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Food Bio-Preservation by Bacteriocins

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Introduction

Ready-to-eat fruits and vegetables are increasingly popular products because they are fresh and healthy, easy to consume and their nutritional contribution. Food spoilage may be defined as 'damage to original nutritional value, texture and flavour of food that eventually makes it unsuitable to eat, leading to food waste and economic losses to manufacturers and consumers'. Mycotoxin production due to fungal growth cause poisoning of food and feed which leads to serious human diseases. Although, some mycotoxins can withstand various food processing treatments and lead to food safety concerns.

Fungicides and chemical preservatives negatively affect human health and environment while bio-preservatives are safe and biodegradable with additional health benefits. Biotechnology is a boon to food-processing sector as it targets the selection, production and improvement of useful microorganisms with their products and technical applications in food quality improvement.

Biopreservation

Bio-preservation or biocontrolis the use of natural or controlled microbiota, or its antibacterial products to extend the shelf life by preventing fungal growth. It rationally exploits the antimicrobial potentialof microorganisms in food and/ortheir metabolites for safe use. It enhances the hygienic quality and minimizing the adverse impact on the nutritionalproperties of perishable food products.

Bacteriocins

Bacteriocins use as bio-preservatives for vegetable food matrices started 20 years ago. In 1953, term 'bacteriocin' was coined to define colicin which was produced by bacterium *Escherichia coli*. Bacterios in is aribosomally synthesized, extracellular released low-

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molecular mass proteins (usually 30–60 amino acids), produced by different groups of bacteria (having bactericidal or bacteriostatic effect on other bacteria either in the same species or across genera. These are potentially valuable biological tools to improve food safety and reduce the prevalence of food borne illnesses.

These can be added to foods in the form of concentrated preparations as-

- Food preservatives
- Shelf-life extenders
- Additives or ingredients in a semi- or purified preparation
- Produced *in situ* by bacteriocinogenic starters
- Adjunct or protective cultures

Benefits of the use of bacteriocins in food preservation-

- Recognized as safe substances
- Extend food shelf life
- Antagonistic activities against fungal pathogens
- Generally pH and thermo-resistant (can maintain antimicrobial activity after pasteurization and sterilization)
- Least use of chemical preservatives
- More 'novel' food production
- Avoid food spoilage and economic losses
- Reduced risk of foodborne pathogen transmission
- Food protection at temperature abuse conditions
- Satisfy industrial and consumer demands

Applications of bacteriocin in food preservation-

- Accelerate cheese ripening by promoting the release of intracellular enzymes to the cheese matrix
- Guarantee homogenous fermented products
- Improve the sensory attribute quality of certain foods
- Production of dry-cured ham and sausages to control toxigenic penicillium
- Stability of sourdoughs

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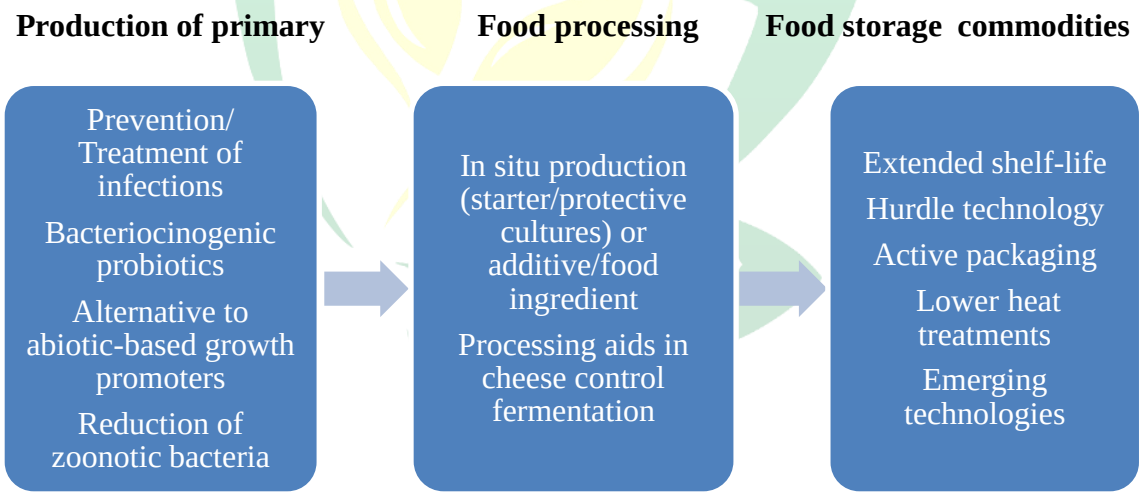
- Preparation of Miso (a fermented soybean paste used in Asian cooking**),** Sauerkrauts (fermented brassica product), refrigerated pickles and mungbean sprouts
- Fermented vegetables i.e. kimchi and ciders
- Non-fermented vegetables i.e. marshed potatoes, fruit and vegetable juices, canned fruits and vegetables

Challenges in using bacteriocin in food preservation-

- Resistance development of pathogens to the applied bacteriocin
- Slower diffusion, solubility and irregularities
- Inactivation by other additives
- Inadequate environmental conditions for the biological activity
- Higher retention of the bacteriocin molecules by food system components

Factors inhibiting bacteriocinproduction include:

- Inadequate physical conditions and chemical composition of food.
- Spontaneous loss in production capacity
- Inactivation by phage of the producing strain
- Antagonism effect of other microorganisms in foods.



Applications of bacteriocin and their antimicrobials along with three main stages of food chain

Conclusion

Fresh fruits are microbiologically safe but they could be contaminated in the pre or post-harvest environment due to various biotic and a biotic factors. There is an urgent need to

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develop new effective antimicrobial agents that are effective throughout the food manufacturing and distribution chain. Bacteriocins enhance the hygienic quality, minimizing the impact on the nutritional and organoleptic properties of perishable food products without compromising on its authenticity by provide a safe and reliable tool to food industry.