Analysis of quality indicators of seed sorting technology

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Abstract: *Seeds are mainly divided into technical and seed seeds. As a result of research, it was found that they are separated into different fractions. Technical seeds are mainly sent to oil mills. This article presents the results of the analyses conducted by the researchers.*
Keywords: *seeds, sorting, fraction, cotton, dirty mixture, mesh drum*

The Republic of Uzbekistan is one of the world leaders in cotton cultivation and export. The production of high-quality fiber that meets world standards poses an important task for cotton processing specialists and scientists to improve existing equipment and technology. In turn, the continuous improvement of spinning and weaving equipment also indicates the need to pay great attention to the quality of cotton fiber.

In order to obtain a finished product, cotton is transported, dried, cleaned, ginned and fiber processed at cotton ginning enterprises. In these processes, cases of cotton fiber mixing with waste are observed. A detailed analysis of research work carried out to reduce fiber loss was conducted. Based on these analyses, it was determined that fiber loss occurs in several processes of a cotton ginning enterprise.

In our country, many theoretical and practical studies have been conducted on cleaning and sorting of seeds from the ginning process and separating seeds containing fiber, but currently it remains urgent to develop techniques and technologies that can fully meet the requirements of the present day. Because, a device has not been developed that would allow preventing damage to seeds during sorting, completely removing impurities from their content, and increasing fiber yield by sorting and re-ginning seeds containing fiber suitable for spinning.

S.Jackson, L.Pezo, A.A.Ordin, S.Xiaoxia, L.Wen, L.Orefise and other scientists have conducted research in the world to increase the productivity of mechanization tools used in sorting and cleaning seeds in cotton ginning enterprises, including screw conveyors, to replace their technological indicators, develop new designs and improve existing ones. Nowadays, after the ginning process in primary cotton processing plants, cotton seeds are sent for cleaning from various impurities, linting, and delinting. Seeds intended for sowing in the fields are sent for sorting as seeds [1,2].

The main part of the impurities that are added to the composition of the seeds occurs during the process of separating the fiber from the seeds (ginning) and must be separated during processing. If the composition of the fiber seeds is observed after the ginning process, they contain small impurities. In addition, they may also contain small, immature seeds [3]. Such impurities can be crushed during the processing of the seeds and lead to an increase in fluff and seed impurities. In addition, the composition of the seed mixture also contains seeds whose fiber has not been completely separated, and by sorting them, it is possible to increase the possibility of fiber production at the enterprise. The technological properties of the seeds are mainly determined by the physical-mechanical and, to a lesser extent, biological, that is, the degree of maturity and affect the technological process to varying degrees. Based on this, they can be conditionally divided into

physical-mechanical and mechanical-technological parts. In this case, the physical and mechanical properties of the seed and the seed mass often differ from each other. The physical and mechanical properties of the seeds include the shape and geometric dimensions, the mass density and weight forces can be introduced[4].

In appearance, a regular and normal seed is pear-shaped, with a large and round base, decreasing in size towards the tip, and a pointed tip at the end. The widest part is approximately one-fourth of the length of the blunt side of the seed, and in most studies the shape of the seed is taken as a sphere [5]. In the manual created by E.T.Maksudov [6], the shape of the seed is considered to be ovoid.

In the studies carried out by X.T.Akhmedkhodjaev [7], a device for sorting seeds by passing them through the holes of the inclined grid of a vibrating sorter was proposed. First of all, the shape and size of the seeds are of great importance in this process. A special device and method have been created to determine the sizes of seeds with different hairiness. Measurements were carried out by taking 200 seeds from medium and fine-fiber cotton seeds and re-sampling them multiple times (Table 1).

Selective variety	Seed size after germination			
	Length (D1), mm	Diametr (D), mm	Mass of 1000 seeds	Indicator in %
C-6524	8,0-12,25	5,5-8,75	138,2	14,2
Namangan-77	7,25-12,3	5,6-9,0	125,8	14,9
Andijon-35	8,1-12,2	5,8-9,8	128,3	13,8

The fiber residue in the seed is the amount of fiber that remains uncleaned in 200 seeds during the ginning of cotton. The fiber residue of the seeds after ginning is considered a necessary indicator for ensuring the normal course of the ginning process. However, the research in the dissertation work revealed that 3-5% of the seeds released from the ginning process contain fibers suitable for spinning. Therefore, it is advisable to separate these seeds in the maximum possible state.

The degree of damage to the seeds also has a significant impact on the sorting process. Studies conducted on the damage to the seeds during ginning and linting revealed the following. For example, S-6524 grade 1 50 g. For cotton seeds, the damage is 2-3% in the third, 9-22% in the middle, and 3-6% in the cotyledon, while for S-6530 II grade seeds, this amount is 1-3% in the third, 8-19% in the middle, and 2-5% in the cotyledon. This "distribution" of shell damage can also be described in terms of the natural physical properties of cotton seeds.

During cottonseed processing, the degree of complete separation of the fiber and the level of residual lint are determined and analyzed. The use of cottonseed both for oil production and as planting material requires a minimum level of lint: the lower the lint content of the seed, the higher the oil recovery rate and the better the germination of the seed.

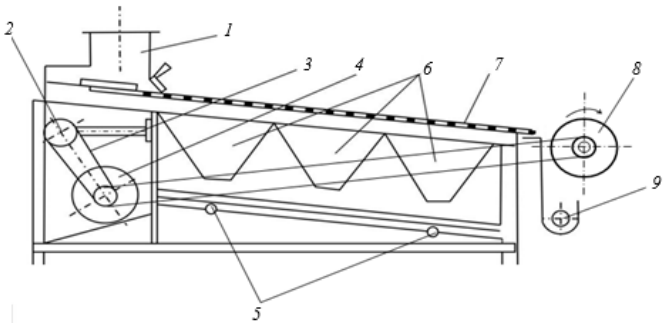

Figure 1. Experimental design scheme of the device for sorting crushed seeds.
1-supply hopper; 2-eccentric; 3-belt drive; 4-electric motor; 5-bearings; 6-chutes for the falling of seed fractions; 7-mesh surface; 8-separating drum; 9-soil mixture auger.

The surface for sorting crushed seeds by fractions is fixed with an eccentric 2. The wires forming the wire parts of the fraction sorter by fractions are taken with a diameter of 4 mm. The supply hopper 1 for transporting seed is made of steel, with a thickness of 1, a width of 1000, a height of 500 and a width of 50 mm.

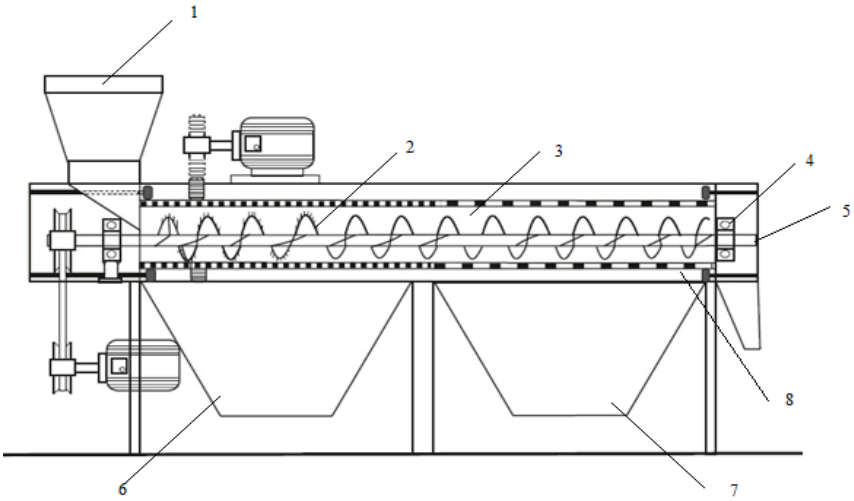

Figure 2. Scheme of the device

1-inlet pipe, 2-screw conveyor, 3-working chamber, 4-bearing, 5-shaft, 6-hopper for impurities in the mill, 7-hopper for seeds completely separated from the fiber, pipe for sending to the second linter, 8-pipe for separating poorly combed seeds with fiber.

The purpose of the comber device proposed by S. Rejabboev is to install it in the technological process of preliminary processing of cotton raw materials at cotton ginning enterprises after the combing process before linting. The combed seeds begin to be shaken and sorted in the comber. The sorter is designed to separate into four different fractions.

Unlike the seed sorters used in cotton ginning plants, the screen-drum and auger of the sorter rotate in opposite directions, which allows for the separation of small impurities from the cleaned seed and the separation of the seed into different fractions and sorting of the seed.

As a result, the grains that enter the working chamber in clumps are shaken and cleaned of various impurities, while the clean grains are sent to the grain storage, the linting grains are sent to linting, and the grains with fiber are sent to re-ginning.

Conclusion. After the grains leave the working chamber of the saw gin, they are divided into grains with poorly separated fibers (not ginned) on the surface, damaged grains, and grains with completely separated fibers. In addition, there are also broken grains. The damage process continues even after leaving the working chamber. As a result of research, effective results have been achieved in order to reduce grain damage and improve fiber quality.

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