A.S. (2008) Determination of optimum twist of the jute blended yarn. Inter J Sustainable Agri. Tech.4(4): 31-34.

[3] Chu CK and Chen YL. (2010) Ballistic-proof effects of various woven constructions. Fibre and Textiles in Eastern Europe; 18(6): 63-67.

[4] Jawaid M, Khalil HA and Bakar AA. (2011) Woven hybrid composites - tensile and flexural properties of oil palm-woven jute fibers based epoxy composites. Materials SciEngi.: A; 528(15): 5190-5195.

[5] Shahabuddin M., Kabir K., Rahman M.H., Azad M.A.K. and Sheikh M.A.S. (1994) Studies on acrylic blended jute fabrics and their properties. Bangladesh J Jute and Fiber Res. 19(1): 47-51.

[6] Shaker A.M. (2017) Utilizing the Leno Weave Aesthetic Values in Teaching Weaving for Art Education Students. DOI:10.21608/IDJ.2017.89185; Corpus ID: 226937992.

[7] Saifullah K. (2011) Annual Technical Programme (Technology Wing). Bangladesh Jute Research Institute. p-58.

[8] Yuhazri M.Y., Amirhafizan M.H., Abdullah A., Sihombing H., SaarahA.B.andFadzol O.M. (2016) The Effect of Various Weave Designs on Mechanical Behavior of Lamina Intraply Composite Made from Kenaf Fiber Yarn. International Engineering Research and Innovation Symposium (IRIS), IOP Publishing; IOP Conf. Series: Materials Science and Engineering 160, 012021 DOI:10.1088/1757-899X/160/1/012021.

[9] Yang C.C., Ngo, T. and Tran, P. (2015) Influences of weaving architectures on the impact resistance of multi-layer fabrics. Materials and Design, 85:.282-295.