

Analysis of the Influence of Enzyme Wash, Acid Wash, Ice Wash and Pigment Wash on the Properties of Knit Garment

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Abstract:

This paper investigates the changes observed after enzyme wash, acid wash, ice wash and pigment wash on different types of knit garment such as 100% cotton single jersey, single jersey slub, single Lacoste and terry fleece. For most of the cases property developed after any types of wash however, acid wash played a negative role. Therefore, Fabric weight increased around 5-10% after any types of mentioned wash except acid wash where weight decreased. Fabric shrinkage and spirality property degraded after wash. Besides, fabric perspiration, dry and wet rub properties remain constants. Moreover, the pH value found slightly acidic in nature. Finally, the pill remains same however, terry fleece fabric has a developed property. So, it can be ensured that there are significant changes after any types of wash and it has become possible for a wide range of design and wash variability.

Keywords —Garment wash, knit garment, properties, performance.

I. INTRODUCTION

Garment washing collaborates with the application of chemicals or other substrates on the dyed or printed surface of the garments to modify the shade, colour and appearance. These also bring comfortability and design variation. The effects largely depended on the types of materials used and methods of application (Ayadi and Souissi, 2015). Necessities of faster fashion trends, better aesthetic properties etc. have enhanced the need for garment washing. Nowadays, faded textile products have become very popular among young customers all over the world. There are two types of washing techniques are available; wet wash and dry wash. Commonly applied wet washing techniques are enzyme wash, bleach wash, acid wash, stone wash etc. On the other hand, tagging, grinding, destroy, whiskering etc. is known as a dry wash (Khalil,

2016) (Imparting, To and Products, 2004). For the easy and smooth production, the knit fabric always has a chance to create newer attraction to the customers. Mostly knit garments faded with wet wash process.

(Of *et al.*, 2019) a conference paper of ICMERE 2019 where researchers have checked the influence of P.P. spray, hand brushing and laser fading on the properties of denim garments. It is found that Samples weight, tensile strength, tear strength, abrasion and pilling resistance properties have been recorded lowered after each dry process, especially after hand brushing; however, water absorbency property developed well. Besides, samples pH value, colour change, colour staining, etc. properties found little bit changed or similar to the original samples.

(Das, Rasel and Khan, 2019) has found a great impact on different properties of weft knitted fabric

if processing parameters such as; yarn count, stitch length, machine diameter, needle gauge, dyeing parameters and finishing parameters remain constant. (Farha, 2015) investigates changes of properties of knit garments after wash where for single jersey fabrics areal density, fabric width, resistance to pilling, width shrinkage increases with the increase of tuck stitch and spirality, length shrinkage decreases. From the investigation, it is also found that fabric structure has less influence on colourfastness to washing, colourfastness to light and colourfastness to rubbing.

(Ansari, 2018) worked with three different types of knitted fabrics (fleece, terry & single jersey) by applying cool pigment colourant and have observed satisfactory results and recommended for bulk application of this process to the knit garment washing.

(Solaiman *et al.*, 2015) researchers have applied enzyme, silicone and softener wash on different types of knit garments and it is observed that after washing, garment weight, CPI, WPI, Absorbency, wet and dry rub properties improved significantly whereas stitch length decreased. Besides, no significant changes have been observed for colourfastness to wash and stain.

In this research, four different types of washing technologies such as enzyme wash, acid wash, cool wash and pigment wash have been applied to different varieties of 100% cotton knit garments i.e. single jersey, single jersey slub, single Lacoste and fleece fabric. Therefore, some physical and mechanical properties were analysed and checked how much properties develop or degrade

2. MATERIALS AND METHODS

2.1 Garment samples

The following knit garments were used for the research purpose.

- i. 100% cotton single jersey garment, GSM 170
- ii. 100% cotton single jersey slub garment, GSM 160
- iii. 100% cotton single Lacoste garment, GSM 230

- iv. 100% cotton terry fleece garment, GSM 270

2.2. Chemicals used

Enzyme (RUCOLASE ZSS), NCQ, Potassium per Manganate (KMnO_4), Caustic Soda (NaOH), Soda Ash (CaCO_3), Acetic Acid (CH_3COOH), Detergent (WBL) and Pigment (Glowin Dark)

2.3. Washing Machine

AZIZ Metal Engineering Works Ltd, M/C capacity-60 kg, Max speed-50 k.m., temp 100°C, Heating source- Steam.

2.4. Methods

2.4.1. Enzyme wash

At first, all the five types of knit fabrics samples are taken to the washing machine. Here material and liquor ratio is 1:5. Approximately 0.08% enzymes (RUCOLASE ZSS), 0.2% acetic acid and 0.06% detergent (WBL) is used. The washing process carried out for 15 minutes at a temperature of 45°C. Then rinse the samples for 2 minutes. Finally, the tumble dryer was used to dry the fabric samples.

2.4.2. Acid wash

Load the samples to the washing machine. Here material and liquor ratio was 1:5. Then acetic acid was added at 60°C and run for 20 minutes. Finally, potassium permanganate was added to neutralize the garment. Normal wash was carried out for 15 minutes and dried by using a tumble dryer.

2.4.3. Cool wash/Ice wash

At first, samples were treated with soda ash (m:l-1:6) and soaked for 15 minutes to prepare the samples for ice wash. Then garment was placed over the rack and ice was placed on the samples. Finally, wait until ice melts. Finally, the sample was dried.

2.4.4. Pigment wash

At first, load the samples to the washing machine and added pigment (1:8) to the water. Then Soda

ash, caustic soda was added and run the solution for 30 minutes at temperature 60°C. Acetic acid was added and run for 15 minutes to neutralize the samples. Finally, the samples were tumble dried.

Therefore, the following types of physical and mechanical properties were measured by following the standard parameters.

- 2.4.5. Determination of fabric weight (ISO 3801)
- 2.4.6. Determination of shrinkage (ISO 5077)
- 2.4.7. Determination of spirality (ISO 3759)
- 2.4.8. Determination of rub fastness (ISO X-12)
- 2.4.9. Determination of pH (ISO 3071)
- 2.4.10. Determination of colourfastness to washing (BS EN ISO 105 C06)
- 2.4.11. Determination of colourfastness to perspiration (ISO 105 E04)
- 2.4.12. Determination of pilling resistance (ISO 12945)

3.0 RESULTS AND DISCUSSION

3.1. Effects of wash on fabric weight of knit garment

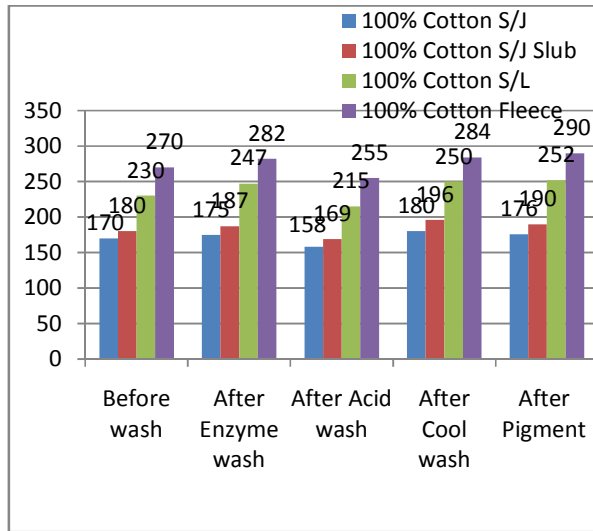


Fig 1: Washing effects on garment weight

There is an upward inclination of fabric weight after application of different types of wash (figure 1). Fabric weight increased to 3-5% for single

jersey fabric; 8-10% for single jersey slub fabric; 9-10% for single Lacoste fabric and 6-8% for terry fleece fabric. The reason behind this is the consumption of chemicals by the samples after wash. Unfortunately, fabric weight reduced slightly after acid wash for all. Therefore, pigment wash has a higher impact than others.

3.2. Effects of wash on shrinkage (lengthwise) of knit garment

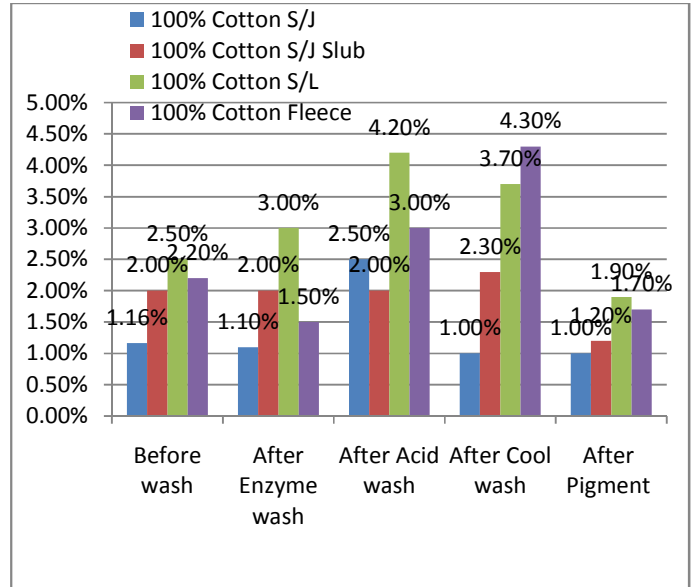


Fig 2: Washing effects on garment shrinkage (lengthwise)

Form graph 2, shrinkage property degrades after acid wash and pigment wash. For single jersey fabric shrinkage property have improved after all wash except acid wash; for slub sample case, the property remains the same or developed, however, degrade after cool wash. Single Lacoste fabric becomes more degraded after enzyme wash, acid wash and ice wash.

3.3. Effects of wash on shrinkage (width-wise) of knit garment

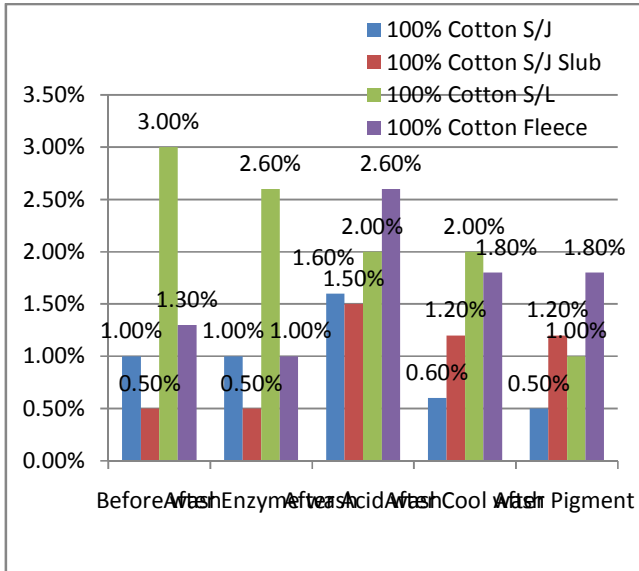


Fig 3: Washing effects on garment shrinkage (width wise)

Figure 3 indicates the shrinkage (width-wise) where shrinkage property increased after acid and cool wash for slub single jersey and single Lacoste fabric case. On the other case, the property remains constant or improved.

3.4. Effects of wash on spirality of knit garment

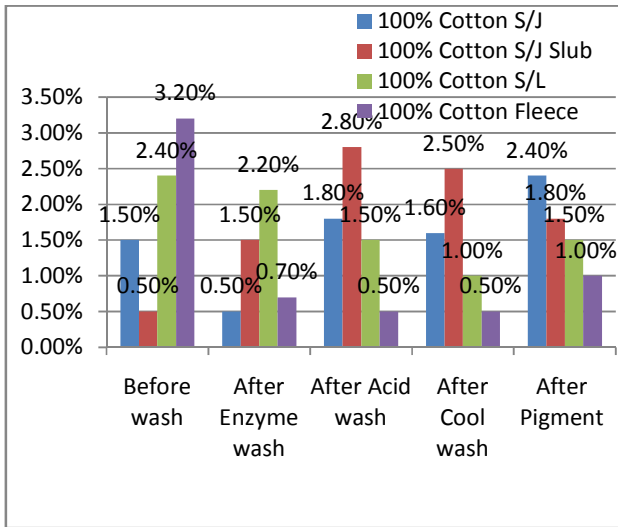


Fig 4: Washing effects on garment spirality

Graph 4 shows that the spirality percentage of 100% cotton S/J is increased after acid was, cool wash & pigment wash unfortunately reduced after enzyme

wash. For 100% cotton S/J slub fabric, spirality percentage is increased after enzyme wash, acid wash, cool wash & pigment wash. For 100% cotton S/L fabric as well as 100% cotton fleece fabric, spirality is reduced after enzyme wash, acid wash, cool wash & pigment wash.

3.5. Effects of wash on dry rub property of knit garment

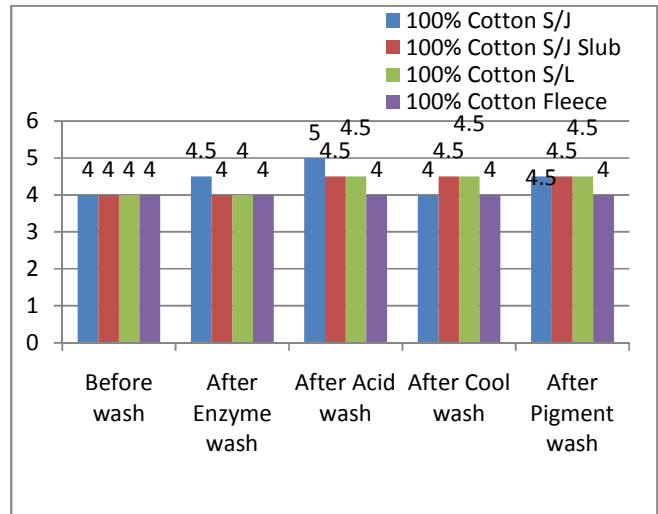


Fig 5: Washing effects on garment dry rub property

From the graph 5, it seems that before washing all the sample fabrics (100% cotton S/J, 100% cotton S/J slub, 100% cotton S/L & 100% cotton fleece) had shown the medium shade of rubbing. For 100% cotton S/J fabric dry rub test result:- After enzyme wash, acid wash & pigment wash - a light shade of rubbing. For 100% cotton S/J slub fabric & 100% cotton S/L fabric, after enzyme wash- medium shade, after acid wash, cool wash & pigment wash- light shade. For 100% cotton fleece fabric, it gives medium shade for all types of wash

3.6. Effects of wash on wet rub property of knit garment

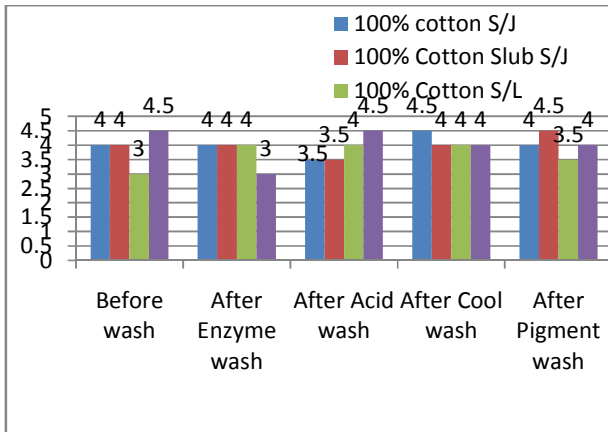


Fig 6: Washing effects on garment wet rub property

From the graph 6, it can be identified that in case of wet rubbing test, 100% cotton S/J fabric- Before wash-Medium shade, after enzyme & pigment wash-Medium shade, acid wash- dark shade, cool wash- light shade. For 100% cotton slub S/J fabric- before wash- Medium shade, Enzyme wash & cool wash- medium shade, acid wash-dark shade, pigment wash- light shade. For 100% cotton S/L fabric- before wash- dark shade; acid wash, enzyme wash & cool wash-medium shade, pigment wash-dark shade. 100% cotton fleece fabric- before wash-light shade, acid wash, cool wash & pigment wash-light shade, enzyme wash- dark shade.

3.7. Effects of wash on fabric pH value

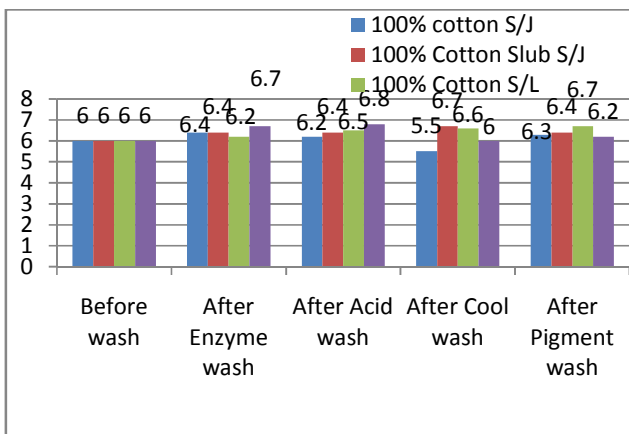


Fig 7: Washing effects on garment pH value

The graph 7 has shown that before wash, all 4 types of fabric had the same P^H value (6) i.e. slightly acidic. For 100% cotton S/J fabric- P^H value slightly increased after enzyme, acid & pigment wash as well as slightly reduced after cool wash. For 100% cotton slub S/J fabric- P^H value has increased after all mentioned washing techniques. For 100% cotton S/L fabric- P^H value has increased after all mentioned washing techniques. For 100% cotton fleece fabric- P^H value has increased after enzyme wash, acid wash & pigment wash as well as after cool wash P^H value remains same as before washing.

3.8. Effects of wash on fabric colourchange

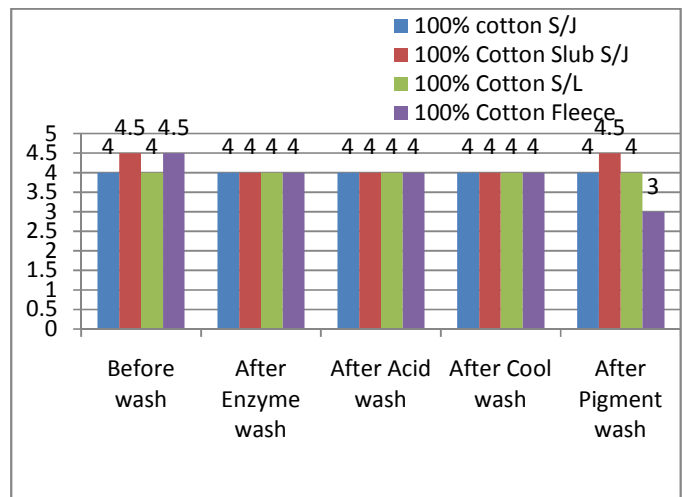


Fig 8: Washing effects on garment colour change

From the graph 8, we can find that after visual examination with greyscale, the obtained result is below For 100% cotton S/J fabric- Before & after each wash-very good colour strength/fastness. For 100% cotton slub S/J- before wash – excellent fastness & after enzyme, acid & cool wash- very good fastness of colour as well as after pigment wash-excellent colourfastness. For 100% cotton S/L fabric- Before wash-very good & after all mentioned wash-very good colourfastness. For 100% cotton fleece fabric- before wash-excellent colourfastness, after enzyme, acid & cool wash-very good colour strength as well as after pigment wash- average colourfastness.

3.9. Effects of wash on fabric perspiration property

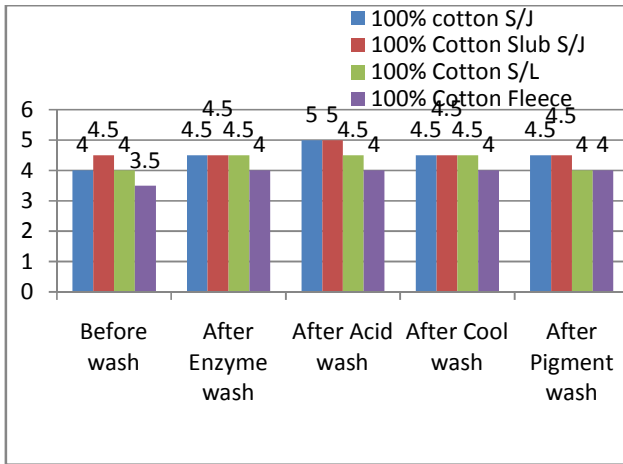


Fig 9: Washing effects on garment perspiration property

From graph 9, perspiration property does not have too much change, more precisely property remains constant or little bit change. Therefore, it can be said that washes have no or little bit impact on the property of perspiration of the sample garment.

3.10. Effects of wash on fabric pilling resistance

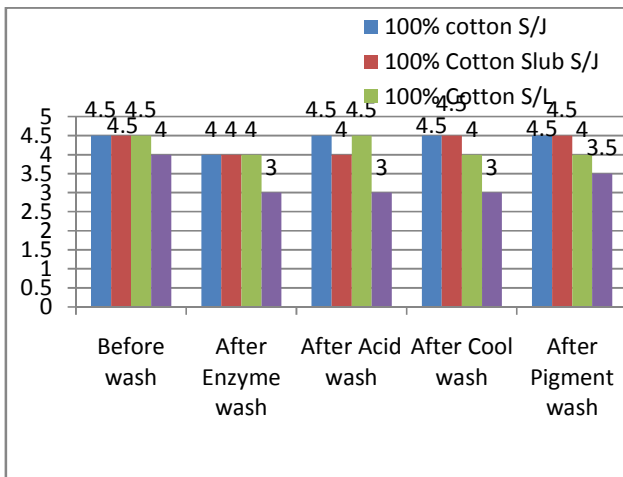


Fig 10: Washing effects on garment pilling resistance property

From figure 10, it is found that the fabric pill forms more after any types of washes, more specifically,

in case of terry fleece fabric after any types of wash. However, the impact seems not too much significant.

4. CONCLUSIONS

It is obvious that different washes have a profound impact on the knit garment. It not only changes the outer surface but also either improved or degrades the properties which have already been discussed. From this research, it is clear that acid wash has a profound impact on the properties of knit garment since acid directly attacks the fabric surface.

Therefore, other washing techniques also play a significant role. All this has become possible since there is an easiest and wide range of design variability in a knit garment than others. So, we cannot deny the importance of washing on the knit garment.

5. RECOMMENDATIONS

- ✓ Each property should be measured since there remain absent during the test
- ✓ Comfort-ability could be a great option to research which is also absent here

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