

Chapter 10

Biopreservatives for Improved Shelf-Life and Safety of Dairy Products: Biopreservatives for Dairy Products

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ABSTRACT

Globally, there is an increasing demand for minimally processed, easily prepared, and ready-to-eat fresh food, globalization of food trade, and distribution from centralized processing which pose major challenges for food safety and quality because perishable food may get contaminated with undesirable microorganisms. Food spoilage adversely affects the economy and also erodes the consumer's confidence. On other hand, food-borne illness leads to loss of earnings and productivity, unemployment and litigation, and weakens trade and tourism. Another challenge for the food producers is to produce less stable foods by processes that confer less harm to the detrimental microflora. A challenge for food producers is to develop products with a sufficiently longer shelf-life and at a competitive price. This brings them to the most promising approach to this end, the so-called biopreservation. This chapter provides a scientific background, functionality, as well as food applications and further commercial aspects of biopreservatives derived from microbial sources.

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INTRODUCTION

The concept of biopreservation is not new to us, as we humans have continuously been using this biotechnological approach for preserving food, for many years, without even knowing the underlying mechanisms. In present world, the changing food trends, lifestyle and increasing consumer's awareness has brought up the challenge to food producers to meet totally contradictory trends and demands (Table 1).

Table 1. Highlighting consumer's preferences, changing food trends and demands, and problems associated with them

Preferences	Trends and Demands	Problems Associated
Health trends	Consumers concern for health has raised the demand for food products with reduced levels of salt, sugar and fat.	This also confers an increase in water activity, which provides a much suitable environment for microorganisms.
Taste preferences	In many products, trends are towards a milder (i.e. less acidic) taste.	This results in a higher pH that again is less adverse for microorganisms.
Perception of "natural"	Demand for milder or minimally processed foods (More natural/fresh food). Demand for "preservative-free" products.	Less inactivation of unwanted microorganisms.
Convenience trends ("practically homemade")		Two main risks associated with this trend—namely, more extensive processing, which results in more steps in which contamination with detrimental microorganisms can occur, and the need for proper handling by the consumer (e.g. sufficient heating), which may be neglected.
Durability and open shelf-life	Market access and economically viable logistics require a long shelf-life.	Furthermore, a sufficient open shelf-life is required to ensure customer loyalty.
Ethical issues		Concerns such as corporate social responsibility, carbon dioxide (CO ₂) footprint, and fair-trade and organic products put restrictions on which solutions a food producer can employ.

Overall, it has been seen that these trends and demands lead to food formulations that provide conditions much more favourable for microbial growth; milder processing results in minimal reduction, more processing steps increase the risk of contamination, more difficult to maintain longer shelf-life, and pressure to minimize the waste. Moreover, the trendsetters and consumers are not in favour to use conventional preservatives. But the fact is that we cannot meet the demands of growing population and maintain present society living standards, and certainly cannot reduce the global food waste problems, with food that is not preserved.

Normally, many consumers associate the term 'Preservatives' with harmful, modern chemicals in foodstuffs. But, as a brief look back into the past will show that there are possibilities to preserve the food by more natural means (such as, fermentation). Despite a number of misgivings, preservatives have nowadays become an indispensable part of the food we eat; due to increasing demand from consumers for greater choice, ease and convenience of foods, and high food safety standards. Thus, there is a strong market need for natural food preservation methods that can ensure both food safety (i.e. reduce the number and/or outgrowth of pathogenic microorganisms) and longer shelf-life (i.e. delayed development of the

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