ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 6, Issue 5, May 2019

Influence of Degree of Maturity on the Qualitative Indicators of Cotton Fiber

Tulkin Ashurovich Ochilov, Mirpolat Kulmetov, Akhmedov Bakhodir, Salomat Saidazizovna Saidmuratova, Akbar Zokirovich Yusupov, Patkhullaev Sarvarjon

Tashkent Institute of Textile and Light Industry (Uzbekistan)
Tashkent Institute of Textile and Light Industry (Uzbekistan)
Tashkent Institute of Textile and Light Industry (Uzbekistan)
Tashkent Institute of Textile and Light Industry (Uzbekistan)
Tashkent Institute of Textile and Light Industry (Uzbekistan)

ABSTRACT: In this article, the quantitative content of cotton fibers from the degree of maturity and their physico-mechanical properties were determined from the selected samples. For this purpose, a special designated area of 10x10 meters was chosen, from which cotton fiber was harvested during the initial opening of the box, when opening the box in 6 days, 10 days, 14 days and 18 days, which were manually separated from the seeds.

KEY WORDS: cotton fibers, linear density fiber, fiber strength,

I.INTRODUCTION

In the conditions of market relations to meet the needs of the population of our Republic with quality products, first of all, for the highly efficient development of spinning production, it is necessary to improve the quality of manufactured products, increase its export potential, increase productivity and expand the range.

The structure of cotton fiber depends on its maturity and is characterized by the following features. There is a primary wall of fiber with a thickness of about 1 micron, which is located outside and contains about 50% cellulose. Fat-wax substances are concentrated on the outer surface of the primary wall, which explains the poor wet ability of cotton fiber with water and other liquids. The primary is followed by the main multilayer secondary wall about 6–8 μm thick, consisting of daily deposits of cellulose formed by protoplasm photosynthesis. Inside the fiber is a channel. The immature fiber is filled with protoplasm, and only its remnants are in the mature fiber. Studies using an electron microscope showed that the individual layers of cellulose are formed from fibrils, which are a complex complex of micro fibrils, consisting of tens and hundreds of large chain cellulose molecules. Separate molecules in micro fibrils and micro fibrils in fibrils fit to each other loosely and are held by the forces of intermolecular interaction, and also due to the fact that long chain molecules enter their separate parts (units) into different micro fibrils and fibrils.

The appearance, growth in length and maturation of all the fibers on the seed does not occur simultaneously, and therefore even on one seed, the fibers are not the same in length and maturity, and other properties. Therefore, when testing fibers, usually determine the average length, the average coefficient of maturity, the average breaking load, etc. The main fiber-forming polymer of the fiber is α-cellulose with a polymerization degree of 5–6 thousand, which accounts for 95–97% of mature fibers (only 80% in completely immature fibers). The remaining 3-5% are in low molecular weight cellulose fractions (hemicelluloses) - up to 1.5%; fatty substances up to 1%; protein and ash (mineral) substances - up to 1.5%. Cotton α-cellulose has an amorphous-crystalline structure with a degree of crystalline of about 70%. With an increase in the degree of maturity of cotton fiber, the amount of hemicelluloses decreases.

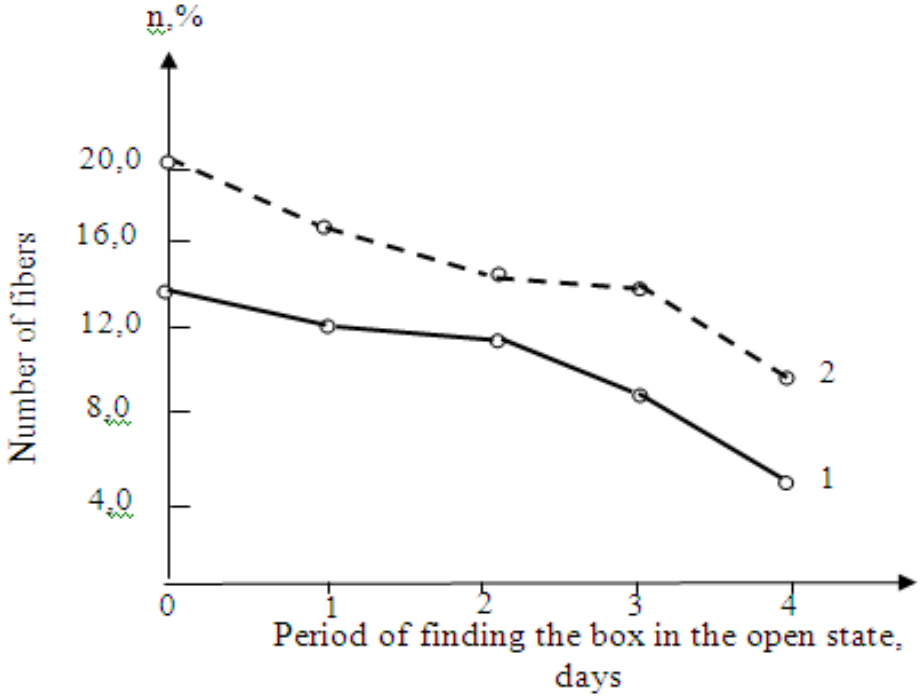
II. ANALYSIS OF EXISTING FILTERING MATERIALS AND RESEARCH RESULTS

In the process of spinning in the development of yarn, the mechanical properties of the fibers are of great The outer layer with a thickness of less than 1 micron is called the primary wall. It is formed from cellulose fibrils rarely located and intersecting at a large angle, the space between which is filled with cellulose satellites. The mass of cellulose in the primary wall is slightly more than half its mass in the fiber. The outer surface of the primary wall consists of a waxy-like layer. In the primary wall of the fibers, there are two layers in which the fibrils are arranged at

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 6, Issue 5, May 2019

different angles. The secondary wall of the mature fiber has a thickness of 6 ... 8 microns. It consists of bundles of fibrils located along helical lines rising at an angle of 20 ... 45 ° to the fiber axis. With greater maturity of cotton fiber, the quantitative content of cotton fibers with a coefficient of maturity of 4.0-5.0 increases, which leads to the development of them yarn, uneven in thickness.

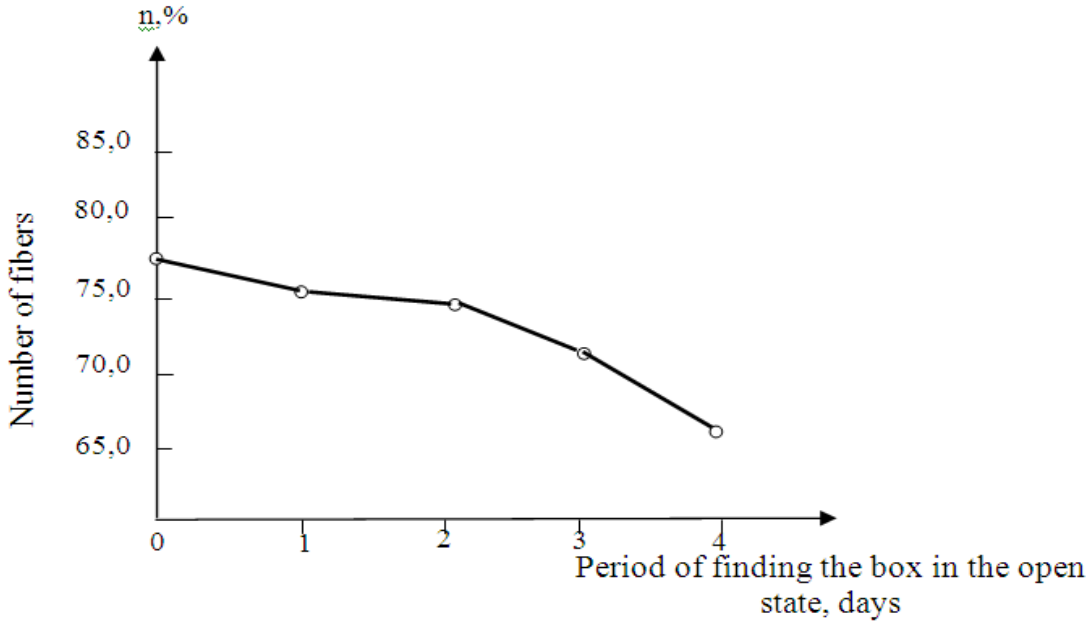
To determine the change in the quantitative content of fibers in cotton according to the degree of maturity, research works were carried out. For this, the selected samples of cotton fibers from bolls with varying degrees of maturity were divided into groups according to the maturity using a microscope and the quantitative content was determined. The obtained test results are shown in Fig. 1 and 2.



Pic.1. The change in the quantitative fiber content according to the degree of maturity depending on the period of cotton opening.

1- when the degree of maturity of cotton fiber 0-1,5;
2- when the degree of maturity of cotton fiber 1,5-3,0.

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 6, Issue 5, May 2019



Pic.2. The change in the number of fibers depending on the period of the box in the open state and the degree of maturity of the fibers.

1- When the degree of maturity of cotton fiber 3,0-4,5.

When analyzing the test results, the quantitative content of fibers with a degree of maturity of 0-1.5 in comparison with the newly opened box when the opening of the box in 3 days increased by 21.4%, with the opening of the box in 7 days by 28.6%, with the opening of the box in 10 days the number of fibers with this degree of maturity increased by 35.7%, with the opening of the box in 12 days the number of fibers with this degree of maturity increased by 57.1%, the quantitative content of fibers with a degree of maturity 1.5-3.0 compared with newly opened box when the opening of the box in 3 days increased by 15.0%, with the opening of the box in 7 days by 25.0%, 10 kun davomid ochilib turgan kasak ichidagi tonalar sony 30.0% ha, with the opening of the box in 12 days the number of fibers with this degree maturity increased by 50.0% decreases, the quantitative content of fibers with a maturity of 3.0-4.5, in comparison with the newly opened box when opening the box in 3 days increased by 8.3%, when opening the box in 7 days by 12 , 0%, with a box opening in 10 days by 14.2%, with a box opening in 12 days by 21.4%.

When analyzing the test results, the quantitative content of fibers with a degree of maturity of 0-1.5 within 12 days increases from 21.4% to 57.1%, the amount of fibers with a degree of maturity of 1.5-3.0 within 12 days from 15,0% decreases to 50.0%, the quantitative content of fibers with a degree of maturity of 3.0-4.5 gurus increases from 8.3% to 21.4% within 12 days.

III. EXPERIMENTAL RESULTS

In addition, changes in the physicomechanical properties were investigated depending on the degree of maturity of the fibers.

The ripening period of cotton fiber is 130-150 days. During this period, the fiber properties change. That is, if you do not pick cotton for a long time after opening the box, the indicators of the linear density and strength of the fibers increase.

According to the O'zDst 604-2016 standard, cotton fiber is divided into 5 grades depending on the color, appearance, and also depending on the staple mass side, the relative breaking load is divided into 9 types.

When producing yarn with a minimum linear density, the linear density of the fiber has a predominant value.

n order to study the effect of changes in linear density and physicomechanical properties of cotton fiber on the degree of maturity, research work was carried out. The results of the tests are shown in table 1.

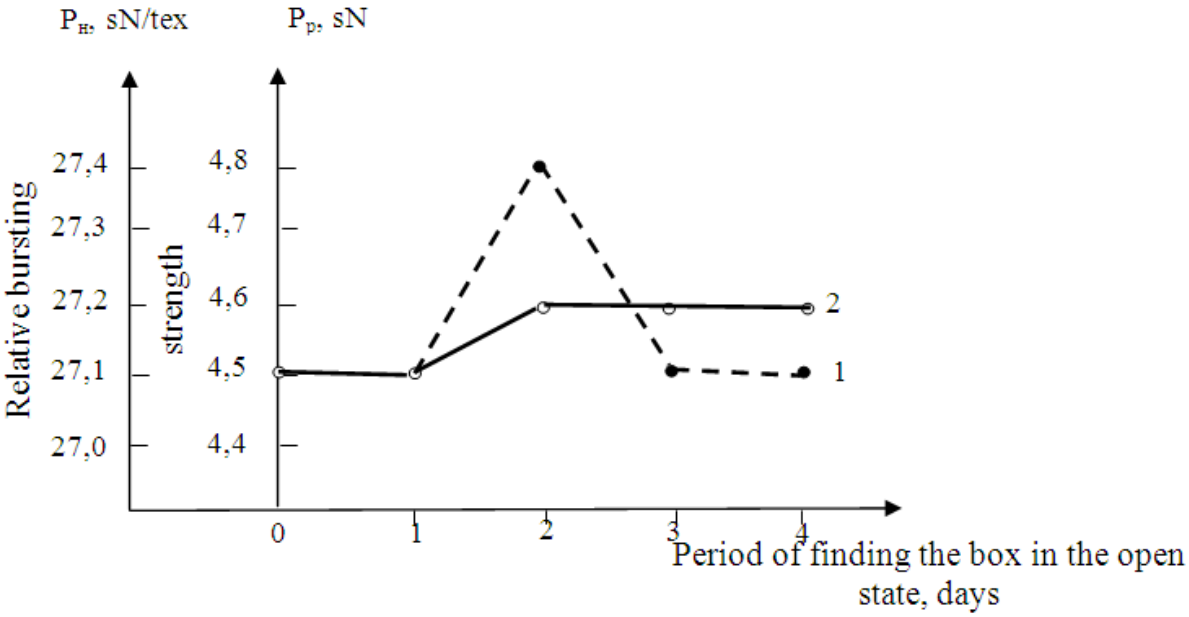
ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 6, Issue 5, May 2019

Table 1
Changes in the physical and mechanical properties of cotton fiber, depending on the degree of maturity of cotton

p/n	Box opening time	Linear density fiber, mtex	Fiber Strength, SN	Relative breaking load, cN / tex
1.	reopened box	166	4,5	27,1
2.	cotton opening time 3 days	166	4,5	27,1
3.	cotton opening time 7 days	168	4,6	27,4
4.	cotton opening time 10 days	170	4,6	27,1
5.	cotton opening time 12 days	170	4,6	27,1

From the test results it can be seen that the linear density of the fibers does not change when the box opens at 3 days, when the box opens at 7 days, the linear density value increases by 1.1%, when the box opens at 10 days, the linear density increases by 2.4%, at the opening of a 12-kun linear density box increases by 2.4%. On this basis, there is a dependence of the linear density of cotton fiber on the duration of the cotton in the open state in the cotton fields.

Based on the data in Table 1, a graph of the change in strength and the relative breaking load of cotton fiber is plotted, depending on the degree of maturity, shown in Fig. four.



Pic.3. The effect of cotton opening time on strength and relative breaking load of cotton fiber.
1- relative breaking load of fiber; 2- fiber strength.

According to the results shown in Fig. 4, it can be seen that the strength and relative breaking load of the fibers do not change in the newly opened box and the box opening in 3 days, the strength in the fibers with the opening box in 7 days increases by 2.2%, the relative breaking capacity load increases by 1.1%, for fibers with a box opening in 10 days, strength increases by 2.2%, relative breaking load does not change, for fibers with a box opening in 12 days, strength increases by 2.2%, relative breaking load narrow has not changed. On this basis, an increase in the strength index is observed with the long-term presence of cotton in the cotton field.

IV. CONCLUSION AND FUTURE WORK

From the test results it can be seen that the long-term presence of cotton in the cotton fields improves the maturity of the fiber..

ISSN: 2350-0328

International Journal of AdvancedResearch in Science, Engineering and Technology

Vol. 6, Issue 5, May 2019

Indicators of strength and relative breaking load of fibers in the newly opened box and with opening of the box in 3 days do not change, for fibers with opening of the box in 7 days, strength increases by 2.2%, relative breaking load increases by 1.1%, for fibers with opening the box in 10 days, the strength increases by 2.2%, the relative breaking load does not change, the fibers with opening the box in 12 days increase the strength by 2.2%, the relative breaking load does not change.

REFERENCES

1. Dev R. Paudel aEric F. Hequet a bNureddin Abidi a Estimation of cotton fiber maturity measurements // Industrial cultures and products. Elsevier. Volume 45, February 2013, pages 435-441.

2. Qi Mingde, Yang Hu, Zhu Jilian, Liu Weidong. Method and device for determining the size and maturity of cotton fiber // CN103630462 (A) - 2014-03-12.

3. Addissu Ayelea Eric Hequeta Brendan Kellyab. The effect of fiber maturity on the assessment of the amount of cotton (Gossypium hirsutum L.) fibers on the surface area of seeds // Industrial cultures and products. Elsevier. Volume 102, August 2017, pages 16-22.

4. Abdurakhmonov Ibrokhim, Buriev Zabardast, Abdukarimov Abdusattor, Saha Sukumar, Jenkins Johnie, Pepper Alan. Cotton PHYA1 RNAi improves fiber quality, elongation of roots, flowering, maturity and yield potential of Gossypium hirsutum L // US2013227723 (A1) - 2013-08-29.