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Efficient hydrogen production by novel microbial consortia (co-culture of Rhodobacter sphaeroides NMBL-02 and Bacillus firmus NMBL-03) from cane molasses

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Hydrogen is a clean and an efficient carrier of fuel. It is widely being accepted as a potential substitute for fossil fuels. Therefore, if hydrogen is to replace fossil fuels in the future, it has to be produced renewably and in large scale, through environmentally benign process. Rhodobacter sphaeroides NMBL-02, photosynthetic purple non sulfur (PNS) bacteria and Bacillus firmus NMBL-03 were isolated from water sample collected from 15-20 inches beneath the surface of ponds from Northern region of India. The PNS and heterotrophic bacteria associated with the culture was purified by clonal selection method and characterized by 16S rDNA sequencing The PNS isolate was identified as Rhodobacter sphaeroides NMBL-02 (ID: 1467407, Accession BANKIT: JN256030) and associated heterotroph as Bacillus firmus NMBL-03 (Gene Bank Accession no.: JN 256029).

The effect of initial medium pH on optimization of hydrogen production was investigated in temperature controlled CSTR (constant stirred tank reactor) using cane molasses as carbon source. The effect of initial medium pH on optimization of hydrogen production was investigated in batch process. The maximum hydrogen potential and hydrogen production rate was 3310 ± 55 ml/l and 18.50 ml/$l_{culture}$ h respectively using glutamate (1.7 mM) as nitrogen source at initial medium pH 5.0 using 1L batch reactor under optimized trace metal concentration using light intensity of 4.5 kLux at 38 ± 2°C. This co-culture has the ability to produce significant amount of hydrogen in pH range of 5.0 to 10.0 with 80% to 35% COD conversion.

Keywords: Hydrogen production, COD, Rhodobacter sphaeroides NMBL-01, Bacillus firmus NMBL-03.

Biography

Anjana Pandey had received PhD degree at the age of 26 years from Banaras Hindu University, India in the area of Biochemistry. She has published more than 35 papers in refereed journals. She is working in the area of Biological hydrogen production, plant biotechnology and Nanobiotechnology.

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Functional analysis of latex specific promoters (hevein) for the production of recombinants in transgenic Hevea brasiliensis

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Any protein, either naturally occurring or designed synthetically, could be produced safely, inexpensively and in large quantities by harnessing the laticiferous system of Heveabrasiliensis (Rubber tree) for the production of recombinant proteins on a plantation scale. Using the constitutive 35S CaMV promoter, recombinant Human Serum Albumin, ScFV antibody and β-glucuronidase have been successfully synthesised in the latex of transgenic Hevea plants. For the functional analysis of a latex-specific promoter, transgenic Heveawith hevein promoter fragments (0.2 kb designated as P1; 0.4 kb designated as P2; 0.7 kb designated as P3 and 0.9 kb designated as P4) fused to uidAc DNA gave signals for single and multiple copies for uidAgene and this was similarly reflected in the positive controls, using the constitutive 35SCaMV promoter (B6 plants) by Southern analysis. The expression of β-glucuronidase(GUS) in latex of transformants was identified qualitatively by the blue coloration of the latex using x-gluc (5-Bromo-4-chloro-3-indoyl-β-D-glucuronic acid) and their level of expression was classified using three categories (strong, moderate and weak) based on the intensity of the blue colour. The profile of the recombinant protein expression in Hevealatex-serum for controls (untransformed - C), negative control (transgenics containing promoterless vector - KAN), positive controls (transgenics containing 35S CaMV promoter - B6) and transformants (containing all four hevein promoter fragments - P1, P2, P3 and P4) is reported. The recombinant protein level for GUS in the latex of Hevea transformants and controls was quantified using ELISA technique. The level of GUS in latex serum from transgenic plants (B6) ranged from 0.079 to 0.063 µg/ml of latex serum. The levels of GUS protein (µg/ml of latex serum) in Hevea transformants P1 ranged from 0.0052 to 1.55; P2 ranged from 0.005 to 0.0012; P3 ranged from 0.0017 to 0.0027 and P4 ranged from 0.0002 to 0.0012. Untransformed and negative controls gave background levels. The highest expressing transgenic plants was derived from B6 using the 35S CaMV promoter for uidA gene (positive control) and P1 containing the smallest fragment of the hevein promoter foruidAgene.

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