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Effect of Knit Stitch on Serviceability of Fabric

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Abstract—*Clothing, the second basic need of human being is fulfilled by fabric manufactured either by weaving or knitting. Weaving is performed by interlacing of yarns while knitted structure is constructed by interloping of continuous length of yarn. Popularity of knitted goods has grown tremendously within recent years because of increased versatility of techniques and growth in consumer demand for wrinkle resistance, stretchable, snug fitting garments, particularly in greatly expanding areas of sports-wear and other casual wear apparels. In the present study, effect of knit stitch on serviceability of the fabric was investigated. In order to find out more serviceable knit stitch a comparative study on physical properties of two types of machine knitted cotton fabrics viz; plain and rib was carried out.*

Key words: *Knit stitch, plain stitch, rib stitch, serviceability, physical properties.*

1. INTRODUCTION

The art of producing knitted fabrics is ancient. Hand knitting was an early invention. From ancient times, the art of hand knitting remains an occupation for women folk and entirely confined to make socks and women's stockings.[2] In recent years, the machine knitted fabrics and made-ups are gaining popularity because of their richer aesthetic appearance, faster production and lower cost. Currently, Knitted textiles and apparel industry occupies approximately one third of the global textile market. Knitted fabrics are used in various ways such as for hospital wear, aesthetic wear, swimwear, upholstery, bedsheets and in furniture.

Basically, Knitting is a fabric construction technique that involves two or more needles and y arn. Knitted structure contains a number of consecutive rows of loops, called stitches. The knit stitch is the basic unit of knitting which is formed by manipulation of interconnected yarn loops. It involves slipping the needle into the loop from front to back, looping the working yarn around the needle and sliding the stitch through onto the second needle.[1]

To produce the variety in fabrics, the variety in knit stitches can be achieved through the use of multiple techniques of action in knitting needles. There are many varieties of stitches such as cable stitch, double knit stitch, miss stitch, pile stitch etc which can be formed by interlooping basic stitches in different ways.

Therefore, in present study, emphasis has been laid on introducing two basic knit stitches for the purpose of comparison. The effect of plain and rib stitches on physical properties of machine knitted fabric would be evaluated. Such systematic and technical information may improve the prospects of marketing and sales of the knitted products on the basis of serviceability of the fabric.

2. METHODS AND MATERIALS:

For the present research work cotton yarn of 30 count having 'S' twist was used for production of two types of the fabrics i.e. plain and rib. Both the fabrics were knitted using weft knitting machine. Circular knitting machine having 11 gauge was used for construction of knitted structure. Single jersey fabric was made with the help of plain knit stitch while rib fabric was constructed by using 1 x 1 rib knit structure.

For identification of more serviceable knit stitch, various physical properties of the fabrics were evaluated. The physical properties of samples were studied after conditioning it at the temperature of 27 ± 2^0C and humidity 66 ± 2 percent for 24 hour. Each test was carried out for 5 samples and average value was calculated. In order to calculate cost of production fabric weight was evaluated. Stitch density, fabric thickness, moisture content and wicking ability tests were carried out for determination of comfort level provided by each fabric. Strength of prepared samples was measured in terms of fabric abrasion resistance and bursting strength. Crimp percent and Shrinkage property were evaluated to optimize the required maintenance. Aesthetic property of the samples was determined by Pilling propensity.

3. RESULTS AND DISCUSSION

3.1 Fabric weight

While comparing the weight of both the fabrics prepared from plain and rib stitch, it was found that plain knitted fabric has minimum weight. Because of less fabric weight, the plain

knitted fabric is finer and easy to put on and put off. Less fabric weight indicates that it causes less yarn consumption that will help in reducing the fabric cost.

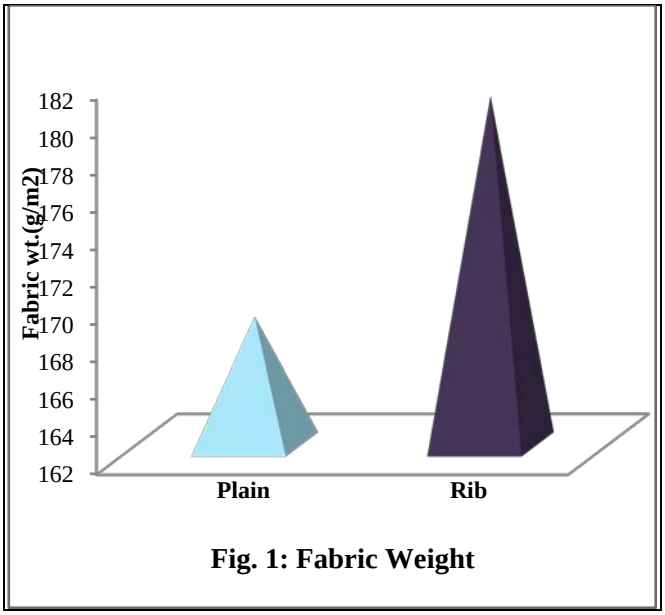

Fig. 1: Fabric Weight

3.2 Stitch density

The stitch density is expressed in terms of courses per inch and wales per inch.[3] It was observed that rib fabric has lower stitch density among both the stitches. Maximum density of plain stitch indicates its maximum covering power.

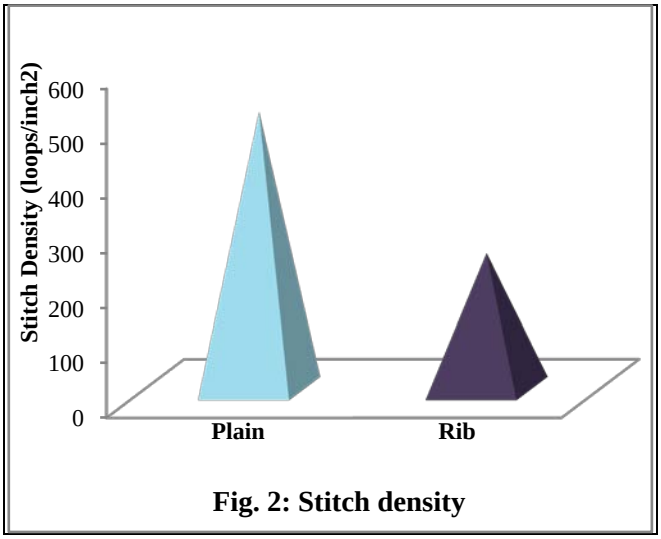

Fig. 2: Stitch density

3.3 Fabric thickness

Rib construction had length wise ridges on both sides of the fabric. Because of this construction rib fabric was thicker among the two. As thicker fabric creates warmth in the body thus rib fabric will be more comfortable in cold weather.

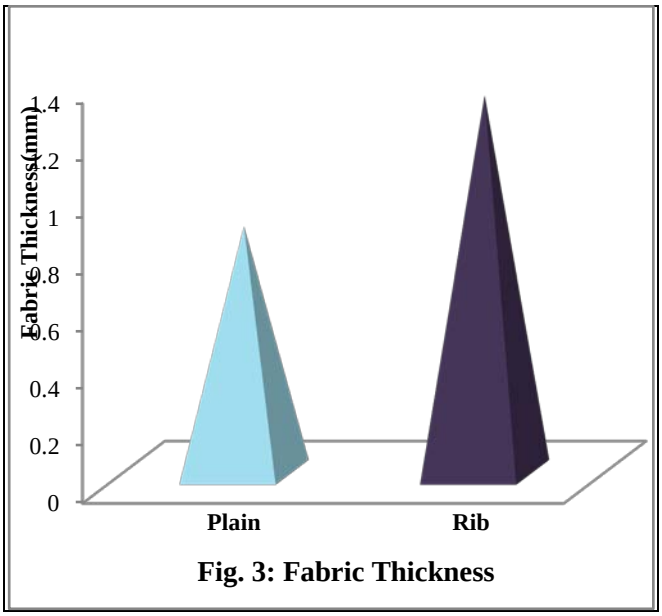

Fig. 3: Fabric Thickness

3.4 Moisture content

Knit construction has significant effect on the moisture content of the fabric. Plain fabric shows more moisture content than rib fabric because it has more number of loops of yarn floats on the surface than rib fabric. It results in penetration of more water molecules onto the surface of plain fabric.

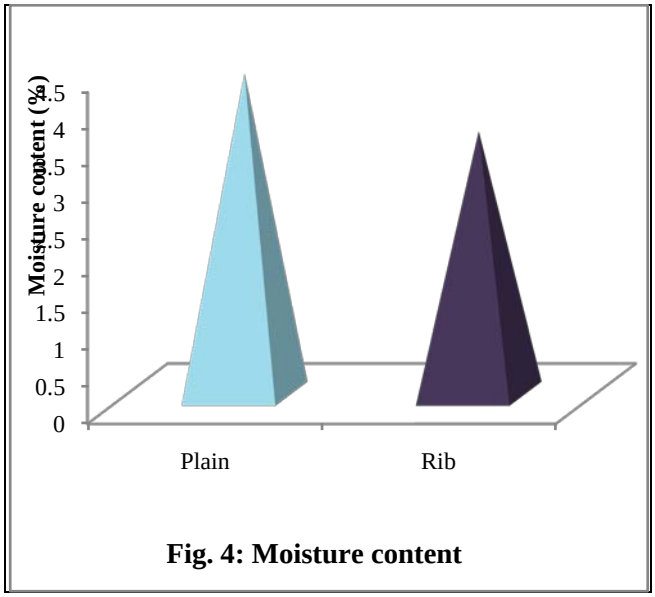

Fig. 4: Moisture content

3.5 Wicking ability

Fig. 5 depicts that the wicking ability of plain fabric was maximum. A simple measure of fabric wetness can truly reflect comfort sensation of wearer[5]. Thus for hot weather, the plain knit fabric is more comfortable.

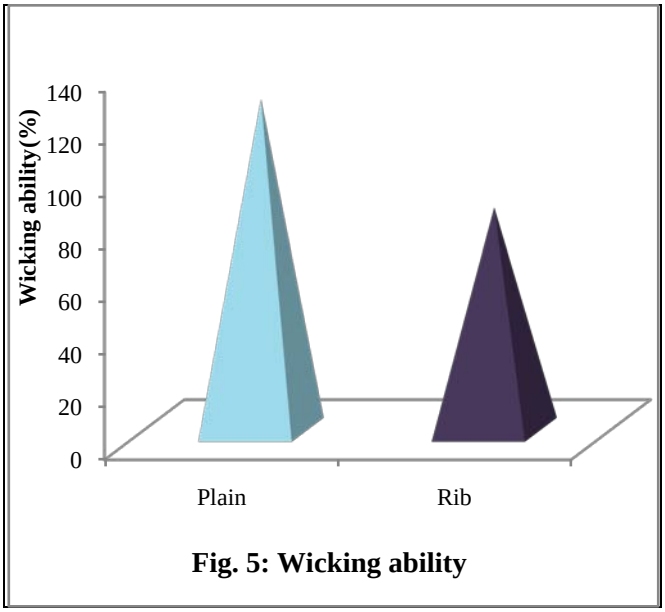

Fig. 5: Wicking ability

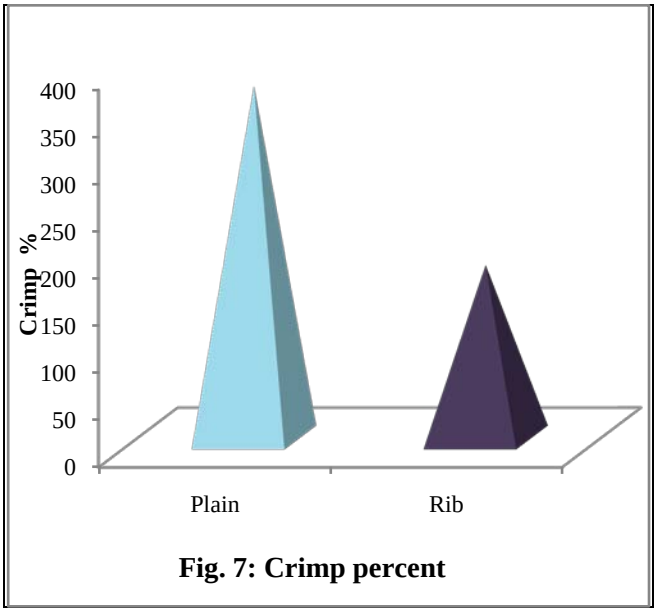

Fig. 7: Crimp percent

3.6 Fabric shrinkage

Fabric shrinkage is the most common problem in knitted fabrics. The good serviceable fabric should have least fabric shrinkage. From the Fig. 6, it can be observed that value of average shrinkage percent for plain fabric was less as compared to rib samples. It will make plain fabrics easy to maintain.

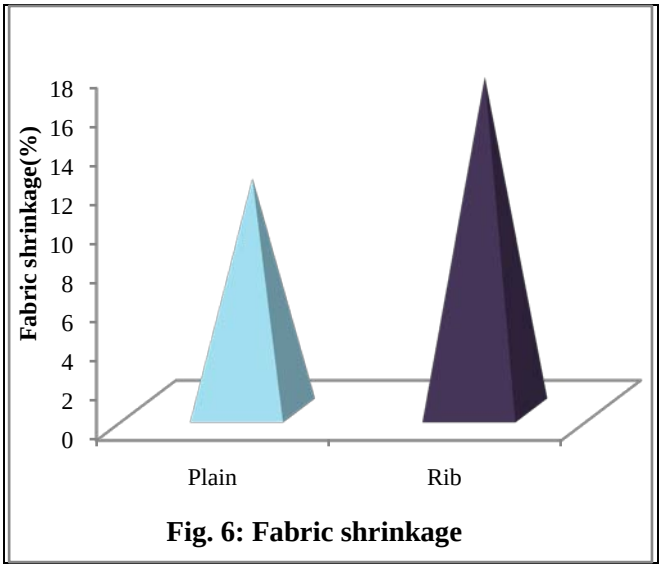

Fig. 6: Fabric shrinkage

3.7 Crimp percent

Crimp percent of both fabrics has been tested. The result shows that crimp percent of the fabric containing plain knit stitch was 372.6 percent. For rib fabric it was 183.2 percent. That means plain fabric construction results in higher crimp percent.

3.8 Abrasion resistance:

In abrasion resistance test, average weight loss recorded for the knitted fabrics was 0.32 percent and 0.71 percent for plain and rib knitted samples respectively. Booth (1947) reported that if the crimp in the yarn is more, the abrasion resistance of a fabric will be more. Plain knitted samples have higher crimp percent that is why abrasion resistance of plain fabric was more than rib fabric.

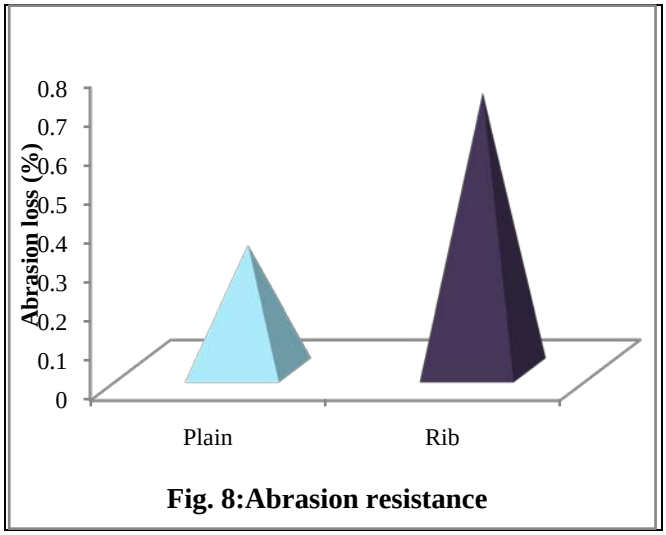

Fig. 8:Abrasion resistance

1.1. Pilling propensity:

It is evident from the Fig. 9 that the plain construction performs moderate pilling while rib fabric shows maximum pilling propensity. The average number of pills or balls were 6 (S/4) and 23(S/2) for plain and rib fabrics respectively.

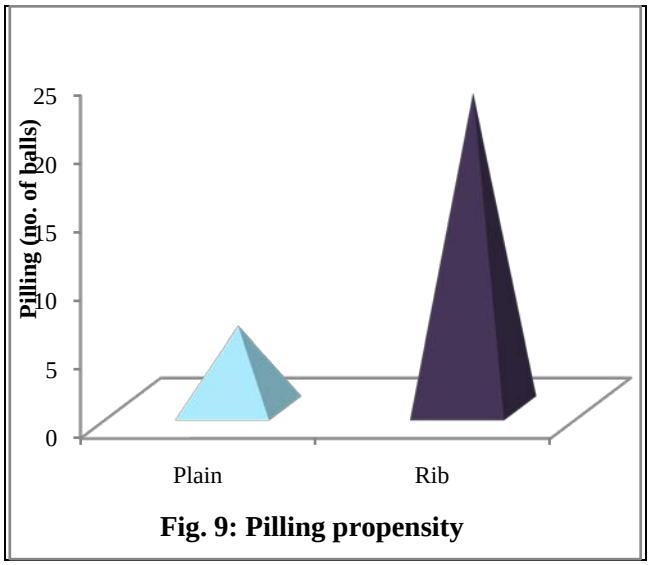

Fig. 9: Pilling propensity

1.2. Bursting strength:

Bursting strength is a measure of the resistance for the fabric to the multidirectional flow of pressure. Bursting strength of rib fabrics was found more in comparison with the plain knitted fabric.

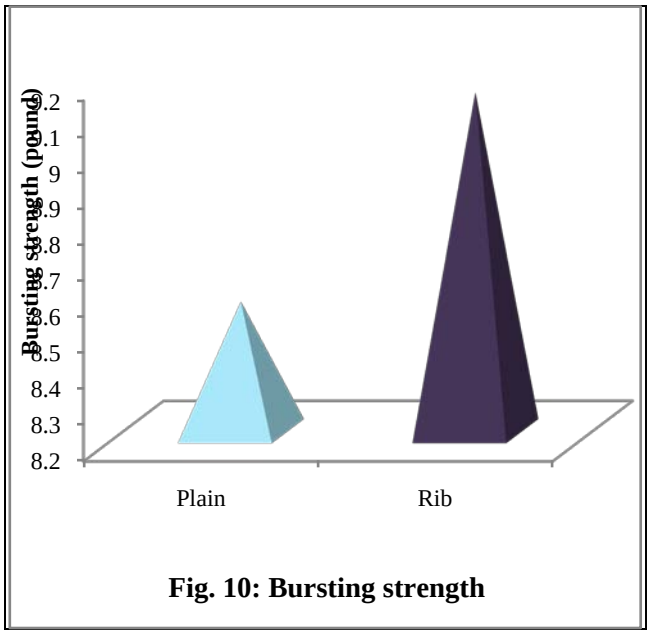

Fig. 10: Bursting strength

1.3. Cost of production:

Cost of raw material required to produce one square meter cloth of both the knitted fabrics was calculated considering cost of raw material, labour, power cost and overhead expenditure. Among both the fabrics cost/meter^2 of plain fabric was lower followed by rib knitted fabrics.

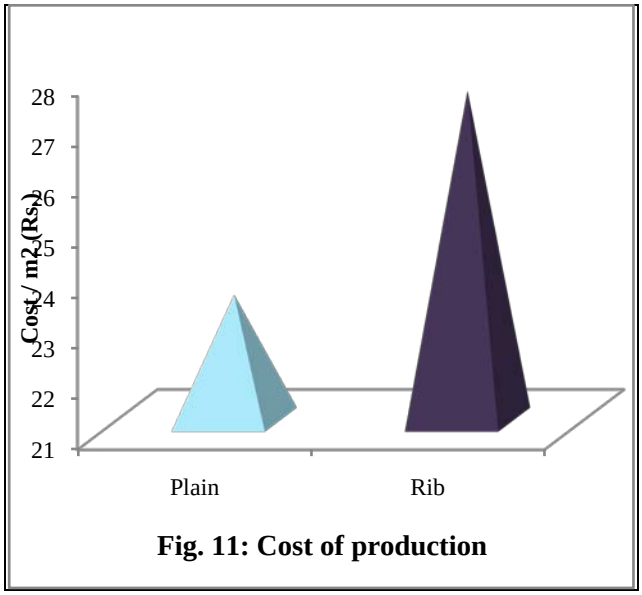

Fig. 11: Cost of production

1.4. Evaluation of most serviceable knit stitch:

Results reveal that rib knit fabric had maximum bursting strength which will make it durable and therefore rib stitch is desirable in cuff, collar and border area of the garment where maximum strain is exerted by the wearer. Rib stitch fabric should be avoided on front and back bodice of the fabric because its surface performance is not good, exhibiting maximum pills. Low stitch density of the rib fabric shows low covering power of the fabric. It shows higher value in fabric weight minimum value in abrasion resistance, wicking ability and moisture content that indicates fabric containing this stitch is less durable and comfortable to wear in hot weather.

Results emphasize that fabric containing plain knit stitch had increased rate of abrasion resistance and crimp percent while lesser pilling propensity. These properties will make the fabric durable and resilient.

Plain stitch was thinner and lighter in weight which will make the fabric more comfortable and more economical. Higher moisture content and wicking ability of plain fabric will not encourage generation of static charge. Both of these properties will make it comfortable to wear specially in hot weather.

2. Conclusion:

It was mentioned earlier that in the present study an effort has been made to explore the effect of knit stitches on the performance of machine knitted cotton fabrics. For the fulfillment of this purpose, physical properties of knitted

fabrics were tested. Plain knit stitch was introduced along with rib stitch.

The present investigation shows that on the basis of physical properties plain fabric was found as more serviceable fabric because it shows higher values in maximum physical properties such as wicking ability, moisture content, abrasion resistance and crimp percent. It has less fabric weight and thickness which make it easy to put on and put off. Less pilling propensity results in increased surface performance. All of the above properties will make fabric more durable, comfortable and easy to care.

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