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Chlorella sorokiniana biomass. In this study, we obtained data of *Nostoc* productivity under Mar del Plata city environmental conditions in autumn in 5-l air bubbled photobiorreactors that further support the previous productivity model and found conditions of phosphorous deficiency for optimizing the carbohydrate to protein ratio of the biomass for a biorefinery. Both cyanobacterial and microalga carbohydrates could be hydrolyzed into soluble sugars in diluted acid (0.3 % H_2SO_4) at 100 °C for 1h with efficiencies higher than 85 %. These conditions are mild in comparison with those normally used for saccharification of lignocelulosic biomass for second generation bioethanol, supporting the convenience of using cyanobacteria/microalgae biomass as a suitable alternative. We further used saccharified cyanobacterial biomass as a feedstock to produce bioethanol by fermentation with the Baker's yeast *Saccharomyces cerevisiae*. We observed that yeasts fermented the syrup into ethanol at 11 % of the theoretical maximum conversion in the absence of yeast growth, while control experiments with hydrolyzed dextrose reached 28 % of the theoretical maximum at 20 h. Current work in our laboratory is focused towards improving, at a laboratory scale, the most critical steps of a conceptual bioprocess for the biorefinery of cyanobacteria/microalgae/yeast biomass for the co-production of biodiesel, bioethanol and protein to be used as biofuel and feed, respectively.

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SYNERGISTIC EFFECT OF XYLANASES PRODUCED IN CO-CULTURE OF *Bacillus* sp. AR03 AND *Paenibacillus* sp. AR247

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In nature, the plant biomass is degraded by a process that requires the cooperative action of multiple microorganisms capable of producing a variety of enzymes to attack the complex structure of lignocelluloses. This work assessed the production and the enzymatic activity over the main hemicellulolytic fraction of plant biomass, xylan, in monoculture and co-culture systems of bacteria isolated from regional niches associated with sugar cane bagasse. The enzyme activity was estimated by measuring reducing sugars released using the dinitrosalicylic acid method. All cultivation assays were performed at 200 rpm and 30 °C in a diluted peptone broth supplemented with 1% CMC (w/v). The viability and the growth of both isolates were estimated by the number of colony forming units, fact that was possible since both isolates exhibited different colony morphology. The specific xylanolytic activity of the co-culture of *Bacillus* sp. AR03 and *Paenibacillus* sp. AR247 was of 7.03 ± 0.46 IU/mg and 8.36 ± 0.49 IU/mg at 48 h and 96 h of cultivation, respectively. In contrast, each isolate assayed simultaneously under identical conditions, produced significantly lower xylanase activities, even when both isolates grew similarly in both, individual and co-cultures, reaching approximately 10^{11} CFU/ml in all cases. These values were of 4.18 ± 0.24 IU/mg and 4.55 ± 0.29 IU/mg of xylanolytic activity at 48 h and 96 h, respectively, for *Bacillus* sp. AR03, while *Paenibacillus* sp. AR247 reached values of 0.59 ± 0.09 IU/mg and 0.40 ± 0.03 IU/mg at the same periods of cultivation. When mixtures (1:1) of the cell-free supernatant of individual cultures were assayed, it was observed that the enzymatic activity reached a maximum of 4.16 ± 0.39 IU/mg after 48 h of cultivation. This value was close to that obtained by the sum of the enzymatic activity of individual cultures, which was 4.77 IU/mg, for the same cultivation time. The obtained results were consistent with the observation of a synergistic effect on the degradation of xylan in the co-culture evaluated, with an estimated degree of synergism of 1.69 at 96 h. This synergy, which has been described for enzyme mixtures on industrial substrates, was observed here during the co-cultivation of *Bacillus* sp. AR03 and *Paenibacillus* sp. AR247. This system displayed a higher xylanolytic activity with respect to the individual cultivation of each isolate and a different zymographic pattern along the cultivation period. The obtained results of the xylanolytic activity for individual strains and the co-culture might indicate that the observed effect could not depend on an only addition of enzyme activities so that we may suggest the existence of a synergistic cooperation during the growth in the co-cultivation of the microorganism evaluated.

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Sección: Biotecnología y Fermentaciones

Modalidad: Poster

BIOACCUMULATION OF LITHIUM BY *Bacillus pumilus* ISOLATED FROM HIGH ALTITUDE ANDEAN LAKES

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