



- Title:** Improvement of Biohydrogen Production under Increased the Reactor Size by *C. acetobutylicum* NCIMB 13357
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- Abstract:** Problem statement: One of the main factors influenced the bacterial productivity and total yield of hydrogen is the partial pressure of produced gas. A novel solution to enhance the bacterial productivity was through reduction of gas pressure. Approach: Increasing the reactor size showed to enhance the bacterial production of hydrogen. Results: The technique of increasing reactor size resulted to enhance the hydrogen yield (YP/S) from 269 mL g<sup>-1</sup> glucose utilized to maximum yield of 448 mL g<sup>-1</sup> glucose utilized by using 125 mL and 2 L reactor size respectively. The hydrogen productivity was also enhanced from 71 mL h<sup>-1</sup> to maximum of 91 mL L<sup>-1</sup> h<sup>-1</sup> was obtained by using 125 mL and 1 L reactor size respectively. Biomass concentration was enhanced from 1.03 g L<sup>-1</sup> to maximum of 1.68 g L<sup>-1</sup> by using 125 mL and 2 L reactor size were used respectively, hydrogen yield per biomass (YP/X) of 267 mL g<sup>-1</sup> L<sup>-1</sup>, biomass per substrate utilized (YX/S) of 0.336 and produced hydrogen in gram per gram of glucose utilized (YH<sub>2</sub>/s) of 0.04 when 2 L reactor size was employed. Conclusion: By using bigger reactor size, the effect of gaseous products in fermentation medium was reduced and enhanced both bacterial productivity and biomass concentration.