

THE INFLUENCE OF FABRIC STRUCTURE ON THE PILLING EFFECT

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Abstract: The abrasion resistance of fabrics is an important parameter for the durability and quality of a garment, i.e. the resistance to loss of mass and strength and, above all, to the pilling effect. It is therefore an important indicator of the wearability of textile products and their life cycle and an important factor in the development of more sustainable garments. The aim of this research was to analyse the influence of different construction parameters and raw materials of the woven fabric on pilling before and after washing. The analysis showed that the pilling values for washed fabrics were slightly higher on average than for unwashed fabrics. In addition to the weave, the raw material had the greatest influence on the occurrence of pilling. Fabrics with viscose yarns in the weft had a lower pilling resistance compared to other fabrics.





Keywords: pilling, fabric construction parameters, basic and complex fabrics, jacquard pattern.

Introduction: Garment manufacturers demand high-quality woven fabrics that simultaneously fulfil the requirements for a good price-performance ratio and guarantee a longer life cycle of the garments in terms of sustainable behaviour. Colour fastness and abrasion resistance, especially pilling, are properties that influence the visual acceptance of the garment and the wearing time of the product. Pilling is caused by the friction of the textile during wearing, washing and drying. Raw materials, yarn structure and fabric structure have the greatest influence on the occurrence of pilling. Textiles made from blends of natural and synthetic fibres are more prone to pilling than textiles made from a single raw material. Similarly, textiles with a higher thread density and more frequent interlacing are more resistant to pilling, which means that woven fabrics are usually more resistant to pilling than knitted fabrics. There are many other factors that contribute to the formation of pilling, including after-treatment, finishing processes, care, etc [1,2].

Material and method: Fourteen fabric samples were woven on the same cotton warp (2 x 8 tex) with a density of 40 threads/cm. Eight fabric samples were woven in two basic weaves (twill and satin, Table 1-left), using four different yarns in the weft: cotton 62 tex, viscose 2x32 tex, wool 73 tex and wool/acrylic 76 tex. The weft density was 17 threads/cm. A further six two-colour jacquard fabrics were woven in a complex double twill weave (Table 1- right), using six different yarn combinations in the weft (weft sequences 1a:1b): cotton: viscose, cotton: wool, cotton: wool/acrylic, viscose: wool, viscose: wool/acrylic, wool: wool/acrylic. The weft density was 28 threads/cm.

The samples were analysed to determine the pilling resistance of the fabrics before and after washing in accordance with the SIST ISO EN 12945-2 standard.

Table 1 Weaves

Basic Weave		Complex weave	
			
5-end twill	5-end satin	dark colour effect	light color effect

Results and discussion: For washed fabrics, complex fabrics showed greater resistance than simple fabrics up to 2000 cycles; above 2000 cycles it was the other way round.

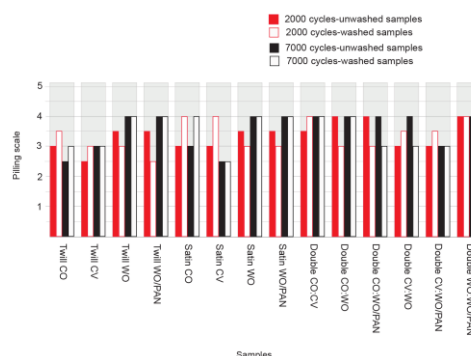


Figure 1 Results of pilling score at 2000 and 7000 cycles before and after washing

The appearance of the surface and the intensity of the pilling have changed depending on the raw material used and the cycles carried out. Fabrics with wool and wool blends in the weft already showed pilling with pronounced grooves during the first cycles, and the surface was more affected than with other fabrics. As the number of cycles increased, the surface changed from the rapid formation of elevations to their falling away from the surface. The degree of peeling was therefore lower at 7000 cycles than in the initial state. The viscose weft showed the opposite tendencies. Fabrics with a basic weave have a more even, smoother surface with the weft lying on the surface of the fabric, which is why they have a slightly lower resistance to pilling compared to the complex fabrics. Fabrics with viscose weft have extremely low pilling resistance compared to other fabrics, while fabrics with wool and wool blends in the weft have the best pilling resistance.

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