

Behavioural Analysis of Multi Design Woven Fabric

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ABSTRACT: The behavioural properties of fabric mainly depend on the structure of the woven fabric. It influences the tenacity, elongation and drape of the fabric. In this research work various structures of fabric were produced and their characteristics were studied. Mainly plain twill sateen and matt and its combined structure were produced with identical parameters. For producing the fabrics the yarn linear density, EPI, PPI and GSM were kept constant.

Key words: Tenacity EPI, PPI, GSM, Linear density

KEYWORDS: Woven fabric, Warp, Weft, Plain, Twill, Satin, Weave Structure.

I. INTRODUCTION

The literature survey reveals that the plain weave fabric is symmetrical, with good stability and reasonable porosity. In case of twill weave gives superior wet out and drape. In case of satin weave there are fewer binding points the weft yarns are able to bind together very tightly, creating a dense smooth fabric. The matt weave is fundamentally the same as plain weave except that two or more warp yarns alternately interlace with two or more weft yarns. As per the literature survey the properties of the basic weave has been listed in the following table.

| PROPERTY | PLAIN | TWILL | SATEEN | MATT |
|----------------|-------|-------|--------|------|
| Good Stability | B | C | D | D |
| Good Drape | D | B | A | C |
| Low Porosity | C | B | A | D |
| Smoothness | D | C | A | D |
| Balance | B | B | D | B |
| Symmetrical | A | C | E | C |
| Low crimp | D | C | A | D |

A – Excellent, B – Good, C – Acceptable, D – Poor, E – Very Poor

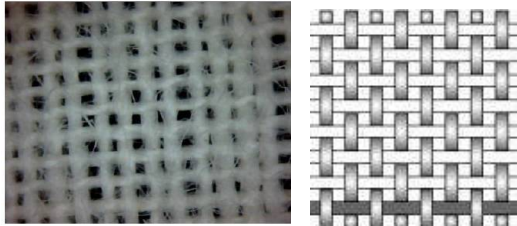
The investigation is made by producing the fabric by using plain weave, Matt weave, Twill weave, sateen weave and multi design weave. For all the structure the repeat size is 8 x8 and the EPI, PPI and Warp, weft count is kept constant. The fabric produced was analysed for the behavioural properties. The microscopic view and the interlacement pattern is shown below

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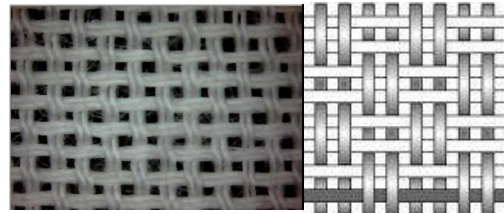
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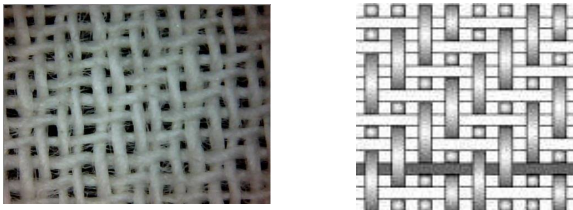
Plain Weave



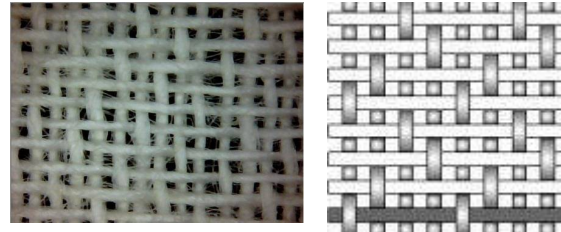
Matt Weave



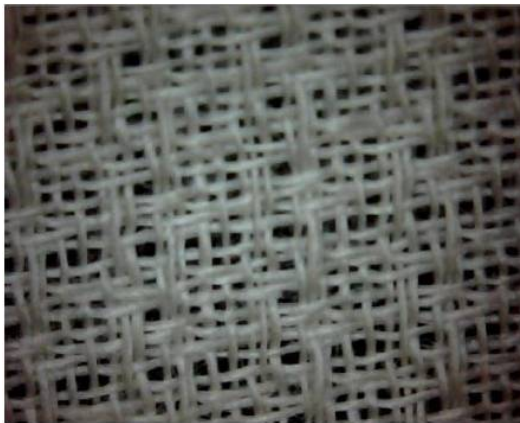
Twill Weave



Irregular Satin Weave



Structure of Multi Design Woven Fabric



| COMBINATION WEAVE | | | | | | | |
|-------------------|---|---|---|-----------------|---|---|---|
| MATT | | | | IRREGULAR SATIN | | | |
| | | X | X | X | X | X | |
| | | X | X | X | | X | X |
| X | X | | | X | X | | X |
| X | X | | | | X | X | X |
| | X | | X | | | X | X |
| X | | X | | | X | X | |
| | X | | X | X | X | | |
| X | | X | | X | | | X |
| PLAIN | | | | TWILL | | | |

The fabrics have been tested for different properties and the effect of multi design structure has been compared with the basic weave structured fabric.

II. MATERIAL & METHODOLOGY

The fabric was produced in plain, twill, sateen, matt and a combination of all the four designs (i.e) multi design fabric. The yarn used to produce all the samples is of cotton material with a 40's count. The yarn was woven into fabrics of different designs by using rapier loom.

PARTICULARS OF THE FABRIC

- Count of warp and weft yarn : 40s combed cotton yarn
- Weave: plain, twill, irregular sateen, matt, multi design.

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- Ends per inch : 80
- Picks per inch : 76
- Loom : Rapier loom

TEST PROCEDURE

The following tests were conducted on all the 5 fabric samples. The results of the tests help us in determining the enriched properties in the multi design fabric.

- Drapability
- Crease recovery
- Bending length
- Abrasion resistance
- Impact strength
- Air permeability
- Tensile strength
- Peak load
- Elongation
- Tearing strength
- Wicking

The average values of test results for the different fabric produced has been tabulated below (table II)

Table II

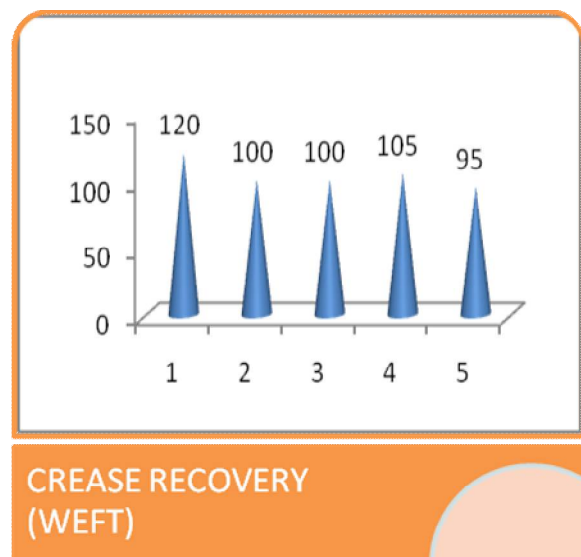
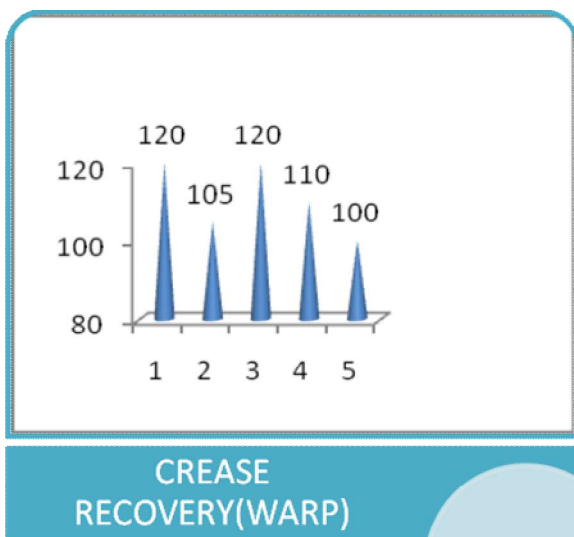
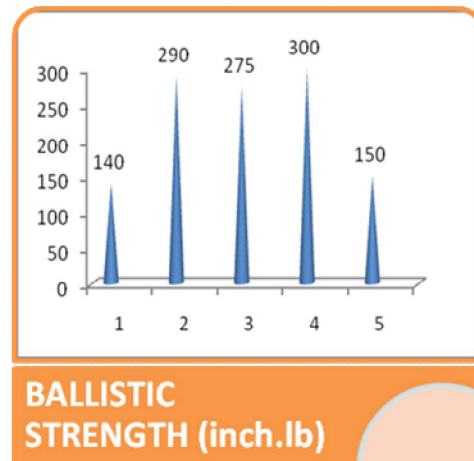
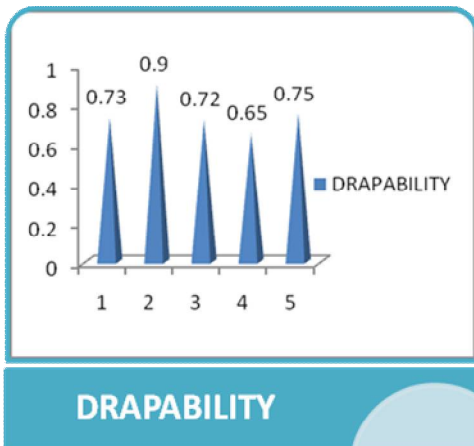
| Property | MULTI DESIGN | PLAIN | MATT | SATEEN | TWILL |
|-----------------------------------------|-----------------|-------|------|--------|-------|
| Drapability | 0.73 | 0.9 | 0.72 | 0.65 | 0.75 |
| Crease recovery(warp) | 120 | 105 | 120 | 110 | 100 |
| Crease recovery (weft) | 120 | 100 | 100 | 105 | 95 |
| Bending(warp) cm | 3.3 | 2.9 | 3.1 | 2.6 | 2.9 |
| Bending (weft) cm | 1.75 | 2 | 1.9 | 1.8 | 2 |
| Ballistic strength (inch.lb) | 140 | 290 | 275 | 300 | 150 |
| Abrasion resistance | 7 | 5 | 2 | 0 | 2 |
| Tearing strength | 3200 | 2880 | 2560 | 2752 | 3008 |
| Bending modulus | 65 | 17 | 10 | 72 | 17 |
| Elongation at break | 8 | 13 | 13 | 6.8 | 11 |
| Peak load comparison | 12 | 15 | 15 | 17 | 15 |
| Tensile strength | 161 | 212 | 203 | 98 | 212 |
| Air permeability | 39 | 17 | 44 | 47 | 35 |
| Wickability | 20 | 25 | 23 | 20 | 18 |

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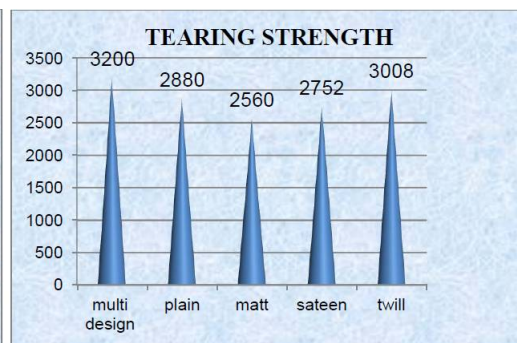
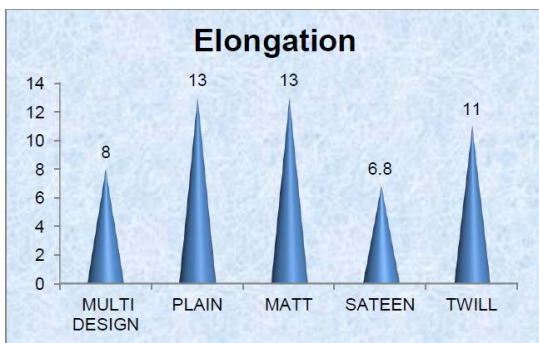
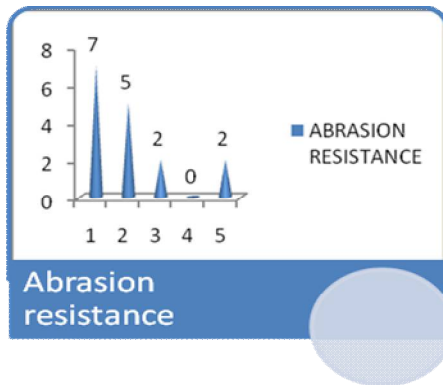
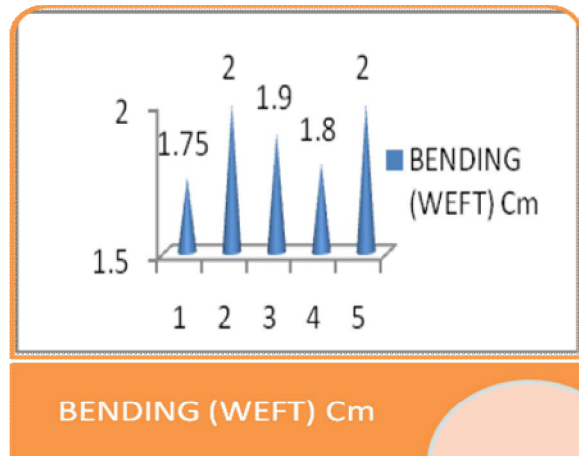
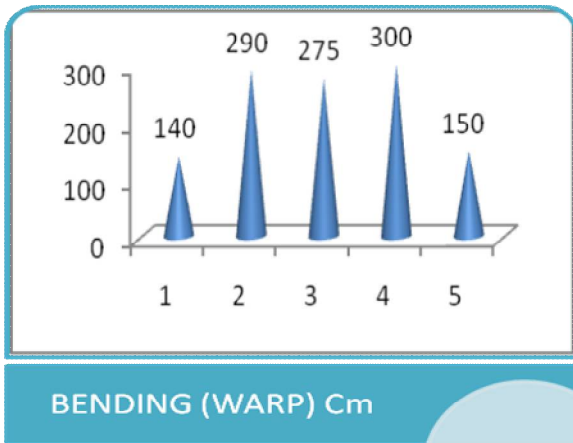
The results of the sample tested has been represented graphically as below



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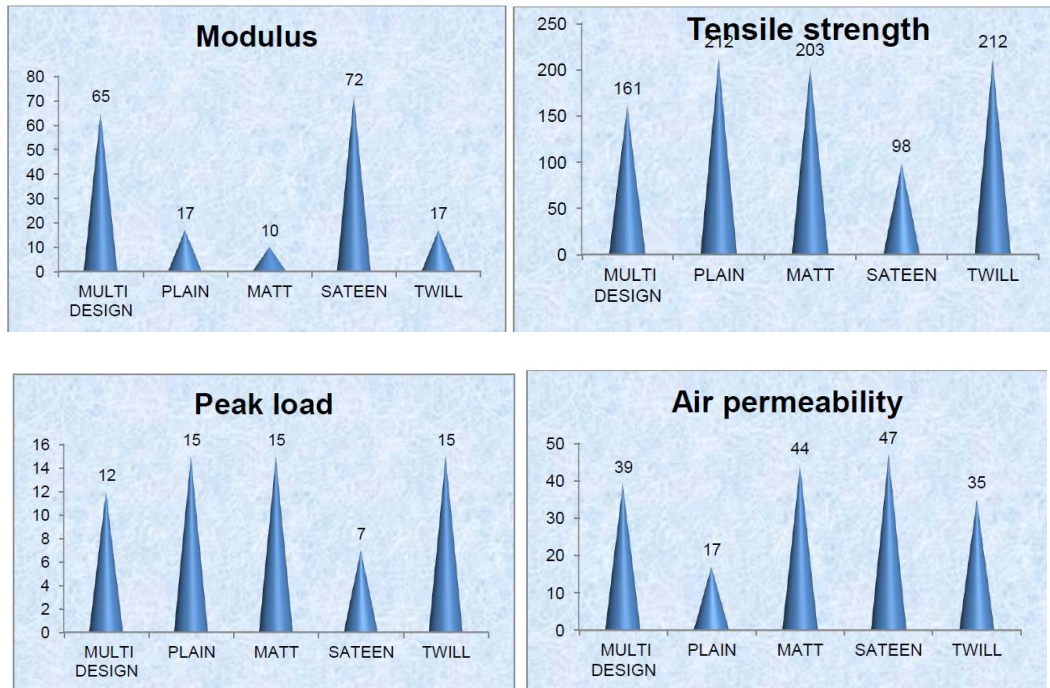
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1 .Multi design, 2. Plain weave , 3. Matt weave , 4. Satin weave 5.Twill weave

III. CONCLUSION

From the tested results the abrasion resistance, crease recovery tearing strength, bending modulus of the multi design woven fabric is giving better results when compared to other fabrics. The other properties of the multi design fabrics show no significant difference when compared to other woven structure. The consolidated results of the inference is shown in the table 2

Table 2

| PROPERTIES | TYPE OF FABRIC |
|---------------------|-------------------------|
| Drapability | Plain |
| Crease recovery | Multi Design And Matt |
| Ballistic strength | Plain And Sateen |
| Abrasion resistance | Multi Design |
| Air permeability | Matt And Sateen Weave |
| Tensile strength | Plain And Twill |
| Modulus | Sateen And Multi Design |
| Peak load | Plain, Matt, Twill |
| Tearing strength | Multi Design And Twill |

Thus by producing the multi design fabric and subjecting the material to various tests such as drapability, air permeability, tensile strength, abrasion resistance etc, the multi design material is found to have good crease recovery, abrasion resistance and tearing strength. In case of high abrasion resistance, this type of fabric can be used in the various fields such as seat covers etc., using different yarns either natural or manmade. It can also be used for geotextiles where abrasion resistance, crease recovery, tearing strength is high.

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