

MICROBIAL PRODUCTION OF L-ASPARAGINASE PRODUCTION FROM SOIL MICROBE AND ITS MEDIUM OPTIMIZATION FOR BIOREMEDIATION OF AGRICULTURAL WASTE

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ABSTRACT

Isolation of *E.coli* for the Production of L-asparaginase enzyme from bioremediating agricultural waste. From various microorganisms, L-asparaginase enzyme can be produced. These enzymes are helpful in the treatment of leukemia and it is also used in starchy food industries. From soil sample screening of L-asparaginase which is useful for producing bacteria was done. The screening is carried by two methods ie, primary screening and secondary screening. The primary screening is done by qualitative method. Here rapid plate assay is used as a qualitative method the secondary screening is done by nesslerization method. The bacterial isolates A6, c11, C19. Were bacillus species and all were staphylococcus species which is observed pink color zone in primary screening. It was identified based on morphological, cultured and biochemical test. L-asparaginase enzyme that used to make proteins and create a new cells as a medication and in food manufacturing. It is approved for medical use in the United states from 1978 onwards.

Keywords : *E.coli*, L. Asparaginase, Agricultural waste, Bacillus species, Bacterial isolates.

1. INTRODUCTION

Escherichia coli L. Asparaginase anti-tumor activity was first established by Broome (1961) and Mashburn and Wriston(1964), it's production utilizing microbial system considered as cost effective and eco-friendly nature. L. Asparaginase is a class of enzymes that hydrolyzes the amino acids L. Asparaginase into aspartic acid and ammonia. The enzyme is also known to have an allosteric site, which can be bound by an effector molecule to alter its activity. L. Asparaginase is an amidase enzyme, it's catalyzes the conversion of amino acid L-asparagine to L-aspartate and ammonia [13]. The amino acid L-asparagine be in amide group is non-essential amino acid and nutritional requirement of both normal and cancerous cells.

Catalytic reaction of L-asparaginase

Hydrolysis of L-asparagine to L-aspartic acid. Since leukemia cells are unable to produce its own endogenous L-asparagine in a sufficient amount, the reduction of blood circulating L-asparagine induces them to starve without affecting healthy cell.

2. SOURCES OF L-ASPARAGINASE ENZYME AND THEIR TYPES

Sources

L-asparaginase formulations are derived naturally from bacterial sources like *Escherichia coli* and *Erwinia chrysanthemi*. There are many number of sources available for isolation of L-asparaginase enzyme, they are bacterial, fungal, plant, animal sources.

Plant sources

The roots of *Pinus pinaster* and *Pinus radiata* have an activity of L. Asparaginase in soil. On the basis of high specificity, *Withania somnifera* is a conceivable source of L. Asparaginase enzyme.

Fungal source

By the filamentous fungi like *Aspergillus tamarii* and *Aspergillus terreus*, the enzyme L. Asparaginase is produced. The best nitrogen source for this enzyme production from *A. terreus* is L-proline.

Bacterial source

Pseudomonas aeruginosa, *Pyrococcus furiosus*, *Thermus thermophilus*, *Serratia marcescens* had been found to be a good Asparaginase source for this enzyme production.

Animal source

L. Asparaginase enzyme is typically derived from *Escherichia coli*, a species of bacteria found in the gut of animals. In some cases, the enzyme can be derived from other sources, such as chicken embryo, porcine pancreas, or baker's yeast.

Types of L.Asparaginase enzyme

There are 3 types of L-asparaginase enzyme. They are *Escherichia coli* which is also known by its brand spectrila, *Erwinia chrysanthemica* bacteria which is also known as Erwinase ,pagylated which is also known as pegaspargase.

3. APPLICATIONS OF L-ASPARAGINAS

Pharmaceutical Industry : Antineoplastic Action

L.asparaginase is used as chemotherapeutic agent in the treatment of lymphoma disease and lymphoproliferative. It plays major role in chemotherapeutic protocols such as acute hodgkin's lymphomas and acute lymphoblastic leukemia. From blood serum , asparagine is hydrolyzes by L.asparaginase. for fast and malignant growth, cancer cells require high amount of asparagine.

Anticancer Drug

For many tumor cells, L.asparaginase is essential amino acid with is used for protein synthesis and cell growth. L.asparaginase is deliberated as important antitumor drug . L.asparaginase is described widely in animals, plants and microorganisms . Combination of chemotherapeutic agent with other drugs is used it the treatment of malignancies.

Food Industry: Acrylamide Formation

L.asparaginas is mainly responsible for acrylamide production.it is used in fried and backed foods.in 2003,zyzak et Al identified that the amide chain is provided from L.asparginase Decreasing acrylamide quantity in foods cause estimated Strategies in reagent reduction or removed .

Biosensor

To analyse the asparaginase level in leukemia , L.asparaginase is used for to develop biosensor. For L.asparaginase analysis, XRD,SEM and TEM are used a change in PH , colour and absorption due to Production of ammonium ion from the hydrolysis of asparaginase.

Amino Acid Metabolism

L. Asparaginase plays a major role in biosynthesis of an aspartic family of amino acids, like lysine, threonine, methionine. According to Kreb's cycle , aspartic acid is direct progenitor of lysine , threonine and is formed by the action of L-asparaginase enzyme [164]

4. CONCLUSION

In this review article, we have presented the importance of L-asparaginase both in pharmaceutical and food industry. L-asparaginase , an amilohydrolase enzyme has wide range of applications. Though disseminate generally in plant, bacteria, animal and fungi, microbial system has considered as cost effective and easy production from microbes. More over, yields of L. asparaginase and gene expression rate of this enzyme is very low. Amino acids generally stimulated the production of enzyme L. asparaginase enzyme used in the treatment of human neoplastic disease which the enzyme be produced in large quantities.

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