Vegetable fermentation products as substrate for hydrogen production by *Rhodopseudomonas palustris* 42OL.

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ABSTRACT

Photofermentation by purple non-sulfur bacteria (PNSB) is a promising technology for hydrogen production that has some advantages over traditional processes based on the use of fossil hydrocarbons, like steam reforming of natural gas; since it is a biological process that uses organic acids and light as sources of energy for hydrogen production. Considering that nowadays this technology is not ready to compete at a large scale, there is a need to develop new processes to reduce costs and increase hydrogen production rates in order to make this process economically viable. The use of organic wastes as substrate is a way to reduce the costs of synthetic media with the simultaneous advantage of treating the waste. Among the most important issues in using waste substrates, we have: a) high ammonium levels that inhibit nitrogenase activity and reduce hydrogen production; b) the dark color of waste-derived substrates which reduces light intensity for photofermentation. In order to explore the use of low cost substrates, we studied the effect of light intensity and dilution of a substrate derived from vegetable waste fermentation for hydrogen production with *Rhodopseudomonas palustris* 42OL. Two light intensities were tested (172-200 W/m^2 and 44-60 W/m^2) using as substrate a vegetable waste-derived fermentation product, under two different conditions, undiluted and two fold diluted with distilled water. After the first 100 hours (without stirring conditions), the hydrogen production showed clear differences among the conditions tested, being the diluted cultures those that showed the highest production: 1,350.7 and 599.76 ml H_2/ L culture at a light intensity of 172-200 W/m^2 and 44-60 W/m^2, respectively. In the undiluted cultures, H_2 production was only observed at the highest light intensity: 160.5 ml H_2 /L culture. These results showed the importance of light intensity in vegetable derived fermentation substrate in hydrogen production by PNSB.