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Influence of Fiber Maturity Degree on Physical and Mechanical Properties of Yarn

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ABSTRACT: The article presents the results of a study of the effect of fiber maturity on the mechanical properties of yarn. For this, a 10x10 plot was selected on a cotton field, where raw cotton was harvested on the first, third, seventh, tenth and twelfth days of unsealing. The fibers from the seeds were separated manually. From the obtained fiber samples with different degrees of maturity, yarn samples were developed and their mechanical properties were investigated.

KEY WORDS: Cotton fiber, fiber thickness , length, breaking load, elongation at break, degree of maturity, mechanical properties, quality control.

I.INTRODUCTION

The transition of the Republic of Uzbekistan to market relations requires deep targeted changes in structural policy in the economy, its individual sectors, in particular the processing industries, designed to provide the population with consumer goods. The restructuring of the sectoral and territorial structure of the cotton processing industries, especially in the transition to market relations, necessitated the allocation of sectoral priorities. The entry of the Republic into new business conditions implies activization of production growth factors, the search for new reserves for the development of cotton fiber processing industries.

In the textile industry for the production of high quality cotton fabrics, it is necessary to produce high quality yarn. Spinning factories operating in our country are well organized and provide the basis for producing high quality yarn. However, due to the defolation of cotton in the fields, harvesting is delayed for a long period of time. As a result, the maturity of the fiber increases, the curl of the fibers decreases, and the risk of yarn production with high unevenness increases. In the spinning process, fiber thickness, breaking load and elongation at break are essential. For example, uneven thickness is one of the main indicators that determine the quality of yarn.

From fine fibers produce a flat, thin and durable yarn that meets the requirements of standards. Light fabrics and knitted fabrics are produced from thin yarn. The thinner the fiber, the greater the number of fibers in the cross section of the yarn. Along with this, in the structure of the yarn, the area of mutual contact of the fibers with each other increases, as a result, the strength of the yarn increases. For threads produced from fibers with a low linear density, the relative tensile strength is less, this indicator for fine yarn is quite tangible. To produce high-quality yarn with indicators corresponding to the normative, in the cross section of the yarn must be a certain number of fibers. The linear density of the fibers is an important factor in yarn production with low linear density. This means that the minimum number of fibers in the cross section of yarn with a minimum thickness varies. The negative sides of very fine fibers are also known. Such fibers in the spinning process are tangled, as a result, the appearance and yarn quality indicators deteriorate.

II. ANALYSIS OF EXISTING FILTERING MATERIALS AND RESEARCH RESULTS

In the process of spinning in the development of yarn, the mechanical properties of the fibers are of great importance, that is because, they affect the wear resistance, compression deformation, bending and movement of the fibers relative to each other. Along with this, such characteristics as length, strength and linear density of fibers are also

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significant indicators for producing high-quality yarn. The better the quality of the fiber, the yarn produced from them, meets regulatory requirements, and is in demand.

Research was carried out to study the mechanical properties of the yarn. To do this, yarn samples were developed from fibers with different maturation periods in the laboratory, examined on modern testing devices, and the results were analyzed.

The results of the study are shown in the table -1.

Table 1

Changes in the mechanical properties of yarn samples produced from fibers with different ripening periods

Box opening period	Yarn strength, SN	Yarn breaking load, cN / tex	Quadratic unevenness at breaking load,%	Elongation at break,%	Quadratic unevenness in elongation at break,%
reopened box	273	9,24	9,99	6,50	9,23
box with a disclosure of 3 days	333	11,47	9,4	6,78	10,84
box with a disclosure of 7 days	325	10,96	5,87	7,89	5,61
box with a disclosure of 10 days	336	11,54	9,5	6,91	7,87
box with a disclosure of 12 days	393	13,30	8,5	6,4	4,7

Based on the results of the research in Fig. 1-3 graphs of changes in the strength of yarn, specific breaking load, quadratic unevenness on breaking load, elongation at break and quadratic unevenness at elongation at break depending on the maturation period of the fiber.

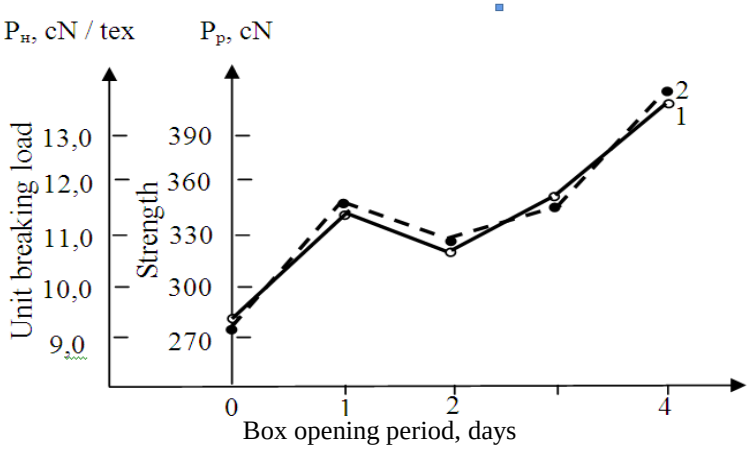

Figure-1. Influences of the period of box opening on the strength and specific breaking load of yarn.
1- specific breaking load of yarn;
2- yarn strength.

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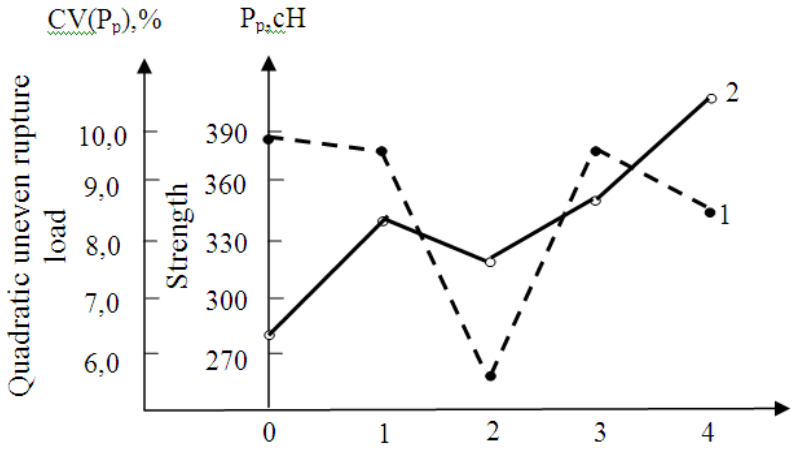

Figure-2. Influences of the period of box opening on the strength and quadratic unevenness of the breaking load.
1- breaking load quadratic roughness; 2- yarn strength.

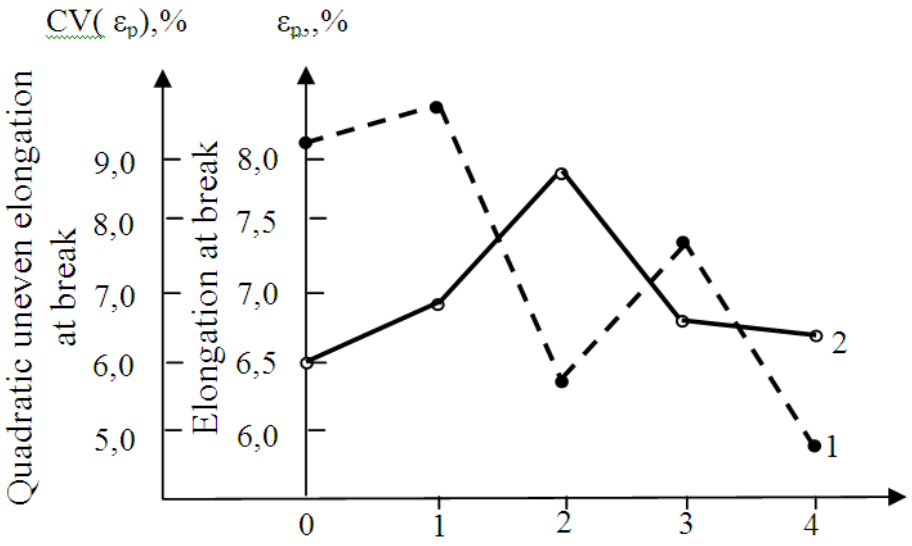

Figure-3. Effects of the box opening period on the elongation of the yarn at break and quadratic unevenness at elongation at break.
1- Quadratic uneven elongation at break; 2- elongation at break.

III. EXPERIMENTAL RESULTS

From the obtained results it can be seen that compared to the yarns produced from the fiber immediately after opening, the strength of the yarn from the fiber after 3 days of opening has decreased by 18.0%, the specific breaking load has also decreased by 19.4%, the quadratic unevenness of the breaking load on 5.9%, elongation at break increased by 4.1%, and the quadratic unevenness at elongation at break increased by 14.8%, the strength of yarn produced from fiber after 7 days of disclosure decreased by 16.0%, the specific breaking load decreased 15.7% quadratic unevenness at breaking load decreased by 41.2%, elongation at break increased by 17.6%, and quadratic unevenness at elongation at break decreased by 39.2%, the strength of the yarn produced from the fiber after 10 days of disclosure decreased by 18.8 %, the specific breaking load decreased by 19.9%, the quadratic unevenness of the breaking load decreased by 4.9%, the elongation at break increased by 5.9%, and the quadratic unevenness of the

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elongation at breaking decreased by 14.7%, the strength of the yarn, produced from fiber after 12 days dropout decreased 30.5%, specific breaking load decreased by 30.5%, quadratic unevenness of breaking load decreased by 14.9%, elongation at break increased by 1.5%, and quadratic unevenness at elongation at break decreased by 49.1%.

IV. CONCLUSION AND FUTURE WORK

The results of the study show that the longer the open box is in the fields, the higher the maturity of the fiber, which leads to an increase in quadratic unevenness in terms of yarn quality indicators.

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