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EFFICIENT USE OF LOCAL RAW MATERIALS FOR ETHANOL PRODUCTION

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Abstract. The article discusses the possibilities of using common reed biomass for ethanol production and its main technological characteristics. The effects of cellulose, hemicellulose, and lignin contained in reed on the processing process are examined, along with the importance of assessing the moisture content and mineral residue of the raw material. The relationships between the stages of biomass pretreatment, grinding, reducing the effects of lignin, hydrolysis, and fermentation in ethanol production technology are analyzed. The necessity of determining the physicochemical properties of the raw material under laboratory conditions and selecting technological parameters based on experimental results is also substantiated. The use of reed biomass is of significant importance for exploring opportunities to utilize renewable raw material resources and deeply process local biomass sources.

Keywords: Common reed, lignocellulose, biomass, cellulose, lignin, hydrolysis, fermentation, ethanol.

Introduction. Today, the production of valuable products from plant biomass and the in-depth processing of local raw materials are of significant scientific and practical importance. In particular, the lignocellulosic compounds contained in common reed, which is widely distributed under natural conditions, provide a basis for investigating its potential for ethanol production. In this process, it is necessary to consider not only the chemical composition of the raw material but also its moisture content, mineral residue, and pretreatment conditions [1,2].

When producing ethanol from common reed biomass, it is important to consider the compositional characteristics of the raw material. Cellulose and hemicellulose are carbohydrate components that can be converted into simple sugars required for



fermentation after appropriate pretreatment and hydrolysis stages. Lignin, in contrast, provides structural strength to plant cell walls and may hinder the processing of carbohydrates. Therefore, evaluating the chemical composition and technological properties of common reed is particularly important when preparing it for ethanol production [3,4].

The aim of this study is to evaluate the technological properties of common reed as a raw material and to substantiate the possibilities of its efficient use in ethanol production. To achieve this aim, it is necessary to examine the main components of reed biomass, the importance of raw material pretreatment, and the factors affecting processing efficiency [5,6].

Materials and Methods. The potential use of common reed biomass was considered as the research material. Reed stems are regarded as a promising lignocellulosic raw material for ethanol production. When evaluating their technological properties, attention should be paid to moisture content, mineral residue, and the main structural components, including cellulose, hemicellulose, and lignin. The research methods include the analysis of scientific literature, comparison of the physicochemical properties of the raw material, and examination of the stages of the technological process. Reed pretreatment, grinding, processing of the lignocellulosic structure, hydrolysis, and fermentation are considered important factors affecting the efficiency of ethanol production. To obtain accurate results, these parameters should be verified through laboratory experiment

Results and Discussion. The efficiency of common reed biomass in ethanol production primarily depends on its structural components and the quality of pretreatment. Cellulose and hemicellulose contained in reed are the main sources of carbohydrates required for ethanol production. However, since these substances are associated with lignin in the plant cell wall, the raw material must undergo appropriate pretreatment before processing.

Grinding the reed reduces the particle size of the raw material and increases its



surface area for interaction with processing reagents. When selecting a pretreatment method, it is necessary to consider carbohydrate retention, reduction of lignin-related effects, and the efficiency of subsequent hydrolysis. Excessively intensive pretreatment may lead to the degradation of certain carbohydrates and increased processing costs. Therefore, it is important to select technological conditions according to the properties of the raw material.

Hydrolysis and fermentation are interrelated stages in the ethanol production process. During hydrolysis, complex carbohydrates in cellulose and hemicellulose are converted into simple sugars. In the subsequent fermentation stage, these sugars are converted into ethanol with the help of suitable microorganisms. Process efficiency depends on the composition of the raw material, pretreatment conditions, degree of hydrolysis, and fermentation parameters. Therefore, each stage should be evaluated separately while taking into account the technological relationships between them.

Conclusion. In conclusion, common reed biomass represents a promising local raw material for ethanol production. Evaluating its technological properties, including moisture content, mineral residue, and lignocellulosic composition, helps in selecting appropriate processing methods. The optimal selection of raw material pretreatment, hydrolysis, and fermentation conditions is essential for improving ethanol production efficiency. Further research should focus on determining the composition of reed biomass under laboratory conditions and experimentally comparing different pretreatment methods.

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