Abstract

Impact of Cultural Conditions on Photoproduction of Hydrogen by *Rhodobacter* sp. GSKRLMBKU-03 Isolated from Pond Water

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Hydrogen proved to be good alternative energy source in view of its highest gravimetric energy of any known fuel, compatible with electrochemical and combustion processes for energy conversion without carbon based emissions. Biological process involving microorganisms offers the potential production of usable hydrogen from variety of renewable resources. The photobiological production of hydrogen is considered as a promising process and offers tremendous potential as a clean renewable energy currency. Among different microorganism, anoxygenic phototrophic bacteria (APB) are most promising for biological hydrogen production which is being investigated all over the world as a potential source of renewable and pollution free energy with less capital inputs and simple facilities and feasible for large scale generation.

In the present study, the photoproduction of hydrogen by *Rhodobacter* sp. strain GSKRLMBKU-03 isolated from pond water, near Thadoba forest region, Chandrapoor district, Maharashtra, India was measured under different cultural conditions. Temperature, pH and salinity of the sample were 30 °C, 0.1% (W/V). Hydrogen production was measured by using a Gas chromatography using argon gas as a carrier. Among different carbon, nitrogen sources and metals used, glucose induced maximum hydrogen (4.95 ± 0.20 mL) production by immobilized cells, while free cells recorded 3.25 ± 0.25 mL of hydrogen under anaerobic light conditions. Immobilization of cells resulted in increased production of hydrogen. Tyrosine promoted more amounts of hydrogen production by free cells (2.45 ± 0.25 mL), whereas glycine enhanced the hydrogen production upto 4.38 ± 0.28 mL in immobilized cells. Among different metals used, Fe^{+3} (3.89 ± 0.20 mL) and Mn^{+2} (3.80 ± 0.22 mL) supported max hydrogen production by both free and immobilized cells. Thiourea and lactate were responsible for less hydrogen production in both free and immobilized cells compared to other carbon and nitrogen sources. Cumulative hydrogen production by the bacterium was recorded with the progress in incubation period. Incubation period of 192 h,

pH of 7.0 and temperature at 30 °C were found to be optimum for the maximum hydrogen production. Significance of the above results was discussed in light of existing literature.