

Investigating the effect of elastic yarn ratios and cotton spinning techniques using different structures on functional and mechanical properties of compression bandages

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Abstract:

Medical bandages are considered one of the vital parts of first aid operations required in many critical cases. Medical bandages have evolved in the way they are produced and have transformed from simple bandages to types with specific uses. These bandages are distinguished by many characteristics and features that they acquire from cotton threads and from the weaving process that the tensile strength of the warp and weft differs, and from here these ligaments acquire their elastic and elastic properties. Rubber (elastic) threads can also be used in the production of medical ligaments, so that they participate with the yarns within the structural composition, giving elongation and flexibility to the fabric and causing a feeling of comfort. The aim of this study is to determine the extent to which different cotton spinning methods affect some of the functional and mechanical properties of woven medical tapes. The research was based on the production of 18 samples on a woven tape machine. Two experiments were conducted for the warp, the first experiment (100% Lycra) and the second experiment, with a mixing ratio of (2 Lycra: 1 cotton), using different weaving compositions (extended plain 2/2 in both directions, 2/2 Twill, satin 4) with the use of wefts. Using different spinning methods (ring - combined - open end) with the constant number of the warp and weft and the density of the warp and weft in the unit of measurement, then conducting laboratory tests on these samples and performing statistical analysis of them. The results of the research indicated that there is a significant effect between the different warp yarns used on most of the functional and mechanical properties of the samples produced, as well as the presence of a significant effect of the different weft spinning methods on both the absorption speed and hardness properties of the fabric ties produced, while the significant effect is evident between the textile compositions used on the properties (strength). Tension - rate of loss of strength - speed of absorption - hardness).

Research problem: • To what extent does the type of cotton spinning method affect the mechanical and natural properties of medical compression bandage? • There is no fixed Egyptian standard for the production of compression bands.

Research aims: • Improving the quality of woven medical bandages in the local market. • Study the effect of cotton spinning methods and structural compositions to obtain the best functional performance of woven medical bandages.

Research importance : • Reaching standard specifications for the production of woven medical tapes. • Using cotton spinning techniques, this will lead to higher functional properties.

Hypothesis: The difference in the percentages of using Lycra threads (rubber threads), whether without mixing or mixing them with cotton threads in a ratio (1 cotton: 2 Lycra), has statistical significance on the functional and mechanical properties of the fabric laces produced. There is a statistically significant difference between different cotton spinning methods on the functional and mechanical properties of the fabric ties produced. The difference in the fabric compositions used has statistical significance on the functional and mechanical properties of the fabric ligaments produced.

Research Methodology: This research follows the analytical and experimental approach.

Research sample: 18 samples were produced on the woven tape machine; Two experiments were conducted for the warp, the first experiment (100% Lycra) and the second experiment, with a mixing ratio of (2 Lycra: 1 cotton), using different weaving compositions (extended plain 2/2 in both directions, 2/2 twill, satin 4) with the use of wefts. From different spinning methods (ring - combined - open end) with the number of warp and weft and the density of the warp and weft constant in the unit of measurement.

Research results: •Although the warp material was stable in the first experiment, the fabric samples differed from each other in tensile strength as a result of the difference in textile structures. •Tensile strength was

affected by various study factors, such as warp material and textile composition, at a significance level of 0.05.

•The highest tensile strength was found in samples with Lycra warp material, and the lowest was in samples with Lycra/cotton warp material. •The highest tensile strength was associated with samples with a 2/2extended plain texture, and the lowest was associated with samples with an Atlas 4texture. •The lowest rate of loss of strength is for samples with the histological composition of satin 4, and the highest rate of loss of strength is for samples with an extended plain texture of 2/2. •The highest elongation was found in samples with an stain 4 texture, and the lowest was in samples with an extended plain texture of 2/2. • The lowest rate of looseness was in samples with a stain 4 histological structure, and the highest rate of loosening was in samples with an extended plain histology of 2/2. • The best absorption time for samples with wefts is achieved by open-end spinning. • Samples with a stain 4 texture gave the highest air permeability, while samples with a 2/2 extended plain texture gave the lowest air permeability. • Samples with a textured composition of satin 4 are less hard, while samples with a textured texture of Extended plain 2/2 have a higher hardness.

Keywords :

Cotton yarn, medical bands, woven tapes, rubber threads

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