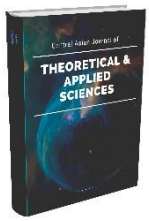

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Study of Factors Affecting the Quality of Raw Cotton During Storage and Processing

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Abstract: *The article provides information on the storage and processing of raw cotton using modern methods and technology at ginning factories.*

Analysis of acceptance and storage of raw cotton showed that moisture and weediness affect the quality indicators of fiber and seeds. When storing raw cotton with moisture and contamination above the norm, it leads to a self-heating process and leads to biological and mechanical destruction of fiber and seeds.

In the process of self-heating, cotton loses its fiber yield due to the destruction of its bond with the seed, and when processing such cotton, the loss of free fibers to waste increases when it is dried and refined at cotton ginning factories.

The study of factors affecting the properties of cotton fiber and seeds shows that it is possible to improve the physical and chemical characteristics, mechanical properties of raw cotton.

Keyword: *raw cotton, acceptance of cotton, storage of raw cotton, self-heating of cotton, fiber, moisture, weediness, grade of raw cotton, air permeability, biological and mechanical destruction of fiber and seeds.*

INTRODUCTION

In order to form market relations between farms, enterprises of the ginning and textile industries, to ensure the production of competitive products with high added value based on the introduction of modern forms of organization of cotton and textile production [1].

An important link that ensures the efficiency of cotton and textile production in the republic is the cotton ginning industry, which consists of cotton factories and procurement points with appropriate infrastructure. Every year, procurement points at ginneries receive over 3 million tons of raw cotton, from which more than 1 million tons of fiber is produced, about 1.6 million tons of seeds, 80 thousand tons of lint and other products [2, 3].

One of the most important tasks is to improve the process of receiving and storing raw cotton using modern methods and technology at cotton picking points.

The issues of preparing raw cotton for the storage and processing process are relevant not only in our country but also abroad [4, 5].

Analysis of acceptance and storage of raw cotton showed that moisture and weediness affect the quality indicators of fiber and seeds. When storing raw cotton with moisture and contamination above the norm, it leads to the process of self-warming and leads to biological and mechanical destruction of fiber and seeds [6].

Thus, the study of the influence of biological and mechanical factors on the quality of raw cotton during harvesting and storage is one of the urgent tasks of the ginning industry.

To solve this problem, at the ginneries, work is being carried out to introduce the use of modern technologies for the acceptance and storage of raw cotton, which, depending on the initial characteristics of the harvested raw materials, allow obtaining cotton products of a given quality, with low cost and competitive quality characteristics. In particular, at the cotton factories of the republic, modern information technologies are being introduced for receiving and storing, taking into account the initial quality indicators of raw cotton [7].

In accordance with the instructions for the acceptance and storage of cotton, cotton factories are working on the introduction of the use of modern information technologies in the acceptance and storage of raw cotton, which, depending on the initial characteristics of the harvested raw cotton, allow to obtain cotton products of a given quality, with low cost and competitive quality characteristics. ... In particular, modern information technologies are being introduced at the cotton factories of the republic for receiving and storing, taking into account the initial quality indicators of raw cotton.

Solving the issues of harvesting and storing raw cotton, based on theoretical and experimental research, will not only save the harvested raw cotton, but also solve the issues of preparing it for storage, improving storage technology.

Closed storage facilities (barns), semi-open or open from four sides warehouses (sheds) are accepted for storage of raw cotton. For better preservation of raw cotton, proper organization of its storage, the picking of raw cotton and its laying in riots is carried out, according to, taking into account the moisture content of the raw cotton and the height of the riot [8].

Covered storage is intended primarily for stowing seed cotton. The average packing density of raw cotton in covered premises should be in the aisles: for grades I and II with a moisture content of 11% - 150-190 kg / m3, for low grades with a moisture content of up to 14% - 130-160 kg / m3. In covered storages, it is allowed to complete raw cotton with high humidity only if there are air exhaust ducts in the floor for air suction.

An analysis of the equipment of cotton picking stations with means of receiving raw cotton showed that, in practice, a sample of raw cotton for analysis is taken manually. The measuring devices used to control the state of raw cotton during storage are ineffective. At cotton picking points, ordinary temperature probes are sometimes used to measure the temperature during storage of raw cotton.

Taking into account the importance of the processes of acceptance and procurement of raw cotton, the development of methods, methods for storing fibrous material and devices for their implementation was devoted to a large number of studies by domestic scientists and specialists [9].

At the cotton factories of the Republic of Uzbekistan, electronic systems for receiving raw cotton have been used in various years.

A device has been developed for an automatic system for receiving raw cotton of the ASPKhi brand, which is installed at the cotton ginning factories. Domestic scientists and specialists together with the Japanese companies "TokioBoeki" and "KeisokkiKogioCoLtd" have developed an electronic system for receiving raw cotton "DOK" [10].

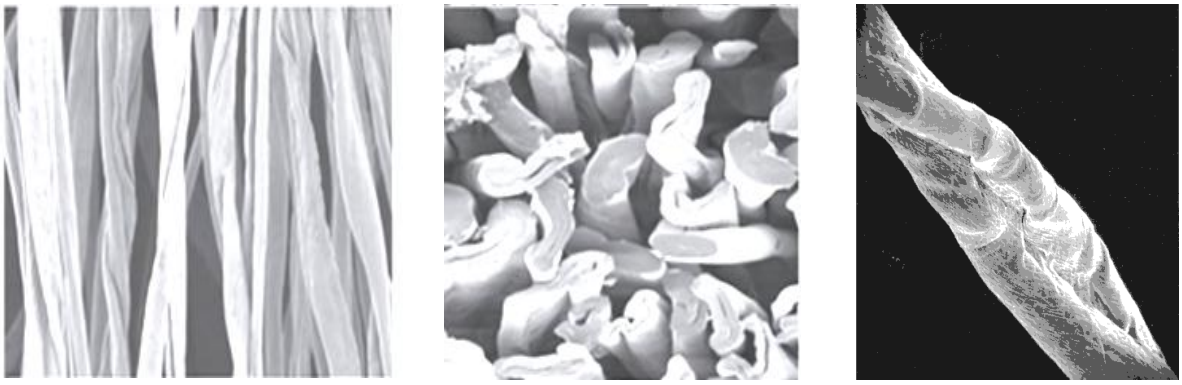
Let us consider the technological conditions of cotton picking, changes in the properties of cotton in subsequent operations and transitions [11].

In the studies of Popov P.Ya. studied the developmental biology and technological properties of cotton fiber. Since cotton is a multicomponent product consisting of fiber and seeds, when studying the mature state of cotton it is characterized by their properties.

Mature cotton fiber consists of cellulose (97-98%), pectin (0.8-1.0%), fat, wax (0.3-1.0%), nitrogen and proteins (0.2-0.3 %) and other substances like a flat, strongly twisted ribbon, somewhat thickened at the edges and compressed in the middle.

Cotton fiber consists of several clearly expressed concentric layers, among which four can be distinguished with a sharply different structure: cuticle - Cut., Primary wall - P, secondary wall - S and central channel L (Fig. 1).

In the outer layers (cuticle and primary wall) or inside the fiber channel, non-cellulosic substances are located: proteins (1.0-1.9%), waxes (0.4-1.2%), pectins (0.4-1, 2%), inorganic substances (0.7-1.6%) and other substances (0.5-8.0%). The term "waxes" is used to encompass all lipid components found on the surface of cotton fibers, including waxes, fats and resins. The chemical composition of cotton fiber differs depending on the breeding and industrial variety, growing conditions (soil, water, temperature, pests, etc.) and maturity.



A) B) C)

Figure 1. Electron micrograph of cotton fiber.

A - Longitudinal section. B - Cross section. C - The appearance of the cotton fiber.

Electron microscopic studies show that the fiber surface consists of a large number of grooves, folds, pits, cracks and tubercles. Such a relatively developed fiber surface favors its drying and moisturizing processes.

Different geometric and chemical structures of raw cotton components, as well as their structure, determine the difference in their hygroscopic properties and moisture content [12].

Cotton is a porous, hydrophilic fiber that readily absorbs water. Under environmental conditions, it recovers (the amount of water as a percentage of dry weight) ranges from 7% to 11%. For cotton fiber, this property helps to control the microclimate.

Research Kadyrov B.G. confirmed that the lower the capsules are located in the sympodial branches and the closer to the main stem, the higher the fiber maturity [13].

Research by M.A. Khadzhinov. and Kadyrov B.G. the presence of the ripening process of seeds and fiber was established during their storage separately in small quantities at an ambient temperature of 22-250C. The practice of cotton processing shows that in the absence of long-term storage of such cotton, the sowing quality of seeds is much lower than that of cotton that was stored according to the instructions for the collection and procurement of raw cotton. Obviously, the technology of storing seed cotton provides sufficient conditions under which this cotton ripens.

METHODS

Taking into account the complexity of the technology of drying, cleaning, the significance of the rate of collection, delivery with limited opportunities and capacities to cotton picking points, the incoming raw cotton is stacked without additional processing (additional drying and cleaning). Due to the specifics of cotton as an agricultural product, the existing preventive measures (air suction) are not able to ensure its safety.

To study the technological conditions for storing raw cotton, a container model has been developed for studying the self-heating process of raw cotton. and the following factors are taken: change in the density of the cotton mass in the model; its moisture content, variety, and the environment was adopted as a special factor [14,15, 18].

Having determined the condition of the environment in which it is necessary to conduct the experiment, we will change the design parameters of the simulated riot body.

During the experiment, the change in the activity of the seeds was monitored, as well as the species change of microorganisms on the raw cotton fiber.

The self-warming process is first a biochemical and biological process inside the seeds, then it is obvious that in its microstructure it should be focal. In the subsequent unification of individual foci and at the boundary conditions of this volume, condensate is formed, since there is a contacting medium of a colder layer with a “hot” layer. This condensate is a favorable basis for the development of biological and biochemical processes on those seeds, which in their maturity and structure by themselves, if it were not for this focal self-heating and, as a consequence, an increase in temperature, it would obviously lie calmly.But once in an environment of high humidity of seeds, the process is also turned on and, ultimately, the focal process of self-heating turns into the general process of self-heating of cotton.

With the development and change of generations, when sugar is depleted, fungi begin to destroy cellulose and cellulose. It has been established that the lower the variety, the more free sugars it contains, which means that it is more likely to be damaged and destroyed by microorganisms and the effect of self-heating has a greater effect on raw cotton, which is less ripe. The fiber has protective waxy outer layers, where the process takes place mainly on the basis of the fibers [16, 19]. Therefore, in the process of self-heating, cotton loses its fiber yield due to the destruction of its bond with the seed, and when processing such cotton, the loss of free fibers to waste increases during drying and cleaning. [17, 20].

RESULTS

One of the factors to preserve the quality indicators of cotton is air permeability, as air is used when storing cotton (air suction), drying and processing cotton with chemicals. To study the air permeability of the mass of raw cotton, an installation was developed and experiments were carried out.

The experimental technique provided for the study of air permeation through a layer of raw cotton mass with established parameters and given densities embedded in a cubic module with dimensions of 0.2 x 0.2

x 0.2 m.

The material for the study was raw cotton of the II grade, C-6524 with a moisture content of 12.7% and weediness of 4.8%.

For the experiments, cotton was placed in a module with a density of 50.75, 150 and 220 kg / m3, and was treated with air at various pressures. Air was supplied to the module by a compressor, and the pressure of the incoming air was changed by adjusting the rotational speed of the compressor shaft. The static pressure inside the layer of the raw cotton mass was measured by the Petrov PPR-2M device.

The experimental technique provided for the determination of the pressure increase when air passes through the module.

As can be seen from the research results given in Table 1, the modulus of raw cotton has significant aerodynamic resistance. So, at a volumetric 50 kg / m3, (i.e. at a density lower than the density of the bulk layer), the pressure drop is more than 95%. Changing the direction of air flow does not affect filtration conditions.

Table 1. Air permeability of the module with different direction of air flow

Variants of air flow through the module	Bulk density of raw cotton in a module, kg / m^3	Air pressure at the module outlet, Pa	Pressuredrop,%
I	50	210,6	95,4
	75	157,0	96,8
	150	83,4	98,8
	220	53,0	98,9

When dividing the total flow into prima and swivel, the pressure of its constituent parts is approximately the same. When the total pressure of the two streams is equal to the pressure drop of the direct-flow action.

Determination of the functional dependence of the filtration capacity of the module, characterized by the change in the pressure of the air flow when it passes through the module. As a result, the empirical equation (1) was obtained.

P_1=25, 4 - 0,09p (1)

Where, p is the bulk density of the module, kg / m3

P1 - air pressure at the module outlet, Pa.

By solving Equation 3 for p, the region of minimum and maximum density of the modulus can be determined. So, at a density of 271 kg / m3, the module is practically impermeable; at a density of 11 kg / m3, the resistance of the module will be minimal, but difficult to implement in practice.

DISCUSSIONS

Thus, it becomes clear that the preventive measures for preserving cotton during storage are not strictly defined and serve to temporarily prevent the effect of self-warming of cotton.

Based on the results of the studies and taking into account the structure of raw cotton volatiles, it is possible to draw some conclusions about the nature of sorption processes in it. The highest sorption rate is possessed by the fibrous seed cover, since it is the outer layer of raw cotton and has a large surface of contact with the environment.

REFERENCES

1. A.M.Salimov, F.N.Sirojiddinov "Technology and equipment for primary cotton processing" T.: 2018.
2. A.M.Salimov et al. “Technology of primary processing of cotton”. T: “Adabiyotuchkunlari”, 2018.
3. A. M. Salimov, To Toychiev, Ht Akhmedkhodjaev "Technology Of Primary Processing Of Natural Fibers" Textbook - Namangan .: 2020
4. A.Salimov, Wang Hua, T.Tuychiyev «Technology and equipment for primari cotton processing» China, 2019 – p. 174.
5. A. Salimov, O. Salimov “Study of foreign experiences in harvesting and storing raw cotton.” TITLP Republican Scientific and Practical Conference. T: - April 2020.
6. Instructions for receiving and storing cotton T.: -2017.
7. Salimov O., Salimov A., Mirzaev B., **“**Research allocation of heat and moisture from the body of the working staff and penetration through a layer of clothes”, Woodhead Publishing Limited, Cambridge, 2007, pp.4. *May-June 2020 ISSN: 0193-4120 Page No. 29495 - 29501*http://testmagzine. biz/index.php/testmagzine/article/view/13388
8. A.M.Salimov, M.E. Ruzmetov, O.A.Salimov. "Study of the processes of moistening and air permeability of cotton fiber." Research and Publishing Center "Relevance. RF "of the XXIV International Scientific and Practical Conference" Eurasia Science ": 2019. pp 145-146.
9. B.G. Kadyrov “Development, optimization of technology and processes of preparation of raw cotton for storage”. Diss. doct. Tech. Sciences. - Kostroma, 1993.
10. A. Salimov, A. Ismoilov, D. Umarkulova "Study of methods and means for harvesting raw cotton"Republican scientific-practical conference" Actual problems of mechanical engineering and their solutions ". T: -2019 y. 322-324b.
11. A. Salimov “Development of technological conditions and methods for the preparation of raw cotton with moisture content of 10-15% for storage”. Dis. forthedegreeofPh.D. T.: 1986.
12. A.Salimov, O.Salimov, Sh.Khusanova, I.Khakimov“The problems of natural fiber and textile materials on fire resistance”Saarj journal Akademicia: an international multidisciplinary research jurnal april-2020. https://saarj. com/wp-content/uploads/special-issue/2020/ACADEMICIA-JULY-2020-SPECIAL-ISSUE.pdf
13. Kadyrov B.G., Latypov K.Sh., Salimov A.M. On the issue of air filtration through a layer of raw cotton. Tashkent. DANUZ 1983.
14. A.M.Salimov. “Modelling of technological conditions of storage of cotton-raw”. International Scientific Journal Theoretical & Applied Science p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online), Published: Philadelphia, USA30.10.2019http://T-Science.org.
15. A.M. Salimov "Fundamentals of the process of harvesting and storing raw cotton." Monograph T.: 2020.
16. A.M.Салимов, O.A.Салимов “Study of methods for improving the physical and mechanical properties of cotton fiber”. International Scientific Journal Theoretical & Applied Science p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085(online),Published: Philadelphia, USA30.10.2019 http://T-Science.org.
17. A. Salimov “Study of air permeability through a layer of raw cotton”.Textile ProblemsT: № 1, 2020.

18. Yu.Ergashev, A.Sh.Khusanova, O.Sh.Sarimsaqov, X.Turdiyev, J.Oripov. Selective technologies of sawing Fergana Polytechnic Institute "Selective technologies of sawing madness" "Classic" publishing house-2020 ISBN: 978-9943-6662-7-6.
19. A.Sh. Khusanova, O.Sh.Sarimsaqov, Yu.Ergashev. "Multi-position saw fiber separator" Journal of Innovation in Scientific and Educational Research_V 04/30/2021.
20. O.Sh.Sarimsaqov, N.M Sattoriv, Z.A.Siddiqov, Sh.A.Xusanova. Improvement of the Process in Disassembling of Cotton Stack and Transfering the Cotton into Pneumotransport// International Journal of Advanced Science and Technology Vol. 29, No. 7, (2020), pp. 10849-10857.

