BIOUTILIZATION OF WASTE AGROINDUSTRIAL COMPLEX FOR RECEIVING BIOGAS

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Relevance. A main problem of many countries is the search of promising energy sources. Biomass (wood, straw, plant residues of agricultural production, manure, etc.) is considered one of the key renewable energy resources of the future. Annually, juice factories in Ukraine produce thousands of tons of fruit and berry waste, which during 1-3 days undergo microbiological spoilage. Therefore they are not suitable for processing for food purposes. The most promising gaseous fuel is biogas. Its receipt is an effective way of utilizing agricultural waste. Biogas is a mixture of the main components: methane (CH_4 – 55–70%), carbon dioxide (CO_2 – 28–43%), as well as in small quantities other gases, for example hydrogen sulfide (H_2S – 1%).

Goals and objectives. The purpose of the work is to obtain biogas from agricultural and food waste. The object of research is potato waste, grape and apple pulp, waste of sugar beet, wheat straw. Subject of research is volume of biogas, methane content in biogas.

Methods. In a flask (1 liter) 0.4 kg of investigated waste was loaded and sealed with a stopper with a tube connecting the container, a water jacket and a gas flask receiver. As a seed material for methane fermentation of waste, biohumus was used. It was mixed with water in a ratio of 1:1. Biohumus contains methanogenic bacteria *Methanococcus, Methanobacteriales* in different ratios. The concentration of dry water-soluble compounds in the sowing material was 4.5%. The flask receiver and the gas meter were filled with water. The receptacle was placed in a laboratory drying cabinet, in which experiments were carried out at a constant temperature of 55 °C. The volume of gas was determined by the volume of the squeezed liquid from the flask-receiver into the gas meter. The separated gas was analyzed for carbon dioxide and oxygen content. For methane fermentation, the pH and temperature parameters, which depend on the process of obtaining biogas, were monitored.

Research results. It is known that in the liquid waste of the food industry methane fermentation occurs easily due to the presence of low molecular weight metabolites – the products of the life of a specific microflora: pure rations of alcohol, wine and beer yeast. These wastes have a low concentration of dry matter. Methanogenic bacteria do not develop in highly concentrated media. Therefore, the acidity of the waste medium (pH = 5–8) and temperature (up to 30–40 °C) allows them to be included in the methane fermentation cycle without additional costs. These wastes have a low concentration of dry matter. The results of the research showed that from 100 g of waste the following volume of biogas can be obtained: from the waste of grapes – 0.042 m^3, waste of apples – 0.033 m^3, sugar maize pulp – 0.023 m^3, potato waste – 0.031 m^3, straw – 0.034 m^3. The chromatographic analysis showed that the content of methane was 53–56% on average.

Conclusions. On the basis of the obtained results it was established that all investigated waste is a promising raw material for biogas production. Recommendations for production are developed. Upscaling from the lab experiments, it is possible to get from 1 t in the industry: of waste of grapes – 420 m^3 of biogas, waste of apples – 330 m^3, of wheat straw – 340 m^3, of waste of sugar beet – 230 m^3, of waste of potatoes – 310 m^3 of biogas. The results of experiments demonstrate the effectiveness of the anaerobic method of biotransformation of the agro-industrial complex waste, which provides high rates of destruction of organic substances, the output of biogas with high methane content and the stability of the course of anaerobic reactions. The use of the proposed technology allows solving environmental problems of utilization of vegetable wastes and obtaining alternative sources of energy. The use of biogas-technologies allows solving the following tasks: energy (energy from the use of fuel biogas), environmental (disinfection of waste, utilization of greenhouse biogas), agrochemical (obtaining high-quality fertilizers), economic (profit from sales fertilizers, reduction of pollution charges environment).

Key words: Biogas, Grape and Apple Pulp, Wheat Straw, Potato and Sugar Beet Wastes