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Standardization of process parameters for the maximum production of extracellular lipase by bacteria, isolated from indigenous sources

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Abstract–Lipases (triacylglycerol acylhydrolases, E.C. 3.1.1.3) are hydrolases, which act under aqueous conditions on the carboxyl ester bonds present in triacylglycerols to liberate fatty acids and glycerol. Out Of the different lipase sources, bacterial lipase is of considerable economic importance because of potential industrial applications. Efforts to optimize lipase production have been done in different reports in literature but still this field holds a wide scope of research due to different novel types of lipases which are yet to be found out and utilized scientifically owing to their characterization and optimum production. In the present study,lipase producing bacteria were screened from water samples around industrial areas near Kolkata and partially characterized. They were used to produce lipase by optimizingmedia components and physicochemical parameters. The growthprofile in production mediashowed that lipase was produced followingnon-growth associated pattern with its maximum activity at 37 °C and pH 7. Lipase production was found to be optimum with an unsaturated oil (olive oil, 10 ml/L) as inducing agentas compared to other oils in media. Lipase activity also increased with the addition of non-ionic detergent like Triton-X 100 upto a certain concentration (3 ml/L).The standardized conditions obtained were as follows: Peptone 10 g/L, yeast extract 3 g/L and $MgSO_4$ 0.5 ml/L. The experimental data were validated and 57% increase in lipase production was observedas compared to standard production media described in the literatures.

Key Words:*Lipases, Activity, Production, Media Optimization*.

1. INTRODUCTION

Triacylglycerol lipases (E.C. 3.1.1.3) are hydrolases, which act on the carboxyl ester bonds present in triglycerides under aqueous conditions to liberate fatty acids and glycerol[1]. Lipases have been found in many species of animals, plants, and microorganisms. However, the enzymes from microbial sources are currently receiving more attention [2, 3]. Microorganisms including bacteria, fungi, yeast etc. are considered as preferred sources of extracellular lipases. Due to their bulk production, extracellular bacterial lipases are of considerable commercial importance. Some important lipase-producing bacterial genera include Bacillus, Pseudomonas and Burkholderia [4].

Lipases as a commercial enzyme areused widelyin industry, such as food, detergent, chemical and pharmaceuticals [5, 6, 7]. The availability of lipases with suitable properties are increasing in numbersand new researchare carried out to commercialize biotransformation and synthesis based on lipases [8].

Recently, lipases have beenconsidered as key enzymes for their multidimensional properties, which find usage in a wide range of industrial applications [4]. This is clearly demonstrated by the amount of information reported in the literature ranging from production, purification, and various industrial applications. This however, require greater understanding of the importance of optimization of lipase production both in small scale and large scale.

Bacterial lipases are produced in the production media generally in the presence of lipids [4], stimulated by triglycerides, with the presence of complex nitrogen sources, preferably organic nitrogen sources as peptone and yeast extract [10, 11].In addition to the various chemical constituents of a production medium, physiological parameters such as pH, Temperature and incubation period also play an important role in influencing production by different microorganisms [4]. Furthermore, effects of cations like Ca^{+2} and Mg^{+2} have been reported to enhance the lipase activity for some lipases [3, 12]whereas reports are also available on mild inhibition of activity by calcium ions for some other lipases[13]. The optimization of media components is the primary step towards the maximum production of lipase using different concentration of the substrates used in the production media [14].