International Research Journal of Natural and Applied Sciences
ISSN: (2349-4077)
Impact Factor 5.46 Volume 6, Issue 5, May 2019
Website- www.aarf.asia, Email : editor@aarf.asia , editoraarf@gmail.com

Fermentation of Lactic Acid

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Lactic acid fermentation is a biological process by which glucose and other six-carbon sugars (also, disaccharides of six-carbon sugars, e.g. sucrose or lactose) are converted into cellular energy and the metabolite lactate. An optimization parameter (or a decision variable, in the terms of optimization) is a model parameter to be optimized. During the optimization process, the parameter's value is changed in accordance to its type within an interval, specified by lower and upper bounds.

Different nutritional and process parameters influencing lactic acid production by Lactobacillus casei, adsorbed to Poraver beads in a recycle batch reactor system, were studied in an attempt to set up a system having a long operational lifetime and permitting use of high substrate concentrations for maximal conversion to the product. The presence of lactose, even as a minor fraction of the total sugar amount, was necessary for complete utilization by the organism for growth and conversion to lactate. Hydrolysed whey protein constituted a richer source of nitrogen compared to yeast extract. Addition of lactate to the medium at the start of the process resulted in severe inhibition compared with the normal process. For a homofermentative process, pH 6.0 was found to be optimal. The overall productivity of the recycle system was higher under all conditions studied in comparison with the batch process using free cells. Enhancement in productivity in the recycle batch reactor was also accompanied by an increase in density of suspended cells. However, the contribution of the suspended cells to the overall reactor productivity was not noticeable. The bead size of the matrix was found to be important for operational stability of the reactor.

The optimization of parameters for studies on current approaches for Pankaj production of lactic acid is virtually as important to the success of an industrial fermentation as is the selection of an organism to carry out the fermentation. Temperature, pH and incubation period have all played significant role in altering the expression of secondary pathways. While exploring mechanisms for increasing product through media manipulation, an unmistakable correlation between specific environmental conditions or stresses and the production of compounds is becoming increasingly apparent. Medium supplies nutrients for growth, energy, building of cell substances and synthesis of fermentation products.

A poor selection of medium components can effect cellular growth and little if any yield of fermentation products.1-8 The optimization of parameters like concentration of selected raw material, hydrogen ion concentration, temperature and incubation period of the fermentation medium can partially or fully influence the types and ratios of products from among those for which a microorganism has biosynthetic capability9-12. Thus, optimization of parameters for studies on current approaches for production of lactic acid is very critical. All organisms require source of energy for their metabolism. Some organisms can use reduced inorganic compounds as electron donors while other organisms use organic compounds as electron donor .

From this brief excursion into the nutritional requirement of bacteria, it is apparent that to grow bacteria successfully the laboratory worker must provide the proper and appropriate kind of medium and also an appropriate set of physical condition such as temperature, incubation period, and pH etc. Thus, by understanding the various physico-chemical parameters controlling enzyme catalysed activities of different microbes, specially lactic acid bacteria Lactobacillus acidophilus NCIM - 1195 , the biological activity may be increased, decreased, or destroyed partially or completely. Among the significant physico-chemical parameters for studies on current approaches for production of lactic acid are the selection of substrate raw material and its percent dilution concentration, H+ ion concentration Pankaj (pH) of the medium, temperature and incubation period. Indeed, enzymes are very sensitive to elevated temperatures. Because of the protein nature of an enzyme thermal denaturation of the enzyme protein with increasing temperatures will decrease the effective concentration of an enzyme and consequently decrease the reaction rate. Thus, on increasing the temperature enzyme activity gradually increases, but at certain stages temperature inactivates the rate of reaction and finally enzyme is denatured (at high

temperature inactivates the rate of reaction and finally enzyme is denatured (at high temperature) as it is proteinaceous in nature.

Thermal stability in the target enzyme may be an useful attributed during production of enzyme itself as heat may be used to destroy contaminant enzyme activity. In addition to pH and temperature, the stability of enzyme is also increased by many factors such as: (a) high concentration of respective enzymes. (b) presence of their substrate and or product. (c) presence of ions. (d) reduced amount of water content in reaction mixture. The substance acted upon by an enzyme is called substrate. Enzyme molecules are exceedingly efficient in accelerating the transformation of substrate (substance acted on by enzyme) to end products. A single enzyme molecule can effect the change of as may as 10,000 to 1 million molecules of substrate per minute. This ability, together with the fact that the enzyme is not consumed or altered in the reaction, reveals why every small quantities of enzyme are sufficient for cellular processes.

Enzymes are biological catalysts. Kinetic analysis is one of the most broadly used tools for characterizing enzymetic reactions. Enzymes are specific in nature and are vulnerable to various environmental factors. Their activity may be significantly diminished or destroyed by variety of physical or chemical conditions but great differences exist among enzymes in this respect. Some may become inactivated by very minor alteration in the environment.

REFERENCES :

1. Paul Ratnasamy : National Collection of Industrial Microorganisms (NCIM) "Maintenance of culture" N. C.L. Pune, India. (1997)
2. Davidson, Alan, and Tom Jaine. The Oxford companion to food. Oxford University Press, USA, 2006. 805. Print. Retrieved Aug. 08, 2010, from [1]
3. Williams, Peter W.; Phillips, Glyn O.. Handbook of hydrocolloids. Cambridge: Woodhead. ISBN 1-85573-501-6 (2000)
4. Balfour, Edward. . The cyclopædia of India and of eastern and southern Asia: commercial, industrial and scientific, products of the mineral,vegetable, and animal kingdoms, useful arts and manufactures. B. Quaritch. p. 71. (1885)
5. Inskeep, C.G.; Breitzke, W. C. and Taylor, G.C. : Ind. Eng. Chem. 44, 1955-1958 (1966)
6. Barker, S.B. and Summerson, W, H.: J. Biol. Chem. 138,535-38 (1941)
7. Villano, Z.F. and Langella, G : Biol. Soc. Ital. Biol. Sper. 18, 173-174. (1943)
8. Edwin, Eegriwe. : Z. Anal Chem. 95,322-327 (1933)