TUDIES OF THE EFFECTIVENESS OF MODIFIERS FOR REGULATING THE PROPERTIES OF COTTON FIBERS.

Sherkulova Nargiza Rustambekovna
Dilmurod Turdimuratovich Shodiev
Khamidova Iroda Olimjonovna
Gulistan State University (Uzbekistan).

Abstract: *In this paper, the effect of water-soluble compositions based on sericin and polyethylene glycol on the physical and mechanical properties of natural cotton fiber is considered. A positive change in the relative breaking load of cotton fibers treated with different concentrations of a polymer composition based on sericin and polyethylene glycol is given.*

Keywords: *Cotton fiber, modification, composition, sericin, polyethylene glycol, physical and mechanical properties, strength, breaking load.*

The problems of increasing the technical level of production, improving technological processes and saving raw materials are fully faced by the textile industry and, in particular, by the cotton spinning industry, which processes natural expensive raw materials. Today, the solution of technological problems related to the resources of raw materials and their processing is extremely important due to the increasing demands of the world population for products based on natural fibers.

A characteristic feature of materials used in light industry is their fibrous capillary-porous structure. During the operation of products, external influences (mechanical, thermal, chemical, etc.) are primarily exposed to the surface layers of materials, and the durability of products depends on their strength and durability.

Traditional methods of surface modification of textile products (mechanical, thermal, chemical, chemical-thermal, electrochemical) do not allow to comprehensively improve surface characteristics and create a number of problems, the most important of which are the shortage of raw materials and energy resources, pollution of the atmosphere and industrial effluents. Moreover, changes in the specified direction of one parameter are usually accompanied by a deterioration in other properties of materials.

The use of polymer-composite technology, for example, in the textile industry, characterized by lower consumption of chemicals and less environmental pollution, makes it possible to reduce the severity of these problems.

One of the main tasks of modern materials science is to establish the relationship between the properties of materials and the peculiarities of their microstructure. Solving such problems allows you to create express methods for assessing structural changes and improve technological modes of production

In [1], using the example of the Mirzachul regions, a dynamic model is considered describing the separation of large and small weed impurities from the cotton mass having an elastic bond with cotton. The relationship between the forces acting on the speck from the angular velocity and radius of the working drum of the cleaner is established, the

patterns of movement of the specks on the surface and inside the cotton mass from the process parameters are obtained

Further, the authors [2] conducted laboratory studies of the distribution of flakes of different weights in an average prototype of raw cotton from a completed batch of grade 4 of the 3rd class, i.e., to improve the quality and assortment of fiber and seeds, a cleaner separator of raw cotton into fractions of different grades and recommendations for its implementation on cotton gins were developed factories.

In [3], a constructive scheme is presented with the principle of operation of the recommended working drum with an elastic shock absorber of the raw cotton riot disassembler. Recommendations on the use of the recommended design of the working body are given.

In addition, the requirements of the fabric market are more fully satisfied with the production of high-quality raw materials due to the use of modern dressing preparations based on modified starches. Despite the higher prices for 1 kg of new generation dressing preparations, their use is economically justified and allows for more rational tissue production.

One of the promising ways to prepare the main yarn for weaving is emulsification. This process is more economical and productive than dressing.

The process is carried out at normal temperature, does not require a drying device. During emulsification, due to an increase in the strength of the yarn, the villosity decreases by 6-8%. The relative tensile elongation of woolen fabric and yarn increases by 20-30%, its extraction and waste during emulsification are significantly reduced.

Emulsification is carried out on special installations for belt warping machines or on distillation-emulsifying machines MPE-180, MPE-230, designed for grouping and winding emulsified main yarn from warping shafts or weaving yarn onto a weaving pile.

The effectiveness of emulsifying dressing replacement is to reduce the cost of processing the bases as a result of reducing the cost of chemical materials and steam by 15-20%, and to increase the productivity of the distillation-emulsifying machine compared to the dressing machine by 1.7–1.8 times. An adhesive preparation and an antiseptic are used to prepare the emulsion. Wool, cotton and linen yarns are mainly emulsified.

However, there is still little consensus on the deformation behavior of cotton, which is largely due to the lack of experimental research.

Along with the search for ways to improve technology and equipment, the development of methods for the effective use of waste generated may be promising.

In silk processing enterprises, waste water containing protein substances is formed in large quantities. The waste water is partially purified and discharged into the drains.

The use of aqueous protein solutions to modify cotton fiber opens up new prospects for improving their hygienic properties. It has a number of advantages over spinning fiber using a mixture of poly alcohols and natural silk sericin at the stage of modification of a cotton polymer based on polymer-like transformations.

To improve the quality of natural cotton fiber, treatment with water-soluble composite solutions based on polyethylene glycol and sericin was applied.

Composite modification methods, or mixing methods, when polymer–compatible components or finely dispersed additives - carriers of new properties are added to the main fiber-forming polymer [4].

It is possible to improve the technological and operational characteristics of products made of cotton textile materials by modifying the mechanical and physical properties of the fiber. The aim of the study is to create effective modifiers based on sericin to regulate the properties of textile fibers.

The effectiveness of the solutions of the created high-molecular composite modifier based on polyethylene glycol and sericin on the wettability of the fiber with water was compared with the similar effect of the solutions of the composition.

The presence on the surface of the elementary yarn fibers of a monomolecular layer of modifying agents associated with cellulose modified with a liquid composite, for the reasons stated above, contributes to an increase in the strength, fatigue and elastic characteristics of textile yarn, which leads to an improvement in their ability to process in weaving. Table 1 shows the characteristics of cotton yarn [5] treated sequentially with sericin and polyethylene glycol, as well as, for comparison, prepared for weaving by dressing.

Table 1.

The main properties of cotton yarn prepared for weaving in various ways

Yarn processing option	Abrasion resistance, cycle.	Endurance to repeated stretching, cycle.	Breaking load, cH	Breaking elongation, %
Raw yarn	43	372	485	4 5
Treatment with polyethylene glycol c by removing it by washing it with water	30	222	560	3 3
Sequential sericin treatment	63	473	660	4,3
Sequential treatment with sericin and polyethylene glycol 2.5 g/l	55	799	616	4,4
Dressing with starch dressing 70 ml	10	312	513	0,8

These tables indicate that yarn treated with sericin and polyethylene glycol is characterized by a better set of properties than yarn prepared for weaving by dressing.

The method of directional modification of the surface properties of textile yarn, the high efficiency of which in preparation for weaving cotton yarn is shown above, and thus used to improve the ability to textile processing of natural cotton yarns and yarns based on them.

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