Influence of cultivation conditions on the physico-mechanical and chemical properties of bacterial cellulose gel-film

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Bacterial cellulose (BC) is a polymer of glucose with two qualities: the finest porosity and mechanical strength. The optimization of producer’s cultivation conditions will allow to obtain a cheap, eco-friendly material with various physical-mechanical (Ph/M) and chemical properties by recycling the waste from industrial manufacturing.

The BC gel-film (BCGF) was obtained by culturing Gluconacetobacter Sucrofermentans in the medium with distillery stillage (DS) and raw beet (RB). Control samples of (BCGF) were received in a standard Hestrin medium (HS). The resulting samples of (BCGF) were measured in terms of thickness, density, and tested for the strength and stretch in accordance with ASTM. The degree of crystallinity (DC) of a (BCGF) was determined by the method of X-ray diffraction. The composition of the medium greatly affects not only the release of (BC), but also the (DC) and (Ph/M) properties of (BCGF). The output of BC and the thickness of the films with (DS) was more than with (HS) and with (RB). (DC) and the strength of (BCGF). The output of BC and the thickness of the films with (DS) was higher than in other medium.

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Decolorization of Bemacid azo-dyes by
Aspergillus niger

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Aspergillus niger van Tieghem, strain ATCC 6275, was screened for its ability to decolorize three industrial Bemacid azo-dyes (Rot, Gelb, Blau). The fungal cultivation was performed in selective medium, containing 200 mg/L of azo-dyes, run in 5 batches at 3, 6, 9, 12 and 15 days of incubation at 28 °C in static conditions. The strain was initially adapted to dye presence in culture media by successive passages on solid nutritive media containing 50 mg/L dye concentration. Spectrophotometric dosage of post-incubation showed dye reduction rates between 78.30% and 99.26%. pH analysis for each batch recorded values drops of 2.51 for B.R. (control 7.53), 2.53 for B.G. (control 7.65) and 1.68 for B.B. (control 8.01), indicating a possible enzymatic activity. Thin Layer Chromatography analyses indicated a higher purity of B.R. dye, compared to the other 2 dyes, which have secondary synthesis products, leading to higher degradation rates for B.R. dye (95.40% average reduction) compared to B.G. (87.7% average reduction) and B.B. (90.76% average reduction). The results highlight the ability of Aspergillus niger to decolorize and degrade synthetic dye effluents into colorless basic constituents, most likely due to biosorption/bioadsorption of dye by the fungal biomass rather than enzymatic degradation. This work was financed by Operational Program Human Resources Development 2007–2013, project no. POSDRU/159/1.5/S/132765.

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Hydrogenotrophic activity under increased H2/CO2 pressure: Effect on methane production and microbial community

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H2 and CO2 are main compounds of synthesis gas. Efficient conversion of syngas to biomethane is a straightforward strategy to integrate the energy value of syngas into existing natural gas grid infrastructures. In this study, the effect of initial H2/CO2 (80/20, v/v) pressure on methane production rate and microbial community diversity was assessed in a hyperbaric bioreactor inoculated with anaerobic granular sludge.

Several batch experiments were performed to distinguish between the effect of initial total gas pressure and H2/CO2 partial pressure: (1) varying initial gas pressure (from 1 to 6 bar) with 100% H2/CO2 mixture; (2) constant initial gas pressure (5 bar), with increasing H2/CO2 partial pressure (from 1 to 5 bar); (3) varying initial gas pressure (from 2 to 5 bar) with constant H2/CO2 partial pressure (2 bar). In (2) and (3), N2 was used for ensuring the necessary overpressure. Microbial community changes in the system were monitored by 16S rRNA-based techniques (PCR-DGGE).

The raise of H2/CO2 initial pressure (100% H2/CO2) from 1 to 5 bar led to an improvement in methane rate production from 0.035 ± 0.014 mmol h−1 to 0.072 ± 0.019 mmol h−1. Similar methane production rates were observed in reactors operated at the same H2/CO2 partial pressures, even when varying the total initial gas pressure. Hydrogen partial pressure was shown to determine the structure of bacterial communities and diversity decreased with increasing H2/CO2 partial pressure. No significant changes were observed for the archaeal communities.

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In vitro antimicrobial activity of a mix of plants extract against Phytophthora infestans

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Phytophthora infestans is the causative agent of tomato late blight and represents a serious challenge of plant protection management in organic agriculture. The aim of this work was the in vitro study of antimicrobial activity of an extract prepared by percolation in ethanol from a mix of plants, as follows Artemisia absinthium,