Poster 1.1.10

Photobiological hydrogen production from sugar beet molasses

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The main aim of this study was to investigate photobiological hydrogen production from molasses by purple non-sulphur (PNS) bacteria. The hydrogen production capacities of four different PNS bacteria; *Rhodobacter capsulatus* (DSM 1710), *Rhodobacter capsulatus* YO3 (Hup-), *Rhodopseudomonas palustris* (DSM 127) and *Rhodobacter sphaeroides* O.U.001 (DSM 5864)) and their co-cultures were tested on defined media and molasses, containing 5–10 mM sucrose concentrations. The batch experiments were performed in 50 and 150 ml photobioreactors maintained at $30 \pm 2\,^{\circ}$C in an incubator. Continuous illumination of 135 W/m^2 was provided on the surface of the photobioreactors. Acetate was produced as the main by-product of the sucrose photofermentation. Maximum hydrogen productivities of 0.78 mmol/lc.h and 0.55 mmol/lc.h were obtained by *R. palustris* (DSM 127) on the defined media and molasses, respectively. Also, maximum hydrogen productivity of 1.0 mmol/lc.h was attained by 1:1 ratio co-culture of *R. sphaeroides* O.U.001 (DSM 5864) and *R. palustris* (DSM 127). The co-cultivation of *Rhodopseudomonas palustris* (DSM 127) and *R. sphaeroides* O.U.001 was more suitable for hydrogen production from molasses comparing with single cell cultures.

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Poster 1.1.11

Bioethanol production from low cost agro-industrial waste products

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In recent years, the rapid increase in environmental problems, greenhouse gas emissions, fuel prices and the unlimited consumption of limited fossil fuel stocks made people search for some alternative energy sources. Bioethanol is one of the most popular alternative source with its many beneficial features. Besides, bioethanol which will be obtained from low cost raw materials will be more attractive. Bioethanol produced from lignocellulosic biomass sources, such as agricultural residues, offers unique environmental and economic benefits. Considering the sugar amount, fruit pomaces which are the waste of fruit juice industry, are very convenient and cheap raw materials for production of bioethanol. 15–20% of a fruit is pomace, this high amount appears as waste in fruit industry every year in the world. With this project, bioethanol which was obtained from apple pomaces via fermentation, could be renewable alternative for fossil fuel and provide a viable solution to multiple environmental problems simultaneously creating sink for waste utilization. Therefore in order to convert the sugar found in fruit pomace to a fermentable form, diluted acid hydrolysis was applied. Furthermore, two fungi (Trichoderma, Aspergillus), which have capability of producing bioethanol from both pentoses and hexoses, coming from hydrolysis of pomace, and the natural ethanologenic yeast (*Saccharomyces cerevisiae*), were added to the fermention media at specific time points. Overall, the goal of this study was to investigate the effects of co-culturing on bioethanol production, to create a low cost alternative solution to bioethanol production and to reduce the accumulation of agro-industrial waste products.

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Poster 1.1.12

Evaluation of Sporotrichum thermophile cellulolytic system for an efficient hydrolysis of cellulose

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Lignocellulosic biomass has been identified as a promising renewable resource for the production of high-added value chemicals, such as biofuels. In order to utilize biomass as a raw material, an efficient enzyme system that will convert cellulose to soluble sugars must be developed. The filamentous fungus Sporotrichum thermophile is a highly proficient decomposer of cellulose, with a specific growth rate on insoluble cellulose similar to its specific growth rate on glucose and is a promising candidate, as it possesses a very efficient cellulolytic enzyme system that is capable of converting cellulose at elevated temperatures. The thermostable enzymes would enable to decrease the costs of the hydrolysis step and allow more flexible process configurations.

Aim of this work, is the optimization of the production of cellulolytic enzymes by S. thermophile concerning both carbon and nitrogen sources. Among the different carbon and nitrogen sources, spent grain and ammonium sulfate were selected and the combined effect of different concentrations of them was investigated. Then the crude multienzyme extract was evaluated with regard to an efficient saccharification of cellulose. Several factors concerning the obtained hydrolysis yield and reaction rate were investigated. Optimal conditions were determined to be 65°C and pH 5.5. Thermal stability of the enzymes at elevated temperatures was also determined. Finally, hydrolysis of untreated cellulose for 24 h at different temperatures was performed, in order to investigate the combined effect of both temperature and thermal stability on cellulose conversion. At 60°C, the conversion of cellulose reached 35% after 24 h of incubation.

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