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Influence of Phenolic Compounds on the Process of Anaerobic Digesestion from Basket Willow *(Salix Viminalis).*

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Extended Abstract

The depletion of sources of energy resources and growing awareness of the risks associated with the impact of conventional energy on climate change are prompting the international community to seek alternative solutions. Renewable energy sources (RES), such as solar, wind, hydropower, biomass and biogas, offer hope for a more sustainable and environmentally friendly energy model. The countries of the European Union, are facing the challenges of meeting climate goals and the urgent need for an energy transition. A transition to more sustainable energy sources is needed, and in this context biogas is becoming an increasingly important part of the energy mix. Biogas is seen as a key component of the green energy transition. In the context of the search for alternative biomass sources for biogas production, lignocellulosic biomass (wood, straw, energy crop stalks, etc.) appears as a promising candidate. Its use in the biogas production process comes with technological challenges. Due to the difficulty in decomposing this type of biomass. Fortunately, advances in biogas technology, such as new methods of pre-treatment, enzymatic hydrolysis or mixed fermentation, are opening the door to the efficient use of lignocellulosic biomass for biogas production. During the production of biogas from biomass, the methane fermentation process can be inhibited by various substances yes inhibitors, which negatively affect the work of microorganisms responsible for methane production .

The study aimed to determine the effect of phenolic compounds on the production of biogas from *Salix viminalis*, which are produced during thermal treatment. Thermal hydrolysis was carried out in the company's proprietary HL-P Reactor. The unit consists of two separate zones: high pressure and low pressure. This unique design combines two plant substrate preconditioning technologies to achieve highly efficient and effective biomass thermohydrolysis. As part of the study, the amount of phenolic compounds produced during microwave treatment was compared and the efficiency of anaerobic digestion was analysed depending on these compounds. Anaerobic digestion was carried out on samples after thermohydrolysis lasting 0 min, 5 min, 15 min and 25 min.

Testing of the substrate's susceptibility to anaerobic decomposition under mesophilic methane fermentation conditions was carried out using the AMPTS II Bioprocess Control Automatic Methane Generation Potential Tester. The system consisted of three subunits. The main component was bioreactors placed in a water bath that allowed the system to maintain a constant 36°C temperature. The quality of the biogas produced was analysed using a 7890A GC gas chromatograph with a TCD detector. In each of the conducted variants of the experiment, the reaction chambers were inoculated with anaerobic sludge from an agricultural biogas plant. An initial load of 5.0 kg/m^3 of organic compounds was applied.

The highest methane production efficiency was obtained at 25 min pretreatment – 265,01 [Nml/g], the highest concentration of phenolic compounds 200,13 [mg/l] was observed then. The results obtained suggest that the increase in the production of phenolic compounds did not inhibit methane fermentation, nor did it affect the efficiency of anaerobic digestion.

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