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BACTERIAL LIPASE: A REVIEW

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ABSTRACT

Lipase is also a hydrolytic macromolecule that breaks down triglycerides into free fatty acids and alcohol. They need many necessary applications in several industrial. Lipases turn the reaction and additionally the synthesis of esters designed from alcohol and long-chain fatty acids. Lipases square measure accepted as acceptable biocatalysts for many applications in food, detergent, pharmaceutical, cosmetics, animal product and paper industries. The sources like microbes, plant and animal square measure able to manufacture protein. However microbial sources square measure used at industrial level thanks to the simple handling, higher specificity and additionally the flexibility to sustain at extreme conditions. The protein producing organism square measure a lot of optimized biochemically and physiologically to induce higher yield. The technique that square measure used for improvement of protein producing bacteria square measure in the main submerged aging framework and solid-state aging framework. Throughout this review several sources, application and methods of protein production area unit mentioned that facilitate to chop back the higher might worth of macromolecule.

Keywords: Lipase, isolation, characterization, optimization, contamination

INTRODUCTION

There are many enzymes that are used in daily industrial bases. Enzymes are divided into many classes such as decarboxylase, dehydrogenase, hydroase, lyases, isomereses etc. Lipase enzymes belong to the hydrolase class of enzymes belong to the hydrolase class of enzyme. Triglycerides acylhydrolases as it catalyse the hydrolysis of triglycerides to glycerol and free fatty acids olive oil-water interface [1]. It is also used in catalysis of hydrolysis and transesterification of other esters [2].

Lipases are found widely in distributed in plant, animals, and microbes [3]. It has gained much of attention due to its ability to catalyse esterification, transesterification, aminolysis, and acidolysis reaction [4]. Lipase enzyme do not require any cofactor to remain active in presence of organic solvents [5]. With the ease, lipase isolated from microbes, bacteria and fungi are predominant source of lipase enzyme.

The structure of lipases extracted from different microbial sources are not alike, they exhibit high sequence diversity [6]. To the result of which enzymes are unique and specific to the type of bioconversion process the catalyse, finding relevance in a wide array of industrial processes [7]. They are useful in various industries such as food, pharmaceuticals medical, and diagnosis, dairy, fatty acids, leather,

cosmetics, detergent, beverage, and paper industries [8].

Microbes producing lipase can be isolated from almost everywhere in environment, waste water, waste volatile substance [9], palm-oil mill effluent [10], intestine of silkworm [11], and on human skin [12].

Metabolic activities of lipase producing bacteria is largely dependent on the composition of media on which they are being harvested. Optimization of enzyme includes variable at a time which include variation in nutritional factors, physiochemical factors, time, temperature, pH, presence of lipid as inducer, cofactors, inhibitors [13]. The study of this process seeks to evaluate the lipase producing potentials of organisms from two sources determine the optimal conditions for scale-up production, isolate and identify the organism with better lipase producing ability.

Lipases extracted from bacterial cell are glycoprotein but some extracellular lipase [14] is greatly influence by the composition of media of media besides its physiochemical factors such as temperature, pH, and dissolved oxygen, triacylglycerols, fatty acids, hydrolysable esters, tweens, glycerol, and bile salts are used as inducer in media composition.

The uses of lipase has increased since 1980s, since the industrial application has

increased drastically [15]. The lipase enzyme is used as biocatalyst with modification of their properties like specificity, stability, pH and temperature [16].

PROPERTIES OF LIPASE

Lipase is reported to be a monomeric macromolecule that weighs upto 19-60 kDa. The position of the carboxylic acid within the glycerine backbone, chain length of the carboxylic acid, and its degree of unsaturation are unit the factors and also the physical properties of lipases rely on it. The sensual and biological process values of the enzyme is plagued by the these properties of the enzyme. Enzyme catalyze the many reaction like esterification thanks to their activation in organic solvents. Lipases displayed hydrogen ion concentration dependent activities, typically at neutral hydrogen ion concentration 7.0 or up to hydrogen ion concentration 4.0 and 8.0 lipases are unit stable, *Chromobacterium viscosum*, *A. niger* and *Rhizopus sp.*, created extracellular lipases are unit active at acidic hydrogen ion concentration, and *P. nitroaeducens* created alkaline enzyme and active at hydrogen ion concentration 11. Beneath bound condition enzyme has the aptitude to reverse the reaction to esterification and inesterification in absence of water. Ca is that the bivalent atom that's needed for the expression of the enzyme protein. Ions like

Co, Ni²⁺, Hg²⁺, Sn²⁺, Zn²⁺, Mg²⁺, EDTA and SDS inhibits the activity of the enzyme protein. Consistent with the region-specificity lipases divided into 2 teams and unconcealed with acyl group glycerine substrate. While not show of regiospecificity solely fatty acids are unit discharged from all 3 positions of glycerols within the 1st cluster of lipases. These enzymes is also accustomed extract optically pure esters and alcohols thanks to these properties. At tide activity mistreatment the organic media offers an exceptional prospect over variation of the solvent. So, variable the properties of the solvents an enzyme's specificity is also remodelled. Any solvent might utilize a considerable influence on the chemical change properties of a protein thanks to the possession of sappy structures and delicate [17].

CLASSIFICATION OF LIPASES

Lipase are divided in two different groups based on the specificity and sources. This enzyme is found from many sources such as plant, animal, insects, and microorganism [18]. Lipase enzyme are extremely unlike in characters and is present everywhere in plants, animals, and microorganism [19]. Microbial lipase have much importance in industries than those from plants, animals, and insects due to desirable ability and functionality at extreme conditions, stability in organic solvent, chemo-selectivity,

enantio-selectivity and they do not require any co-factor [20, 21].

Lipase is considered as the most recognised biocatalyst in biotechnology field due to its high versatile nature, which allows their applications in different industries like food, detergent, pharmaceutical, leather, textile, cosmetic, bio diesel production and paper industries [22, 23, 24]. Due to its ability to perform a very specific chemical and biological transformation has make them increasingly popular in those industries [25].

RESERVOIRS OF LIPASE

Lipase may be gathered from animals for the foremost half from abdomen tissue of calves or sheep and duct gland tissue of swine's and pigs. Among the drawbacks of utilizing animal lipases enclosed in presence of enzyme for pig duct gland lipases, that brings concerning unpleasant tasting amino acids, distance of lingering creature hormones or contamination unbiased as their inconvenient influences within the getting ready of eater or kosher. Plant lipases are in addition accessible but not victimised economically as a result of the yield and alternative procedures concerned.

Microscopic bacterium, parasites, yeast and *Actinomyces* are perceived as favoured wellsprings of extracellular lipases, encouraging the catalyst healing from the means of life stock. *Candida*, *Mucor*, *Rhizopus*, and *Geotrichum sp.* stand apart because the major monetarily sensible strains.

Microbial lipases that are extracted for industrial use are made by bacterium, fungi and actinomycetes. Enzyme isolated from fungi are thought of to be the most effective amongst alternative. microorganism strains are being improved in enzyme production.

Bacterial enzyme were initial discovered or ascertained in year 1901 in strain of genus *Serratia marescenes* and *Pseudomonas aeruginosa*. Bacterium manufacturing lipases are *Pseudomonas sp.* and *Eubacterium sp.*, *P. aeruginosa*, *Pseudomonas fluorescenes*, *Eubacterium pumilus*, *B. thermcatenulants*, *B. subtilis*, *B. licheniforms*, *B. coagulans*, *B. cereus*, and *B. halodurans*. Alternative genera like *Acinetobacter*, *Staphylococci*, *Eubacterium*, *Burkholderia*, *S. marescens*, *Achromobacter*, *Arthrobacter*, *Alcaligenes*, and *Chromo bacterium* too are studied for manufacturing enzyme catalyst.

Table 1: Comparison of optimal temperature and pH of some lipase isolated from different Bacteria.

Isolates	pH	Temperature (°C)	Enzyme activity(μ/ml)	References
<i>Pseudomaonas gessardii</i>	3.5	30	156	[28]
<i>Burkholderia multivorans V2</i>	8	37	14	[29]
<i>Salinivibrio sp. strain</i>	7.5	50	5.1	[30]

PRODUCTION OF LIPASE

Among the assorted enzyme made industrially, enzyme made victimization the

being has gained a lot of importance, thanks to its broad substrate specificity, stability, and property [31, 32]. Bacteria, fungi, and

yeast are many being that are potential producers of the enzyme catalyst. There are 2 ways for the economic production of the lipase:

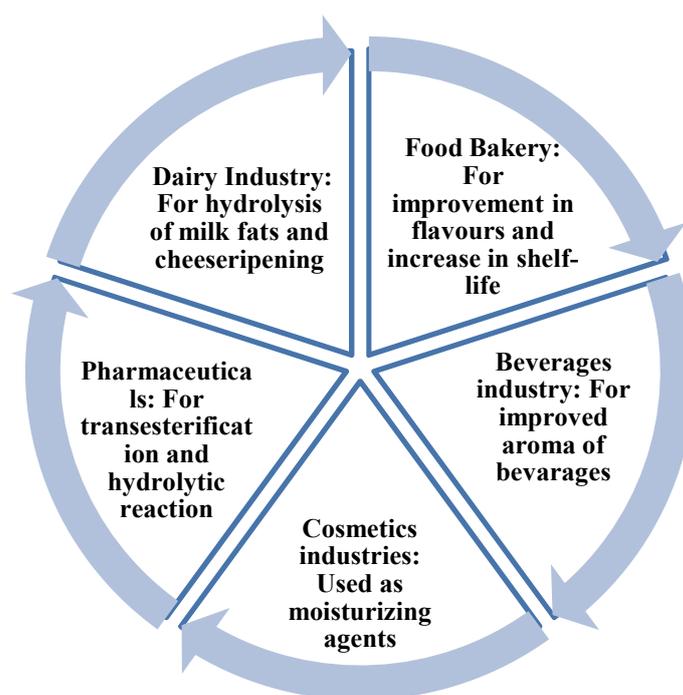
Submerged aging Framework:

Submerged aging framework additionally referred to as fluid aging framework, could be a system of development of microorganisms in fluid juices medium that separates the provided supplements to compound. Further, the recovery happens that is followed by purification of lipases by submerged aging framework. Submerged aging Framework is mostly used for the assembly of enzyme from microorganism strains.

Solid state aging framework: solid state aging framework is another name for solid state aging framework that's utilized in the realm of nourishment and prescribed drugs

enterprises for the creation of mixtures from being on substrate media [33]. For the foremost half, SSF accustomed deliver contagious, mycelia and yeast lipases by utilizing totally different sturdy substrate. For example, used mustard oil because the substrate for enzyme generation by *Aspergillus sp.* in each SSF and fluid maturation and therefore the best outcome was appeared in SSF. The upsides of delivering enzyme compound by SSF are featured obtainable the attenuated creation prices. solid state maturation (SSF) is associate degree economical elective for large scale generation of proteins that are delivered by organisms. During this approach, generation of lipases by sturdy state aging could be a good and favoured alternative than submerged aging.

APPLICATION OF LIPASE



CONCLUSIONS

Bacterial lipases square measure a major cluster of enzymes that supply immense potential for various applications, and there's intensive enthusiasm for recognizing and making microorganism lipases. It can be isolated from different plant and animal sources but lipase isolated from microbial sources are considered over other sources.

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