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Killer yeast inhibit hydrogen-yielding acidogenic step of anaerobic digestion of bio-waste, intermediate products and by-products of the sugar industry

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For the purpose of innovative technologies based on microbial processes, it is desirable to build modern biogas plants where the hydrogen- (hydrolysis and acidogenesis) and methane-yielding (acetogenesis and methanogenesis) stages of anaerobic digestion are separated to respectively favor the production of hydrogen and methane under controlled conditions. Hydrogen-yielding fermentation is considered to be one of the most attractive alternative biological methods of hydrogen production. Effective biomethane production from non-gaseous fermentation products could make biological production of hydrogen economically attractive. The well-recognized factors inhibiting hydrogen production are: (i) increase in hydrogen partial pressure that inhibits activity of NADH:ferredoxin oxidoreductase (NFOR); (ii) metabolic shift – acid accumulation causing a drop of pH in bioreactors; (iii) hydrogen-consuming microorganisms such as methanogens and acetogens; (iv) substrate competition between microorganisms including replacement of hydrogen fermentation by lactic acid or ethanol fermentation; (v) excretion of bacteriocins by lactic acid bacteria inhibiting growth of other bacteria. We have developed and described a laboratory-scale two-stage anaerobic digestion system that produces hydrogen (in stage 1) and methane (in stage 2) from sucrose-rich by-products, intermediate and waste products of the sugar beet refining industry as the primary energy substrate under mesophilic conditions. Here, killer yeasts are reported to be a serious factor inhibiting hydrogen production during acidogenesis whereas it has no influence on methane-yielding steps of anaerobic digestion. Changes in the performance of the hydrogen-producing bioreactors were observed. 11 strains of yeast were isolated from hydrogen-producing bioreactors, identified and their killer-activity against pure bacterial strains and hydrogen-yielding microbial community were studied.

Biography

Anna Detman has graduated from Faculty of Chemistry, Warsaw University of Technology. She is currently a PhD student in Institute of Biochemistry and Biophysics, Polish Academy of Sciences. She has published four papers in reputed journals and one book chapter.

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