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BIOHYDROGEN PRODUCTION IMPROVED WITH SUCCINATE SUPPLEMENTATION USING *Rhodopseudomonas palustris* AND MIXED CULTURES OF NON-SULFUR PURPLE BACTERIA

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Abstract

Hydrogen is one of the answers to face up energy crisis and environmental pollution. Thus, the innovation of technologies leading to safe, sustainable, economically feasible H_2 production is in urgent demand. Mixed cultures are more suitable for hydrogen production instead of those pure strains that need specific conditions or pretreat the influent in order to maintain product. The objective of this study was to evaluate the effects of carbon source type of culture (mixed, GBAER1, and pure strain *Rhodopseudomonas paliustris*) on heterotrophic bio hydrogen production.

The experimental design was a factorial 2^2, *i.e.*, type of substrate, succinate and acetate, and type of culture, mixed and pure strain (*R. palustris*). The mixed culture GBAER1 was obtained from Winogradsky columns as reported by Acevedo-Benitez (2009) and *R. palustris* from CINVESTAV Microbial Collection. Biogas composition ($\%H_2$) was measured in GC-TCD. Biohydrogen production tests were carried out as described in literature.

Hydrogen production and yield were increased 4 fold when succinate was used versus acetate, although there were longer lags phases with succinate. In general *R. palustris* showed higher H_2 production and yield than GBAER1, this difference was more noticeably with acetate as substrate (30% increase) than with succinate (0 to 12% increase). Correspondingly, the H_2 content in biogas was also higher in *R. palustris* minireactors than GBAER1 units.

Several works have described performance of various PNSB mixed cultures or pure strains with a variety of substrates such as malic, acetic, lactic, butyric or succinic acid. The role played by succinate in increasing hydrogenogenic photofermentation performance in our work is in agreement with former reports. On the other hand, our mixed culture GBAER1 displayed a performance close to that of the pure strain *R. palustris*. Some researchers observed that photoheterotrophic mixed cultures could even achieve higher H_2 production than pure *R. palustris*. Finally this study has shown that a proper enrichment could select for a mixed culture that produce amounts of bioH_2 close to those of NSPB pure strains, under similar process conditions.