

1. ULUSLAR ARASI
“ADRIYATİK’TEN KAFKASLAR’A
GELENEKSEL GIDALAR”
SEMPZYUMU
BİLDİRİ KİTABI



THE 1ST INTERNATIONAL SYMPOSIUM ON
“TRADITIONAL FOODS
FROM ADRIATIC TO CAUCASUS”
PROCEEDINGS BOOK

15-17 APRIL 2010 TEKİRDAĞ / TURKEY

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BİLDİRİ KİTABI - PROCEEDINGS BOOK

TEKİRDAĞ

Dizgi- Kapak

Typesetting-Cover Design : Kadir Gürbüz GÜNER

Baskı

: Başak Ofset

Press

Davutpaşa Litros Yolu 2. Matbaacılar Sitesi

1A-3 Topkapı – İSTANBUL

0212 613 0063



İsteme Adresi - Request Address:

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ISBN: 978-605-4265-02-2

- ULUSLAR ARASI “ADRIYATİK’TEN KAFKASLAR’A GELENEKSEL GIDALAR” SEMPZOYUMU BİLDİRİ KİTABINDA YER ALAN MAKALELERİN TÜM SORUMLULUĞU YAZARLARINA AİTTİR.
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BIOTECHNOLOGY OF SOME TRADITIONAL FOODS

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ABSTRACT

The main objectives of food technology are to exploit natural food resources as efficiently and profitably as possible. Adequate and economically sound processing, prolongation of shelf life by preservation and optimization of storage and handling, improvement of safety and nutritive value, adequate and appropriate packaging, and maximum consumer demand appeal are key prerequisites to achieving these aims. Fermentation, drying, baking, brewing, pickling and dairying are common and the oldest methods of food preservation. However, there are many problems during the production, packaging, storing and marketing of the traditional foods. In recent years, by utilization of biotechnological methods for the preparation, manufacturing, packaging and preservation of traditional foods, final product will be in good situation for the major targets and markets. By introduction of pure or mixed starter cultures under aseptic conditions, it will be possible to create rich and full flavors in traditionally produced foods. The aim of this study is to review some traditionally produced foods, and manufacturing them by biotechnological methods.

Key words: Traditional food, Fermented food, Starter cultures, Food biotechnology.

1. INTRODUCTION

One of the major advances in human history was the ability to preserve food. There was “biotechnology” when there was not biology. The term “biology”, coined in the early 1800s is quite recent compared to some classical biotechnological applications as artificial selection and hybridization, brewing, and cultured milk products which date back to several millennia. “Yoghurt”, one of the few Turkish words (yoğurt) adopted in English language, is now a household name. There is evidence of yoghurt production as food for at least 4500 years and was recorded in the books *Divanü Lügati't-Türk* by Kaşgari Mahmud and *Kutadgu Bilig* by Yusuf Has Hacib written in the eleventh century [1]. The earliest preservation technologies developed were drying, smoking, chilling and heating. Later on, the art of controlling these technologies was developed. The work of Pasteur in the nineteenth century then made it possible to understand the real mode of operation of preservation techniques such as heating, chilling and freezing, providing the basis for more systematic monitoring and control [2].

Biotechnology in the food processing sector makes use of micro-organisms for the preservation of food and for the production of a range of value-added products such as enzymes, flavour compounds, vitamins, microbial cultures and food ingredients. Biotechnology applications in the food-processing sector, therefore, target the selection and manipulation of micro-organisms with the objective of improving process control, product quality, safety, consistency and yield, while increasing process efficiency [3, 4]. The development of new high technologies for upgrading the quality of traditional foods of Türkiye will lead the growth and survival of the food industry.

2. APPLICATION OF BIOTECHNOLOGY TO TRADITIONAL FOOD PRODUCTS

Biotechnology has been central to many aspects of food products for thousands of years. Many traditional foods such as cheese, bread, butter, and yoghurt are based on fermentation processes. Fermentation was used by the ancient Babylonians in 6000 BC for brewing beer and by the Egyptians in 4000 BC to bake leavened bread. Louis Pasteur, in his pioneering studies in the late 1800s, showed definitely that these products were caused by micro-organisms in the food fermenting the raw materials. *Food biotechnology* is defined as the application of biological techniques to food crops, animals and microorganisms with the aim of improving the attributes, quantity, safety, ease of processing and production economics of our food [5, 6]. In this review, biotechnology application methods will be categorized into three major food groups: dairy products, meat products, and bakery.

2. 1. Biotechnology of Dairy Products

Milk is the most important foodstuff for a mammal and has always been the first food of the newborn. Biotechnological methods on dairy products are based on sknown scientific principles, their microbial cultures are known, and their quality can be optimized. Fermentation by modern technologies involves specific lactic acid bacteria to bring about specific fermentation under controlled conditions to result in a specific fermented product with enhanced organoleptical, nutritional and therapeutic qualities [7].

Among various fermented milk products, yoghurt has been benefited due to considerable growth toward healthy food and much new product development. Recently, yoghurt has become a popular tool for the incorporation of probiotic cultures such as *Bifidobacterium bifidum* and *Lactobacillus acidophilus* for improved health and nutrition [8]. A common practice in yoghurt manufacture is the addition of skimmed milk powder to improve the yoghurt's nutritional status and to thicken it. This also increases the lactose content of the yoghurt and such yoghurt may be unsuitable for those who have lactose intolerance. Food

technologists have therefore investigated the possibility of making yoghurt from milk with reduced lactose content. This procedure involves pretreating the milk with the enzyme β -galactosidase to hydrolyse its lactose to glucose and galactose [9]. Modern biotechnology may play an important role in the development of nutritionally balanced or improved cheese varieties. For the manufacturing of wholesome natural ripened cheese, various stages of cheese production such as milk selection and preparation, the role of starter bacteria, curd coagulation and cheese ripening should be taken into consideration [10]. A process for manufacturing a fermented flavored whey drink has been developed that combines the nutritional properties of whey and the health benefits of *Lactobacillus* strain GG. For this purpose, demineralized lactose-hydrolyzed whey concentrate has been fermented with *Lactobacillus* GG [11].

2. 2. Biotechnology of Meat Products

One of the more infamously inaccurate predictions of the future came from Winston Churchill, who claimed in 1932, "Fifty years hence we shall escape the absurdity of growing a whole chicken in order to eat the breast or wing by growing these parts separately under a suitable medium." Churchill's prediction of a method for producing "cultured meat" *in vitro* should have been realized by 1982. Most edible animal meat is made of skeletal muscle tissue. Thus the production of cultured meat *in vitro* must draw upon techniques developed for skeletal muscle tissue engineering. In scaffold-based techniques, embryonic myoblasts or adult skeletal muscle satellite cells are proliferated, attached to a scaffold or carrier, such as a collagen meshwork or microcarrier beads, and then perfused with a culture medium in a stationary or rotating bioreactor. By introducing a variety of environmental cues, these cells fuse into myotubes, which can then differentiate into myofibers the resulting myofibers may then be harvested, cooked, and consumed as meat [12]. The natural fermentation of sausages is a complex microbial process in which the main participants are represented by lactic acid bacteria (LAB) and coagulase-negative cocci (CNC). Recently new tools, based on molecular methods, allowing fast and unequivocal identification of strains, isolated from fermented sausages, became available. These methods have been successfully applied and, in general, biochemical and molecular identification compared well [13]. Today, most of the fermented sausages are produced by using microbial starters, usually from both *Lactobacilli* and *Micrococaceae* because this combination ensures rapid acidulation and optimal flavor development [14].

2. 3. Biotechnology of Bakery Products

Bakery products (especially bread) have an important role in human nutrition. Generally, wheat bread is considered to be a good source of energy and irreplaceable nutrients for the human body. Sourdough fermentation is one of the oldest biotechnological processes used in food production. In recent years, traditional sourdough bread production has enjoyed renewed success with the ever-increasing demand by the consumer for more natural, tasty and healthy foods. Sourdough comprises a mixture of lactic acid bacteria (LAB) and yeasts where the dominant are the lactic acid bacteria. Lactic acid bacteria fermentation creates optimum pH for the activity of endogenous factors which improves texture changes, contributes directly to bread flavour, especially, through the synthesis of acetic acid, increases the loaf volume, delays starch retrogradation and bread firming and inhibits ropiness by spore-forming bacteria [15, 16]

One of the most common methods used to reduce the rate of bread staling is the addition of enzymes. The most frequently used enzymes are alpha-amylases, which randomly hydrolyze the α -1,4 glucosidic linkages in starch, resulting in short chains of low-molecular weight polysaccharides. The antistaling effect of these enzymes has been attributed to their ability to produce low-molecular weight dextrans that interfere with starch retrogradation and disrupt the continuity of the starch network, reducing its rigidity [17].

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