INVESTIGATION OF QUALITY INDICATORS IN THE PROCESS OF COTTON RAW MATERIALS OF THE RIOT PROCESS

Nutfillayev Oybek Odil ugli
Researcher, Bukhara state technical university

Qabul qilindi: 18.10.2025
Ko‘rib chiqildi: 19.10.2025
Tasdiqlandi: 20.10.2025

Keywords:
raw cotton, fiber, heat, temperature, compression, humidity, variety, density, compressive strength.

Abstract. This article presents the results of research on the analysis of the impact of cotton and its components on the laws of change of thermal and physical parameters in the process of ginning cotton. The density of raw cotton has been found to depend on its moisture content, variety, type, method of picking, and shear forces.

Introduction. In world practice, the creation of new techniques and technologies for drying raw cotton, which have a positive impact on the quality of products produced by the technological processes of primary processing of cotton, is becoming increasingly important. In this regard, the creation of a scientific basis for the laws of change of thermal and physical properties of cotton and its components, the speed of construction of cotton fiber and seeds in non-stationary heat and mass transfer processes and its uniformity, new technology of cotton drying and the implementation of targeted scientific research in areas such as the development of techniques is one of the important tasks.

One of the issues included in the program of economic development of the country is the issues of increasing production productivity, production of high quality fiber and its sale on the world market. The production of high quality fiber from raw cotton depends on the fact that the production process is organized on the basis of technical requirements. Especially in the process of drying cotton in processing plants, it is important to reduce and maintain its moisture content on a normative basis [1].

Raw cotton is a material consisting of three different components that are not identical in their composition. These components include fiber, seed pods, and kernels. Cotton fiber and bark are capillary-perforated materials. The fiber is located along the surface of the seed and is 97% cellulose. Depending on the type and variety, the average fiber length is 25-50 mm, the thickness is 15-25 microns,

and the seed thickness is 0.25-0.4 mm. According to its chemical composition, bark consists of 40-45% cellulose, 20-25% lignin, 28-30% lectazone, up to 3% protein, and 2-3% dust. The kernel is made up mainly of fat and protein. It contains carbohydrates, crystalline and colloidal sugars, pectin in colloidal-dispersed state. The seeds are colloidal in nature and capillary-perforated in composition [2].

Cotton is placed in sheds, awnings or covered buildings before processing. Construction of warehouses, awnings and sheds will be carried out on the basis of technical documentation of the project organizations.

Cotton fields should be covered with a hard surface (asphalt, concrete or straw mud) 40 cm above the ground. The size of the pond is 25 m x 14 m, and the middle surface should be raised by 5-7 cm to allow rainwater to flow. When digging a tunnel in the middle of the pit, a longitudinal slice is drawn to indicate the correct direction. It is not recommended to build piles of other sizes [3].

Cotton picking is carried out only when the weather is dry, and it is forbidden to pick cotton when it is raining. The spilled cotton should be spread evenly and evenly throughout the area.

Cotton with a moisture content of more than 20% is placed near the drying and cleaning shop, as it must be dried and processed immediately. Cotton with a moisture content of up to 14% should be located in the ginning area, and more than 14% should be located in the ginning area. After the cotton ball has formed and sunk, the sides and corners of the cotton ball are flattened.

Care should be taken to ensure that the cotton is evenly distributed and densely packed on the surface of the bale. The compacted edges of the pile should always be below the average level of the pile.

In the following cases, the mounds are not strong enough and they collapse:

- the bottom and subsequent layers of cotton are not sufficiently moistened;
- the corners of the pile are not positioned correctly and are not sloping enough;
- not on the whole surface of the pile, but on the parts that are not well connected to each other;
- if the amount of cotton ginned during the day and night exceeds the allowable limit by 60-65 tons.

When the cotton is baled, it ends with a dome-shaped cap with a height of 2.0-2.5 m, so that the head of the cap should cross from the middle of the bale to close the two-sided slope [4].

After ginning, the cotton gradually collapses, and after 10-15 days its height decreases by 1-1.5 m. A tarpaulin measuring 8.5x7 m is used to cover the cotton stored in the open. Seed cotton stored in piles should be covered with new or first-class tarpaulins. One tarpaulin should cover an average of 30 tons of cotton. It is forbidden to cover the pits with extra tarpaulins.

One longitudinal tunnel should be opened for 8-10 days for cotton fields with normal humidity and 3-5 days for excess moisture. The next day, when the tunnel is completed, a tunnel can be dug and a ventilator installed.

The temperature of the cotton bunch of all classes I and II of the 1st and 2nd classes with average humidity not exceeding 9-10%, humidity of 11-13% of all classes III and V is 1 time in 5 days, high humidity. The temperature of the cotton balls is measured every 3 days [6].

If the temperature of cotton harvested in warm weather (September, October) does not exceed 35 ° C and does not change within 2-3 days, then the temperature is considered normal.

In stored cotton bales, if the temperature of the cotton is higher than the temperature indicated in the first measurement, or rises to 2 ° C-3 ° C after the initial measurement at certain points, Immediate action should be taken to remove and forcibly cool the cotton temperature. The air is sucked through a tunnel. The tunnel is dug using a machine or by hand when the pile is located along the length of the pile and is submerged to the required level. The width of the tunnel should be 0.8-1.0 m and the height should not be less than 1.8-2.0 m. A special UVP device is used to suck air.

When working with tunnel diggers, air suction for cotton with a moisture content of 14.0-22.0% can be carried out after 3-4 days.

Cotton fiber is a type of fibrous material that is difficult to weave in terms of structure. The elastic strength of cotton fibers prevents the cotton from over-compacting during storage, so that some of its space and internal volume is filled with air. These properties of seed cotton are used to cool and dry it when it is heated.

The porosity of stored cotton is determined by the following formula in terms of K percent:

$$K = \frac{\gamma_x - \rho_x}{\gamma_x} * 100\%$$

γ_x - specific weight of cotton, γ_x = 1500 N / m^3 or 15000 kg / m^3.

ρ_x -is the density of cotton.

K = 93 ... 96% - for cotton.

The porosity coefficient E is calculated as follows:

$$Г = \frac{\gamma_x - \rho_x}{\rho_x}$$

E=20÷23- for medium fiber cotton.

E=13÷14 - for fine-fiber cotton.

The upper layers of the seeded cotton are pressed against the lower layers, as a result of which they begin to crush and compact each other.

The density of seed cotton depends on its moisture, variety, type, method of picking and shear strength. The average density of a loose layer of cotton up to 500 mm in height can be found by the formula of A.Ya. Yampolsky.

$$\rho_x=26,3+0,05h+0,93W=26.3+0.05*550+0.93*7.8=61$$

where, h-layer height, 550 mm; Moisture content of W-cotton, 7.8%.

For hand-picked first grade cotton

$$\rho_x=40+0,05h+W=40+0.05*550+7.8=75$$

Empirical formula for the relationship between the density of seed cotton and the compaction load

$$R=(1...30)*10^3 \text{ Pa}$$

for the boundary found:

$$\rho_x= mP^n$$

R -is the specific compressive strength of the cotton gin, Pa.

m and n are coefficients depending on the type and moisture content of seed cotton. For grade I cotton, n = 0.3 and m = 11.4 when the moisture W = 7.8%; 11.54; 11.45. For grade I fine-fiber cotton, n = 0.25 at a moisture content of W = 8%; m = 23.3. The change in bulk density of seed cotton depending on the industrial navigation and specific pressure is given in Table 1.

When the seed cotton is compacted without expansion, there is a lateral pressure bond with the compressive force, which

$$R_b=K*R_N$$

K- is the side pressure coefficient depending on the moisture content of the seed cotton;

RN- is the normal compressive strength.

When the moisture content of seed cotton W = 7.8 ... 11.5%, the value of K is K = 0.22 ... 0.26, the lower value of which corresponds to a higher value of moisture [5].

The side of the cotton pile with the horizontal plane at the time of free attaching of cotton wool forms a certain angle. This is determined by the angle, the value of which varies depending on the humidity of the cotton wool.

$\alpha=45^0$, W=8...15 % to

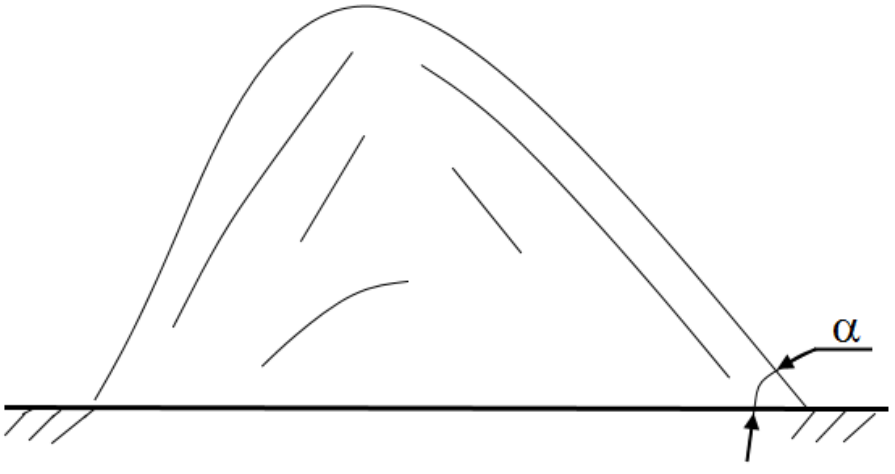
$\alpha=48^0$, W=20...35 % to

This resistance is determined by τ:

$\tau=R_N*tg\varphi+S$ it is found by expression.

Table 1.

Specific pressure, kPa	Density of cotton, kg/m^3		
	Medium fiber cotton		Fine-grained cotton
	I- sort	IV- sort	I- sort
Under the influence of its own gravity	64	59	91
1,3	105	100	139
4,8	149	132	194
8,1	171	151	-
11,2	188	165	247
17,6	214	187	271
24,0	240	208	293
30,3	252	218	300



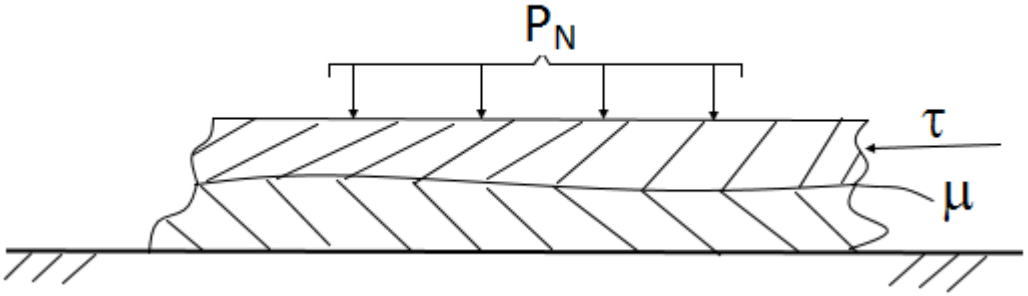
When carrying cotton, it has a certain amount of resistance.

the power of emigration is here τ;

μ=tgφ the coefficient of internal friction between the fibers-the coefficient of friction, φ=24...26^0;

R_N=(1...3)*10^3 kg/sm; S is an unchanged coefficient, S=0,012...0,022 kg/sm^2 for medium-fiber cotton;

And for thin-fiber cotton S=0,03...0,08 kg/sm^2.



The compressive strength generated by cotton poppy

When the cotton is stretched by a certain R force, the force of pressure q directed to its sides is formed:

$$q=k*P_N$$

here, k is the coefficient of the side pressure force. For 108-F, k=0,15...0,17 is W=7...10%, for 213 is k=0,11...0,12, W=7...10%.

PN-R is the normal organizer of power.

Farm pollution is transferred to 7.8% 1-sort 2-grade cotton with 11.0% and humidity 5000 kg. The calculation weight of cotton, which is included in the calculation of pollution [6]

$$M_p = 5000 \cdot \frac{100+7.8}{100+2.0} = 5284 \text{ it weighs kg}$$

Air conditioning weight of the same cotton:

$$M_k = 5284 \cdot \frac{100-9.0}{100-11.0} = 5403 \text{ kg}$$

It is important to control the quality of the product, which is acceptable in the reception of cotton in the preparation punk. Its accuracy depends not only on the income of the cotton plant, but also on the correct accumulation of the pile, which ensures reliable storage of cotton.

REFERENCES

1. Raxmonov X.Q. “Initial processing of light industry raw materials” training Guide Toshkent : Editorial Publishing, 312 page, 2018 y

2. Rakhmonov Kh., Fayziev S., Rakhimov Kh., Kazakova D. Relative speed and temperature effect investigation of the of the drying agent on the moisture content of cotton // E3S Web of Conferences 264, 04008 (2021) CONMECHYDRO-2021. P. 1-7 https://doi.org/10.1051/e3sconf/202126404008

3. Fayziev S.Kh. “Improvement of resource-saving technology of raw cotton feeding system for drying drum”. candidate of technical sciences. diss. Bukhara. 2021.

4. Fayziyev S.Kh., Rakhmonov Kh.K. Study of effect of speed and temperature of the drying agent in the feeder-loosened of new design on the quality of fiber // International journal of emerging trends in engineering research, 8(10), October 2020, P. 7008-7013.

5. Fayziev S.Kh., Rakhmonov Kh.Q., Creation of a New Design of a System for Feeding raw Cotton to a Cylinder // International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8, Issue-4, November 2019. P.12753-12759.

6. Fayziyev S.Kh., Rakhmonov Kh.Q. Improvement of equipment and technology of drying of the cotton mass and its technological assessment on the basis of its thermal properties // International journal of advanced research in science, engineering and technology. Vol.6, Issue 5, May 2019. P.9496-9500.