International Journal of
Inclusive and Sustainable Education

ISSN: 2833-5414
Volume 2 | No 2 | February-2023

Fiber Matured at Different Periods Change of Structure

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Abstract: in this article, research work was carried out on a farm in Karshi district. For him, a special 10x10 meter area was selected from the cotton field, cotton was picked from the first, 3th, 6th, 9th and 12th days of cotton and separated from the seed by hand. The structure of the obtained samples was analyzed with a scanning electron microscope in the laboratory of the "Innovative Technologies Center".

Keywords: protoplasmic cellulose material, dead, spirally twisted flat tubes, oil, wax and mineral substances, if cotton fiber is exposed to cold caustic alkalis, the fiber swells, the twist disappears, the surface is smoothed, it becomes silky, the hardness increases, and the dyeability improves.

I. INTRODUCTION

To ensure high and stable growth rates in the republic's textile and sewing-knitting industry, to attract and absorb foreign direct investments, to produce and export competitive products, to create new high-tech jobs due to the implementation of strategically important modernization projects, Systematic work is being carried out to further deepen structural reorganization aimed at technical and technological updating of enterprises, introduction of an advanced "cluster model".

At the same time, a comprehensive analysis of the development of the textile and sewing-knitting industry, the changing state of the world market in the face of increased competition, requires state support for the industry, as well as the development and implementation of mechanisms for more stable and rapid development.

A characteristic feature of textile and light industry in a market economy is the short-term period of products, which justifies the need to produce a large assortment of small-volume products. This leads to frequent product model changes, reduced batch sizes, and increased launch frequency. In order to maintain the competitiveness of production, it is necessary to respond flexibly and adequately to changes in the external market conditions by the internal organization of production. Basic research on the theoretical basis and practical provision of production system flexibility.

The textile industry is becoming one of the most powerful industries in the world. This is represented by the availability of raw materials, which is considered the most basic, decisive factor necessary for the development of the industry.

Almost all textile materials consist of textile fibers. The appearance and properties of different materials depend on the properties of the fibers that make them up.

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Cotton farming is an important sector of the national economy of Uzbekistan. Cotton raw materials, cotton leaves, stalks, bolls and roots are used for various purposes. Cotton clothes a person. A variety of food products and many valuable raw materials for industry are obtained from it.

Defoliation is of great importance in accelerating the ripening of the cotton crop and harvesting it with the help of machines in a short period of time. Defoliation is the artificial dying of cotton leaves using chemical agents. Drying of cotton with the help of chemicals is called desiccation. Defoliation allows harvesting more than 90 percent of the crop before frost, the productivity of the machines increases by 20-25%, the amount of cotton delivered to 1 variety increases by 4-5%, the cost of the product decreases, and the harvesting time is somewhat shortened. Drugs are applied to cotton leaves by spraying or dusting. In this case, the preparations penetrate into the leaf cells, damage it, dehydrate the tissues, the process of photosynthesis is disturbed, and as a result, the leaf dries up and falls off. The effect of defoliants depends on air temperature and soil moisture. High efficiency is achieved when the air temperature is not lower than +18-21 0 C, soil moisture is 65-70% of the field moisture capacity. Cotton leaf sheds 80-90% in 10-12 days.

As a technical crop, cotton is grown mainly for the production of long silky fibers with universal application properties. Clothes and technical fabrics are made from cotton fiber. Products such as lint, cottonseed oil, kunjara, shulkha, and meal have high consumer value. Cotton products are widely used in light, food, automobile, electrical engineering, chemical, pharmaceutical, oil industry, construction materials production and other sectors of the national economy. It is known that the quality and weight of cotton fiber and seed is related to the quality of raw materials, and this indicator, in turn, is related to the natural conditions of the regions, soil fertility, land reclamation, the type of cotton planted in the farmer's field, the preparation of the land for plowing and planting, the fertility and fertility of the seed planted in the soil, to carry out agrotechnical measures in crop care in optimal terms, to organize the fight against weeds, diseases and pests correctly from scientific and practical aspects, to carry out cotton defoliation taking full account of the condition of plants and climatic conditions, to harvest the grown crop in short periods without destroying nests, It is directly related to the strict adherence to the procedures and rules of crop rotation in cotton fields, the level of introduction of the science and technology of cotton cultivation, the experience of the pioneers to the production of farms.

Cotton is a perennial, heat-loving woody plant. As a result of applying the experience of cotton planting for many years, by selecting the best types, one-year, high-yielding, localized cotton varieties with good fiber quality have been created. The distribution range of cotton does not pass from the parallel of 47 degrees of north latitude to the parallel of 35 degrees of south latitude.

A boll is formed after cotton flowers. During the growth of cotton, the size of the boll increases. Fibers grow on the seed inside the pod, and their development is divided into two periods, that is, in the first period, the fibers grow only in length, and in the second period, cellulose layers are formed as a result of biological synthesis from the protoplasm.

Under the influence of sunlight, protoplasm forms cellulose material and settles in the fiber wall. As a result, the fiber thickens and its physical and mechanical properties change.

Cotton bolls are picked by hand when 30-40% open and by machine when 60-60% open. Cotton is clean when picked by hand, but picking productivity is low, while picking by machine is more productive and dirtier, the spindles of cotton picking machines have a negative effect on the quality of fiber and seed.

The fiber consists of some cells extending along the length of the outer epidermis of the seed coat. Therefore, each fiber is only one cell. The cell of the outer epidermis in the seed bud, which becomes a fiber, is called an active cell. Some cells swell late and grow slowly, and the linter turns into cotton (fluff).

For 25-30 days, the fiber grows to the height of the batomom, and in the remaining 25-30 days it ripens. Fiber walls are covered with cuticle in the first stage, and in the second stage, they begin to be covered with a spiral-fibril layer and become thicker. When the fiber is mature, it dries up along with the seed and pod, the cell sap evaporates, and the fiber twists into a spiral.

When untreated or raw fibers dry, the degree of twist is weak and uneven, or completely absent. Fibers that do not twist at all are called dead fibers in the textile industry. Fibers with excessively developed walls are also included in low-quality fibers.

The structure of cotton fibers depends on their maturity level. Immature (dead) cotton fiber is flat, ribbon-like, thin-walled and has a wide tube, cavity in the middle. As the fibers mature, cellulose accumulates in the walls and the walls thicken and the tube narrows, the fibers become twisted. Longitudinal view of ripened cotton fibers consists of spirally twisted flat tubes. Between the most ripe fibers, the tube is small, and the fiber is cylindrical in shape.

One side of the cotton fiber gap is open. The cross-section of cotton fiber also depends on the degree of ripeness.

In addition, the cross-sectional surface of perfectly immature fibers is ribbon, that of immature fibers is bean-shaped, that of mature fibers is ellipsoidal and that of the best matured fibers is circular. In terms of chemical composition, cotton fiber consists of almost pure cellulose. Ripe cotton fiber consists of 95-96% cellulose and 4-5% various impurities - oil, wax and minerals. The outer layer is called the cuticle and consists of fibrils arranged at an angle of 40-450.

The length of the cotton fiber depends on the variety, from 25 to 45 mm, and the average size of the cross section is from 12 to 25 μm. Cotton fiber is resistant to acid, it is corroded even by diluted acids, long-term exposure to acids causes the thread from it to become so weak that it tears like cigarette paper. If we expose cotton fiber to concentrated sulfuric acid, then the fiber turns into coal. If the cotton fiber is exposed to cold caustic alkalis, the fiber swells, loses its twist, the surface is smoothed, it becomes silk-like, its hardness increases, and its dyeability improves. Cotton fiber dissolves under the influence of copper hydroxide solution in alcohol. As a result, when water is poured into the resulting solution, the concentration of alcohol decreases and the mass of cellulose settles in the form of a colloidal solution.

During the growth and development of cotton, the degree of ripeness, color, thickness and strength of the fibers in the boll also change to a certain extent. Because the amount of cellulose in cotton fibers increases under the influence of sunlight.

Before picking, cotton is defoliated using various chemicals to drop its leaves. This causes the opened cells to be retained for a long time, resulting in a certain amount of yellowing of the fiber.

98% of the cotton grown in Uzbekistan is medium fiber cotton. Because this type of cotton meets production requirements in terms of agrotechnical indicators and physical-mechanical properties of its fiber. The height of medium fiber cotton is 90-130 cm, the stalks are strong, they do not lie down. The pods are 4-5-lobed. 7-9 seeds are formed in each pod. The output of fiber from seeded cotton in one bag is 35-37%. Staple fiber length 29-33 mm, linear density (thickness) 180-200 mtex, specific breaking strength 23-24 sN/tex, yield 25-35 ts/ha, ripening 120-150 days.

II. METHODOLOGY

Samples were taken from the fibers ripened in the basket for different periods, and their structure was determined using a scanning electron microscope.

A scanning microscope is a device used in various fields to study objects at high magnification, where an energetic electron beam is used. Scanning microscopes have been known since the early 1930s, when the study of organic cells and tissues began. The main difference between a light microscope and an electron microscope is the optical system of the latter, which uses electromagnetic and electrostatic lenses that direct the beam of electron beams and focus it on the object being studied to obtain and study a magnified image.

Scanning electron microscope: the principle of operation is based on the arrival of electron beams of different energies. In the studied sample, it is oriented in the form of a spot whose size does not exceed 5 nm. Thanks to this point, the entire surface of the object is scanned. When the electron

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beam collides with the surface of the object, it penetrates it a little, while the process of emitting not only electrons, but also photons from the object itself, entering the cathode, and the beam tube, where they are converted into an image.

All the images obtained in the study using a scanning electron microscope are divided into those formed by secondary electrons; those produced by scattered electrons, as well as those produced by X-rays.

The scheme of SEM-EVO MA 10 (Zeiss, Germany) scanning microscope is presented in Fig. 1. The use of electron microscopy in different fields not only of science, but also of technology is characterized by the use of different microscopes.

Figure 1. Schematic of SEM - EVO MA 10 (Zeiss, Germany) scanning microscope.

Scanning probe microscopy is used to determine the morphological structure of the sample and determine its surface using a probe (optical probe or needle) that is in contact with the surface of the object being studied.

Scanning tunneling microscopy is one of the types of probe microscopy, the difference is that the potential is applied to the needle to scan the surface of the object, and a tunnel current is formed, in which the distance between the needle and the surface does not exceed 0.1 nm.

Confocal laser scanning microscopy is performed not only on the surface of the test sample, but also at a certain depth of the test object. With this, you can get accurate information about the layered structure of the drug.

When working with modern equipment, it is possible to obtain a three-dimensional image of the object, as a result of which specialists can conduct more research.

Research work was carried out at the "Innovative Technologies Center". For this, we used the SEM - EVO MA 10 (Zeiss, Germany) device to study the structure of the obtained new type of fiber using a scanning microscope.

Morphological studies of the fiber surface were carried out using a SEM - EVO MA 10 (Zeiss, Germany) scanning electron microscope. Scanning electron microscope experiments were performed as follows. Given that the investigated fiber samples are dielectric (does not conduct electricity), it was necessary to spray an electrically conductive layer to remove the electric charge from the surface of the sample created by the electron beam. The most suitable material for deposition were metals with a high yield of secondary electrons. For this, magnetron sputtering technology is used.

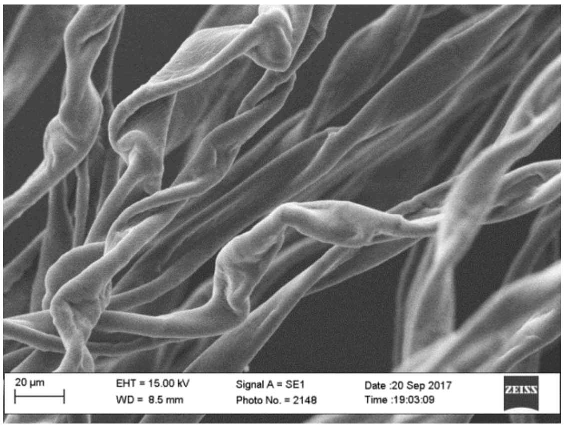
A silver badge was used as the metal. Metal deposition was performed using a silver target on a Q150R ES Quorum magnetron sputtering unit. The deposition rate varied from 5 to 10 nm/min; When it reached 5 nanometers, the metal plate "Shutter") automatically blocked the process of deposition on the surface of the samples. In general, a film with a thickness of 5 nanometers is deposited on the surface of the sample.

Then, to carry out the sample preparation process, in a round holder made of a metal alloy, on which a carbon film with a double-sided adhesive surface is glued, pieces of fibers of the required size are applied to it.

During the measurement, an accelerating voltage of 15 kV (EHT - Extra High Tension) was used, the working distance (WD-working distance) was 8.5 mm. The measurement was carried out in the backscattered electrons detection (BSD- backscattered electrons detection) mode. Image captured using SmartSEM software at different scales of 200µm, 20µm and 10µm.

III. RESULTS AND DISCUSSION

The results of the study are presented in Figure 2.



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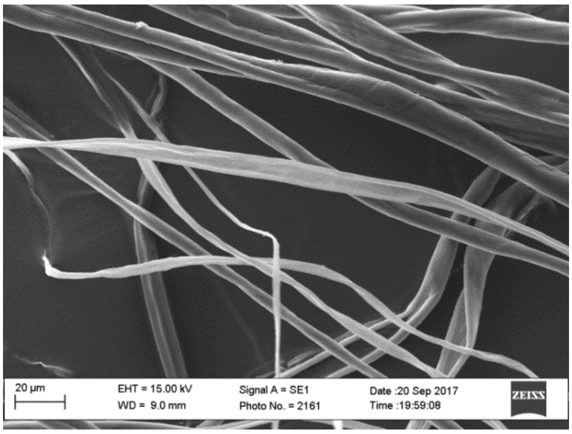
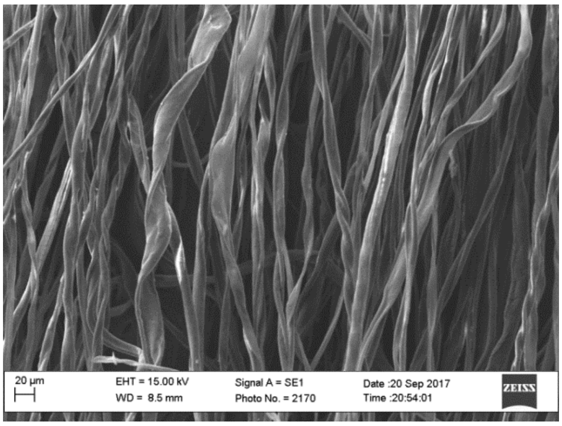


Open blister for 3 days



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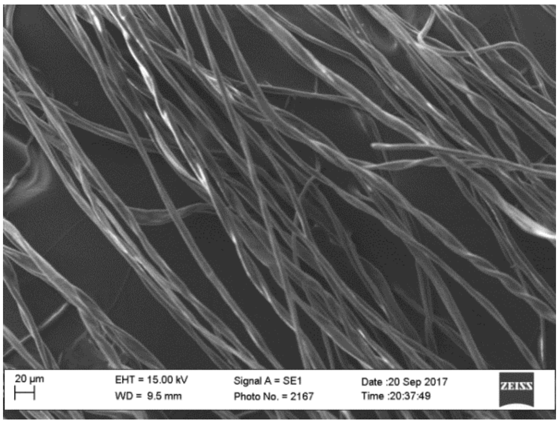
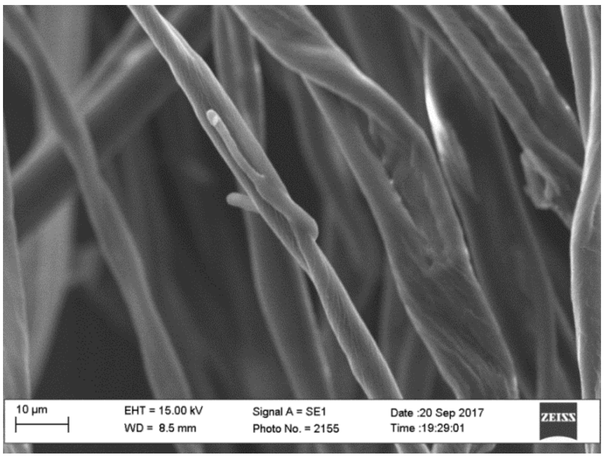


Open blister for 9 days



Open blister for 12 days

Figure 2. Analysis of the structure of fibers ripened at different times using a scanning electron microscope.

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IV. CONCLUSION

The higher the cotton fiber is ripened, that is, the higher the fiber content is 4.0-5.0, the higher the degree of unevenness is produced.

A cotton fiber looks like a tube when viewed under a microscope. In ripe fibers, the wall of the tube is thicker. This is due to the fact that, as the fiber grows, new layers are added to its inner wall from the channel filled with protoplasm, and the cellulose molecules forming the layers are arranged in an elongated shape. A group of such molecules forms twists lying at an angle of 30-40° relative to the length of the fiber.

Immature fibers are ribbon-shaped in cross-section, medium-ripe ones are bean-shaped, and mature fibers are elliptical or sometimes circular in cross-section.

As the wall of the tube thickens, the stiffness and toughness of the fiber increases. Fibers with different levels of maturity also have different twists on their surface.

If we analyze the structure of the fibers ripened in different periods, the appearance of the fibers in the first opening of the cotton boll is plate-like, and their appearance changes as they ripen. For example, in cotton, the number of twists in the outer appearance of the fibers in the cocoon opened for 3 days is almost nonexistent. In cotton, the number of twists gradually appears on the outer appearance of the fibers in the opened cocoon for 6 days, the number of twists increases on the 9th day, and the twistiness of the fibers decreases on the outer appearance of the fiber during the 12th day.

In summary, the outer appearance of the fibers in the first opened boll in cotton is plate-like, and as they ripen, their appearance changes, the number of twists in the appearance of the fibers in the boll opened for 3 days in cotton is almost non-existent, and the number of twists in the appearance of the fibers in the boll opened in cotton for 6 days gradually decreases. appeared, it was found that the number of twists increased in 9 days, and the twistiness of fibers decreased in the outer appearance of the fiber during 12 days.

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