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ANALYSIS OF RESEARCH RELATED TO COTTON SEED CLEANING AFTER GINNING

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Abstract

This article provides a comprehensive analysis of research conducted on the cleaning of cotton seed masses generated after the ginning process prior to the subsequent linting stage. The study systematically evaluates various methodologies and technological advancements aimed at enhancing the efficiency of seed preparation. Particular attention is given to the mechanisms of removing residual impurities and the impact of pre-linting purification on the overall quality of the final product. Furthermore, the paper examines the integration of cleaning systems within the production cycle to optimise industrial performance and reduce mechanical damage to the seeds.

Keywords: Cotton seed, linting process, residual lint, airflow, separation technology, seed cleaning.

Cleaning cotton seeds prior to the linting process and isolating seeds with high residual lint content serves a dual purpose: it prevents valuable fibres from being diverted into the cotton linter, thereby increasing the overall fibre yield, and it enhances the operational uniformity of linting equipment while extending the service life of its working components.



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A substantial body of scientific literature has addressed the refinement of seed cleaning and linting processes. Scholars such as Muradov R., E.T. Maqsudov, Sarimsakov A.U., A.E. Lugachev, X.S. Usmanov, Ahmedkhodjaev H.T., Karimov A.I., Obidov A.A., R.K. Djamolov, and M. Akromov, among others, have conducted extensive research into seed cleaning technologies, mechanical separation procedures, and the complexities of separation under the influence of airflow.

In the manual developed by E.T. Maqsudov [1], the geometric form of the cotton seed is primarily characterised as ovoid. However, such a generalised approach tends to overlook the specific physical nuances of the seeds, which complicates the precise classification and differentiation of seeds produced immediately after the ginning stage. Observations of fractions isolated via a regenerator revealed a significant presence of seeds with high lint content among the mass directed towards linting. In these specific seeds, the fibre length ranges between 25–33 mm; while categorising them strictly as "letuchka" (free fibre with seed) may be inaccurate, classifying them as standard seeds does not fully reflect their actual physical state.

X.T. Ahmedkhodjaev [2, 3] proposed a specialised device designed to sort cotton seeds by passing them through the apertures of an inclined grid on a vibrating sorter. In this particular methodology, the geometric configuration and dimensions of the seed are of paramount importance. To determine the dimensional parameters of seeds with varying degrees of pubescence, a dedicated measuring instrument and methodology were developed. The research involved selecting 200 samples each from medium-staple and fine-staple cotton seeds, with data established through multiple measurements and subsequent averaging.



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Table 1. Dimensions of planted cotton varieties

Selection Variety	Post-ginning cottonseed dimensions			
	Length (mm)	Diameter (mm)	Mass of 1,000 Seeds (g)	Lint Content (%)
S-6524	8.0–12.25	5.5–8.75	138.2	14.2
Namangan-77	8.2–12.22	5.4–8.84	136.9	14.0
S-9070	8.1–12.2	5.8–9.8	128.3	13.8
S-6530	8.2–12.22	5.4–8.84	136.9	14.0
An-60	8.1–9.8	4.5–5.3	108.1	—
9871-I	8.1–10.2	5.1–6.8	117.3	—
9853-I	8.2–9.8	5.2–5.8	125.25	—

The data presented in Table 1 indicates that the length of cotton seeds in medium-staple varieties remains relatively consistent, fluctuating primarily within the range of 8.0–12.25 mm. The diameter measurements similarly exhibit minimal variance, although it is notable that the S-9070 variety possesses a higher upper diameter threshold (9.8 mm) compared to other analysed varieties.

Regarding the mass of 1,000 seeds, the highest value was recorded for the S-6524 variety (138.2 g), while the lowest was observed in the An-60 variety (108.1 g). This observation confirms that seeds of fine-staple varieties are generally smaller and lighter in comparison. The lint content for medium-staple varieties ranges between 13.8% and 14.2%, showing negligible disparity; the maximum lint percentage was identified in S-6524, whereas the minimum was found in S-9070. Depending on their degree of pubescence, cotton seeds post-ginning possess several distinct values that characterise their frictional properties. The primary indicators of these frictional characteristics are the coefficients of static friction and sliding friction. Furthermore, these properties encompass detachability—the



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inverse of which is adhesiveness—which was quantified through the measurement of adhesive force.

Based on the results of this analysis, it can be concluded that during the seed sorting process, diameter and mass parameters serve as more critical identifiers for separation than length. These specific parameters exert a profound influence on the ability of the seeds to pass through grid apertures and their subsequent distribution into various fractions.

In the research conducted by Jo'rayeva M., Komilov Sh.R., Sarimsakov A.U., and Muradov R.M. [4, 5], the quality indicators of cotton seeds following the ginning process were scrutinised. The authors demonstrated that seeds are differentiated into fractions according to their pubescence levels and volumetric parameters, highlighting the industrial significance of this classification.

The study further noted that post-ginning seed masses often retain impurities such as sand, soil, leaves, and other foreign matter. Additionally, immature and undersized seeds tend to be crushed during processing, which increases the volume of waste. Critically, it was determined that 3–5% of the seeds may still retain spinnable-grade fibre; the isolation and reprocessing of such seeds have been shown to enhance overall fibre yield. The research also indicated that while seed shape, length, diameter, and the mass of 1,000 seeds significantly influence the sorting process, the inherent differences between varieties complicate the development of a universal sorting apparatus. Simultaneously, it was cautioned that excessive mechanical impact can damage the seed coat, thereby exerting a detrimental effect on the quality of the planting material.

Conclusion

The emergence of a heterogeneous cotton seed mass following the ginning process, characterised by varying levels of residual lint content, remains a significant technological challenge within the industry. Research indicates that as



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the moisture content and impurity levels of the raw cotton increase, the quantity of fibre remaining on the seeds rises sharply. This phenomenon not only diminishes the overall efficiency of the subsequent linting process but also leads to substantial economic losses for the processing enterprise due to the loss of potentially recoverable fibre.

Effective pre-linting separation, based on the physical and dimensional parameters of the seeds, is therefore essential to mitigate these issues, optimise equipment performance, and maximise the output of high-quality fibre.

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