

Role of Biotechnological Applications in Dairy Based Products

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Introduction

Staple food constitutes the most indispensable and basic need of man for fulfilling minimal nutritional requirements to sustain human life on earth. Man has been traditionally depending upon agriculture and livestock to meet food demands since times immemorial. It is obligatory on the part of all Governments to provide safe, wholesome and nutritious foods to their citizens belonging to all the sections of society. A healthy diet can play a significant role in creating a healthy mind and healthy society in the country. Adequately nourished and healthy citizens can serve as the work force in building a nation by boosting the growth, prosperity and productivity. However, the overall quality and safety of food commodities can be considerably influenced by the food processing and packaging to provide optimal nutritive value to the consumers.

Role of biotechnology in food sector

The high value-added products are progressively more created in more scientifically highly developed budding countries for use in their food and non-food processing application. Many of these high value-added products are also imported by budding countries for use in their food processing applications. The applications of biotechnology method in the food and agricultural manufacturing are one of the many aspects of biotechnology that has great force on society. Biotechnology has a main application in the food. Biotechnology has already benefitted the food industry in a big way. It has given us high quality foods that are tasty, nutritious, wholesome, convenient, shelf stable and safe. As research and development initiatives continue, it seems inevitable that biotechnology will have an increasing impact on the food we eat. However, the major focus is now on exploring the modern biotechnology which is based on a combination of molecular genetics, applied enzymology and fermentation technology for value addition to foods. It is the modern Biotechnology which is becoming increasingly important part of the overall efforts to improve methods of food production and to increase the variety, quality and safety of foods we eat.

Potential Areas for Biotechnological Applications

There are several potential areas in the food industry where the traditional and modern biotechnological tools can be applied during processing for the overall improvement of the nutritional quality, safety and health promoting attributes of the processed foods specifically with regard to the dairy based fermented products. Some of the potential areas of considerable commercial interest in food industry that can be targeted for biotechnological interventions are listed below:

1. Food fermentations
2. Starter cultures technology and genetic manipulation
3. Recombinant Enzymes
4. Bio preservation of foods
5. Functional / Health foods and Nutraceuticals
6. Probiotics, prebiotics and symbiotic foods
7. Genetically modified foods (GMFoods)
8. Milk derived bioactive peptides and other functional ingredients
9. Low calorie foods
10. Food packaging
11. Diagnostic tests for food safety and quality assurance
12. Biosensors

Food biotechnology in milk and milk-based products

Milk is a white liquid biological secretion from the mammary glands of female mammals. Conventionally, milk has been considering the most entire food providing by nature. It is a vital resource of necessary nutrient required for the growth and growth of newborn. It is also extremely suggested in the diet of adult humans due to its high dietary assessment. It is, generally, composed of water, proteins, lipids, carbohydrates, vitamins, and minerals. Lactose is the main carbohydrate found in milk. It has been reported that lactose can stimulate the combination of minerals together with calcium and magnesium. It is the major resource of nourishment for young mammals before they are able to digest another type of food. Early

lactation milk contains colostrum, which carries the mother's antibodies to its young and can decrease the hazard of many diseases.

Probiotics

Probiotic is a fairly new word meaning "for life," which is used to name microorganisms that are linked with the advantageous effect for humans and animals. The probiotic microorganisms consist mainly of the strains of the genera *Lactobacillus* and *Bifidobacterium*, but strains of *Bacillus*, *Pediococcus*, and some yeasts have also been established as appropriate candidates. Probiotics are defining as the living microorganisms administer in a plenty number to endure in the intestinal system. They should have a positive effect on the host. Probiotic foods are the best ever-growing area of functional food development. A number of health benefits linked with probiotic food products comprise treatment of diarrhea, alleviation of a symptom of lactose intolerance, reduction of blood cholesterol, ant carcinogenic properties and improvement in immunity.

Dairy Products

In the manufacture of probiotics is a significant factor in the food substrate. Moreover, buffer the bacteria during the stomach; it may hold useful ingredients that interrelate with the probiotics, changing their actions. Yogurts with high-fat content showed inhibitory property beside probiotic cultures, mainly *B. bifidum* BBI. The supplementation with vitamins has been report to get better the viability of *L. acidophilus* in yogurts. The addition of substance such as whey protein may also improve the viability of a number of probiotics, possibly due to their buffer property. In addition, the employment of prebiotics in yogurt formulations can stimulate the growth and activity of probiotics.

Non-dairy Products

A few matrices have been use in the growth of nondairy probiotic foodstuffs such as fruits, vegetables, legumes, and cereals. Fruits and vegetables can be measured good matrices because they enclose nutrients such as minerals, dietary fibers, and antioxidants. The growth of diverse probiotic fruit juices has been studied. Describe a revision about an assortment of non-dairy probiotic beverages.

Prebiotics

The word prebiotic has been used to explain a dietary component that stimulates the growth and activity of a preferred group of microbes, thereby

provide these organisms with a competitive benefit over other bacteria in the environment. Mixture of both probiotics and prebiotics is known as Symbiotic. This mixture can progress the survival of the probiotic organism. Consuming a probiotic supplement that also includes the suitable prebiotic has many beneficial effects. The mixture of both probiotic and prebiotic has the capacity to heal and control the intestinal flora, mainly after the devastation of microorganisms following antibiotic, chemotherapy, or radiation therapies.

Latent applications of biotechnology in dairy Sector

Biotechnology has previously made significant offerings in dairy industry. Some of the possible applications and future scenario are given below:

Dairy Production

- Recombinant bovine
- Recombinant vaccines

DNA fingerprinting

- Embryo transmit technology
- Animal cloning
- Gene forming and transgenic

Dairy Processing

- Food grade bio-preservatives
- Dairy enzymes/proteins
- Probiotics
- Functional foods and nutraceuticals
- Dairy waste organization and pollution control

Role of enzyme activity Rennet

Milk contains proteins, especially caseins that uphold its liquid form proteases are enzymes that are added to milk throughout the cheese manufacture, to hydrolyze caseins, which stabilize micelle arrangement, prevent coagulation. The most familiar enzyme extracted from rennet is chymosin.

Chymosin

Chymosin can also obtain from numerous other animals, microbial, or vegetable sources, but indigenous microbial chymosin is unsuccessful for making cheddar, and other hard cheeses Bio-engineered chymosin may be concerned in the manufacture of up to 70% of cheese products. Milk contains number of diverse type of proteins, in addition to the caseins. The denaturing of whey proteins such as

lactalbumin and lactoglobulin using proteases result in the creamier yogurt product.

Lactase

Lactase is a glycoside hydrolyzes enzyme that cut lactose into its essential sugars, galactose, and glucose. Lactase is used commercially to organize lactose-free products, mainly milk, for such individuals it is also used in the preparation of ice cream, to make creamier and sweeter tasting manufactured goods. Lactase is as frequently organized from *Kluyveromyces* sp. of yeast and *Aspergillus* sp. of fungi.

Catalase

The enzyme catalase has established partial use in one exacting area of cheese manufacture. Catalase enzymes are characteristically obtained from bovine livers and are further to transfer the hydrogen peroxide to water and molecular oxygen.

Lipases

Lipases are used to break down milk fats and give attribute flavours to cheeses. The flavor comes from the free fatty acid created when milk fats are hydrolysed. Hydrolysis of the shorter fats is preferred, since it results in the popular taste of many cheeses and the longer chain fatty acids can affect in also soapiness or no flavor at all.

Nutrition and food safety

Fermentation processes enhance the nutritional value of foods through the biosynthesis of vitamins, essential amino acids and proteins, through improving protein and fibre digestibility; enhancing

micronutrient bioavailability and degrading antinutritional factors. Many bacteria in fermented foods also exhibit functional properties (probiotics). The safety of fermented food products is enhanced through reduction of toxic compounds, such as mycotoxins and cyanogenic glucosides, and production of antimicrobial factors, such as bacteriocins, carbon dioxide, hydrogen peroxide and ethanol, which facilitate inhibition or elimination of food-borne pathogens.

Conclusion

Biotechnology is one of the frontier areas of scientific growth in the world today. While the beginning of pasteurization has help to make sure the protection of dairy products, improvement has been slower in prevent the microbial spoilage of cheese and dairy products. The feasibility of probiotics is a key factor for mounting probiotic food products. Latest studies have recommended that probiotics have established valuable effect to human and animal health.. New biotechnology products being developed for use in livestock manufacture, but they are also being developed for use in food processing. Dairy industry in particular can enormously benefit throughout biotechnological intervention which can not only progress the overall quality and safety of processed dairy foods but also enhance their commercial values for local consumption and exports. This will convey many challenges to the dairy processor, but maintain the value and shelf life of this extremely healthful food should not be one of them.
