



 Research Article

## Determination of Parameters for Equipment Designed for The Separation of Ginned Cotton Seeds According to Their Fuzziness

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### ABSTRACT

The present article investigates the critical issue of enhancing the efficiency of separating residual fibrous seeds that remain within the seed mass following the ginning process. Based on comprehensive experimental research, an analysis has been conducted regarding the influence of the operational modes of the improved RNS equipment and the structural parameters of the loosening peg-paddle drum on the overall technological process. During the course of the experiments, particular attention was paid to the impact of the screw pitch on the drum in relation to the distribution of the seed mass across the surface of the saw drum and its subsequent effect on regeneration efficiency. The findings of the research indicate that increasing the screw pitch to a specific threshold significantly improves separation efficiency; however, an excessive increase leads to a decline in process performance. According to the experimental results, it has been determined that the optimal value for the screw pitch within the loosening peg-paddle drum is approximately 150 mm.

### KEYWORDS

Cotton seeds, ginned seeds, residual fuzziness, RNS equipment, regeneration efficiency, drum parameters, screw pitch.

## INTRODUCTION

In the process of separating cotton fibre from the seed, it is observed that a certain portion of the fibre remains on the seed surface. This phenomenon varies depending on the operational modes of the ginning machines, the condition of the working components, and the moisture and trash content of the raw material. In practice, the fuzziness of ginned seeds typically ranges between 10.5% and 12.0% [1, 2].

The conveyance of residual fibrous seeds to subsequent technological stages often results in a decrease in economic efficiency. This is due to the observed increase in fibre loss and higher energy consumption during the seed linting process. Consequently, the separation of residual fibrous seeds after the ginning process and the improvement of their processing methods represent one of the most critical tasks in the industry.

To achieve this objective, RNS-type equipment is utilised within the cotton industry. However, in practice, the efficiency of separation in such equipment may decrease due to the uneven distribution of seeds across the working components. In this connection, the improvement of the loosening peg-slat drum construction, which ensures the equal distribution of seeds across the surface of the saw drum, as well as the determination of its rational parameters, constitutes a highly relevant task.

### Research Aim and Objectives

The primary aim of this research is to determine the rational structural and technological parameters of the process for separating ginned seeds according to their fuzziness using improved RNS equipment.

To achieve this aim, the following objectives were established:

- Substantiation of the fundamental structural parameters of the loosening peg-slat drum;
- Investigation of the conditions required for the equal distribution of seeds across the surface of the saw drum;
- Assessment of the impact of operational modes on the efficiency of separating residual fibrous seeds;
- Identification of optimal operational modes that allow for a reduction in the degree of mechanical damage to the seeds.

### Experimental Program

An experimental research programme was developed to implement the stated aim and objectives. During the experiments, the primary focus was directed towards studying the parameters of the loosening-distributing peg-paddle drum and the operational modes of the RNS equipment [3, 4].

The studies analysed the influence of peg arrangement patterns on the drum, the screw

pitch, and structural dimensions on the process. The screw pitch of the pegs was varied within the range of  $L = 100-200$  mm, the width of the peg slats  $H = 20-30$  mm, the height of the pegs  $h = 30-50$  mm, and the distance between the pegs  $b = 30-50$  mm. The rotation speed of the drum was studied within the range of  $n = 100-140\text{min}^{-1}$ .

The experiments are conducted in two stages:

- In the first stage, single-factor experiments were performed to determine the impact of each individual parameter;
- In the second stage, three factors exerting the greatest influence on the process were selected based on the results of the preliminary studies, and investigations were carried out according to a multi-factor experimental design.

All experimental variants were repeated three times, and the average values of the results were adopted for analysis.

## METHODOLOGY

Experimental studies were conducted in a laboratory environment closely resembling the conditions of a cotton ginning enterprise. The experiments utilised ginned seeds obtained from "Sulton" selection variety cotton, belonging to the I-industrial grade. The initial moisture content of the seeds was 7–9%, and the trash content was 0.3–0.4%. For each experiment, a 100 kg seed sample was prepared.

Initially, to improve the efficiency of the RNS regenerator, we shall determine the screw pitch of the installed peg-paddle drum to ensure the uniform distribution of ginned seeds across the surface of the saw drum.

## RESULTS AND DISCUSSION

In the course of the experimental research, the impact of the screw pitch ( $L$ ) of the loosening peg-slat drum on the efficiency of separating residual fibrous seeds was investigated. The obtained results are presented in Figure 1.

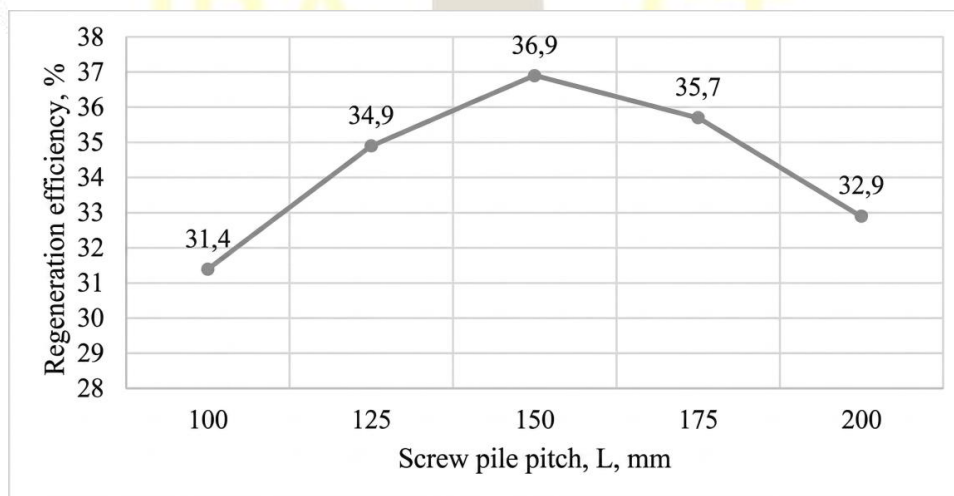


Figure 1. The influence of the peg-paddle screw pitch on regeneration efficiency.

As is evident from the graph above, the regeneration efficiency increases up to a certain threshold as the screw pitch is increased. Specifically, when  $L = 100$  mm, the regeneration efficiency was 31.4%, whereas increasing the screw pitch to 125 mm saw this indicator reach 34.9%.

Increasing the screw pitch to 150 mm yielded the highest results in the process, with the regeneration efficiency reaching 36.9%. This phenomenon is explained by the fact that the peg-slats positioned on the drum distribute the seed mass relatively uniformly across the working zone. Consequently, the residual fibrous seeds engage in a more effective interaction with the surface of the saw drum.

However, it was observed that a further increase in the screw pitch (175-200 mm) led to a decline in process efficiency. For instance, at  $L = 175$  mm, the regeneration efficiency was 35.7%, and at  $L = 200$  mm, it decreased to 32.9%. This occurrence is attributed to the uneven distribution of the seed mass along the drum resulting from the increased distance between the pegs.

Based on the results obtained, it can be concluded that the optimal value for the screw pitch in the loosening peg-paddle drum is appropriately established at approximately  $L = 150$  mm. At this parameter, a stable distribution of the seed mass across the working zone is ensured, and the technological efficiency of the regeneration process is manifested at a high level.

## CONCLUSION

Based on the investigation into the process of separating ginned seeds according to their

fuzziness, the following conclusions have been drawn:

- The high level of residual fuzziness remaining in the seeds after the ginning process leads to increased fibre loss and higher energy consumption during the linting stage, thereby necessitating the improvement of the regeneration process.
- It was identified that the construction of the loosening peg-paddle drum within the improved RNS equipment serves to distribute the seed mass uniformly across the surface of the saw drum.
- During the experimental research, it was confirmed that the screw pitch ( $L$ ) of the peg-paddle drum is a primary factor exerting a direct influence on regeneration efficiency.
- Increasing the screw pitch from  $L = 100$  mm to 150 mm ensured the optimal distribution of seeds across the working zone, leading to an increase in separation efficiency from 31.4% to a peak value of 36.9%.
- An excessive increase in the screw pitch beyond 150 mm (175-200 mm) resulted in the uneven distribution of the seed mass and a subsequent decline in efficiency to as low as 32.9%.
- According to the research findings, the optimal screw pitch for the loosening drum was established at 150 mm, which enables an increase in the efficiency of seed processing within cotton ginning enterprises.

## REFERENCES

1. Rejabboyev, S. T., Muradov, R. M., & Isaxonov, H. (2020). Jindan chiqqan chigitlarni saralash

qurilmasini tadqiqi. Namangan muhandislik-  
texnologiya instituti ilmiy-texnika jurnali, (5),  
24–25.

2. Maqsudov, E. T., Shorasulov, N. S., & Qosimov, S. M. (1991). Paxta chigitidan kalta tolalarni ajratish. Fan.
3. Yudin, M. I. (2004). Planirovanie eksperimenta i obrabotka ego rezultatov. Krasnodar: Kuban State Agrarian University.
4. Augambayev, M., Ivanov, A. Z., & Terekhov, Yu. I. (1993). Osnovy planirovaniya nauchno-issledovatel'skogo eksperimenta. Tashkent: O'qituvchi.

