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The responsiveness rate of two types of compact cotton yarns structure to influence initial preparatory processes

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Abstract:

Statement of the problem: 1- Two types of compact cotton yarns (carded, combed) lack to aesthetic and functional properties required in cotton yarns manufactured from the latest spinning methods, which harms to appearance, regularity of yarns and thus fabrics especially after final finishing process. As for functionally, these imperfections (IPI) weaken physical and mechanical properties of compact cotton yarns, which leads to short life span of fabrics produced from and such (IPI) increase clearly especially with low quality of current cotton grades. 2- Improving and developing performance of final product aesthetically and functionally, as cotton fabrics are exposed to strong competition from synthetic fibers, which have many desirable properties such as high appearance, luster, resistance to wrinkling, tensile strength and color stability, which cotton fabrics lack. 3- Using environmentally and healthily-rejected materials in final finishing process of cotton fabrics to achieve high appearance, luster, reduce shrinkage and quick drying in what is known as "easy care equipment", these materials are carcinogenic of first degree because contain a percentage of low formaldehyde, which causes skin infections (decreasing health properties, polluting environment) and use these materials leads to deterioration physical, chemical and mechanical properties of cotton fabrics. **Significance**: 1 -Analysis, evaluation and compare between physical, chemical and mechanical properties of compact cotton yarns (carded, combed) before conducting initial preparatory process (raw), and after performing to determine extent of difference in yarn properties. 2 -Obtaining compact cotton yarns (carded, combed) superior to untreated yarns and synthetic yarns by using healthy, environmentally safe materials and completely free of formaldehyde. While preserving all of physical, chemical and mechanical properties of yarns after treatment process, thus there is no harmful effect on end user healthy or environment, which achieves aesthetic and functional performance of final product and contributes significantly in marketing process. 3 -The following process whether weaving or knitting free of cotton fluff, which has a bad effect on human health and environment. **Objectives**: 1 -Studying response rate of compact cotton yarn structure (carded, combed) to effect of initial preparatory processes (Kier Boiling or Scouring, then bleaching). 2 -Achieving physiological comfort for human body through aesthetic and functional properties in proportion to aesthetic and functional performance of outerwear and domestic fabrics by using healthy and environmentally safe materials. Which reduces the effect of harmful substances in fabrics and reduces the amount of environmental pollution. 3 -Produce compact cotton yarns (carded, combed) completely free from imperfections (IPI) of natural fibers using healthy and environmentally safe materials, thus obtaining desirable properties of highest quality and lowest cost. Which opens the way to achieve new and desirable properties by using many initial preparatory processes for yarns produced by different spinning methods, whether cotton, blended or synthetic. **Delimitations:** Produce three compact carded cotton yarns and three other compact combed cotton yarns (compact spinning with Air-Guide Element). Then perform both (kier Boiling or scouring, then bleaching) processes in form of soft cone in a separate bath to determine response rate of two types of compact cotton yarn structure to effect of initial preparatory processes. **Methodology**: The research follows experimental and analytical method. **Experimental Work :** Giza Cotton (94), a new item of Egyptian Long Staple Category used in produce three compact carded yarns (compact spinning with Air-Guide Element (are : 16/1s, 20/1s, 30/1s (Z), twist factor 3.8 and three other compact combed yarns (compact spinning with Air-Guide Element) are : 50/1s, 70/1s, 80/1s (Z), twist factor 3.8. Then, each of them stacked on perforated plastic cone in winding process under low tension to become a low density (soft cone) to facilitate penetration of treatment solutions through yarns. Then kier Boiling or scouring process carried out using a hot alkaline solution of NaOH (Caustic Soda) 20% for compact carded yarns, 32.5% for compact combed yarns and then, bleaching process using hydrogen peroxide H2O2 50% for both of them has a separate bath. All laboratory tests performed on compact cotton yarns (carded, combed) before and after kier Boiling or scouring and drying process by 12 ~ 24 hours and after performing bleaching and drying process by 12 ~ 24 hours in standard atmosphere laboratory at (20°C ±2 and relative humidity 65% ±2) according to ASTM, Tests are : yarn count, yarn tensile strength, yarn elongation, yarn hairiness, yarn imperfections (IPI) including sum of (thin places, thick places, Neps/ 1000 m) using Uster Evenness Tester-5, yarn Humidity ratio and actual yarn T.P.I using Uster ZWEIGLE TWIST TESTER. **Research Results :** 1 -Superior response of compact cotton yarns (carded, combed) structure of new item of cotton Giza (94) for kier Boiling or scouring and bleaching processes .2 -Yarn Count of compact cotton yarns (carded, combed) increased with numbering of English cotton after two processes of kier Boiling or scouring and bleaching. 3 -Tensile Strength of compact cotton yarns (carded, combed) increased significantly after two processes of kier Boiling or scouring and bleaching. 4 -Breaking Elongation ratio of compact cotton yarns (carded, combed) decreased after kier Boiling or scouring process, then increased after bleaching process. 5 -Hairiness values decreased to very high degree, it almost completely disappeared in compact cotton yarns (carded, combed), especially in compact combed cotton yarns after two processes of kier Boiling or scouring and bleaching. 6 -Imperfection (IPI) which are sum of (thin places, thick places and Neps/ 1000 m) disappeared in compact cotton yarns (carded, combed), especially in compact combed cotton yarns after two processes of kier Boiling or scouring and bleaching. 7 -Humidity ratio decreased in compact cotton yarns (carded, combed) after kier boiling or scouring process, then Humidity ratio increased in both types of compact cotton yarns after

bleaching process. 8 -T.P.I. of compact cotton yarns (carded, combed) decreased after two processes of kier Boiling or scouring and bleaching .

Keywords:

Compact Spinning, Compact Carded Cotton Yarns, Compact Combed Cotton Yarns, Yarn initial preparatory processes, Kier Boiling or Scouring, Bleaching

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