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Lactic Acid Bacteria as A Bio Preservative: Importance and Production

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Abstract: ***Biopreservation is the method of employing natural microflora and their antimicrobial compounds to extend the storage life and improve the safety of foods. Streptococcus lactis was the first pure strain of lactic acid bacteria which was isolated from milk by Liszt. He named it bacterium lactis. Lactic acid bacteria are gram-positive, acid-tolerant, have low Guanine-Cytosine content and are generally non-sporulating, non-respiring, either spherical cocci or rod-shaped bacilli bacteria that share most of them their metabolic and physiological characteristics. These bacteria are mostly present in decomposing plants and milk products. They have an increased tolerance to acidity. Most species are incapable of respiration and therefore media used for lactic acid bacteria include a carbohydrate source. At the end of carbohydrate fermentation, these bacteria give out lactic acid as a major end product. The review focuses on the process of lactic acid production by lactic acid bacteria and its expanding importance in a variety of disciplines.***
Keywords: Lactic acid bacteria, bio preservative, food, microflora

I. MAIN TEXT

A. Background

Lactic acid bacteria have a major potential for use in biopreservation because they are safe for consumption and dominate the microflora of many foods naturally when stored. In food, these bacteria stop the growth of pathogenic bacteria and maintain the nutritive quality while improving the shelf life of foods due to the production of inhibitor agents. Examples of a few inhibitor agents include bacteriocins, organic acids, diacetyl, reuterin and hydrogen peroxide. Production of various alcohols, aldehydes, acids, esters and sulphur compounds due to the degradation of lipids and proteins add to the generation of flavour in different fermented food products. Lactic Acid Bacteria are used primarily as starting cultures in a wide range of fermented dairy goods, fruits and vegetables, cereal products, meat and fish. They also add flavour, texture, and nutritional value to fermented foods, therefore they're utilized as adjunct cultures.

The review focuses on the lactic acid generation process by lactic acid bacteria and its growing importance in a range of fields.

Many investigators have reported on the use of bacteriocins as food preservatives to extend the shelf-life of various foods. Bacteriocins are a group of proteinaceous antimicrobial substances which prevent the growth of closely related bacteria. However, some bacteriocins produced by lactic acid bacteria (LAB) have a broad antibacterial spectrum and are effective against a variety of food-spoilage and health-threatening bacteria.

B. Commercial Production

Starter strains are grown under strictly controlled conditions. Starter concentrate production can be divided into steps like preparation of inoculum, preparation of media, fermentation at constant pH, harvesting the culture, adding the cryoprotectant, freezing, freeze-drying, packaging and drying. Industrial-scale production of cultures involves batch fermentation. Problems with continuous fermentation include undesirable contamination, complex equipment and bacteriophage problems. In batch fermentation, all the required materials such as carbon source, nitrogen source and other components are added before the beginning of the fermentation process. It is easy to perform and is therefore the most commonly practised fermentation.

The use of cheese whey and whey permeate as a growth medium is common. Skim milk is the most common medium for lactococci. pH, temperature, mixing, and the type of neutralizer employed all have an impact on fermentation. The ideal temperature for growth is 32 degrees. The ideal pH range to utilize is 6-6.5. Ammonium hydroxide is the best neutralizer for this fermentation. Continuous agitation is required to maintain pH. Cells are harvested from the medium by centrifugal separation. The entire process takes approximately 10-12 days.

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II. APPLICATIONS

A. In milk, brined vegetables, cereal products and meats with added carbohydrates, growing lactic acid bacteria leads to the formation of new products.

B. Lactic acid bacteria become the dominating population in raw meats and fish chills held under a vacuum or in a high carbon dioxide concentration, preserving the meat with a "hidden" fermentation.

C. Bacteriocins, which are polypeptides created ribosomally by bacteria and have bactericidal properties, are produced by a variety of lactic acid bacteria strains utilized in food fermentation. They are called bioprotective cultures. It applies to processed meats if the lactic acid bacteria survive heat treatment or are inoculated onto the product after heat treatment.

D. Several beverages are produced by using lactic acid bacteria. *Lactobacillus* and *pediococcus* traces have been found in popular drinks like kombucha after the drink has been produced.

E. The beer and wine-making processes also utilize some lactic acid bacteria, generally lactobacillus.

F. Probiotics have been researched to affect antibiotic-associated, pediatric and travellers' diarrhoea, inflammatory bowel disease, and irritable bowel syndrome.

G. They are used as adjunct cultures which are defined as cultures that are intentionally added at some point in the manufacture of fermented foods, but their primary role is not the production of acid. Adjunct cultures are used for the manufacturing of cheese to balance out some of the microorganisms removed by pasteurisation, advanced hygiene and the use of defined-strain starter culture. These are usually non-starter LAB which influences the flavour and catalyse the maturation process.

H. They are used as starter cultures for fermented foods which are produced by the fermentation of specific sugars by LAB.

III. CONCLUSION

Lactic acid, produced by lactic acid bacteria, is one of the most common bio preservatives and proves its importance in various fields. These bacteria are gram-positive and are widely present in milk products. The production process of lactic acid, though not the easiest, is a vital one. It is carried out in several steps: preparation of inoculum, preparation of media, fermentation, harvesting the culture, adding the cryoprotectant, freezing, freeze-drying, packaging and drying. The review highlights its main uses in the food industry including the preparation of various fermented products and its use as a bio preservative for increasing the shelf life of products. A supplement of highly active lactic acid bacteria strains has great potential to boost the immune system of the host, specifically important during the times of a pandemic, perhaps protecting them against a variety of diseases, including some malignancies.

A. List of Abbreviations

LAB: Lactic acid bacteria

IV. DECLARATIONS

1) *Ethics Approval and Consent to Participate:* Not applicable
2) *Consent for Publication:* Not applicable
3) *Availability of Data and Material:* Not applicable
4) *Competing Interests:* The authors have no conflicts of interest to declare that are relevant to the content of this article.
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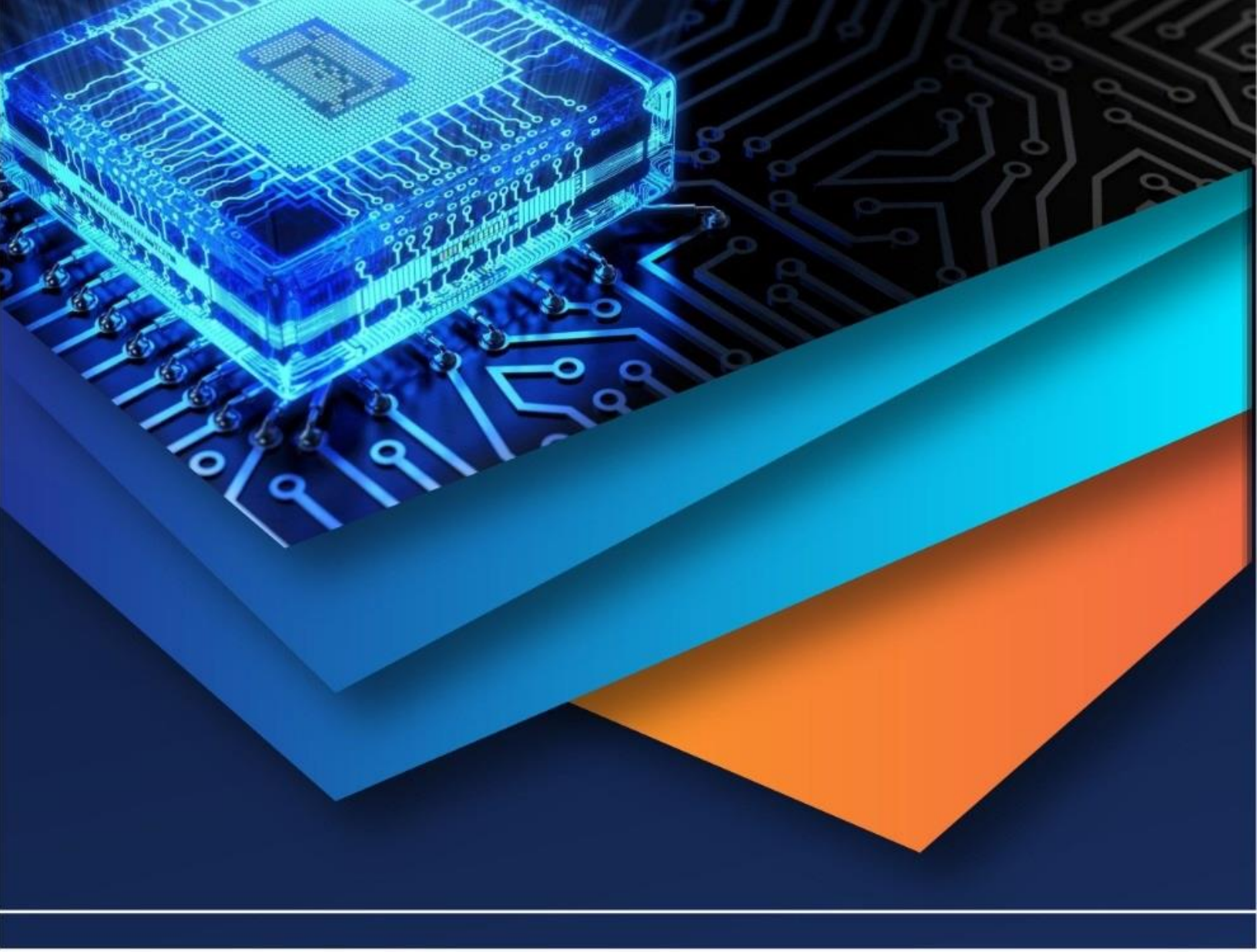

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