STUDY OF THE STRUCTURE, CHARACTERISTICS AND METHODS OF OBTAINING BASIC FOOD ACIDS.

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Abstract

We all know that the foods we eat every day contain various types of acid and more.

Food acids are a group of substances of organic and inorganic nature, diverse in their properties. The composition and characteristics of the chemical structure of food acids are different and depend on the specifics of the food object, as well as on the nature of acid formation. This article discusses the main food acids, study their physical and chemical properties, and get acquainted with methods for determining acids in food products.

Keywords:

Distinctive feature, lactic acid, dairy products, biochemical transformation, digestive processes, carcinogenic nitrosamines, cancer pathologies.

Almost all food products contain acids and their acidic and moderate salts. In processed products, acids come from raw materials, but they are often added during production or formed during fermentation. Acids give products a specific taste and smell, extend shelf life, and also contribute to their better absorption [1].

Organic acids most often found in plant objects are malic, citric, tartaric, oxalic, pyruvic, and lactic. Lactic, phosphoric, and other acids are common in animal products. In addition, fatty acids are found in a free state in small quantities, which sometimes worsen the taste and smell of products. As a rule, food products contain mixtures of acids [2]. Due to the presence of free acids and acid salts, many foods and their aqueous extracts are acidic.

As a result of food processing and storage, acidity may change. Thus, the acidity of cabbage, cucumbers, apples and some other vegetables and fruits increases during the fermentation process as a result of the new formation of acids. The acidity of the dough increases during the fermentation process, and the acidity of milk

increases during the production of, for example, kefir, sour cream, and yogurt; At the same time, fermented milk products have new properties compared to the original raw materials, and some of them are considered dietary [3].

When storing finished products, their acidity may increase, as a result of which their quality decreases (souring of table grape wines, dairy products, rancidity of fats, etc.). Fresh wheat and rye flour always has an acidic reaction, which is caused by acidic salts, mainly KH2PO4 and Ca(H2PO4). During long-term storage, the acidity of flour increases as a result of the enzymatic breakdown of phosphoglycerides with the formation of fatty acids and phosphoric acid, as well as due to the hydrolysis of fats into fatty acids and glycerol. At high humidity during the storage of sugar and flour, lactic acid is formed under the influence of lactic acid bacteria, which can subsequently be converted into acetic and propanoic acids under the action of appropriate bacteria [4].

The acidity of milk and dairy products is formed both due to lactic acid, which is formed as a result of biochemical transformations of lactose in milk, and due to other acids and acid salts contained in milk, as well as acid groups of casein.

The most typical components of various fruits and berries are citric and malic acids. Among other acids, quinic, succinic and oxalic acids are often found. Common acids also include shikimic, glycolic, fumaric, glyceric and tartaric acids [5]. The concentrations of individual organic acids in different fruits and berries are different. Citrus fruits contain mainly citric acid and small amounts of malic acid. The content of the latter in oranges is 10 - 25%, in tangerines - up to 20%, in grapefruits and lemons - up to 5% in relation to total acidity. Unlike fruits, orange peels contain a significant (approximately 0.1%) amount of oxalic acid [4].

Citric acid is also the main acid in the acid spectrum of pineapples, where its content reaches 85%. The share of malic acid in these fruits accounts for about 10%.

The dominant acid in pome and stone fruits is malic acid, and its content in their acid spectrum ranges from 50 to 90%.

In sour varieties of apples, malic acid makes up more than 90% of the total acidity; in cherries and cherries its concentration reaches 85 - 90%, in plums (depending on the variety) - from 35 to 90% [6]. Other acids in these fruits include citric and quinic.

More than 90% of the acidity is due to malic, citric and quinic acids in fruits such as peaches and apricots, and the ratio of malic and citric acids can fluctuate over a wide range, which in some cases is associated with changes in the content of these acids in fruits during the ripening process. It has been established, for example, that when peaches ripen, the amount of malic acid in them increases significantly, and citric acid decreases.

Unlike other types of fruits, the main one in grapes is tartaric acid, which makes up 50 - 65% of the total acidity. The remainder is made up of malic (25 - 30%) and citric (up to 10%) acids. The content of tartaric acid during the ripening of grapes decreases less intensively than tartaric acid [7].

The acid spectrum of vegetables is predominantly represented by the same organic acids, the ratio of which varies widely. In addition to the already known ones, succinic, fumaric, pyroglutamic and some other acids of various structures are found in vegetables. The presence of inorganic acids in tomatoes - phosphoric, sulfuric and hydrochloric - is their distinctive feature. Lactic acid is the main organic acid in milk and dairy products. Its formation is associated with the biochemical transformation of milk sugar - lactose, under the influence of lactic acid bacteria.

The main function of organic acids that make up food is determined by their participation in digestive processes [8].

Some other effects have been found for various organic acids.

It has been shown that certain food acids, such as citric acid, prevent the formation of carcinogenic nitrosamines in the body and help reduce the risk of the occurrence and development of cancer pathologies. Citric acid (respectively, citrate) also promotes the absorption of calcium by the body (its content in bones and teeth is

0.5 - 1.5%), and has an activating or inhibitory effect on certain enzymes. Benzoic acid has an antiseptic effect [9].

However, the negative effects of some acids are known. For example, oxalic acid in the form of a calcium salt can be deposited in joints or in the form of stones in the urinary tract. The main food sources of this acid are green gooseberries, spinach leaves, sorrel and nettle. In contrast, urea citrate plays an important role in processes that prevent the precipitation of calcium salts in the ureters. The formation of complexes with calcium and magnesium also underlies the process of bleeding inhibition. Tartaric acid is not absorbed by the human body.

Food acids in the composition of food raw materials and products perform various functions determined by the quality of food objects. As part of a complex of flavoring substances, they participate in the formation of taste and aroma, which are among the main indicators of the quality of a food product. It is taste, along with smell and appearance, that has a more significant impact on the consumer's choice of a particular product when compared with such indicators as composition and nutritional value. Changes in taste and aroma are often characteristic signs of the onset of spoilage of a food product or the presence of foreign substances in its composition [5].

The main taste sensation caused by the presence of acids in the product is sour taste, which is generally proportional to the concentration of H+ ions. For example, the threshold concentration (the minimum concentration of a flavoring substance perceived by the senses) that allows one to perceive a sour taste is 0.017% for citric acid and 0.03% for acetic acid [1].

In the case of organic acids, the perception of sour taste is also influenced by the anion of the molecule. Depending on the nature of the latter, combined taste sensations may occur, for example, citric acid has a sweet and sour taste, and picric acid has a bitter and sour taste. A change in taste sensations also occurs in the presence of salts of organic acids. For example, ammonium salts give foods a salty taste. Naturally, the presence of several organic acids in the product composition in

combination with flavoring organic substances of other classes determines the formation of original taste sensations, often characteristic exclusively of one specific type of food product [5].

Nutrition is the main factor ensuring optimal growth and development of the human body, its ability to work, and adaptation to the effects of various environmental conditions. The nutritional factor has a decisive influence on human life expectancy and active activity. In the process of nutrition, food is transformed from an external into an internal factor, the elements of food serve as a source of energy for the physiological functions and structural elements of the human body.

Food chemistry is the science of the chemical composition of food systems (raw materials, intermediate products, finished food products), its changes during the process flow under the influence of various physical, chemical and biochemical factors. She studies the relationship between the structure of the properties of nutrients and the nutritional value of food products. This science develops new principles and methods for analyzing food systems, as well as quality management systems. The main direction of food chemistry is the chemical composition of food raw materials, semi-finished products, finished food products, nutritional value and environmental safety. Based on this, we can conclude that it is very important to understand what we eat and what chemicals are contained in our products.

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