FACTORS AFFECTING THE EFFICIENCY OF THE SAXAUL SEED DEWINGING DEVICE

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Abstract. *This article analyzes the working principle and efficiency of a device designed to remove the wings of saxaul seeds. The influence of the gap size between the brush drum and the sieve on the dewinging and damage rates of the seeds was studied. The results indicate that when the gap is set between 1.0-1.5 mm, the dewinging rate reaches 98.7-99.6%, while the damage rate remains at 0.9-1.1%. These findings help define the optimal conditions for improving the efficiency of the seed processing process.*

Keywords: *saxaul seed, dewinging, brush drum, sieve, gap, damage, efficiency, mechanical processing, seed quality, optimal value.*

Introduction. Saxaul is an essential plant found in desert and semi-desert regions, playing a significant role in protecting the soil from erosion and preserving biodiversity. It helps maintain ecological balance and serves as a valuable forage plant for livestock. Additionally, saxaul contributes to soil stabilization and reduces salinization processes in desert and semi-desert areas.

Currently, the environmental degradation and soil deterioration in desert and semi-desert regions are among the major global challenges [1-2]. The sufficient propagation and restoration of saxaul are crucial for minimizing sand encroachment, erosion, and salinization in these areas. Furthermore, mechanizing the saxaul planting process and ensuring high-quality seed processing contribute to environmental conservation and more efficient land use [2-3].

The dewinging process is a critical step in the propagation of saxaul seeds. Dewinging is necessary to achieve uniform seed distribution and create optimal conditions for seed germination. This process is performed using mechanical devices, as the natural wings of seeds facilitate wind dispersal but may cause complications in artificial planting.

This article examines the working principle, efficiency, and impact of gap size in a specialized device designed for dewinging saxaul seeds. The study results will help enhance seed processing techniques and improve the overall efficiency of the saxaul propagation process [4-8].

Methodology of the experiment. The experiment was conducted to evaluate the efficiency of removing wings from saxaul seeds. The mechanical device used for seed processing consisted of a brush drum and a sieve, with an adjustable gap allowing the observation of different outcomes.

Materials and Equipment. Saxaul seeds (collected and cleaned); Brush drum dewinging device; Various sieves; Electronic scale (to determine the proportion of damaged seeds); Magnifying glass and microscope (to assess the external condition of the seeds); Mathematical and statistical analysis tools.

Experimental Procedure. The saxaul seeds were standardized and prepared for analysis. The seeds were placed into the specialized dewinging device. The gap between the brush drum and the sieve was adjusted from 0.5 mm to 2.0 mm. For each gap setting, 100 grams of seeds were processed, and the results were recorded. The proportions of dewinged and damaged seeds were determined. All results were subjected to statistical analysis and presented in graphical and tabular form.

Evaluation of experimental results. Dewinged seed percentage (%): The proportion of seeds completely separated from their wings. Damaged seed percentage (%): The proportion of seeds damaged during the dewinging process. Optimal gap value: The gap size that ensures maximum dewinging while minimizing seed damage.

Experimental results. During the study, the effect of the gap size between the brush drum and the sieve on the dewinging process of saxaul seeds was examined.

The table below presents the percentages of dewinged and damaged seeds at different gap values.

Gap between brush drum and sieve (mm)	**Dewinged seeds (%)**	**Damaged seeds (%)**
0,5	100,0	3,2
1,0	99,6	1,1
1,5	98,7	0,9
2,0	97,6	0,4

Based on the table results, when the gap is 0.5 mm, the seeds are completely dewinged; however, 3.2% of them sustain damage. This level of damage may negatively affect the seeds' germination ability. When the gap is increased to 1.0 mm, the percentage of dewinged seeds reaches 99.6%, while the proportion of damaged seeds decreases to 1.1%.

At a 1.5 mm gap, the dewinging rate drops to 98.7%, while the proportion of damaged seeds decreases to 0.9%. This result is considered optimal for ensuring high-quality seed processing. However, at a 2.0 mm gap, the dewinging rate further decreases to 97.6%, while seed damage is reduced to 0.4%. Although this result is beneficial for seed integrity, it increases the number of seeds that retain their wings, which may impact sowing efficiency.

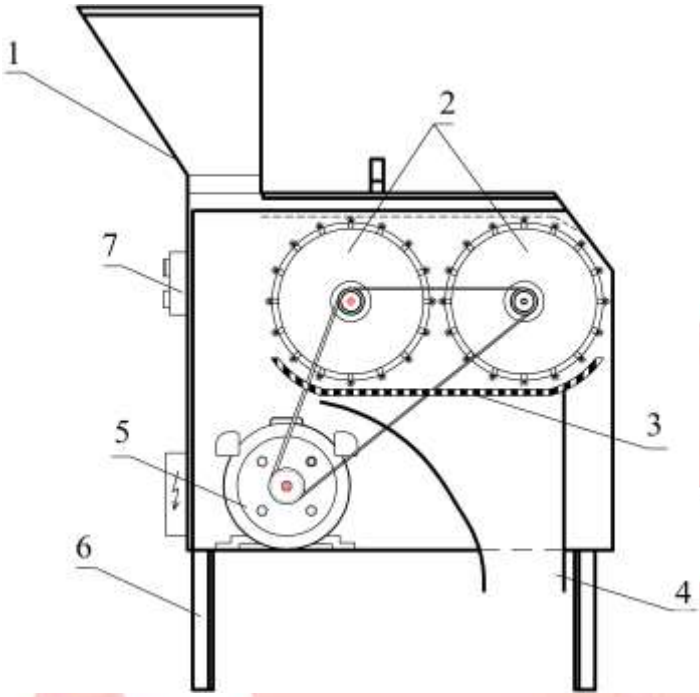

Figure 1. Dewinging device for desert plant seeds.

The device consists of a seed hopper (1), friction drums (2), their casing (3), seed discharge chute (4), electric motor (5), frame (6), and start-stop button (7).

Selection of the optimal gap value. Based on the experimental results, an analysis was conducted to determine the optimal gap value. The gap size directly affects the dewinging efficiency and the likelihood of seed damage.

When the gap is set to 0.5 mm, the dewinging efficiency is high; however, 3.2% of the seeds were found to be damaged, which could negatively impact their germination potential.

At a 1.0 mm gap, the dewinging rate reached 99.6%, while seed damage decreased to 1.1%. When the gap was increased to 1.5 mm, 98.7% of the seeds were dewinged, with a damage rate of 0.9%. At a 2.0 mm gap, the dewinging rate dropped to 97.6%, while seed damage was further reduced to 0.4%.

Therefore, the optimal gap size was determined to be in the range of 1.0-1.5 mm. Within this range, the seeds achieve maximum dewinging with minimal damage.

Selecting the optimal gap value ensures high-quality seed processing and positively impacts the quality of saxaul seedlings.

Conclusion. The gap size between the brush drum and the sieve plays a crucial role in the dewinging process of saxaul seeds. An optimal gap of 1.0-1.5 mm ensures a balance between dewinging efficiency and seed integrity. The research results indicate that when the gap size is between 1.0 mm and 1.5 mm, 98.7-99.6% of the seeds are successfully dewinged, while the damage rate remains between 0.9-1.1%.

These findings highlight the importance of selecting the optimal gap value in the seed processing procedure. Choosing the right gap size not only enhances seed quality but also improves their germination potential. Additionally, attention should be given to the design of mechanical devices to further increase dewinging efficiency and minimize seed damage.

The research results contribute to improving the seed processing process and increasing the efficiency of saxaul seedling production. This, in turn, facilitates the expansion of saxaul plantations in desert and semi-desert regions and supports ecosystem conservation efforts. Moreover, future advancements should focus on automating this process and developing more efficient mechanical solutions.

REFERENCES:

1. Abdullaev Sh., Ergashev K. *Desert Plants and Their Cultivation*. – Tashkent: Fan, 2005.
2. Karimov U. *Mechanical Processing Technology of Plant Seeds*. – Tashkent: Mehnat, 2010.
3. Norqobilov Sh. *Ecological Significance of Saxaul*. – Samarkand: SamDU Publishing, 2015.
4. Oripov B. *Forest Management Mechanization*. – Tashkent: UzDTI, 2012.
5. Sidiqov F. *Sowing and Care of Desert Plants*. – Bukhara: BukhDU Publishing, 2018.
6. Tokhtaev J. *Storage Characteristics of Plant Seeds*. – Tashkent: Science and Technology, 2014.
7. Khasanov A. *Biology of Field Plants*. – Namangan: NDU Publishing, 2016.
8. Yusupov R. *Seed Processing Technology*. – Tashkent: Navruz, 2020.