

An evaluation of basic food science and main food biotechnology processes products from point of nutrition and obesity

Abstract

Food biotechnology comprise sorts of scientific disciplines including food chemistry, biochemistry, molecular biology, microbiology, bioreactors, fermentation process, nutrition and food quality assurance. In the Daily diet, fermented food and drinks have and special importance because of their functional properties and biochemical compounds. Food biotechnology products have great importance from point of nutrition and obesity. Alcohol consumption must be reduced because of high calorie intake and harmful effect to some organs such as brain, liver and also cause social problems when consumed excessive amount. In Turkish traditional fermented foods such as yogurt, kefir and kimiz, boza, ty and tarhana and special pickles etc., have various functional properties and biochemical compounds that have beneficial effect to organism. They contain lactic acid bacteria, probiotics, B complex vitamins, nutritive minerals, and some specific compounds which can prevent to development of cancer and tumors, cardiovascular diseases and cholesterol reducing effect. Food biotechnology also includes Genetically Modified Organism (GMO). Studies are evaluated in food biotechnology too. On the other hand, the another significant and common fermented product types are beer, wine, wine agar, even distilled alcohol drinks those produced ethyl alcohol from carbohydrates sources e.g. grape fig, barley, wheat, rice or any carbohydrate sources. Food biotechnology can be evaluated in basic food science and food biotechnology process. The mentioned topics were reviewed in detail.

Keywords: food biotechnology, food science, process, functional properties, nutrients, health

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Introduction

Biotechnology has been one of the most important branches of the millennium era along with electronics and computer science. Food biotechnology is the production of new products in the food industry or in food production with the basic sciences of living organism systems. Nutrition is an indispensable reason for life and the main reason for survival. It is a field of research and development which covers multidisciplinary characteristics of food biotechnology based on many disciplines. In the healthy diet, essential food elements; essential amino acid vitamins, essential fatty acids, nutritive minerals must be taken with other nutrients that sufficient carbohydrate, lipids and protein content in the diet. Food biotechnology also includes Genetically Modified Organism (GMOs). Studies are evaluated in food biotechnology too. Functional properties and medicinal compounds are known as anti-aging and functional agents who affected health in positive way and preventive and protecting effect to organism. The process of the each of fermented food biotechnology products are established by the enzymes in aerobic and anaerobic conditions. Fermentation includes such a complex long ways to be able obtain products. The mentioned topics were reviewed in detail. Food biotechnology is a multidisciplinary field of science and research and development that includes many disciplines on the basis of biotechnology.

- Food chemistry and biochemistry
- Microbiology and food microbiology
- Food safety

- Nucleic acids
- (DNA and RNA nucleotides and sequences)
- Principles of nutrition
- bioreactors
- Mechanical
- Mechatronics
- Electric and electronic
- Computer science

However, all food sciences and food industry productions are based on agriculture, my father profession veterinary medicine, agricultural engineering; It depends on plant and animal productions. In addition, food biotechnology medicine, biology, genetic sciences are also involved (Figure 1).

The most important production, study and research field of food biotechnology is fermentation sciences. Enzyme studies and productions are also included in the subject, while plant and animal genetic studies are directly related to food biotechnology, but they are the fields where other professions operate. Food chemistry and biochemistry; Functional foods and their properties, nutraceuticals, bioactive compounds, bioactive compounds due to their beneficial and protective effects in preventing diseases such as healthy lifestyles, anti-aging nutrition etc., together with major macro and micro nutrients etc. interest of scientists. People prefer to consume functional foods and drinks for longer and anti-aging life style. The main macro nutrients

are lipids, carbohydrates, water, and micro nutrients are minerals and vitamins.¹In food biotechnology, fermentation applications, enzyme science and enzyme production, plant and animal genetic working groups for food, genetically modified organisms are GMOs. The main genetic material DNA and RNA nucleotides and bases, rectorors are essential elements in the field of food biotechnology (Figure 2).²

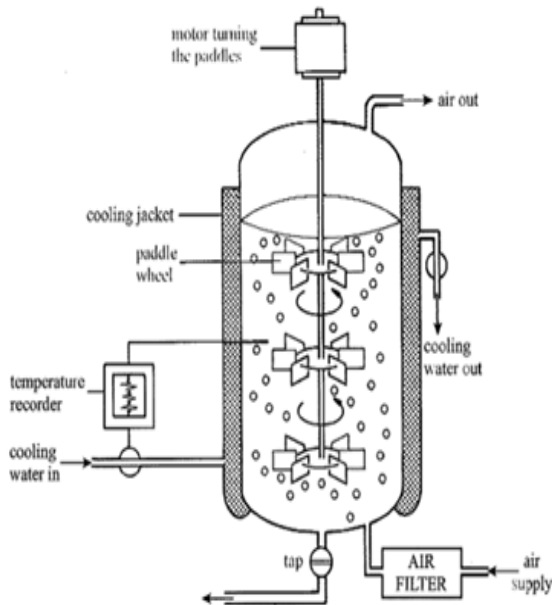


Figure 1 A picture of fermentor bioreactor.

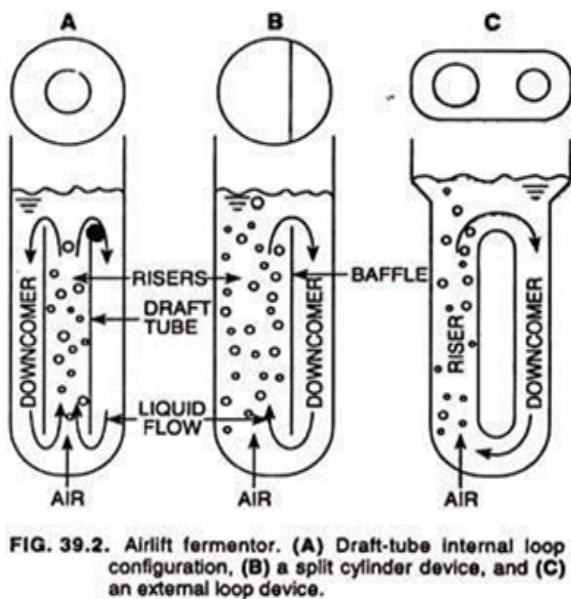


Figure 2 The types of fermenter (bioreactor) commonly used in industry are mixed tank fermenter, air lift fermenter and bubble column fermenter.

The main macro nutrients are lipids, carbohydrates, water, and micro nutrients are minerals and vitamins. In food biotechnology, fermentation applications, enzyme science and enzyme production, plant and animal genetic working groups for food, genetically modified organisms in the seed studies and applications, animal breeding etc. were investigated and applied in the life. Food biotechnology products are also obtained from new raw materials such as beer, wine, yeast and

ethyl alcohol, which are different from the raw material, used in many food industries durable products. New biochemical compounds and substances are formed due to fermentation reactions, each of which is used in the food industry. For example, in the production of beer and wine, carbon dioxide is obtained and evaluated as a by-product. Food biotechnology consists mainly of fermentation technologies (Figure 3).

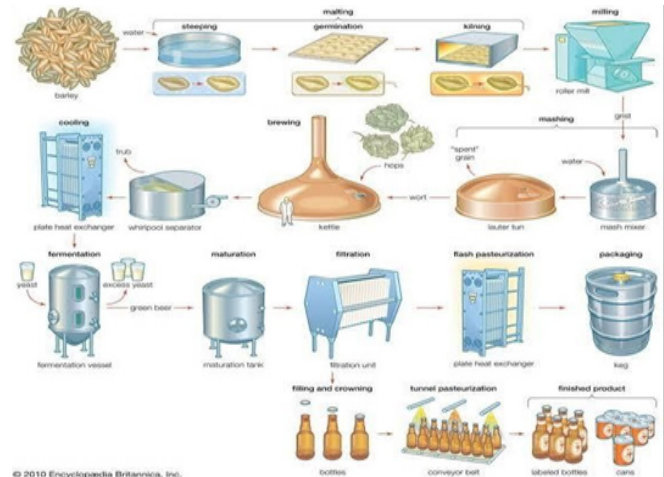


Figure 3 Beer production picture.

Material and methods

Food biotechnology and of bioreactors

Bioreactors are production vessels³that use the disciplines such as mechanics, process control, mass transfer, basic processes, heat transfer, thermodynamics etc. where reaction processes are used in a very wide sense in biotechnology. As with all food processes, the optimum physical and chemical factors that enable the work of enzymes that are essential in food biotechnology should be created together with other factors. The main factors include pH, temperature, pressure, formation of oxygenated or non-oxygenated medium, dry matter, water activity, carbohydrate source, or substrate, etc. These are the closed systems that optimize the main factors and provide the desired conditions in production. Most places are tanks. Some areas of food biotechnology are carried out with continuous, semi-batch and batch systems. In continuous and semi-continuous systems, the entire production can be directed by process control panels. Food engineering is also known as process engineering. It is important for hygiene sanitation to be designed according to CIP (Cleaning in Place) system. The healthy operation of enzymes is possible by providing complete and perfect process conditions in order to obtain the desired product in fermentation technologies (Figure 4).^{4,5}

Main fermentation food products

We consume many fermentation foods in our daily life, especially leavened bread. These are the main food products with high production rates and are also included in food preservation methods. Fermentative dairy products; kefir, kimiz, yoghurt, buttermilk, etc., boza, turnip, tarhana, pickles and olives, etc. are brine products. On the other hand, the production of beer, wine, ethyl alcohol, the production of distilled spirits (the production of ethyl alcohol on the basis of the process, suma, various spices and herbs as known drugs) i.e. flavors) are known as biotechnology activities.

There is an important principle in the food industry “Good raw materials cannot be produced from bad raw materials” so the raw materials must comply with quality standards. In fact, HACCP (Hazard analysis in critical control points) constitutes the basis of food safety standards in the world.⁷In food biotechnology quality of raw material must be controlled in beginning of treatment together with process conditions (Figure 5).



Figure 4 Bread production picture.

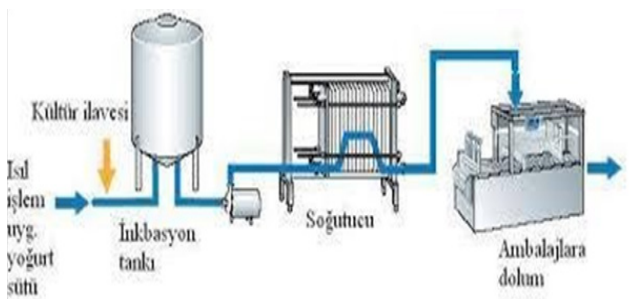


Figure 5 Yogurt production.

Economy and main food biotechnology products description

Today, oil and natural gas-rich countries, and even industrialized countries, have created huge incomes from agriculture oriented agriculture and created employment. Soils, water and seas are the most important elements that need to be protected. Improving agriculture in the development and elimination of unemployment, developing agriculture based industries, especially food industry, creating employment and development and prosperity should be ensured in each society and regions. The peace and development of our country, even the countries in which we are located, will also serve as an example. Our country is also a granary and the development of industrial branches connected to grain will create an important value-added economy. The peace and tranquility of our country will be an example even in the geography of our country. Countries will protect their unity and integrity by strengthening together with us. Our country is also a granary and the development of industrial branches

connected to grain will create an important value-added economy (Figure 6).

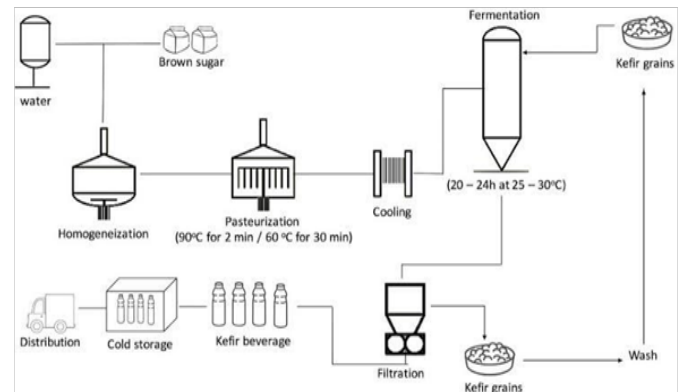


Figure 6 Kefir production.

Beer

The raw material in beer production is barley. It is preferred compared to other cereals because it is husked that gives aroma beer, protects leaflet in germination, helps in filtering. Hops (*Humulus lupulus*) is an important medicinal plant and beer that gives aroma, gives an astringent and bitter taste to beer, helps to coagulate proteins, and is effective against even tuberculosis bacteria. Barley malt is prepared for quality control.⁸ Barley is cleaned, soaked after being classified, germinated barley called germinated green malt. Then it is dried and roasted (Figure 7).

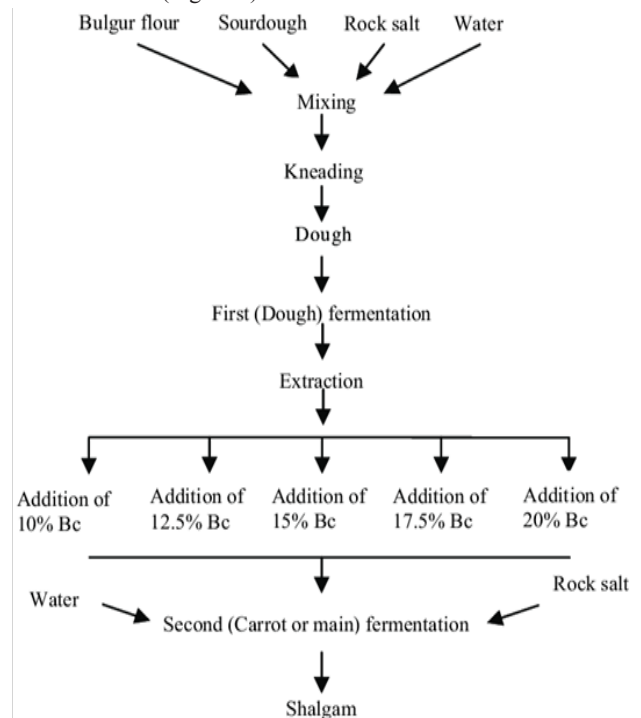


Figure 7 Shalham production scheme.

- I. The malt is ground and mixed with water to obtain a mash, then filtered to obtain must, boiling with hops, hops are separated and cooled to fermentation temperature after filtration
- II. The fermentation phase is started.

- III. 1. It is put into the original fermentation and then 2. It is put into fermentation or rest. Filtering, bottling and pasteurization are done.⁹

Fermented bread

Production of fermented bread that produced by fermentation of fermented dough (*Saccharomyces cerevisiae*) brewer's yeast) are mainly fermentation products such as bread, boza and tarhana. Fermented bread production has fermentation process that is evaluated in food biotechnology. Yeast (*Saccharomyces cerevisiae*) added dough reaches approximately three times higher than initial dough volume. Gluten content and quality is the most important element in bread making.¹⁰ Gluten of wheat and it provides volume during the fermentation by forming a network just like honeycomb during the fermentation. While developing beneficial nutrients in fermented bread, phytic acid breaks down phytic acid, which prevents the intake of essential minerals such as Fe, Zn, and enables the body to benefit from beneficial minerals. Therefore, leavened whole wheat bread should be the most preferred type of bread.^{11,12}

Turkish fermented milk product productions

Yoghurt, kefir, buttermilk and koumiss are the most functional products that are introduced to the world by Turkish Culture and are very useful for human health.¹³ Yoghurt, kefir, ayran and kimiz are highly functional products that are introduced to the world by Turkish Culture and are highly beneficial to human health. Together are the most important locomotive products.¹⁴

Kefir

Kefir is a beverage in which more than two 25 to 30 kinds of microorganism cultures are produced using a combination. Kefir can be evaluated as functional and medicinal food subjects because of containing various beneficial compounds and probiotic. Kefir is one of famous Turkish fermented dairy products.¹⁵ Kefir has other important benefits in addition to the health-rich probiotic composition. B complex is also rich in vitamins and minerals. In addition, Kefir has been shown to have beneficial effects on the digestive system, reducing the tolerance of lactose, anti-bacterial effect, hypocholesterolemic effect, control of plasma glucose, antihypertensive effect, anti-inflammatory effect, antioxidant, anti-carcinogenic and antiallergic activity.^{16,17} Fermented dairy products also have therapeutic properties against some diseases, such as bone resorption, hepatic encephalopathy, insufficient renal function, diarrhea, gastric ulcer, anti-helicobacter, provide protection against the side effects of radio therapy.¹⁸

Tarhana

According to the description of Turkish Standards Institute (TSE) tarhana; "Wheat flour or crushed or semolina or a mixture of yogurt, pepper, salt, nectarine, tomato, taste and smell, harmless to the health of herbal substances (dill, mint, tarhana grass, etc.). is a food with high nutritional value."¹⁹

Shalgam

Turnip bulgur flour from black carrot is a fermentation product produced by lactic acid fermentation. It contains an important antioxidant anthocyanin cyanidin-3-glycoside. It is a fermented product which has an important place in the food culture of our southern provinces such as Adana and Mersin Cities.²⁰

Boza

Boza is a fermented and lactic acid traditional Turkish beverages²¹ and is produced with millet, maize, rice and wheat. that consumed in kinds of rituals especially in winter evenings as hot or cold with leblebi.

Raw materials

Boiling mixture (1-2 h.), Cooling and filtration, Sugar addition (average %20), Fermentation 15-25°C, 24 h.), Cooling(under 15°C), Packaging and storage.

Wine, champagne, vinegar, yeast (*saccharomyces cerevisiae*) and ethylalcol productions

Wine is understood to mean light alcoholic beverages obtained by anaerobic alcohol fermentation from red and white grape must. Sparkling wine is known as champagne. The added ecology of wine grapes is one of the most important industrial products.²² Vinegar production is firstly obtained by alcohol fermentation and then by aerobic fermentation under aerobic conditions. It is not known with this name when it is produced from grape, but it is produced as known from other fruits rather than other fruits. In addition, yeast production from kinds of carbohydrate substrate sources is a typical food biotechnology study in which bioreactors are used in the food industry where semi-batch or even continuous bioreactors are used. Productions are carried out in factories that have high technology accounts and process control schemes and employ large amounts of employment.²³

Distilled alcoholic beverages

Raki and other alcoholic beverages due to the production of ethyl alcohol and suma, as well as whiskey, rum, cognac drinks, aged alcoholic beverages, gin, vodka, liqueur, aged in oak barrels, such as anise, juniper seed, coriander, aromatized alcohol ratios with various fruits Distilled alcoholic beverages contains around 50% alcohol. In modern factory products, where intermittent bioreactors are used in the production of ethyl alcohol that expose to fermentation treatment from carbohydrate substrate such as grape.^{2,24}

Conclusion

Main essential nutrients; Essential amino acids, essential fatty acids, proteins of high biological value, vitamins and mineral substances are combined with foods that provide enough calories to the extent needed by the organism.

Food biotechnology products have great importance from point of nutrition and obesity. Alcohol consumption must be reduced because of high calorie intake and harmful effect to some organs such as brain, liver and also cause social problems when consumed excessive amount. Essential nutrients must not be able to synthesize from the body, but the functional compounds are not essential. They are good and beneficial effect to body. They can be supportive and help prevent diseases, but they are not "essential". That is, if not taken, systemic diseases due to their deficiencies do not occur, but they can be preventive and supportive. In addition, fermentation food biotechnology products, which are rich in functional nutrition, antioxidants, antimicrobials, probiotics and bioactive components, are products that produce added value economies by producing them in high capacity factories in modern systems.

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