NEW HORIZON COLLEGE OF ENGINEERING

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"Optimization of Solid State Fermentation for enhanced production of Lovastatin by Response Surface Methodology using *Aspergillus terreus*"

Bachelor of Engineering

in

Bio-Technology

Of

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Abstract

Statins are fungal secondary metabolites, which inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase (EC 1.1.1.34) as the first committed enzyme of cholesterol biosynthesis. Lovastatin is produced as a secondary metabolite by fungi *Penicillium sp.*, *Monascus ruber*, *Aspergillus terreus* and *Aspergillus oryzae*. *Aspergillus terreus* appears to be the most commonly used producer of this drug. Lovastatin is one among the statin compound commercially derived from *Aspergillus terreus* through fermentation. In earlier period, lovastatin was produced by Liquid Surface Fermentation (LSF) techniques, but currently Submerged Fermentation (SmF) techniques are employed throughout the world. Due to extremely low yield, extensive downstream processing and the consequent high capital and operating expenses the cost of production of lovastatin has gone very high. Recently several attempts are made based on Solid State Fermentation (SSF) for the production of lovastatin, to minimize the production expenses.

In this present investigation the focus is on optimization and comparative study using Submerged and Solid State Fermentation. Plackett-Burman design was applied for SmF to determine the most important variable. Response Surface Methodology was applied to optimize the medium constituents, Central composite design (CCD) was chosen to explain the combined effects of four factors, viz. particle size, moisture content, inoculum volume and fermentation time. Lovastatin produced was subjected to qualitative analysis by UV Spectrophotometry (214-286nm) and TLC analysis using pure Lovastatin as standard (Biocon) and quantitative analysis by UV Spectrophotometry at 238nm. The yield of Lovastatin is as high as 3065mg/ml by SmF and yield of 27.5 mg/g DFM by SSF. The factors in SmF that had significant impact on lovastatin production are Lactose (70 g/L), Yeast extract (20 g/L), Incubation period (10 Days) and p^H (6.8). In SSF, three factors had significant impact on lovastatin yield ie., moisture content (60% v/w), inoculum volume (20% v/w) and fermentation time (10 days). Results of both the processes were interpreted and concluded that production of lovastatin by Solid State Fermentation is more beneficial than Submerged State Fermentation i.e. higher yield, lower production cost, cheap renewable agriculture and industrial by-products (fermented ragi with dead yeast as a by-product of Beer industry) and single step downstream processing.