NEW SOURCE AND OPTIMIZED CONDITIONS FOR HYDROGEN PRODUCTION
BY RHODOBACTER SPHAEROIDES DURING PHOTO-FERMENTATION

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Photosynthetic bacteria are often presented as perspective organisms for the biohydrogen (H₂) production [1]. Purple non-sulfur bacteria Rhodobacter sphaeroides, isolated from Arzni (sodium-chloride type with pH 6.3–6.6) and Jermuk (sulphate-chloride type with pH 5.9–7.6) mineral springs in Armenian mountains [2], can produce H₂ in various conditions upon illumination. H₂ production by R. sphaeroides during “photo-fermentation” depends on different factors. of carbon (succinate, malate) and nitrogen (various amino acids, yeast extract) sources Yeast extract enhanced ~6 fold H₂ production (compared to glutamate) [3]. Various metal ions such as Fe²⁺, Mo⁶⁺ and Mg²⁺ had stimulating effect on H₂ production and F₀F₁-ATPase activity [4]. Regulations of H₂ production by external reducers and oxidizers and light-dark duration alternations have been also shown [5,6]. To develop biotechnology enhancing H₂ production cheap source and optimized conditions are of significance.

Using ethanol fermentation waste, distillers grains (DG), for H₂ production has the advantages of recycling wastes and protecting environment. H₂ production by pure and co-cultures of photo- (R. sphaeroides) and dark-fermentative (Escherichia coli) bacteria using DG has been investigated. During growth on diluted DG media at pH 7.0 H₂ production by pure and co-cultures was started at 24 h growth, whereas H₂ production by R. sphaeroides cells, grown on Ormerod medium, was detected after 48 h. Moreover, the co-culture has produced significantly more (~2-3-folds) H₂ from 2-5-folds diluted DG during 96 h growth compared with pure culture. This could be related with formation of reductive power and ATP synthesis during photo-fermentation [5,6]. The results obtained indicate that DG can be used as effective and valuable substrate in H₂ production by R. sphaeroides and other bacteria.