Effect of Weight Loss Percentage and Pilling, After Treating With Enzyme by Changing Ph, Time, Temperature on Single Jersey Knitted Fabric

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EFFECT OF WEIGHT LOSS PERCENTAGE AND PILLING, AFTER TREATING WITH ENZYME BY CHANGING PH, TIME, TEMPERATURE ON SINGLE JERSEY KNITTED FABRIC

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Abstract: The knitted fabrics, single jersey, were treated with enzyme with different ph, time, temperature and pilling was observed, from the overall comparison, the effect of enzyme was best for cotton and fastness property was best. Enzyme treatment technologies are frequently applied in textile processing for the modification of fabric handle appearance and other surface characteristics in regard to cotton fabrics. The purpose of this paper is to understand the impact of enzyme treatments on fabric preparation, dyeing, and finishing processes of knitted fabrics with a cellulase enzyme. After each of the enzyme treatments, single jersey fabrics lost their weight and, therefore, they became thinner. Furthermore, the extension properties become higher in both directions with regard to the untreated knitted fabric for all used enzymes and carried out treatments.

Keywords: pilling, GSM, weight loss, scoured, bleached.

1. Introduction
The GSM of fabric is one kind of specification of fabric which is very important for a textile engineer for understanding and production of fabric. ‘GSM’ means ‘Gram per square meter’ that is the weight of fabric in gram per one square meter. By this we can compare the fabrics in unit area which is heavier and which is lighter.

Jersey is a knit fabric used predominantly for clothing manufacture. It was originally made of wool, but is now made of wool, cotton, and synthetic fibres. Since medieval times Jersey, Channel Islands, where the material was first produced, had been an important exporter of knitted goods and the fabric in wool from Jersey became well known. The fabric can be a very stretchy single knitting, usually lightweight, jersey with one flat side and one piled side.[1] Enzymes are macromolecular biological catalysts. They are responsible for thousands of metabolic processes that sustain life.[2] The internal dynamics of enzymes has been suggested to be linked with their mechanism of catalysis.[3] Enzymes can be regulated through covalent modulation. This can include phosphorylation, myristoylation and glycosylation. For example, in the response to insulin, the phosphorylation of multiple enzymes, including glycogen synthase, helps control the synthesis or degradation of glycogen and allows the cell to respond to changes in blood sugar.[4] However, increasing temperature also increases the Vibrational Energy that molecules have, specifically in this case enzyme molecules, which puts strain on the bonds that hold them together. A pill, colloquially known as a bobble, is a small ball of fibres that forms on a piece of cloth. 'Pill' is also a verb for the formation of such balls.[5] Pilling is a surface defect of textiles caused by wear, and is considered unsightly. It happens when washing and wearing of fabrics causes loose fibres to begin to push out from the surface of the cloth, and, over time, abrasion causes the fibres to develop into small spherical bundles, anchored to the surface of the fabric by protruding fibres that haven't broken. The textile industry divides pilling into four stages: fuzz formation, entanglement, growth, and wear-off.[6] Pilling normally happens on the parts of clothing that receive the most abrasion in day-to-day wear, such as the collar, cuffs, and around the thighs.
and rear on trousers.[7] All fabrics pill to some extent, although fibres such as linen and silk pill less than most.[8] A minority on the ASTM committee argued for the higher yarn count number obtained by counting each single yarn in a plied yarn and cited as authority the provision relating to woven fabric in the Harmonized Tariff Schedule of the United States, which states each ply should be counted as one using the "average yarn number. [9] Fabric softeners work by coating the surface of the cloth fibers with a thin layer of chemicals; these chemicals have lubricant properties and are electrically conductive, thus making the fibers feel smoother and preventing buildup of static electricity. Other functions are improvements of iron glide during ironing, increased resistance to stains, and reduction of wrinkling and pilling.

2. Materials and Methods

2.1. Fabrics: 100% cotton single jersey fabric.

2.2. Collection of Dyes and Chemicals
Chemicals were collected from Matex Internationals Ltd.

2.3. Experimental Procedure
At first, 100% cotton single jersey scoured and bleached fabric was taken into dye bath and treated with required chemical such as detergent 1 gm/L, acetic acid 1cc/lit, sequestering agent 2.5 gm/L prepared solution for enzyme (1% on the weight of fabric) wash and water was added to it. Bath was kept at (40-50) °C temperature for (30-40) minutes and all the chemicals along with the material were added to it. Then the bath was kept for 30 min-40 min without raising the temperature. PH of bath is controlled by acetic acid at 4.5 - 5. After Enzyme wash the fabric was treated with mild alkali because of increasing PH and at the same time hot rinse and cold rinse as well as after treated with detergent and required chemicals. At last we determine the gsm and pilling variation.

2.4 Recipe

3. Results and Discussion

3.1. GSM variation of single jersey at different condition:

<table>
<thead>
<tr>
<th>No</th>
<th>PH</th>
<th>Time (min)</th>
<th>Temperature (°C)</th>
<th>Before Enzyme (gm/m²)</th>
<th>After Enzyme (gm/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>5</td>
<td>40</td>
<td>40</td>
<td>217.87</td>
<td>208.22</td>
</tr>
<tr>
<td>02</td>
<td>5</td>
<td>40</td>
<td>50</td>
<td>217.87</td>
<td>205.7</td>
</tr>
<tr>
<td>03</td>
<td>5</td>
<td>30</td>
<td>50</td>
<td>217.87</td>
<td>204.4</td>
</tr>
<tr>
<td>04</td>
<td>5</td>
<td>40</td>
<td>50</td>
<td>217.87</td>
<td>202.9</td>
</tr>
<tr>
<td>05</td>
<td>4</td>
<td>40</td>
<td>50</td>
<td>217.87</td>
<td>202.6</td>
</tr>
<tr>
<td>06</td>
<td>5</td>
<td>40</td>
<td>50</td>
<td>217.87</td>
<td>201.4</td>
</tr>
</tbody>
</table>

3.2 Pilling variation of single jersey

<table>
<thead>
<tr>
<th>N o</th>
<th>P1° Time (min)</th>
<th>Temperature (°C)</th>
<th>Before Enzyme</th>
<th>After Enzyme</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5</td>
<td>40</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
<td>40</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
<td>30</td>
<td>3</td>
<td>4</td>
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<tr>
<td>0</td>
<td>5</td>
<td>40</td>
<td>3</td>
<td>4</td>
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<td>0</td>
<td>4</td>
<td>40</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
<td>40</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

In case of sample no. 1 we found before enzyme the GSM is 217.87 and after enzyme wash GSM decreased and rating is 208.22 subsequently before enzyme the weight is all same in the entire sample but after enzyme the rating is 205.7, 204.4, 202.9, 202.6, and 201.4.

Pilling ratings
5—no pilling
4—slight pilling
3—moderate pilling
2—severe pilling
1—very severe pilling

In case of all pilling the rating before enzyme is 3 and after pilling the rating is subsequently 4, 4, 4, 4, 5 and 5.

Vary little change in GSM is found at temperature variation when the fabric treated with enzyme, GSM increase with increase of time and GSM increase proportionally with the pH at a certain period. Pilling reduce proportionally with increase temperature.
Change of pilling with time is negligible. At pH (4-5) pilling properties of the fabric is good. We found more pilling in fabric at high pH. The effect of Enzyme varies in different condition. From this study among different condition pilling and GSM variation properties has changed which has shown on the above graph.

4. Conclusion
From all the condition, the effect of enzyme is increased with the increased of time and temperature. But the effect of enzyme is not increased after certain limit. In case of sample no. 1 we found before enzyme the GSM is 217.87 and after enzyme wash GSM decreased and rating is 208.22. Subsequently before enzyme the weight is all same in the entire sample but after enzyme the rating is 205.7, 204.4, 202.9, 202.6, and 201.4. In case of all pilling the rating before enzyme is 3 and after pilling the rating is subsequently 4, 4, 4, 4, 5 and 5.
The effect of Enzyme varies in different condition. From this study among different condition pilling and GSM variation properties has changed which has shown on the above graph.

4. References

Md. Asib Iqbal is working as a scientific officer of Pilot Plant and Processing Division, Manik Mia Avenue, Bangladesh Jute Research Institute, Dhaka-1207. He is engaged in research and development activities of variation of salt concentration during Jute dyeing and on stenter machine. He has obtained B.Sc in Textile degree from Bangladesh university of Textile.