



COMPARATIVE STUDY OF THE HYDROGEN PRODUCTION PROPERTIES OF B10 AND IR3 VARIETIES OF THE BACTERIAL STRAIN “*RHODOBACTER CAPSULATUS*”

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Introduction. The fossil fuels dominated the world economy during the last few decades as sources of energy. The global reserves of fossil fuels however are already very limited which makes the search of alternative sources of energy (clean and renewable) of a great importance. Hydrogen being a clean source of energy can be considered as a potential and more sustainable energy substitute of the fossil fuels, but unfortunately no natural hydrogen resources exists and hence efficient end-use technologies must be developed to become the hydrogen important energy carrier [1–3].

The photosynthetic bacterium, *Rhodobacter capsulatus*, is known to produces hydrogen under anaerobic conditions, using various carbon substrates. The employment of food industry wastes as a carbon substrate and sun light as a energy source could results in a very cost effective biotechnology method for hydrogen production. The main problem however is the low rate of the bacterial hydrogen production and its increase can be achieved by the employment of some genetically modified strains.

The modified variety IR3 of the *Rhodobacter capsulatus* strain [4] properties were compared with those of the wild variety B10 of the same strain in respect of the hydrogen production rate and the results are presented in the present work.

Methods. It was measured the volume of the produced hydrogen by the modified variety IR3 and the wild one B10 of the strain *Rhodobacter capsulatus* at same conditions as a function of the time, varying the temperature, the light intensity and substrate composition to find the optimal conditions for maximal average hydrogen production.

Results. The average hydrogen generation rate of the genetically modified variety of 2.27 ml / hr is much higher than the rate obtained with the wild one 1.60 ml / hr. in spite that the maximum production rate of the wild variety B10 (5.79 ml /hr) is much higher than those obtained with the genetically modified variety IR3 (5.40 ml/hr).

The total volume of the produced hydrogen by the genetically modified variety IR3 of the *Rhodobacter capsulatus* strain is 1.39 times higher than that produced by the wild variety B10.

These data are consistent with the total volume generated data showed in Table 1 showing numerically the average and maximum production rate as well as the total volume of the hydrogen and the substrate conversion efficiency at same light intensity (distance between the reactor and the light source).

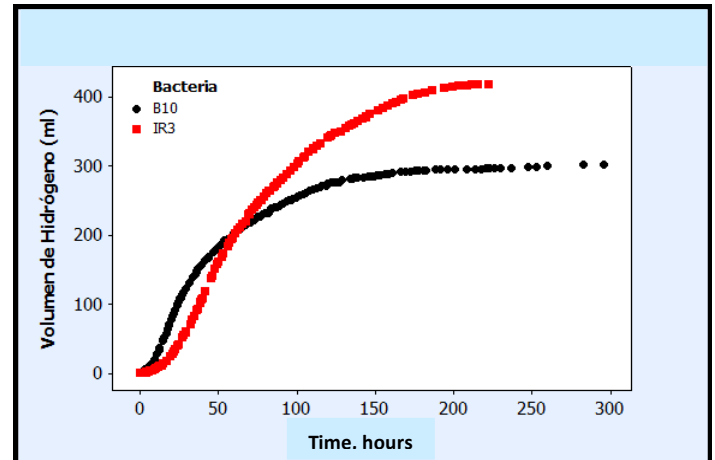


Fig.1 Maximal hydrogen production rate of B10 and IR3 variety of *Rhodobacter capsulatus* at anaerobic conditions. Light source: 75 W tungsten lamp; distance from the bio-reactor 0.5 m

Table 1. Maximal and average production rate as well as the hydrogen volume produced by the varieties B10 and IR3 at 35 °C, 2,500 lux

| Parameters | B10 | IR3 |
|---|------|------|
| Maximal hydrogen production rate, mL/H | 5.79 | 5.40 |
| Average hydrogen production rate, mL/H | 1.60 | 2.27 |
| Total volume of the produced hydrogen, mL | 302 | 419 |
| Efficiency of the substrate conversion, % | 30.1 | 41.7 |

Conclusions. The hydrogen production properties of the modified variety IR3 of the bacterial strain *Rhodobacter capsulatus* and the wild one were compared. IR3 possess much higher average hydrogen generation rate (2.27 ml/hr) than the wild variety B10 (1.60 ml/hr) at the same optimal conditions.

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