SCIENTIFIC SUBSTANTIATION OF THE DIRECTIONS FOR SORTING AND PROCESSING SEEDS BASED ON RESIDUAL FIBER CONTENT

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ABSTRACT

The text describes the influence of initial moisture (W) and cotton impurity (S) on the ginning process and the amount of residual fiber in the seeds. Experiments conducted at the "Rishtan" cotton ginning enterprise on industrial cotton varieties I-II-III of the S-6524 variety showed that an increase in raw material moisture and contamination complicates the operation of the saw cylinder and directly increases the amount of fiber remaining in the seeds.

Indicators of raw cotton moisture and impurity content adopted at cotton ginning plants are reflected in each process of primary cotton processing, i.e., they also influence the amount of residual fiber content in the seeds separated during ginning from poorly dried and cleaned cotton during drying and cleaning. During the ginning process, small impurities in the cotton pass into the seeds and partially into the fiber. High moisture content and cotton impurities hinder the operation of the saw cylinder during ginning, and the presence of impurities between the saw teeth and the fiber leads to an increase in fiber residue in the seeds. To clarify the above theoretical analyses in experiments, the following experiments were conducted at the "Rishtan" cotton ginning enterprise in the Fergana region. Since the cotton of the S-6524 selection variety and the I-II-III industrial varieties with different moisture and impurities have different moisture and impurities, samples were taken during the processing of these industrial varieties, quality indicators and residual fiber content in the seeds were determined, and the results are shown in Table 1.

The experimental results in the table below clearly show how changes in the moisture (W) and impurity (S) of the seed cotton transferred to the ginning process affect the seed quality. In particular, it has been experimentally proven that an increase in cotton moisture and impurity leads to an increase in seed moisture, seed impurity, and the amount of fiber preserved in the seeds.

Table 1

Seed condition and residual fiber content depending on the moisture and impurity of the cotton transferred to the gin

o	Moisture content of cotton transferred to the gin W, %	Cotton impurity in the gin S, %	Cotton moisture content, %	Seed contamination, %	Fiber remaining in 100 kg of seeds, kg	Residual fiber content, 200/g
.	7.5	0.9	7.7	0.6	1.54	0.36
.	8.0	1.0	8.2	0.7	1.58	0.37
.	8.5	1.2	8.7	0.8	1.63	0.39
.	9.0	1.4	9.3	0.9	1.70	0.40
.	9.5	1.6	9.6	1.1	1.78	0.42
.	10.0	1.7	10.3	1.2	1.86	0.44
.	10.5	1.9	10.7	1.3	1.95	0.46
.	11.0	2.0	11.3	1.4	2.04	0.49
.	11.5	2.1	11.8	1.6	2.14	0.51
0	12.0	2.2	12.4	1.8	2.25	0.54

According to the results in Table 1.6, when the moisture content of the cotton transferred to the gin ranged from 7.5% to 12.0%, the moisture content of the seeds obtained after ginning also changed from 7.7% to 12.4%. This is explained by the uneven distribution of moisture between the fiber and the seeds. In practice, seeds retain more moisture than fiber, so the moisture content of seeds is usually 0.2-0.4% higher than the moisture content of cotton [43].

With an increase in cotton impurity from 0.9% to 2.2%, the impurity of the seeds separated from it changed from 0.6% to 1.8%. The main reason for this is the persistence of certain fine impurities on the seed surface during ginning, as well as the easy adhesion of impurity particles to it due to the rough structure of the seed coat.

The most important result was a sharp increase in the amount of fiber remaining in the seeds. Specifically, at a cotton moisture content of 7.5%, 1.54 kg of fiber remained in the sample taken from 100 kg of cotton seeds, while with a 12.0% increase in moisture content, this figure was 2.25 kg. Consequently, as moisture increases, the amount of fiber remaining in the seeds increases by 2.3 times.

This is explained by the fact that under high humidity conditions, the fiber-seed bond strengthens and the fiber separation process becomes more difficult. At the same time, increased humidity creates conditions for the preservation of more fiber fragments on the seed surface. With every 0.5% increase in cotton moisture, the residual fiber content varied within the range of 0.04–0.11 kg per 100 kg of sample. Especially in cases where the moisture content exceeds 10%, the increase in residual fiber content accelerates.

The experimental results show that cotton moisture and impurity directly affect seed quality. That is, as these indicators increase, seed moisture, seed contamination, and the amount of residual fiber in the seeds also increase. This can lead to additional work in the subsequent stages of cotton processing (cleaning, lintering, seed preparation) and increase technological costs.

Therefore, maintaining the moisture content of the cotton transferred for ginning at 7.5-9.0% and reducing the level of contamination is an important requirement. However, excessive drying of cotton is also not an optimal solution, as at low humidity, the fiber becomes brittle, and as a result of increased breakage and shortening, the quality indicators of the high-grade fiber may decrease.

Furthermore, in production conditions, the moisture and impurity of the cotton are not maintained constantly. Due to the variety of raw material batches, transportation and storage conditions, as well as the influence of the external environment, seeds with low and high residual fiber content appear in a mixed state in the seed mass obtained after ginning.

If the fiber loss is calculated for 200 seeds with residual fibrous seeds, the seed yield after ginning ranges from 0.36 g to 0.54 g depending on the moisture content. If their difference is 0.18 kg, then 0.71 kg of fiber is lost in 100 kg of seeds, and 7.1 kg in 1000 kg of seeds. If 50,000 kg of seeds are produced per day, then 355 kg of fiber is lost per day. If this is multiplied by 25 working days per month, 8,875 kg of fiber will be lost. At current exchange prices for fiber [44], the average cost is 11.0 million soums, and the enterprise suffers a loss of 97,625,000 soums per month.

Therefore, in order to ensure stable requirements for seed quality, it is impossible to limit oneself to maintaining normal moisture levels. It is technologically and practically necessary to develop and implement a special sorting equipment that allows for the separate separation of seeds with high residual fiber content after ginning. This facilitates further processing, reduces fiber losses, and improves seed quality.

Conclusions

Analysis shows that the seeds obtained after ginning contain small impurities, defective seeds, and incomplete fiber separation, which reduces lint yield and quality during the lintering process, leading to rapid equipment wear. Although the mechanical and pneumatic cleaning devices used in practice, including RNS equipment, separate fibrous seeds to a certain extent, the ability to completely separate seeds with high residual fiber content is limited. Scientific analysis shows that the persistence of fine impurities, defective seeds, and incomplete fiber separation in the seed mass after ginning leads to a decrease in lint quality during the linting process, an increase in fiber losses, and rapid wear of the equipment's working parts. Although various mechanical and pneumatic methods for seed cleaning and sorting have been proposed in the literature, in practice, the problem of accurately separating seeds by residual fiber content has not been fully resolved; as a result of research, it has been proven that when sorting seeds, their diameter, mass, and friction properties are more important than their length, and that the coefficient of friction and movement properties change with increasing fiber content..

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