Whole Cell Based Biotransformation: An Effective Approach for Synthesis of valuable Compounds

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"Reduction of the impact of Chemistry on the Environment by preventing the pollution at its source level and avoiding the use of toxic/ hazardous reagents is what we call as Green Chemistry".

Biocatalysis these days has attained much attention as a green and sustainable alternative for the synthesis of biologically valuable compounds replacing the well-established chemical synthesis reactions [1-4]. Chemical synthesis pathways suffer from serious disadvantages such as; the use of toxic catalysts, harsh reaction conditions, side product formation, mixture of stereoisomer products, lesser yields and most importantly generation of toxic fumes/solvents/chemicals which are hazardous to environment. Hence, greener alternatives for the synthesis of valuable compounds are in much demand and is a field of interest for many researchers [5,6]. Biocatalysis can often be performed by either purified enzymes or whole cell systems.

Among the broad variety of enzymes produced by microorganisms; hydrolases (63%), isomerases (25%) and lyases (5%) are the most commonly used purified enzymes in industrial production of compounds [7]. There are wide variety of reports available for synthesis of valuable compounds making use of purified isolated enzymes [8,9]. However, recently, many researchers have opted for the use of whole cells for biocatalytic reactions [2,6,10-12]. Whole cell based biotransformation is a new and upcoming tool for synthesis reactions. It is a much preferable route of synthesis especially where co-factor regeneration is required and in the cases where multi-enzyme cascades is required [4]. Additionally whole cell based biotransformation have other advantages over purified enzymes such as; (a) they provide a native environment to the enzyme like that of a bag; the enzyme is protected from harsh pH etc.; (b) whole cell based systems are cost-effective as opposed to purified enzymes wherein purification of enzymes, co-factor addition, intermediate addition etc. is required which further adds to the cost.

Now the question arises, how to get an efficient whole-cell biocatalyst? Bioprospecting is necessary for synthesis of the desired compound [13]. There can be two ways to find an efficient biocatalyst; (a) Pre-existing library- this consist of a set of organism that has been previously characterized to some degree or mentioned in the literature but their detailed enzymatic activity is unknown; (b) Randomly-generated library- here the researchers screen various samples such as soil, rotten piece of fruit etc. for the detection of desired activity of microbe.

For whole cell based biotransformation, host cell is of much importance. An ideal host should have following prop-
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