TITLE: CHARACTERIZATION OF KINETICS AND HYDROGEN-PRODUCING ACTIVITY OF ENTEROCOCCUS SP. ISOLATED FROM CITRUS PEEL WASTE

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ABSTRACT:

This study aimed at evaluating the kinetics of Enterococcus casseliflavus isolated from Citrus Peel Waste (CPW) and its application on biodigestion of lignocellulosic biomass, with concomitant production of H$_2$ and organic acids. The strain was isolated from an anaerobic consortium obtained through self-fermentation of in natura CPW by serial dilution (10$^{-1}$ to 10$^{-30}$) in PCS medium (peptone 5 g.L$^{-1}$, yeast extract 1 g.L$^{-1}$, CaCO$_3$ 5 g.L$^{-1}$, NaCl 5 g.L$^{-1}$; pH 7.0) for 48 hours under static and mesophilic conditions (37°C). The flask with the higher dilution in which H$_2$ was still being produced was plated (PCS medium plus 1.5% agar) and incubated in an anaerobe Gas-Pack Jar at the same conditions. The hydrogen-producing strains were identified through 16S rRNA gene sequencing by Sanger method. The sequence obtained was similar to E. casseliflavus (99% similarity). The kinetics parameters estimated after the isolation step (glucose 3 g.L$^{-1}$) were specific growth rate (μ 0.35 h), generation time (Tg= 1.98 h$^{-1}$), production (P= 9.1 mmol H$_2$.L$^{-1}$), yield (Rm= 1.99 mmol.h$^{-1}$), and fermentation starting period (λ= 4.08 h), as well as 61.34% cellulose (filter paper) degradation rate. It was possible to observe assimilation and production of hydrogen from various carbon sources (3 g.L$^{-1}$) evaluated (glucose, fructose, sucrose, xylose, starch, glycerol, cellobiose, cellulose and lactose), especially from xylose, with P= 10.3 mmol H$_2$.L$^{-1}$. The main metabolite was acetic acid (365 mg.L$^{-1}$), which indicates prevalence of the acetogenic metabolic pathway. The use of CPW (15 g.L$^{-1}$) as substrate, with addition of the isolated strain, resulted in higher hydrogen production (P= 13.9 mmol H$_2$.L$^{-1}$; Rm= 1.09 mmol.h$^{-1}$ and λ= 2.12 h), making it possible to infer that the application of E. casseliflavus has great potential in biodigestion of complex substrates to obtain products of biotechnological interest.

Keywords: lignocellulosic biomass, autochthonous consortia, kinetic parameters, agro-industrial waste, nutritional evaluation

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