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Research Article

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Production and optimization of L-asparaginase by *E.coli* ATCC10536 from food waste

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ABSTRACT

The current study aimed at utilization of food waste as squid pen (SP) and cooked chicken bone (CCB) for L-asparaginase (LA) production and optimization using E.coli culture. During our investigations, high levels of L-asparaginase were obtained from E.coli using squid pen as a sole carbon source as compared to CCB. Optimization of parameters resulted in 2.5folds increase in the L-asparaginase activity. Optimum L-asparaginase production 4.316IU/mL was observed when production media was supplemented with 1%, (w/v) ammonium sulphate, 2%, (w/v) substrate at pH 9, and 37°C after incubation for 5 days.This study underlines the use of food waste as an alternate substrate for the production of L-asparaginase and to improve the cost effectiveness of this enzyme.

Keywords: L-asparaginase, Squid pen, Chicken bone, Optimization, *E.coli*

INTRODUCTION

L-asparaginase is an important therapeutic enzyme used to treat acute lymphoblastic leukemia in combination with other drugs. L-asparaginase makes use of substantial need, tumour cells have got for amino acid asparagine [1]. For tumour cells, L-asparagine is an essential amino acid while normal cells are self-sufficient and can produce within the cells by an enzyme called asparagine synthetase. L-asparaginase presence deprives tumour cells of an important growth factor by converting all L-asparagine to L-aspartate and ammonia, as a result, they may fail to survive [2].

L-asparaginase is extensively distributed among the animals, plants, and microorganisms. Owing to easy culturing methods and convenient extraction and purification techniques microorganisms are proved to be a better source of L-asparaginase enzyme. L-asparaginase has been reported from both Gram positive and Gram negative bacterial species from the terrestrial and marine environment [3].. L-asparaginases from most of the Gram negative bacteria can be categorized into two main types: type I L-asparaginase that are expressed quantitatively and possess enzymatic activity on both L-glutamine and L-asparagine amino acids, while type II L-asparaginase possess high specific activity on L-asparagine and only induced in anaerobic condition [4]. Type II asparaginases produced from *Escherichia coli* (EcAII), and *Erwinia chrysanthemi*(Er A) has been used as ananti-tumour agent for the effective treatment of (ALL) for over 30 years. L-asparaginase from two bacterial sources like *E. coli and E. carotovora* is currently in clinical use for the treatment of acute lymphoblastic leukemia [5]. L-asparaginase production has been studied in various bacterial and fungal species such as *Escherichia coli, Erwinia carotovora, Pseudomonas eruginosa, Enterobacter aerogenes, Bacillus subtilis, Aspergillus tamari, Aspergillus niger* and *Aspergillus terreus*[6-11].

In recent years, utilization of biodegradable food waste has gained more importance in bioprocess industries because of low cost and high nutrient content. Transferring the waste products into valuable biomolecules like enzyme by