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## EFFECT OF KNIT STITCHES PERCENTAGE ON PHYSICAL PARAMETERS OF WEFT-KNITTED FABRICS

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### ABSTRACT

In this study 100% cotton 29.5 tex yarn was used to develop hybrid knitted structures with a combination of knit, tuck and miss stitches. A single jersey circular weft machine (FUKUHARA, Japan, 1992) with diameter 30 inches and gauge 20E was used to develop the samples. The samples were scoured, bleached, dyed, and treated with softener. The physical properties of the samples, e.g. area density, thickness, and wale and course density were determined according to the standard test methods. It was concluded from the analysis of results that fabric area density and thickness were found to depend on the percentage of different stitches in the fabric structure.

### KEYWORDS

Weft knitting, cotton, tuck, miss, single jersey, physical properties.

### INTRODUCTION

Row after row of intermeshed stitches is knitted together to form knitted structures. The interconnectedness of each stitch to its neighbours on either side and above and below it determines the features of a knitted construction. Knitted fabrics have distinct properties, because they are made by different machines under different conditions to generate different types of cloth [1].

Salvia Rahman and Shamima Akter Smriti [2] studied the effect of stitch length on area density of knitted fabrics and found that tuck stitches have been found to have an effect on fabric area density. It was clear from the observations that the area density of all fabrics increased as the stitch length decreased. Tuck stitches were discovered to improve air permeability, area density, width extensibility, and length-wise shrinking in a given construction. The tuck stitch also provides moderate drape, thickness, and reduces stretchability in terms of length. The drape ability, width-wise extensibility, fabric weight, length-wise shrinkage, thickness, and the density of the area are all affected by the miss stitch. It has less width-wise extensibility and recovery than single jersey and single pique. High bending rigidity, bulkiness, and a smoother fabric surface are all advantages of the miss stitch. The air permeability, the area density, and the thickness of the fabric are not affected by the knit stitch.

Renu Sing and Dr. Ritu Pandey [3] showed in their study that the low stitch density indicates the low covering power. It has a higher fabric weight, but a lower abrasion resistance, wicking ability, and moisture content, indicating that cloth with this stitch is less durable and comfortable to wear in hot weather. The results showed that plain knit stitch fabrics have a higher abrasion resistance and crimp percent. The cloth will be sturdy and resistant as a result of these features. The tendency to produce fewer pills will improve the aesthetic properties of the tuck fabric. The tuck stitch was the most beautiful and decorative stitch, according to visual examination.



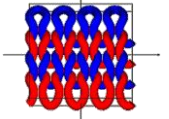
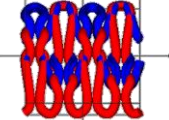
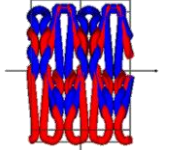
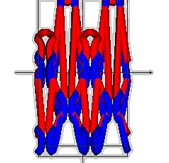
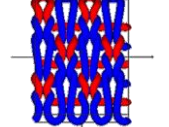
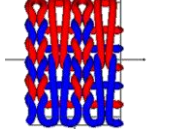
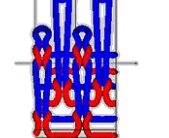
The aim of this research work is to study the effect of the percentage of knit stitches on the physical properties of weft knitted fabrics.

## MATERIALS AND METHODS

100 % cotton yarn 29.5 tex was used to develop seven hybrid knitted structures to study the effect of percentage of knit stitches on the fabric physical properties. Circular weft knitting single jersey machine (FUKUHARA, Japan, 1992 FXC-3S) with 4 tracks, diameter 30 inch, 20E gauge, 90 feeders and 1884 needles was used to develop hybrid knitted samples. The details of the samples with physical appearance are given in Table 1.

After development, all specimens were conditioned according to Standard ASTM D 1776. Area density of all specimens was calculated according to Standard ASTM D 3776 and the densities of the courses and wales were calculated by following Standard ASTM D 8007. Standard ASTM D-1777 was used to determine the fabric thickness.

**Table 1. Parameters of developed weft knitted samples.**

Sample code	Design name	Knit stitch ratio (%)	Tuck stitch ratio (%)	Miss stitch ratio (%)	Fabric Design
<b>K100T0M0</b>	Single Jersey	100	0	0	
<b>K75T25M0</b>	Single Pique	75	25	0	
<b>K66.6T33.3M0</b>	Double Pique	66.6	33.3	0	
<b>K50T50M0</b>	Polo Pique	50	50	0	
<b>K75T0M25</b>	Weft Lock knit	75	0	25	
<b>K66.6T0M33.3</b>	Double Miss	66.6	0	33.3	
<b>K50T0M50</b>	Bird eye	50	0	50	

Notes: K – knit stitch; T – tuck stitch; M – miss stitch

100, 75, 66.6, 33.3, 25, 0 denotes the percentage of different stitches in the structure.

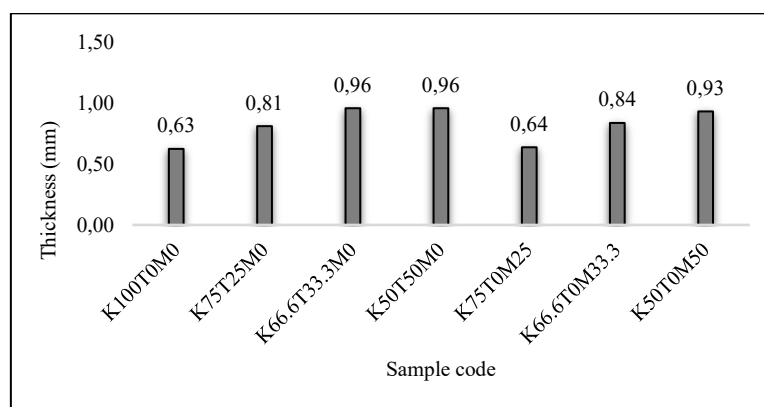
## RESULTS AND DISCUSSION

Physical properties of all knitted specimens were calculated after finishing of the fabric. A summary of the physical properties of the fabric, and statistical analysis are given in Table 2.

**Table 2. Results of developed weft knitted samples.**

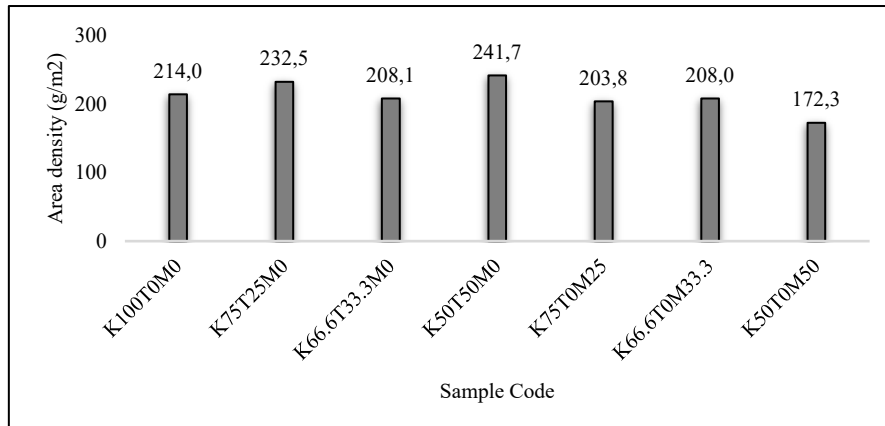
Sample No.	Sample code	Wale, cm <sup>-1</sup>	Courses, cm <sup>-1</sup>	Stitch density, cm <sup>2</sup>	Area density, g/m <sup>2</sup>	Thickness, mm
1	K100T0M0	31	55	1705	214.0	0.63
2	K75T25M0	22	39	858	232.5	0.81
3	K66.6T33.3M0	22	36	792	208.1	0.96
4	K50T50M0	27	38	1026	241.7	0.96
5	K75T0M25	26	38	988	203.8	0.64
6	K66.6T0M33.3	27	36	972	208.0	0.84
7	K50T0M50	33	41	1353	172.3	0.93

Figure 1 showed that with the change in stitch type the thickness also changed. Single jersey showed the lowest thickness due to single thread interlooping. It was concluded that with the increase in miss-stitch percentage the thickness is also increasing due to crossing of miss behind the stitch legs. Tuck stitches are passing of two needle loops together from old stitch. Due to overlapping of heads of stitches, it shows the highest thickness. The thickness of sample K66.6T33.3M0 and K50T50M0 is equal due to the fact that 2 tuck stitches pass together and overlap needle loops.



**Figure 1. Thickness of the developed hybrid knitted fabrics.**

In Figure 2, area density depended on the type of stitches used in the fabric structure. Area density of fabric was dependent on tightness factor of fabrics. In the fabric, yarn consumption per unit area was minimum due to miss without attaining stitch shape. During formation of the tuck stitch, the needle pulls the previous stitch more to pass two stitch heads together. This mechanism increases the weight of fabric due to accumulation of yarn at tucking places.



**Figure 2.** Area density of the hybrid knitted fabrics developed.

## CONCLUSION

It was concluded that the physical parameters of knitted fabrics changed with the change in percentage of stitch type used for development of hybrid knitted fabrics. From the results it was found that thickness increases with increase in miss stitch percentage. Effect of percentage of knit stitches changes the area density.

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