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EFFECT OF FABRIC STRUCTURE ON RIB FABRIC PROPERTIES

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Abstract

In this work,1×1Rib,1×1Skeleton rib, 2×2English rib, 2×2Swiss rib, 6×3Derby rib were produced with 20/2 Ne and 32/2 Ne combed ring yarn and V-bed knitting machine of 14 Gauge. In addition, Wales per 3cm, Course per 3cm, Stitch density, Stitch length, Tightness factor, GSM, Dimensional Stability of fabric were tested. According to test result, Wales per 3cm, Stitch density, Cover factor, GSM of 1×1Rib were higher than the 1×1Skeleton rib;Wales per 3cm, Course per 3cm, Stitch density, Stitch length, Cover factor, Shrinkage%, extension% of 2×2English rib were higher than the 1×1Rib; Wales per 3cm, Stitch density, GSM, Shrinkage%, extension% of 2×2Swiss rib were higher than the 1×1Rib; in 6×3Derby Rib values of the properties were higher than other structure; shrinkage and extension percentage increase with the increase of needle drop in knitting.

Keywords: Knitted fabric, cotton, wales per cm, course per cm, stitch density, Stitch length, tightness factor, GSM, dimensional change.

Introduction

The term knitting describes the technique of constructing textile structures by forming a continuous length of yarn into columns of vertically intermeshed loops (Spencer, 2001). There are two major varieties of knitting: weft knitting and warp knitting (Knitting Basics, 2004). Four primary structures –plain, rib, interlock and purl-are the base structures from which

all weft knitted fabrics and garments are derived (Spencer, 2001). Structure of rib fabric is most important factor for rib fabrics properties. Different structure show different value for wales per cm, course per cm, stitch density, stitch length, tightness factor, GSM, dimensional stability if the same yarn and machine setting are used.

Materials and method

100% conventional cotton raw material was taken to produce 20/2Ne and 32/2Ne combed ring yarn where TPI is 18 for 20/2Ne and 20 for 32/2Ne with nearly same machine settings.

We produced rib structure on Flat/V-bed knitting machine (14 gauge, 40 inch width). Here five rib fabrics 1×1Rib,1×1Skeleton rib, 2×2English rib, 2×2Swiss rib, 6×3Derby rib were produced.On each sample the following test parameters were measured: Wales per 3cm, Course per 3cm, Stitch density, Stitch length, Tightness factor, GSM, Dimensional Stability. Method of test for cotton weft knitted fabrics relevant to the starfish process control package. Relaxation system, Number of Visible Course and Wales per 3cm, stitch density, stitch length, mass per unit area, cover factor, dimensional changes are measured in B.S. 1051, 1981; ISO 139,1937

Results and discussion

Properties of some selected fabric structures named 1×1Rib,1×1Skeleton rib, 2×2English rib, 2×2Swiss rib, 6×3Derby rib from 20/2 Ne and 32/2 Ne combed ring yarn are shown in Table 1 & Table 2.

Properties	**32/2 Ne**				
	1 × 1 *Rib*	1 × 1 *Skeleton rib*	2 × 2 *English rib*	2 × 2 *Swiss rib*	6 × 3 *Derby rib*
Wales per 3cm	48	45	60	54	66
Courses per 3cm	33	33	36	36	33
Stitch density (cm^2)	176	165	240	216	242
Stitch length (mm)	4.146	5.02	4.303	4.94	4.30
Cover factor	1.465	1.211	1.412	1.234	1.414
GSM	242.52	191.48	336.62	282.34	324.18
Shrinkage%	2.062	3.252	5.111	7.12	9.199
Extension%	2.58	5.111	7.12	8.838	10.344

Table 1: Knitted fabric properties for 32/2 Ne

Properties	**20/2 Ne**				
	1 × 1 *Rib*	1 × 1 *Skeleton rib*	2 × 2 *English rib*	2 × 2 *Swiss rib*	6 × 3 *Derby rib*
Wales per 3cm	45	42	54	48	63
Courses per 3cm	30	30	33	33	30
Stitch density (cm^2)	150	140	198	176	210
Stitch length (mm)	4.18	4.69	4.53	5.08	4.324

Cover factor	1.834	1.211	1.696	1.513	1.78
GSM	423.01	352.11	530.89	505.32	565.37
Shrinkage%	1.198	2.785	3.162	4.501	8.063
Extension%	3.162	5.201	8.063	8.838	12.07

Table 2: Knitted fabric properties for 20/2 Ne

Wales per 3cm, Courses per 3cm, Stitch length & Stitch density (Spencer, 2001)

Stitch density refers to the total number of loops in a measured area of fabric and not to the length of yarn in a loop (stitch length). It is the total number of needle loops in a given area (such as a square inch, or three square centimeters). The figure is obtained by counting the number of courses or pattern rows in one inch (or three centimetres) and the number of wales in one inch (or three centimetres), then multiplying the number of courses by the number of wales.

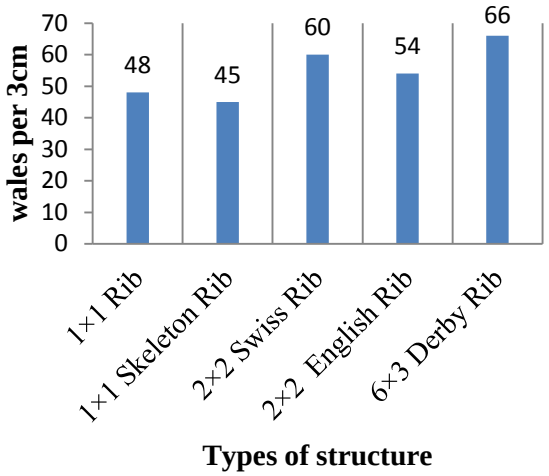

Figure 1: Effect of fabric structure on wales per 3cm for 32/2Ne

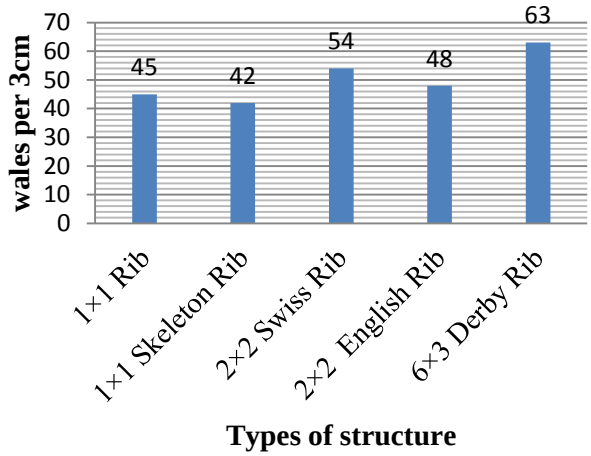

Figure 2: Effect of fabric structure on wales per 3cm for 20/2Ne

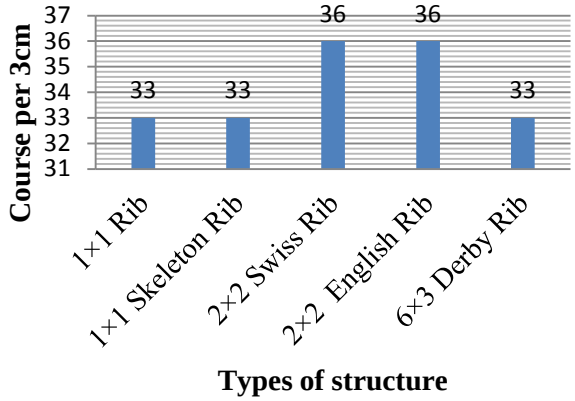

Figure 3: Effect of fabric structure on course per 3cm for 32/2Ne

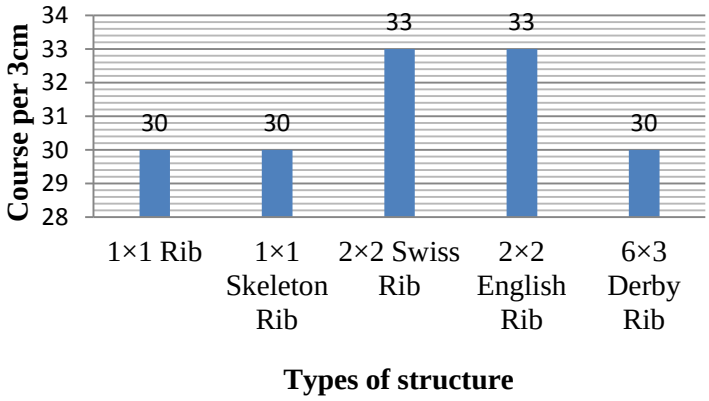

Figure 4: Effect of fabric structure on course per 3cm for 20/2Ne

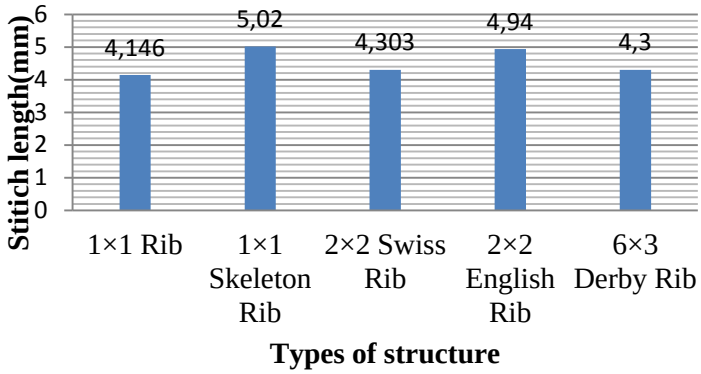

Figure 5: Effect of fabric structure on Stitch length (mm) for 32/2Ne

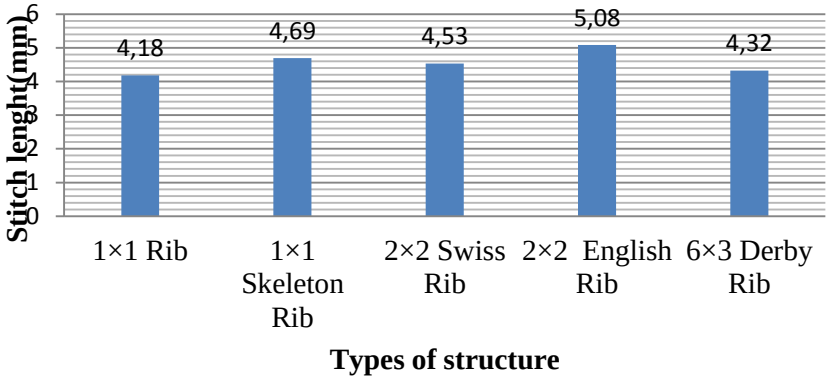

Figure 6: Effect of fabric structure on Stitch length (mm) for 20/2Ne

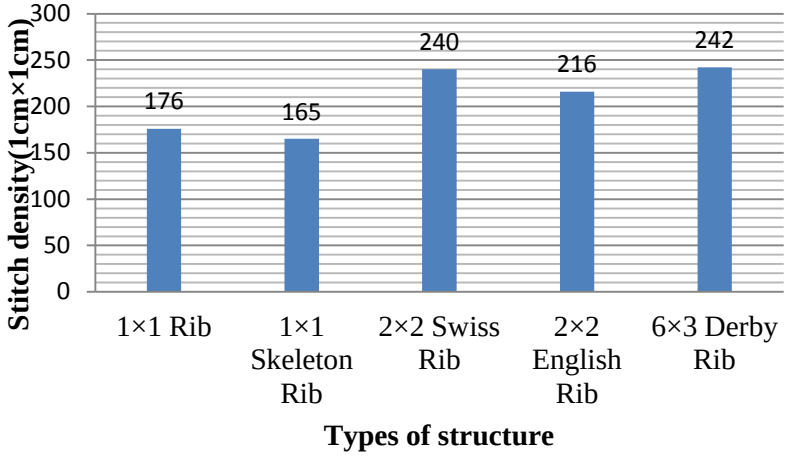

Figure 7: Effect of fabric structure on Stitch density (cm^2) for 32/2Ne

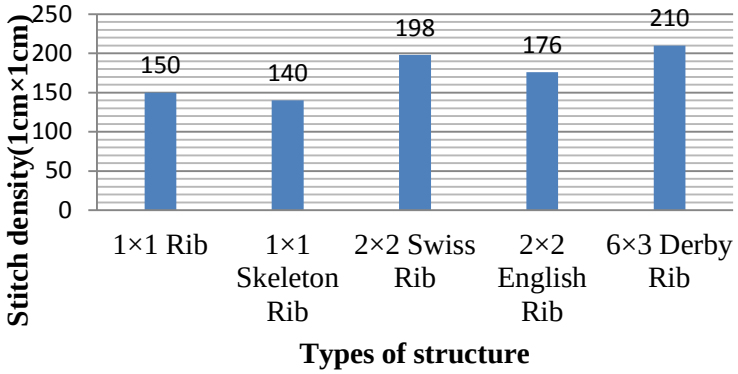

Figure 8: Effect of fabric structure on Stitch density (cm^2) for 20/2Ne

Cover factor (Hans-Karl Rouette, 2001)

A term used for the comparative assessment of knitted fabric density. The cover factor CF is calculated from the number of knitted courses c, the number of knitted wales w, and the yarn count Nm.

$$CF = \frac{c + w}{\sqrt{Nm}}$$

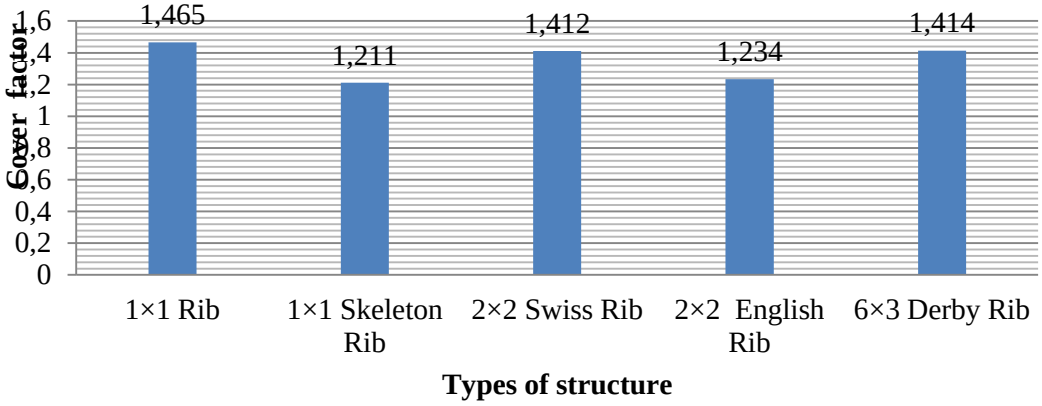

Figure 9: Effect of fabric structure on cover factor for 32/2Ne

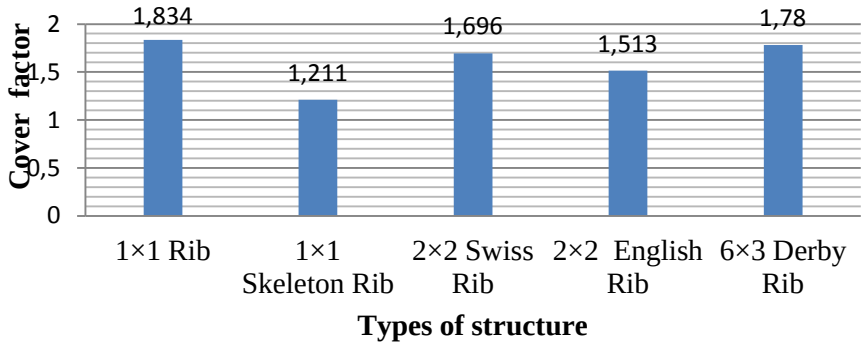

Figure 10: Effect of fabric structure on cover factor for 20/2Ne

Fabric weight (Hans-Karl Rouette, 2001)

Fabric weight may be expressed either as the weight per piece, per running metre, or per unit surface area. Weight per square metre: quotient of the weight and length of a single layer of fabric

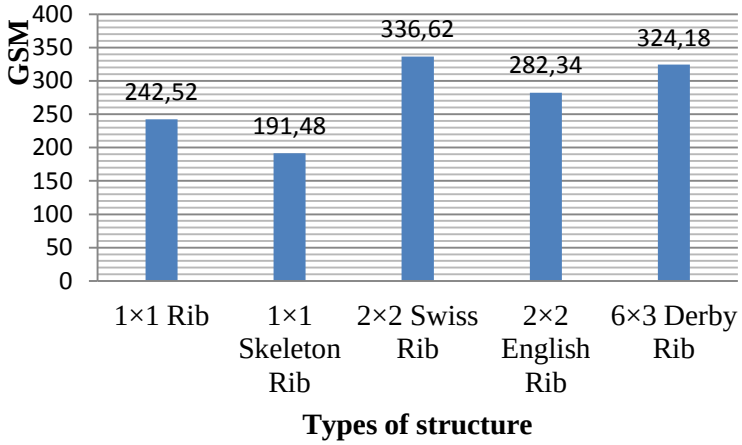

Figure 11: Effect of fabric structure on fabric GSM for 32/2Ne

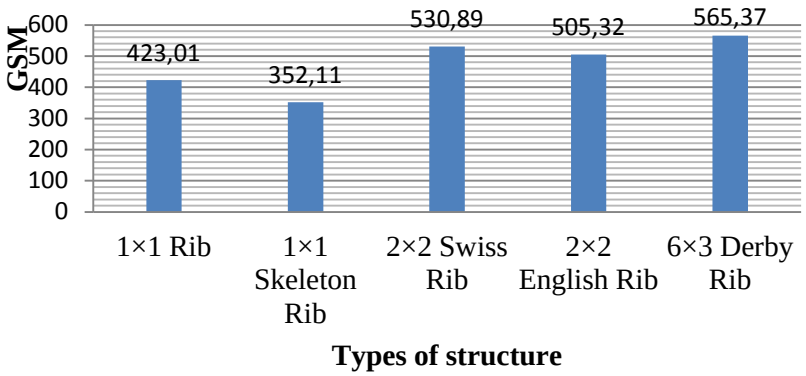

Figure 12: Effect of fabric structure on fabric GSM for 20/2Ne

Dimensional change (Hans-Karl Rouette, 2001)

Dimensional change is the change in length of a test specimen in the lengthwise and/or widthwise direction. Dimensional change is expressed as the ratio (in percentage) of the change in length induced by the treatment compared to the original (untreated) length and is given a negative prefix when the distance between the measurement marks is shorter (due to shrinkage) and a positive prefix when it is longer (due to extension).

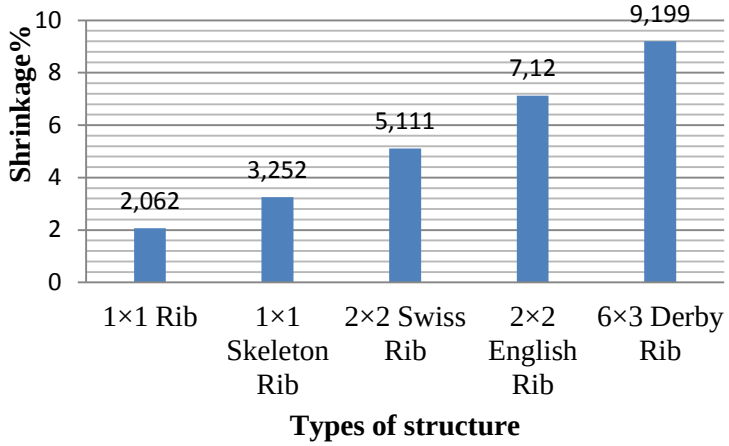

Figure 13: Effect of fabric structure on Shrinkage% for 32/2Ne

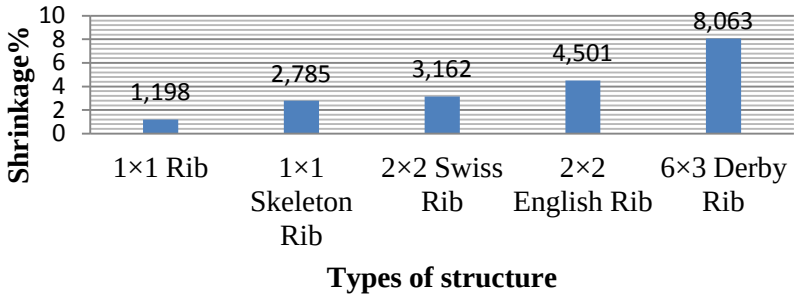

Figure 14: Effect of fabric structure on Shrinkage% for 20/2Ne

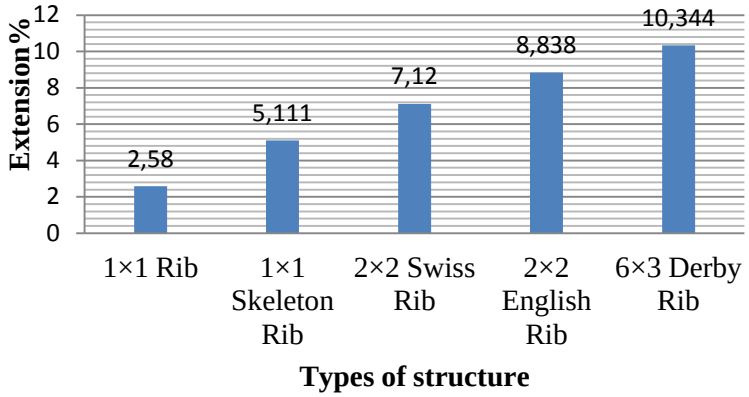

Figure 15: Effect of fabric structure on extension% for 32/2Ne

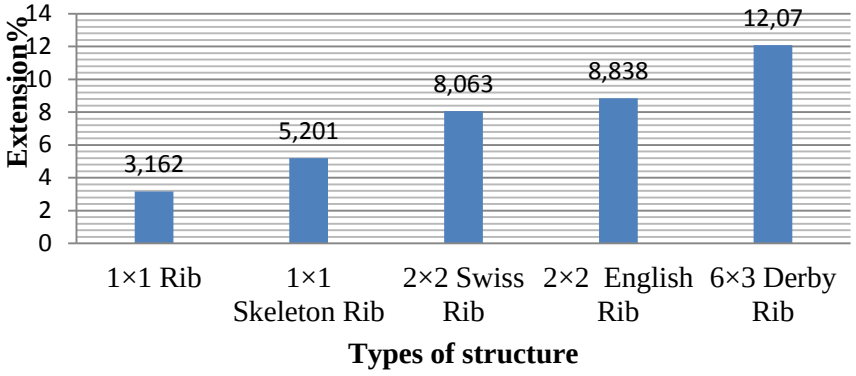

Figure 16: Effect of fabric structure on extension% for 20/2Ne

Conclusion

It is found that, the values of properties Wales per 3cm, Stitch density, Cover factor, GSM of *1×1Rib* were higher than the *1×1Skeleton rib;* Wales per 3cm, Course per 3cm, Stitch density, Stitch length, Cover factor, Shrinkage%, extension% of *2×2English rib* were higher than the *1×1Rib*; Wales per 3cm, Stitch density, GSM, Shrinkage%, extension% of *2×2Swiss rib* were higher than the *1×1Rib* ; Wales per 3cm, Course per 3cm, Stitch density, Cover factor, Shrinkage%, extension% of *2×2English rib* were higher than the *1×1Skeleton rib;* in *6×3Derby rib* values of the properties were higher than other structure; shrinkage and extension percentage increase with the increase of needle drop in knitting; comparisons are tested with 32/2 Ne and 20/2 Ne combed ring yarn.

In this work, we tried to analyze and observe different properties of rib fabric structures and to build up some relations among those. All of data are collected gained by experiments.

In some cases our data was limited. The limitation of data may create some undesirable consequences. More data have to be collected to obtain a precise result. Experiments have to be done on the uncommon fabrics

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