Effect of Spandex Ratio on the Shrinkage of Woven Fabrics Made of polyester yarns

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Abstract:

The aim of this research is to study the effect of the spandex ratio on shrinkage in the direction of warp and weft for woven fabrics made of polyesters, and to determine the effectiveness of each element of the structure of the spandex yarns (spandex ratio – multi Filament in the cross section – yarn counts) For the best shrinkage rates of fabrics, The test samples were spun with two spandex yarns (75 denier - 150 denier) for warp and weft Laboratory tests for shrinkage were performed, The laboratory test results were analyzed for the tested properties by the analysis of variance, In addition the calculation of Step Wise between each of the independent variables (spandex ratio – multi Filament in the cross section – yarn counts) and between the shrinkage property as a dependent variable. In addition to determining the contribution of each of the independent variables by testing participation rates for overlapping verbs of independent variables, The results of the study showed that the properties of shrinkage depend on the content of spandex fibers to increase the ratio spandex in the shrinkage of the fabrics in the direction weft, It also showed that the yarn count 150 denier had the greatest effect on the reduction of shrinkage in the direction of warp for woven fabrics, The results of the statistical analysis showed a positive correlation between the spandex ratio and the deflation in the direction of warp and weft. The results also showed the importance of determining the effect of the independent variables on the shrinkage in the direction of warp and weft, where the shrinkage rate of the cloth can be controlled in the direction of warp and weft according to the operating requirements as well as the specification used for the final product.

Key words: polyester spandex, spandex ratio, Shrinkage, Shrinkage properties

Introduction

Textile specifications are the main pillars of textile and clothing products, where they play an important and essential role in economic promotion and marketing of textile products according to the technical dimensions of the textile product through some physical and mechanical properties that affect the thinking and planning of manufacturers in all areas of textile production, and play the relationship The relationship between the spandex ratio and the contraction plays a major role in the use of the final product in terms of its aesthetic appearance and its prominence in a form that fits the functionality required by the form.

The resultant application of force, energy or change in the environment allows a product to be comfortable [13] and implementation as the relationship between form and content or integration of form with its functional performance.

Spandex yarns are one of the most important yarns used in textile products because of their important features and characteristics in the comfort of clothes and matching with the appropriate body structure and flexibility, as the spandex yarns increase the elongation of

DOI: 10.12816/mjaf.2019.15944.1279

fabrics according to the direction of the spandex thread "warp or weft" in the cloth, Spandex yarn, also known as elasin, is synthetic fibers known for their exceptional flexibility that exceeds 100% of the traditional fibers in which the spandex fiber is made up. The long-chain industrial elastomer bar consists of at least 85% of the weight of the divided polyurethane [10].
Fabrics containing spandex yarns are applied in a variety of uses, especially because of increased stretchability, flexibility, comfort, dimensional stability and stability [3,12,20] .These types of fabrics are used for sportswear, recreational clothing, socks, and underwear, as these clothing takes These postures are mainly used in sports activities such as cycling, swimming and athletics. These types of fabrics help improve athletes' performance by offering less resistance during stretching. Labs and enhance the power through rapid moduli of the dimensions of the fabric [11].
Experimental studies of Islam and others [7] have shown that shrinkage values are higher for fabrics containing spandex yarns higher than others, and useful [10] indicated that increasing the spandex ratio further decreases the elongation of fabrics. Spandex of 4% -10% leads to a decrease in the elongation of fabrics from 2% -4% due to the further decrease in strength in the direction of the meat for woven fabrics by increasing the ratio of spandex.
Haji [9] measured the physical properties of fabrics from spandex yarns. Statistical analysis showed that dimensional stability and air permeability were negatively affected by spandex, and that weight increased significantly by increasing the spandex ratio. Marmarali [1] argued that fabrics with a high content of spandex yarn tend to be tighter than others with less spandex and emphasized that the weight and thickness of fabrics increase with the increase of spandex as air permeability decreases. Prakash and Thangamani [2] decided that increasing the proportion of spandex changes the dimensions of fabrics and show a significant change during the absorption of sweat, Sadek [17] that laboratory tests showed the effect of spandex ratio on the elongation of fabrics by up to 232% per layer for knitted fabrics. The practical experiments of Gokarneshan and Thangamani [14] proved that the elongation of the fabric is increased with the use of soft spandex yarns, where they decided that the basis of the composition of the spandex yarn is multiple materials and thus in turn elongate the fabrics.
The results of experimental research of Hearle and others[6]on the filaments of continuous filaments produced by polyester a decrease in the elongation coefficient under the tensile test, Taylor [21]went to the irregular distribution of stresses on filaments continuous filaments is the difference in the tension on the outer surface filaments The curve of the longitudinal yarn (not in contact with the transverse threads threaded with it) under the tensile test and its attempt to straighten, which increases the bonding of filament filaments and then increases the strength of the filament tension.

Research problem:

1- The lack of practical criteria for shrinkage of woven fabrics for warp and weft of polyester spandex yarns.
2- Performance mechanisms for the structures of spandex yarns that achieve the technical and aesthetic effects of woven fabrics are lacking in the experimental and analytical studies theoretical and evaluated, through which the technical and functional dimensions of the textile product can be enriched.

3- not to stand on the technical dimensions of the changing woven polyester fabrics of spandex yarns because of the difference in the number of filaments in the cross section of the number of yarns as well as the proportion of spandex.

Research Objective:

1- Analysis, evaluation and comparison of the various performance activities of spandex yarns to achieve the required technical dimensions.
2- to achieve the best rates of contraction property in functional uses, which are often indefinite, and then expand the employment circle for polyester fabrics of spandex yarns to horizons beyond the norm.
3- Improving the technical and functional dimensions of shrinkage of woven fabrics of polyester.
4- Increased comfort and flexibility rates for clothing used from spandex yarns.

Materials and Methods

samples were weaved using continuous polyesters (DTY) for warp and wefts, using two tigers (75 deniers and 150 denier) of plain 1/1. Using the Picanol-Optimax-4-R-220 machine, the test samples were dyed and processed and the shrinkage tests were performed according to the 135 Revision 18T, 2018 AATCC shrinkage direction in the warp and weft direction.

Results and Discussion

1- Effect of research variables on shrinkage in the direction of warp (%) of the produced samples :

Table (1-2) shows the results of the shrinkage test in the direction of the warp for the samples of the woven fabrics using three variables at the same time of the variables of polyester asteris:

1- Number of multi Filament in the cross section (36-72-144) for number 75 denier, (72-144-288) for number 150 denier.
2- Spandex ratio % (3.5-7-10).
3- Yarn counts (75 deniers - 150 denier)

Analysis of variance of the results of shrinkage in the direction of the warp by the table on the shrinkage in the direction of the warp indicates the effect of the shrinkage rate in the direction of the warfare significantly at the level of 0.05 and the overlap of the action of both variables (Spandex% - number of multi Filament in the cross section) for the samples of woven experiments using The yarn counts is 75 denier, as well as the samples of woven experiments using the yarn counts 150 denier.

1-1- The effect of the number of multi Filament in the cross section

- Study the effect of different number of multi Filament in the cross section as an independent variable on shrinkage in the direction of the warp (for both woven samples using number 75 denier and woven samples using number 150 denier) with fixation of the other independent variable (spandex ratio) through tables (1-3). (1-4) It is clear that there is a significant effect of the number of multi Filament in the cross section on the shrinkage in the direction of the warp, and that there are significant differences between the shrinkage ratios from the direction of the warp according to the difference of the number of multi Filament in the cross section where there is a gradual and significant increase in the shrinkage in the

direction of the warp, Increase the number of multi filament in the cat The number of filaments is 72 for 150 denier, while the highest number is achieved with 144 filaments for 75 denier.

2- Effect of research variables on shrinkage in the direction of weft (%) of the produced samples :

Table (1-2) shows the results of the shrinkage test in the direction of the warp for the samples of the woven fabrics using three variables at the same time of the variables of polyester asteris:

4- Number of multi Filament in the cross section (36-72-144) for number 75 denier, (72-144-288) for number 150 denier.

5- Spandex ratio % (3.5-7-10).

6- Yarn counts (75 deniers - 150 denier)

Analysis of variance of the results of shrinkage in the direction of the weft by the table on the shrinkage in the direction of the warp indicates the effect of the shrinkage rate in the direction of the warfare significantly at the level of 0.05 and the overlap of the action of both variables (Spandex% - number of multi Filament in the cross section) for the samples of woven experiments using The yarn counts is 75 denier, as well as the samples of woven experiments using the yarn counts 150 denier.

2-2- Effect of Spandex ratio %

- Studying the effect of different spandex ratio as an independent variable on shrinkage in the direction of the meat (each of the samples woven using the number of 75 denier and the woven samples using the number of 150 denier) with the fixation of the other independent variable (the number of multi Filament in the cross section) through tables (1-13) (1-14) It is clear that there is a significant effect on the rate of shrinkage in the direction of the meat, and that there are significant differences between the rates of shrinkage from the direction of the meat according to the difference of the spandex where there is a gradual and significant increase in the shrinkage in the direction of the meat affected by increasing the proportion of spandex and achieve the lowest rates using Spandex ratio 3.5%, while the highest rates using the Spandex ratio 10%.

Conclusion

This research shows the importance of the structural composition of spandex yarns (spandex ratio - number of multi Filament in cross section – yarn counts) and the effect of these variables on the rates of shrinkage of the fabric in the direction of warp and weft, during which the rates of shrinkage properties of fabrics can be controlled and shown The effect of research variables on shrinkage in the direction of warp is that by examining the effect of different number of multi Filament in the cross section as an independent variable on shrinkage in the direction of the warp it is clear that there is a significant effect of the number of multi Filament in the cross section on shrinkage in the direction of the warp and that there are significant differences between the shrinkage ratios There is a gradual and significant increase in the shrinkage direction due to the increase of the number of multi Filament in the cross section and achieved the lowest rates using the number of multi Filament 72 for a number of 150 denier while achieving the highest rates using the number of multi Filament

144 for a number of 75 denier. The effect of different spandex ratio as independent variable on deflation in the direction of warp It is clear that there is a significant effect on the deflation rate in the direction of the warp and that there are significant differences between the deflation rates from the direction of the warp according to the difference of the spandex ratio where there is a gradual and significant increase in To shrink in the direction of warp affected by increasing the ratio of spandex and achieve the lowest rates using the ratio of spandex 3.5% while achieving the highest rates using spandex rate of 10%, and by studying the effect of different tiger floss as an independent variable on the shrinkage in the direction of the warp shows that there is a significant impact on the rate of shrinkage in the direction There are significant differences between the shrinkage rates from the direction of the warn according to the difference of the number of the thread where there is a gradual and significant increase in the shrinkage in the direction of the warn due to the decrease of the number of the thread and achieve the lowest rates using the number of 150 denier while achieving the highest rates using the number of 75 While the effect of research variables on the contraction in the direction of the weft is evident that by examining the effect of the difference of the number of multi Filament in the cross section as an independent variable on the contraction in the direction of the meat it is clear that there is a significant effect of the number of multi Filament in the cross section on the contraction in the direction of the meat and that there are significant differences between Shrinkage from the direction of the meat according to the difference of the number of multi Filament in the cross section where there is a gradual and significant increase in the shrinkage in the direction of the meat affected by the increase of the number of multi Filament in the cross section and achieved the highest rates using the number of multi Filament 144 for a number of 75 denier while achieving the highest rates using The number of multi Filament 72 to the number of 150 denier, and studying the effect of different spandex ratio as an independent variable on the shrinkage in the direction of the meat it is clear that there is a significant effect on the shrinkage rate in the direction of the meat and that there are significant differences between the shrinkage rates from the direction of the meat according to the difference of the spandex where there is a gradual and significant increase in The contraction in the meat direction was affected by increasing the spandex ratio and achieving the highest rates using the spandex ratio 10% while achieving the lowest rate using the spandex ratio 3.5%. Studying the effect of different tiger floss as an independent variable on the contraction in the meat direction. There was a significant difference between the percentage of shrinkage from the direction of the meat according to the difference of the number of yarns, where there is a gradual and significant increase in the shrinkage in the direction of the meat affected by an increase in the number of yarns and achieved the highest rates using the number of 75 deniers while achieving the lowest rates using the number of 150 deniers.

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