Effects of Change on Cotton Harvesting Physical and Mechanical Performance

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Abstract: This article analyzes the work of domestic and foreign scientists on modern methods of picking cotton and the factors affecting the physical and mechanical properties of cotton harvested in the usual way, taking samples from different methods of picking and testing. and the properties of spin were evaluated.

Keywords: testing, cotton fibre, sample ,natural fibere ,defects of cotton fibre, micronaire, short fibre, trash area, cleaning, moisture.

Today, in accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan "On measures to increase the level of mechanization of cotton harvest and harvesting in the regions of the Republic" dated January 14, 2020 No 21 for the development of the cotton industry Increasing the level of mechanization of the cotton harvest at the expense of the organization is one of the most pressing issues. Therefore, the use of modern methods of cotton picking in our country is one of the priorities.

Growing and harvesting cotton is a labor-intensive process. Today, as in all sectors of agriculture, the use of modern technologies in the field of cotton is saving labor, achieving quality and high productivity. In our country, cotton is harvested in two different ways. The first is hand-picked and the second is picked on cotton picking machines. Both methods have their advantages and disadvantages. Until now, cotton in our country was mainly harvested by hand. When cotton is picked by hand, the fiber is less damaged and less contaminated. But it takes a lot of time and manpower. People pick cotton from dawn to dusk. Thousands or even millions of workers will be needed to harvest cotton in the vast cotton fields without destroying them, on cold, rainy, and snowy days. In order to prevent such problems, the second method of picking cotton in our country, the method of picking on cotton picking machines, is expanding. [1]

This requires the application of the properties of cotton harvested by modern picking methods.

In African countries, cotton is harvested mainly by hand. Due to the long fiber content of the harvested cotton, it is not possible to clean it in sawmills. Cotton can be ginned in ginneries only by passing it through a roller gin. [2]

According to American scientists, the more times we clean cotton, for example, up to 3 times, the staple mass length of the fiber decreases by 0.25 mm, the amount of short fibers increases from 7.1% to 9.8%, and the amount of long fibers decreases from 60.4% to 52.2%. [3]

Minor defects in the cotton picked by machine were 3.2%, with a cleaning rate of 18% after one minute and 25% after two minutes. The higher the moisture content of the seed cotton, the lower the degree of purification of the cotton. If the moisture content of the seed cotton was 11%, after 3 minutes of cleaning, the cleaning rate of the seed cotton was 52.7%, and the moisture content was 14.9% and 25.9%. If the moisture content of the seed cotton is 3.4%, then the degree of purification of the seed cotton is reduced by half. [4]

The main link in the technical development of the cotton industry is the mechanization of harvesting. In the past, cotton was harvested by hand and lasted up to 100 days. Now, due to the development of technology, it is possible to harvest the crop in 20-25 days by machine. Our machine-building industry produces modern machines and trailers for cotton picking.

In the introduction of promising technologies for the production of cotton by machine, first of all, the effective use of a two-row cotton picking machine between 60 cm and 90 cm rows, along with the reduction of harvest time:

➢ Prevention of damage to the seeds of cotton fibers and fibers of machines;

➢ increase the completeness of machines;

➢ increasing the level of daily technical readiness of machines;

➢ Ensuring the repairability of the main structural elements;

➢ One of the main factors is the full mechanization of the process of clearing the field of cotton stalks and their utilization;

➢ The quality of cotton harvested by machines and the performance of the harvesting machine at the required level of technology also depends on the quality of pre-harvest defoliation. [5]

Cotton picking machines are agricultural machines used to pick unopened cotton. Depending on the method of operation, it is divided into pneumatic, mechanical, pneumo-mechanical, and electromechanical types. On a pneumatic cotton picking machine, cotton is picked using an air stream. They are divided into vacuum, electro-hose, suction and drive-suction machines. The working bodies of these machines consist of various nozzles and tripods. On mechanical cotton picking machines, cotton is picked using a mechanical device. Depending on the type of workpiece, they can be spindle-shaped, needle-mounted, tapered, looped, or disc-shaped. Mechanical cotton picking machines are subdivided into flat-type cotton pickers who harvest the entire size of the cotton stalks or shape the stalks by squeezing them from the sides. In practice, spindle cotton pickers are common. They are divided into horizontal and vertical spindles. The main part of horizontal and vertical spindle cotton picking machines is the cotton picking machine. It consists of spindle drums, separators, spindle drum rotation mechanism, reducers, ball indicators, receiving chambers. Modern cotton picking machines are equipped with devices that mimic the field relief. In horizontal spindle cotton pickers, the spindles enter horizontally between the cotton balls from the side and rotate around the axis, wrapping the loose cotton around themselves and rotating with the drum towards the separator. The disc-shaped convex separators rotate, pulling the cotton from the spindle surface and directing it to the receiving chamber, from where the collected cotton is sent to the hopper by air by ejection (suction). On vertical spindle cotton pickers, the spindles are mounted on a drum or chain. Cotton balls are squeezed between two drums. The spindles on the drum rotate around their axis and along with the drum, wrapping the cotton. A splitter is used to separate the cotton wrapped around the spindle and throw it into the receiving chamber. As a result of reversing the spindle and cleaning it with a rotating separator made of bristle brushes, the cotton from the separator is transferred to the receiving chamber and collected in the receiving chamber. There, the fan sucks the cotton and passes it to the bunker. When the bunker is full of cotton, the mechanizer pours it on the tractor trailers. On pneumomechanical cotton picking machines, cotton is picked using air and mechanical equipment. In electromechanical machines, cotton is harvested using an electric field. [1]

It is natural to increase productivity when typing on a machine, but we have studied how the physical and mechanical properties of the fiber change.

The main purpose of the research is to study the quality of fiber obtained from cotton harvested in different ways.

To achieve this goal, the following tasks must be performed.

➢ Analysis of relevant scientific literature and other scientific sources;

➢ To study the physical and mechanical properties of cotton fibers harvested in different ways;

➢ -study the causes of the increase in injuries;

➢ Study and analysis of the quality of cotton fiber samples collected in different ways in a modern system;

➢ To recommend the optimal variant of the technology of the spinning method to obtain quality raw materials in spinning mills in the conditions of market relations.

To do this, samples of cotton fibers grown in one place, under the same conditions, at the same time, in two different picking methods were taken and tested separately in the HVI 900 SA system, and the following results were obtained..

Figure 1

Dialing method	Micronair	Specific tensile strength gk / tex	upper average length	Longitudinal uniformity index%	Short fiber index	Elongation at interruption%	Number of contaminants	Light reflection coefficient	The degree of yellowing
Hand picking	4.5	30.89	1.11	82.64	8.77	7.5	14	73.49	7.73
Pick up by machine	4.2	33.44	1.1	83.13	9.47	7.92	20	74.05	7.43

Table 1 presents 9 quality indicators of cotton fibers with different picking methods in a convenient way for comparison. Analyzing the results, the micronaire index of hand-picked cotton fibers was 4.5, the specific tensile strength was 30.89 g / tex, the upper average length was 1.11, the longitudinal uniformity index was 82.64%, the short fiber index was 8.77, and the elongation at break was 7.5%. the number of compounds was 14, the reflection coefficient was 73.49, and the yellowing rate was 7.73.

The micronaire value of machine-picked cotton fibers was 4.2, specific breaking strength was 33.44 g / tex, high average length was 1.1, length uniformity index was 83.13%, short fiber index was 9.47, break strength was 7.92%, and the number of impurities was 20. the light reflection coefficient was 74.05 and the yellowing rate was 7.73.

Histogram of the results obtained in the HVI 900 SA system.

Figure 1
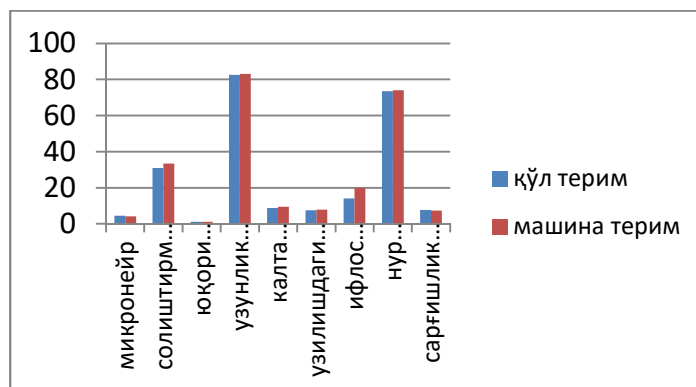
The results obtained in the HVI 900 SA system show that changes in the dialing method lead to changes in the fiber properties.

In other words, it was found that the physical and mechanical properties of the fibers deteriorated during manual typing compared to manual typing. This is due to the mechanical impact of the spindle on the fiber, the main element of the cotton picking machine, the unpreparedness of the cotton fields for picking (unsatisfactory deflation, unsatisfactory selection of agates and cotton) and damaged cotton fibers.

To prevent these consequences, improve the details of cotton picking machines that affect fiber quality, prepare cotton fields with the requirements of the method of picking, conduct research on selection varieties of cotton and identify the best alternative to machine picking, the process of cotton processing Measures such as the modernization of technology (for example, the use of US technology) would be appropriate.

Today, fiber raw materials for yarn produced at spinning mills are mainly imported from ginneries in the area where the enterprise is located. The method of picking cotton is determined by the extent to which the region has a large or small workforce and the availability of cotton picking machines. Experiments have shown that when picking cotton on machines, the fiber content and impurities are higher than when picking by hand, and the physical and mechanical properties of the fiber are lower than when picking by hand. And that, in turn, affects the cost-effectiveness.

The economic efficiency was determined on the basis of quality indicators of fiber yarn obtained from cotton ginned in different ways to obtain quality products in industrial enterprises.

According to the results of the experiments, the samples taken from hand-picked cotton fibers belong to the middle class of the 1st grade, and the samples taken from the machine-picked cotton fibers belong to the 1st class of the ordinary class. Cotton fiber grown in Uzbekistan is sold on the international market on the Liverpool Stock Exchange. Fiber is listed on the stock exchange according to the A index. The pricing according to the A index is shown in Table 2.

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Industrial type	Superior	Good	Medium	Simple	Dirty
1	+5	+4	0	-3.2	-7.5
2	+2	-1	-4.5	-8	-12
3	-1	-3.5	-7	-11.5	-16
4	-5	-15	-20	-25	-30
5	-25	-35	-45	-50	-55

According to the A index, the price of 1 kg of hand-picked cotton fiber in Uzbekistan is estimated at $ 1.8, while the price of 1 kg of machine-picked cotton fiber is estimated at $ 1.74. An enterprise processes an average of 50 wagons a year, or 2,500,000 kg of fiber, and sells hand-picked cotton for $ 4,500,000 and machine-picked cotton for $ 4,350,000. So, along with the introduction of machine typing, one of our important tasks is to process the fiber in our country and then export the finished product.

In short, we need to move to the method of picking cotton by machine in accordance with modern requirements. However, the other side of the issue is to prevent the increase in fiber damage when typing in the machine, which is a priority for industry professionals. To do this, it is necessary to improve not only cotton picking machines, but also the technology of the process of cleaning the harvested cotton.

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