

<https://doi.org/10.7250/CONNECT.2023.061>

BIOBUTANOL PRODUCTION FROM AGRO-INDUSTRIAL BY-PRODUCTS USING ABE FERMENTATION: ANALYSIS OF FEEDSTOCK EFFECT ON BIOBUTANOL YIELD AND TITER

Kriss SPALVINS^{1*}, Zane KUSNERE², Svetlana RAITA³, Indra BERZINA⁴

¹⁻⁴ Institute of Energy Systems and Environment, Riga Technical University, Āzenes iela 12/1, Riga, LV-1048, Latvia

* **Corresponding author.** E-mail address: kriss.spalvins@rtu.lv

Abstract – This study examined a range of agro-industrial by-products that could be used as potential carbon and nitrogen sources for ABE fermentation. In general, the study examined more than a dozen different by-products from dairy, biodiesel, sugar, agriculture, beverage, food, etc. production industries. The by-products were tested to determine which of them would result in higher biobutanol yield and concentration in the fermentation medium. All by-products were used in the cultivation of three bacteria of the genus *Clostridium* to observe differences also between the strains' ability to utilize the respective substrates. The test results demonstrated that the most suitable by-products for ABE fermentation, which served as carbon sources, are biodiesel and sugar production by-products and hydrolysates of agricultural residues. These by-products are available in large quantities. The tests show that they serve as a good energy source for the production of butanol fuel. By-products of dairy processing and specific beverage production residues (yeast residues) showed the best results as the most suitable nitrogen sources; however, these by-products are either limited in availability at scale or their transportation is uncompetitive due to the high water content. This study shows that ABE fermentation can be provided with a range of different agroindustrial by-products. The wider use of these by-products in the future can reduce the negative impact on the environment, reduce the production costs of ABE fermentation products and allow obtaining an efficient biofuel – biobutanol, which can compete with bioethanol and biodiesel.

Keywords – *Acetone-Butanol-Ethanol (ABE) fermentation; agricultural by-products; bioprocess optimization; butanol; feedstock; industrial by-products*