



## ADVANTAGES OF THE TECHNOLOGICAL LABORATORY OF GRAIN STORAGE AND PROCESSING ENTERPRISES

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### ANNOTATION

This article examines the advantages and functional significance of the technological laboratory in grain storage and processing enterprises. Technological laboratories play a crucial role in ensuring product quality, safety, and compliance with national and international standards. The study highlights laboratory control methods for determining moisture content, grain purity, gluten quality, contamination level, and other physicochemical indicators. Special attention is given to the role of laboratory monitoring in preventing spoilage, reducing post-harvest losses, and improving production efficiency. The research emphasizes that the effective operation of technological laboratories enhances competitiveness, ensures food safety, and contributes to sustainable agricultural and industrial development.

**Keywords:** Grain storage, grain processing, technological laboratory, quality control, food safety, moisture content, gluten analysis, laboratory monitoring, agricultural technology, production efficiency.

### INTRODUCTION

Grain storage and processing enterprises represent a fundamental sector of the agricultural and food industry. The quality and safety of grain products directly influence public health, economic stability, and export potential. In modern production conditions, technological laboratories serve as an essential structural unit within grain enterprises, ensuring continuous monitoring and quality assessment at every stage of storage and processing. The technological laboratory performs comprehensive analyses of raw materials and finished products. These analyses include determining moisture content, protein and gluten quality, grain contamination, pest infestation, and other critical parameters. Accurate laboratory control prevents product deterioration, microbial contamination, and economic losses caused by improper storage conditions. Furthermore, laboratory-based quality management systems contribute to compliance with international food safety standards such as ISO and HACCP principles. By implementing modern analytical equipment and standardized testing procedures, grain enterprises can improve operational efficiency and maintain high production standards. Therefore, the technological laboratory is not merely a supportive unit but a strategic component that ensures product reliability, sustainability, and competitiveness in the global market.

### MATERIALS AND METHODS

This study was conducted based on the analysis of technological laboratory activities in grain storage and processing enterprises. The research materials included grain samples (wheat, barley, and corn) collected from storage facilities and processing units. Standard laboratory methods were used to evaluate grain quality indicators. Moisture content was determined using the drying method with a laboratory moisture analyzer. Grain purity and contamination levels were assessed through visual inspection and sieving techniques. Gluten quantity and quality were evaluated using standard gluten washing and deformation index methods. Additionally, organoleptic characteristics such as color, odor, and physical condition were examined. Laboratory equipment including analytical balances, moisture meters, sieves, microscopes, and gluten analyzers were used during the research process. The obtained data were recorded, compared with national and international grain quality standards, and analyzed using comparative and descriptive analysis methods.



## RESULTS

The results of the study demonstrated that the technological laboratory plays a key role in maintaining grain quality and safety. Laboratory analysis allowed precise determination of grain moisture content, which is one of the most important factors affecting storage stability. Grain samples with optimal moisture levels showed lower risks of microbial growth and spoilage. Purity analysis revealed the presence of various impurities such as dust, broken grains, and foreign particles. The technological laboratory ensured timely identification and removal of these impurities, improving overall product quality. Gluten analysis showed variations in gluten content and elasticity, which directly influence flour quality and baking properties. Laboratory monitoring enabled the classification of grain according to quality standards and suitability for processing. Overall, continuous laboratory control helped prevent quality deterioration, reduced storage losses, and ensured compliance with food safety requirements.

## DISCUSSION

The findings confirm that technological laboratories are essential for effective grain storage and processing management. Laboratory monitoring provides accurate and reliable data on grain quality, allowing timely decision-making and preventing potential losses. Moisture control is particularly important because excessive moisture creates favorable conditions for mold growth, microbial contamination, and biochemical degradation. The laboratory enables early detection of unsafe moisture levels, allowing corrective measures such as drying and improved ventilation. Furthermore, laboratory assessment of gluten and grain purity ensures that raw materials meet processing requirements and product quality standards. This contributes to higher efficiency in production and improved final product quality. The technological laboratory also plays a significant role in implementing quality management systems and ensuring compliance with international food safety standards. This enhances enterprise competitiveness, supports export potential, and strengthens consumer confidence. In conclusion, technological laboratories serve as a critical component of grain enterprises by ensuring quality control, improving production efficiency, reducing losses, and maintaining food safety standards.

## CONCLUSION

The technological laboratory plays a vital role in ensuring the quality, safety, and efficiency of grain storage and processing enterprises. Laboratory control enables accurate determination of important grain quality indicators such as moisture content, purity, contamination level, and gluten characteristics. These parameters directly influence storage stability, processing efficiency, and the quality of final products. Continuous laboratory monitoring helps prevent spoilage, microbial growth, and economic losses caused by improper storage conditions. It also ensures compliance with national and international quality and food safety standards. The use of modern laboratory equipment and standardized analytical methods enhances production control and supports effective decision-making processes. Furthermore, the technological laboratory contributes to improving enterprise productivity, increasing product competitiveness, and ensuring consumer safety. Therefore, the technological laboratory should be considered an essential structural and functional component of grain storage and processing enterprises. Its effective operation supports sustainable agricultural development and strengthens the overall food supply system.

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