International Journal of Advance Research in Science and Engineering
Vol. No.6, Issue No. 01 , January 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

THE EFFECT OF SOME CONSTRUCTION OF COTTON FABRIC ON GARMENT PERFORMANCE

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ABSTRACT

Fabric construction are very important parameters during the sewing of cotton fabric, some physical and mechanical properties of these fabrics such as pilling ,stiffness at warp and weft direction, weight were also tested. therefore the aim of this study is to evaluate the effect of some construction of cotton fabric on garment performance From the results of this study obtained we can concluded that, the sewability of fabric from twill 1\2,Carded yarn , at 20 pick\cm give lower (penetration force , pilling ,stiffness) that means have better functional performance characteristics.

Keywords: Carded Yarn, Compact Yarn, Pilling, Sewability, Stiffness.

1. INTRODUCTION

For specific textile end-use applications, the fibers will be chosen according to their mechanical properties (1). These properties are important factors for evaluating the quality of cotton products. Since yarn strength is determined by fiber interactions and fiber strength. (2) Garments made of cotton introduce a good mix of comfort and softness. (3)

In conventional yarns ring, "the yarns triangle" can be defined as the region between the twisted end of the yarn and the nip line of the pairs of delivery rollers. This is the most critical portion of the ring yarns system. In this region, the fiber assembly contains no twist. The edge fibers play out from this region and make little or no contribution to the yarn tenacity. Moreover, they cause the familiar problem of yarn hairiness. (4)

In compact yarns, under the same tension, almost all fibers are incorporated into the yarn structure as a result of almost diminishing of the yarns triangle. This leads to valuable advantages such as, yarn abrasion resistance, increasing yarn tenacity and reduction in yarn hairiness. (5, 6) It enhances mechanical and physical properties. These factors have provided a foundation for progressing the weaving and yarns processes. (3) Also, compact yarns fabrics have been found to have less tendency of pilling. (7)

If customers yarns mills "- producers of woven and knitted fabrics - require high The quality of spun yarn and we are willing to pay nearly 10% higher price for them (because of the higher cost of the compact ring yarns machine a little higher energy costs energy costs), then the future of compact yarns will be promising due to the improved quality and higher production of compact yarns. (8) This refers to the compact yarn having less hairiness and tighter structure than the combed yarn. (9)

Pilling can be defined as fibers entangling on the surface of fabrics during wearing, washing, dry-cleaning or testing to form pills or fibers balls that stand on the fabric surface and are of such density that will prevent light

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ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

from passing through them and they cast a shadow. (10) It affects not only the fabric appearance, but also its quality and texture.(11)Several researchers have studied the impact of yarn production technology, raw material, chemical treatment, and yarn twist on the abrasion resistance of knitted, woven and nonwoven fabric (12).The problem of pilling became even more serious. (13)

The penetration force of sewing needle can be defined as the damage quantitative measure that appears as the result of the sewing process. (10) High penetrating strength means high resistance of the fabric and thus a high risk of damage. (14)

In garment business, the process of sewing is considered one of the most critical processes for the determination of the quality and productivity of the finished garment. Very high bending rigidity values of fabrics may cause handling and sewing problems due to the reality that they are too stiff to be controlled and manipulated. (15, 16) Resistance to bending and stiffness in the textile testing. The longer the bending length, the stiffer is the fabric. (14, 17)

Bending stiffness can be defined as a property of fabric that affects the comfort and aesthetic properties of clothing. (16) The sewn seams are strongly affected by the fabric stiffness. Fabric stiffness is mostly desired to be reduced for a good drape in garment fabrics. There is therefore a need to improve the standards, such as sewing and sewing-size thread type, density and stitch seam allowance in order to control the stiffness of the fabric on the clothes. It is believed to affect drape of garment significantly due to the implications of the previously mentioned parameters of sewing (15, 18 and 19)

Although the impact of the sewing thread on performance of the fabric is usually much more noticeable than that of the seam, occur of many situations when you use the best sewing represent the thread a practical solution to a seam performance problem (19)

The aim of study is to found the relation between kind of fabric construction (fabric structure, two kind of yarns, Scour or Non scour at weft count 30/1, warp count 50/2, End 30/cm on the performance of cotton fabric garment.

II MATERIAL AND METHOD

2.1 FABRICS

In this study cotton fabric produce from two kind of yarn Compact and Carded yarn , with three setting of pick setting , Two different weave structures (plain 1/1, Twill 1/2), (Scour, Non scour), weft count 30/1 , Warp count 50/2 , Table 1 shows twelve for fabric construction which used in this study .

Table 1: Constructions properties of woven fabrics

S.Co	F.ST	Yarn	S.O.N	Pick/cm
1	Plain 1/1	Carded yarn	scour	20
2	Plain 1/1	Carded yarn	scour	23
3	Plain 1/1	compact	scour	26
4	Twill 1/2	compact	scour	20
5	Twill 1/2	Carded yarn	scour	23
6	Twill 1/2	compact	scour	26
7	Plain 1/1	Carded yarn	Non scour	20

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8	Plain 1/1	Carded yarn	Non scour	23
9	Plain 1/1	compact	Non scour	26
10	Twill 1/2	compact	Non scour	20
11	Twill 1/2	Carded yarn	Non scour	23
12	Twill 1/2	compact	Non scour	26

S.Co: Sample code **F.ST:** Fabric structure **S.O.N:** Scour or Non scour **W.C:** Weft count30\1 **Warp count:** 50/2 Weft yarn ratio cotton Different Yarns 100 % **E:** Ends/ cm: 30

2.2 Method of Construction

Used two kinds of yarns: **First** compact yarn and **second** is Carded yarn.

2.2.1 MEASUREMENTS

2.2.1.1 SEWABILITY

Using the sewability tester (based on US patent 3979951, 1976), a device used in many studies on the needle penetration force. This equipment simulates a sewing machine by penetrating the tested fabric with an unthreaded needle, at a rate of 100 penetrations per min., with (needle count 14/90, 18/110). (20) DB Singer. Sewability tested properties are given in Table2

TABLE2: SEWABILITY TESTED PROPERTIES

S.Co	Sewability at warp 14/90 Newton	Sewability at weft 14/90 Newton	Sewability at warp 18/110 Newton	Sewability at weft 18/110 Newton
1	30	40	57	57
2	62	60	83	88
3	82	82	119	134
4	20	21	23	24
5	24	28	39	37
6	38	30	54	52
7	10	29	50	47
8	24	46	73	86
9	56	59	89	93
10	14	15	19	22
11	24	22	34	38
12	26	36	40	51

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2.2.1.2 PILLING TEST

Pilling tester is used to determine the pilling resistance of all kinds of textile structures. Sample was rubbed against the same material of sample at low pressures and the amount of pilling is compared against standards parameters. Pilling test was carried out according to standards ASTM standard D4970 (pilling), all samples and standard fabrics should be conditioned in the standard atmosphere for testing (20c - , + 2 and 65% RH - , + 2%). The specimens assed are using the following 5 point scale.

2.2.1.3 STIFFNESS TEST

The Stiffness of Cloth Tester is used to measure the stiffness of woven fabrics, by means of cantilever bending of the fabric under its own weight; thus calculating the bending length and flexural rigidity. Stiffness test was carried out according to standards ASTM standard D5732-95 (2001), all samples and standard fabrics should be conditioned in the standard atmosphere for testing (20c - , + 2 and 65% RH - , + 2%).

2.2.1.4 FABRIC WEIGHT TEST

Purpose to determine the mass per unit area (GSM), This test was performed using an electronic balance of sensitivity (0.001) g / cm. According to American Standard Specification (ASTM, D 295 – 2008).

2.2.2 WASHING PROCESS THAT HAS BEEN CONDUCTED ON SAMPLES SEARCH

Washing was conducted on the process of samples produced by the addition of ionic salt is 5 g / l, 30 minutes, the water temperature of 40, with the addition of 3g/l of sodium carbonate, then squeeze it then dried in room air for two days. [21, 22]

III RESULT AND DISCUSSION

3.1. PILLING , WEIGHT AND STIFFNESS

Table 3 illustrates the results of pilling, weight and stiffness of different sample.

Table3: Pilling, Weight & Stiffness of different Construction

s.co	F.ST (X_1)	Sp (X_2)	S.O.N (X_3)	Pick/cm (X_4)	Pilling degree	Weight g\m^2	warp stiffness mg.cm	weft stiffness mg.cm
1	1	1	1	20	3.4	129.6	2.2	1.88125
2	1	1	1	23	4.5	133	2.38125	2
3	1	2	1	26	4.6	137	2.44375	2.25625
4	2	2	1	20	2.5	122.7	2.025	1.49375
5	2	1	1	23	3.6	131.3	2.34375	1.71875
6	2	2	1	26	3.7	141.4	2.425	2.16875
7	1	1	2	20	3	114.9	1.116667	0.991667
8	1	1	2	23	3.4	120.2	1	1.25
9	1	2	2	26	3.5	125.7	1.7	1.425
10	2	2	2	20	2.3	112.1	0.5	0.5
11	2	1	2	23	3.4	119.4	1.225	0.75
12	2	2	2	26	3.5	126	1	0.625

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ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

Table 4 shows the statistical properties the above results

Table4: Statistic tested properties

Statistic	Sew.Wa 14/90 Newton	Sew.Wa 14/90 Newton	Sew.Wa 18/110 Newton	Sew.Wa 18/110 Newton	Weight g\m^2	Stiffness mg.cm	Pilling degree
Multiple R	0.907859	0.951538	0.973449	0.952137	0.981991	0.982798	0.946538
R Square	0.824208	0.905425	0.947602	0.906565	0.964307	0.965892	0.895934
p-value:							
Intercept	0.48438	0.988892	0.911712	0.586475	0.000001	0.013002	0.411513
X_1	0.01509	0.000455	0.000058	0.000444	0.57632	0.024839	0.047434
X_2	0.301171	0.363248	0.475035	0.49896	0.331796	0.537566	0.032921
X_3	0.035854	0.078413	0.0486	0.251601	0.000014	0.000004	0.011361
X_4	0.017149	0.006102	0.000981	0.004005	0.000077	0.00265	0.000562

3.1.1 WEIGHT

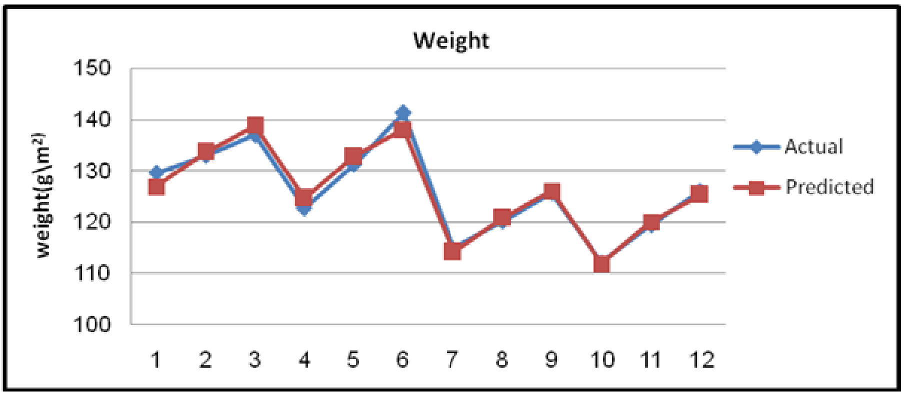

Fig. 2 Relation between sample and weight (R^2= 0.964)

The lowest weight form Fig.1 are **S10**(twill-compact-non scour-pick\cm 20) and **S7**(plain-Carded yarn-non scour-pick\cm 20) due to decrease in pick density.

3.1.2 STIFFNESS

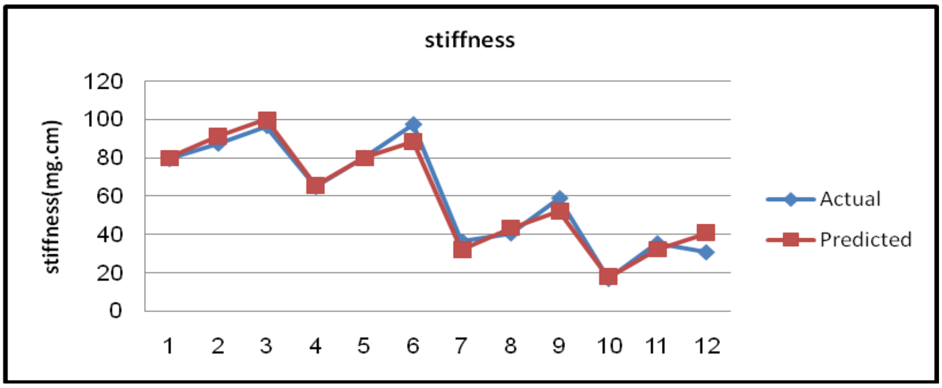

Fig. 2 Relation between sample and stiffness (R^2= 0.965)

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The best result from Fig. 2 is **S 3,6** (**F.ST** plain 1\1, Twill 1/2 , **s.o.n** Scour ,**pick\cm** 26) due to the highest density of weft and when scour the fabric the space of weft and warp are very low.

3.1.3 PILLING

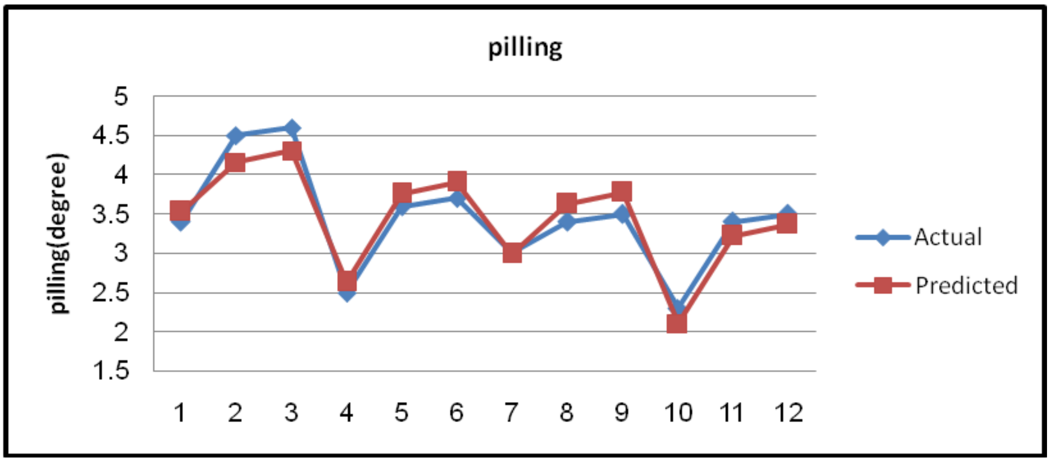

Fig. 3 Relation between sample and Pilling (R^2= 0.895)

The best result from fig. 3 is **S 2, 3** (**F.ST** plain 1\1,**s.o.n** Scour**, pick\cm** 23, 26) due to the highest number of intersections in the plain 1/1

3.2 SEWABILITY

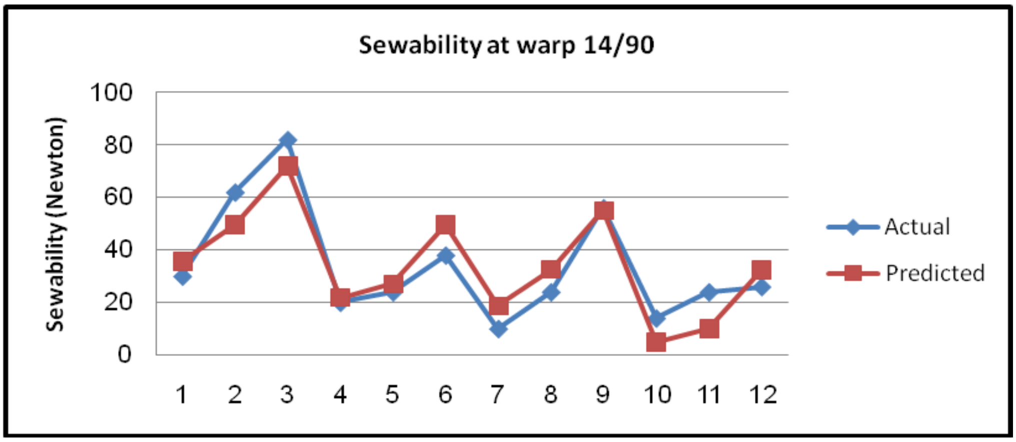

Fig. 4(a) Relation between sample and Sewability at warp 14/90

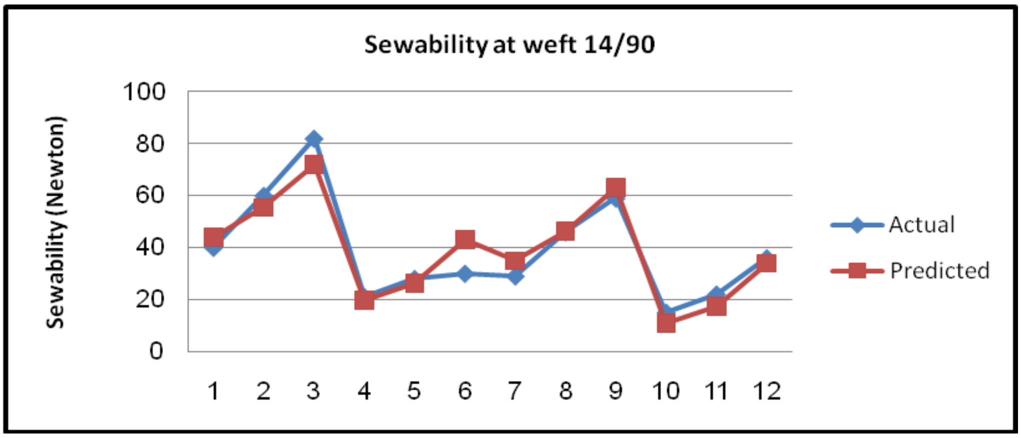

Fig. 4(b) Relation between sample and Sewability at weft 14/90

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ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

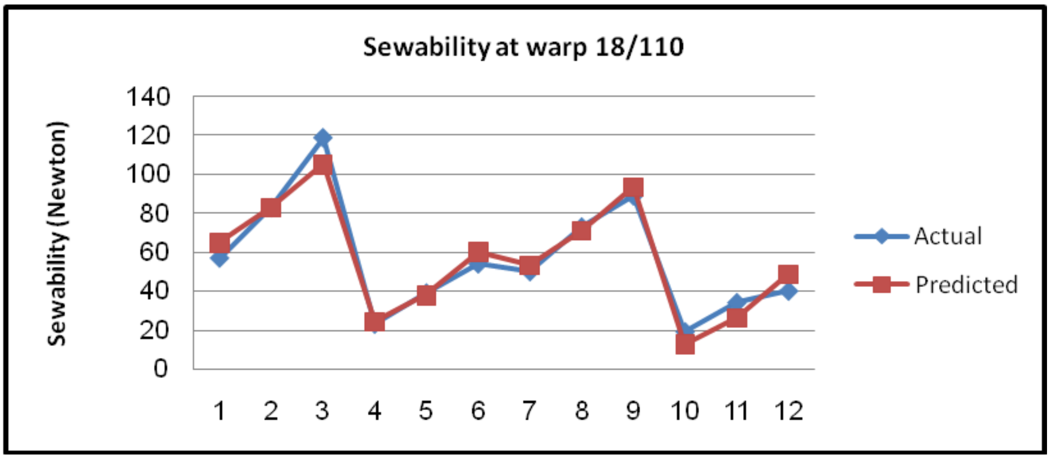

Fig. 4(c) Relation between sample and Sewability at warp 18/110

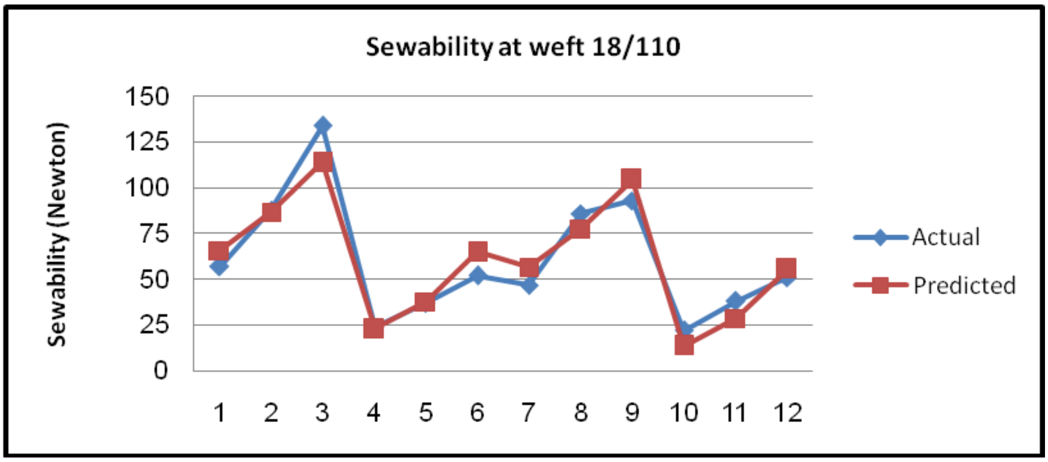

Fig. 4(d) Relation between sample and Sewability at weft 18/110

Fig. 4 (a, b, c, d) Sewability at (warp, weft) for needle (14/90, 18/110)

A $R^2=0.824$ ***b*** $R^2=0.905$

c $R^2=0.947$ ***d*** $R^2=0.906$

R: Coefficient of determination

From all *Fig*. (4 a, b, c and d), it was found that the best result. The best result: *Fig*. 4(a) for needle 14\90 at warp direction **S no 7**(10 Newton-plain 1\1-Carded yarn -no scour-20 pick \cm) and *Fig*.4 (b) at weft direction **S no 10** (15 n - twill1\2-compact -no scour-20 pick\cm)

For needle18\110 at warp **S no 10** (20 Newton), fig (c) **S no 10** (19 Newton) and fig (d) at weft direction S **no 10** (20 Newton) this may be attributed to decrease in pick density.

CONCLUSIONS

In this study the effect of fabric construction (fabric structure ,two kind of yarns , Scour or Non scour at weft count 30/1 , warp count 50/2 ,End 30/cm on the sewability , pilling , stiffness , weight have been evaluated .

The results could be summary as follows:

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ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

- There is direct relation between weft /cm with sewing needle penetration force due to high density of weft / cm.
- Sewing needle penetration increases after washing process or plain 1/1 structure than twill 1/2 at needle 18/110 due to higher intersections.
- Weight /cm increase at high density of weft, structure plain 1/1 due to the increase of intersections.
- The weight increase after washing due to the increased number of warp and weft increase section
- The study proved that pilling increase at plain 1/1 due to increased number of intersections , pilling increased after washing due to increase no of weft , warp in cross- section.
- Compact yarns high stiffness due a big angle twisting to save a lot of hairs and increase the degree of parallel fibers to form chains more stiffly.

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