

MILK AND MILK BY PRODUCTS AND ALTERNATIVE ASSESSMENT METHODS МОЛОКО И МОЛОЧНЫЕ ПРОДУКТЫ: АЛЬТЕРНАТИВНЫЕ МЕТОДЫ ОЦЕНКИ

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There are always byproducts and residues in the processing of raw material into final crops. These constitute parts of the original material that are not evaluated. In the dairy industry, various residues remain in the processing of the raw material milk into crops. “Skimmed milk, cheese water and buttermilk” are left over from the separation of milk into cream, processing into cheese and butter and making butter from yogurt. In terms of utilizing these substances, preventing the loss of nutritionally important nutrients, and also using them in animal and human nutrition, commercial products such as glue, oil paint, artificial fabric contain raw materials such as acetone, alcohol, acid. They are of great importance in terms of food supply and economy.

При переработке сырья в конечную продукцию всегда есть побочные продукты и остатки. Они представляют собой части исходного сырья, которые не оцениваются. В молочной промышленности при переработке молочного сырья в продукцию остаются различные остатки. «Обезжиренное молоко, сыворотка и пахта» остаются после сепарирования молока на сливки, производства сыра и масла и изготовления масла из йогурта. С точки зрения использования этих продуктов, предотвращение потери важных питательных веществ, а также их использование в питании животных и человека, торговые продукты, такие как клей, масляная краска, искусственные ткани, содержат такое сырье, как ацетон, спирт, кислоты. Они имеют большое значение с точки зрения поставки продуктов питания и бережливости.

Keywords: Buttermilk (yogurt churn residue), whey, milk, skim milk, butter milk

Ключевые слова: пахта (остатки перемешивания йогурта), сыворотка, молоко, обезжиренное молоко, пахта.

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Introduction

Wastes from dairy product such as alcoholic and non-alcoholic whey drinks, buttermilk drinks, lactose, lactic acid, acetic acid, citric acid, whey powder, whey protein concentrate, lactalbumin, whey protein isolate, biomass (single cell protein), ammonium lactate, different by-products such as buttermilk, curd, margarine, butter can be evaluated as.

In addition, these wastes can be used in animal nutrition, cosmetics industry, medicine and some agricultural applications [1–3]. There are some residues in butter production. Milk is not only offered to consumption directly, but it is also processed into various products as it loses its properties in a short time. In addition to these products, residues are also obtained and a significant part of the nutrients in milk pass into these residues [4].

The aim of this study is to reveal the by products and alternative assessment methods in milk and milk products processing sector.

By-Products and Alternative Assessment Methods in Dairy Processing Industry

Dairy residues containing animal protein, fat, sugar and mineral substances are utilized in different ways by many countries. The whey left over from cheese and casein technology is one of the most produced by-products of the dairy industry. It is the most problematic residue to evaluate for reasons such as low dry matter, easily perishable like milk, and uneconomic to transport [4].

It is used in modern business and also sometimes given to animals or dumped in fields, sometimes it has to be thrown into canals and streams. In addition, if these valuable products are disposed of without processing, they damage life in

the waters they mix as a result of some bacteriological and chemical degradation, and even cause them to die completely after a certain point [5].

It is the treatment method generally applied to comply with certain parameters of dairy industry wastes [5]. This method consists of 3 steps:

A – Pretreatment: In this, coarse substances are separated by grids. The pH is kept at a certain level, the oil in the waste is separated from other waste. In this section, the BOD (Biological Oxygen requirement) goes out and its rate is 25–35% [5].

B – Chemical Treatment: Coagulation is made using substances such as calcium hydroxide, aluminum sulphate and ferric chloride. BOD removal rate is 50–85% [5].

C – Biological Treatment: This stage can be done in 2 ways (aerobic and anaerobic). Dairy industry wastes can be easily treated by aerobic method. In this system, biochemical oxidation accelerates with the provision of oxygen and bacteria culture and thus dissolved organic substances are removed [5].

Whey

Whey is a green-yellow liquid obtained from cheese production. Whey is classified as sweet and acidic whey due to the processing of milk with the casein enzyme.

Sweet (rennet) whey is obtained after the reaction of the chymosin enzyme with the casein fraction of milk, which constitutes a significant part of milk proteins. As a result of the loss of colloidal solubility, a coagulation from casein is seen and this structure separates into whey and curd. Whey consists of 93–94% water and milk serum such as lactose, soluble proteins, minerals, lactic acid and oil (Table 1) [6, 2].

Table 1 – Some compositions of sweet and sour whey (g/L) [2]

Composition	Sweet whey	Sour whey
Total dry matter	63–70	63–70
Lactose	46–52	44–46
Protein	6–10	6–8
Ca	0.4–0.6	1.2–1.6
Phosphate	1–3	2–4.5
Lactate	2.0	6.4
Cl ₂	1.1	1.1

Whey proteins have high nutritional value and functional properties. As a result of these features, it is mostly used in both animal and human nutrition [7]. Although acidic whey contains more lactic acid than sweet whey, the ratio of lactic acid affects the nutritional and process values of whey.

Significant advances have been made in whey production and processing techniques, especially in the last thirty years. There is an increasing commercial interest in the separation and classification of whey components in particular [6].

These properties are enhanced in functionality and nutritional value by purifying whey proteins and isolating them from other ingredients. On the other hand, their high salt content limits the application area of whey ingredients and whey. Salt content directly affects their functional properties and nutritional value, as well as aroma and quality. Therefore, demineralization technique should be applied before other techniques [7].

When the functional properties of milk proteins are examined, apart from their high nutritional value, they are also defined by properties specific to whey, such as structural, appearance, viscosity and texture. However, the parameters that make the functional properties of proteins effective are due to some of their physical and chemical properties.

It has been determined that the functional, physical and chemical properties of these proteins can be changed by different techniques applied during food processing. The most obvious example of this is the increase in the structure and hydrophobic interactions of proteins with denaturation. These properties are enhanced in functionality and nutritional value by purifying whey proteins and isolating them from other ingredients. On the other hand, their high salt content limits the application area of whey ingredients and whey.

Salt content directly affects their functional properties and nutritional value, as well as aroma and quality. For this reason, the demineralization technique should be applied before other techniques [7].

The properties and composition of whey depend on the cheese production technology and the quality of the milk used in cheese production [7].

Products Made of Whey

Today, various whey products are obtained thanks to developing technologies such as ultrafiltration, microfiltration, reverse osmosis and ion exchange. Whey protein concentrates, whey protein isolates, low-lactose whey, demineralized whey, and hydrolyzed whey are used commercially [8, 9].

Whey Drinks

In the food industry, whey is utilized in different ways. However, it is mostly dried as whey powder or used for the production of whey protein concentrates and for the separation of lactose or proteins [10].

Beverage production from whey started in the 1970s. One of the oldest whey drinks is Rivella produced in Switzerland. Until today, the production of different natural sweet or sour, de-proteined, reconstituted, fermented and dried whey drinks

has developed widely. Because of its beneficial effects on health, it has been used since the ancient Greek age in the treatment of some diseases such as tuberculosis, skin and digestive system ailments [10].

Non-Alcoholic Whey Drinks

The production of whey beverages whose formulas and methods have been developed in the last decade, various dry matter amounts of fruit added with fruit concentrate (5–20%) have been registered with various patents. Of these beverages, drinks with a citrus flavor and other tropical fruit flavors such as mango, banana or papaya are most often recommended. Because these beverages have proven to be very effective in masking the unwanted cooked milk aroma and the salty-sour aroma of fresh whey [10].

Until today, the production of different natural sweet or sour, de-proteined, reconstituted, fermented and dried whey drinks has developed widely. Whey-based drinks target a wide range of consumers, from the elderly to young children. Due to its beneficial effects on health, it has been used since the Ancient Greek era in the treatment of some diseases such as tuberculosis, skin and digestive system disorders. In the 18th century, specialized institutes were established for the treatment of diseases with whey, and detailed studies were started on the nutritional and therapeutic properties of whey [10].

At that time, terms called “cheese cures” were common in Switzerland, Germany and Austria. Whey is also successfully used for the treatment of diarrhea, biliary diseases, skin problems, scaling in the urinary area and some intoxications.

Due to the high amount of protein in these beverages with high nutritional value, they are the ideal food and energy source for athletes. Whey proteins are a rich source of branched chain amino acids such as isoleucine, leucine and valine. These amino acids are unlike other essential amino acids because they are metabolized and are the first amino acids used directly in muscle tissue and during exercise and resistance training [10].

Whey protein fractions are lactoferrin, an iron-binding protein, rennet in cheese making. It also includes post-use glycomacropeptide (GMP), naturally free phenylalanine and α -lactalbumin, a calcium-binding protein. This route can be used as a functional food in whey beverages due to the presence of lactoferrin, improving the absorption of iron from the desired foods and / or keeping pathogens without binding to the intestinal walls [10].

Whey Products

Lactic acid production

Whey is purified from unwanted microorganisms by heat treatment and lactic acid is obtained by inoculating with homofermentative lactic acid bacteria. *Lactobacillus helveticus*, *Lactobacillus delbrueckii*, *Lactobacillus casei*, *Lactobacillus delbrueckii* ssp. Many studies have been done on the use of bulgaricus bacteria in production [11].

Whey powder

“Lactoserum” in French, “Whey” in English, “Molke” in German, concentrated whey, whey powder, lactose reduced and demineralized whey, whey concentrate, whey protein isolate and various It is used in the production of pure proteins [12].

It is obtained by drying whey. The drying process is carried out in a spray dryer. The moisture content of the product obtained varies between 12–15%. Whey powders mixed with molasses and soy flour are mostly used as animal feed [12].

In the food industry, it is widely used in the production of baby food, yoghurts, ice cream, cakes, sweeteners, confectionery, meat products, soups, sauces and beverages. It has been reported that the use of whey powder in bakery products increases the quality and nutritional value of the products [12].

Whey protein isolate

This product contains more than 90% protein in its composition, it contains only 1% fat, 1% lactose and 3% mineral substance [7]. In addition to all these, modified whey products can also be used in making margarine.

In the USA, in addition to other milk protein concentrates, whey powder obtained by gel filtration method and partially removed lactose is used between 2–4% in order to improve the texture and water release properties of margarine [13].

Buttermilk

The main residue in butter production is the “buttermilk” that is left behind as a result of the churning of butter. Since most of the fat-soluble vitamins are separated with the oil, the ratio of these kinds of vitamins in buttermilk is low. Phospholipid ratio is very high.

The reason for this is that these substances remain under the churn during churning. Buttermilk coagulates easily in the stomach, so it is easy to digest [14].

The composition of buttermilk varies according to the composition of the cream used, the butter production method and the processes at the various stages of production (Table 2) [14, 15].

Table 2 – Chemical Composition of Buttermilk [15]

Composition	Buttermilk (%)
Protein	3.5
Lactose	5.1
Ash	0.8
Fat	0.1

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АНАЛИЗ ЗАБОЛЕВАЕМОСТИ НАСЕЛЕНИЯ ГРОДНЕНСКОЙ ОБЛАСТИ БОЛЕЗНЯМИ СИСТЕМЫ КРОВООБРАЩЕНИЯ

ANALYSIS OF THE MORBIDITY OF THE POPULATION OF THE GRODNO REGION WITH DISEASES OF THE BLOOD CIRCULATION SYSTEM

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Результаты проводимого исследования свидетельствуют о выраженном росте заболеваемости системы кровообращения, в Гродненской области за 2016–20 гг., которые имеют устойчивую тенденцию к росту ($R^2 = 0,9$). Среднегодовой показатель общей заболеваемости системы кровообращения составил 30422,34 на 100 тыс. населения, а первичной - 2838,16 на 100 тыс. населения. За 2016–20 гг. БСК у взрослого населения Гродненской области увеличились на 18,6%.

The results of the study indicate a pronounced increase in the incidence of the circulatory system in the Grodno region during 2016–20, which have a steady upward trend ($R^2 = 0.9$). The average annual rate of general morbidity in the circulatory system was 30,422.34 per 100 thousand of the population, and the primary rate was 2838.16 per 100 thousand of the population. During 2016–20, the BSC in the adult population of the Grodno region increased by 18.6%.

Ключевые слова: болезни системы кровообращения, заболеваемость, диагностика, эпидемиологические аспекты.

Keywords: diseases of the circulatory system, morbidity, diagnosis, epidemiological aspects.

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