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TECHNOLOGICAL FACTORS AFFECTING THE STORAGE OF THE QUALITY OF SEMI-HARD CHEESES

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ANNOTATION

The article shows that the formation of the organoleptic characteristics of cheeses occurs in the process of its maturation, i.e. aging under certain temperature and humidity conditions as a result of enzymatic processes that cause a change in all components of the cheese mass and the formation of a characteristic taste and texture. Cheese is stored at lower temperatures, but the enzymatic processes do not stop, but proceed more slowly. The factors influencing the preservation of consumer characteristics of cheeses during storage until the expiration date, such as the quality of the original milk, the nature of the origin of the milk-clotting enzyme preparation, are considered. A very important factor in preserving the consumer characteristics of cheese during storage is the compliance of its chemical composition with the recommended parameters. Of particular importance are the mass fraction of moisture, active acidity and mass fraction of salt. When forecasting for long-term storage of semi-hard cheese, in order to preserve its organoleptic characteristics until the end of the shelf life, it is necessary to reduce the mass fraction of moisture as much as possible. The combination of high humidity, low pH and high salt content is critical.

Keywords: cheese, ripening, organoleptic indicators, shelf life, storage capacity, risk factors, quality.

INTRODUCTION

Semi-hard cheeses (Samarkand) are products with a relatively long shelf life. The technology of their manufacture is also long in time, because. includes such a stage as “ripening”, which, depending on the type of cheese, can last from 15 to 90 days. Ripening or aging of cheese occurs under certain temperature and humidity conditions (temperature (12 ± 2) ° C, relative humidity (80 ± 10)%).

Cheese maturation is a complex set of interrelated microbiological, biochemical and physicochemical processes occurring in the cheese mass under the action of enzyme systems of starter microflora, milk-clotting enzyme, natural milk enzymes. At the same time, all its constituent parts (milk sugar, proteins, fat and other organic and mineral components) undergo certain transformations, which ultimately determines the formation of organoleptic indicators inherent in this type of cheese.

After the end of the ripening period, the cheese storage period begins at other, lower temperatures (4 ± 2) ° C, however, the biochemical processes of proteolysis and lipolysis do not stop, but proceed more slowly. As a result, during long-term storage, both the taste of the cheese and its consistency change.

Do not confuse storage with expiration date. Shelf life - the period after which the product is considered unsuitable for its intended use (Chapter 1, Article 1 of the Law "On Protection of Consumer Rights") "On Food Safety" (Chapter 1, Article 4) establishes the following definition of the shelf life: “shelf life of food products is the period of time during which food products must fully comply with the safety requirements imposed on it, established by this technical regulation, and also retain their consumer properties stated in the labeling.”

The expiration date must be indicated on the cheese label [1]. With regard to cheese, the fulfillment of this requirement often raises many questions, because the expiration date for ripening cheese (if it is set within reasonable limits) does not mean that the cheese must be destroyed. This is especially true for hard cheeses with a long ripening period (for example, 9-12 months or more). Cheese may lose its original characteristics, but remain usable. For cheese, there is such a thing as "age". This concept is necessary for calculating the duration of cheese ripening. The beginning of the technological process of making cheese is the date when the prepared milk went directly to the cheese maker to obtain a clot and process the cheese grain with further necessary technological operations. From the same date, the age of the cheese is also counted. For example, if the start of cheese production falls on 05/01/2022, and the duration of its maturation according to the technological instructions is 25 days, then the last day of maturation should be considered 05/25/2020. The next day, April 26, 2020, the cheese will have a full 25 days of age and will be suitable for sale. It must be understood that the age of cheese is the period that cheese has existed as a food product. It ends when the cheese is eaten or processed.

During the storage of cheese at the manufacturing plant, the quality of the cheese is checked every 30 days. To do this, by order of the director, a commission is appointed, consisting of specialists from the enterprise. Based on the conclusion of the commission on the quality of the

cheese, a protocol is drawn up and a decision is made on the possibility of further storage of the cheese, or its shipment to a distribution network, or on industrial processing or disposal.
However, any manufacturer is not immune from the situation when the demand for products falls, resulting in an increase in its stocks. In addition, it is known that the sale of cheese has a pronounced seasonal character. During this period, it is very important to maintain the quality of the product, i. its compliance with identification indicators, incl. and organoleptic criteria.
The processes of transformation of the protein matrix during cheese maturation proceed under the action of proteolytic enzymes of the starter microflora and a milk-clotting enzyme preparation. If in the manufacture of traditional semi-hard cheeses with a low temperature of the second heating, starter microflora with an unconventional composition (for example, lactic acid sticks) was used, then non-specific flavors may appear in the cheese during storage, which will also lead to a distortion of its consumer characteristics.
Milk-clotting enzyme preparations used in the manufacture of cheeses as a functionally necessary component have a different nature of origin. In semi-hard cheeses with a low second heating temperature, they also participate in the proteolysis process. Regulatory documents for each type of cheese usually indicate their preferred use. However, the latest generation of milk-clotting enzyme preparations show interesting results.
Studies conducted at VNIIMS showed that recombinant chymosin, which is currently widely used in industry, due to its low degree of nonspecific proteolysis, has increased the shelf life of semi-hard cheeses compared to cheeses produced using enzyme preparations of animal origin [2]. This knowledge is very important for manufacturers predicting the storage capacity of their product.
In cheesemaking, there is the concept of "overripe" cheese, more often applied specifically to semi-hard cheeses. This refers to the change in the organoleptic characteristics of cheese during storage compared to the characteristics of cheese at a standard age. This is the case when the cheese has changed its initial characteristics, but remains usable. Although on formal grounds it does not meet the requirements of regulatory documentation.
The overripening of cheese is expressed not only in a change in taste (the appearance of atypical notes in the flavor bouquet), but also in a change in the state of its consistency. The slower the process of proteolysis proceeds, the slower the protein matrix of the cheese is destroyed, the longer the elastic-plastic characteristics of the consistency are preserved.
A very important factor in preserving the consumer characteristics of cheese during storage is the compliance of its chemical composition with the recommended parameters. It is they who must ensure (subject to other conditions of the technological process) the receipt of organoleptic characteristics regulated by regulatory documentation by the end of the ripening process. Of particular importance are the mass fraction of moisture, active acidity and mass fraction of salt.
The regulatory documentation for any type of cheese indicates the maximum allowable moisture in the finished product. Of course, it is attractive for any manufacturer to work at the upper permissible values of indicators, since it depends on the yield of cheese. However, if it is assumed that the cheese will be stored for a long time, then in order to maintain its quality until the end of the shelf life, the mass fraction of moisture will have to be reduced. Increased humidity implies the activation of enzymatic processes due to a greater energy potential for the

starter microflora, i.e. higher lactose content in cheese mass. Proteolysis is more active - the cheese overripes faster.

The active acidity (pH) of the cheese mass at the end of grain processing determines the content of calcium and phosphorus in the cheese, the amount of milk-clotting enzyme remaining in the cheese mass affects the composition and structure of paracasein, the formation of organoleptic indicators. A low pH value contributes to the loss of calcium and phosphorus by the cheese mass, a decrease in its buffering properties, a decrease in the rate of proteolysis, and leads to the formation of a crumbly texture. A higher pH value than recommended for each group of cheeses increases the calcium content in the cheese and contributes to the formation of a rubbery texture [7].

The combination of high humidity, low pH and high salt content is critical. In this case, during the ripening of the cheese, there is no sufficient accumulation of flavoring substances, the cheese does not ripen, because. proteolytic processes are inhibited. When storing such cheese, the accumulation of foreign flavors in the flavor bouquet is possible due to the development of extraneous salt-resistant microflora, the consistency may acquire the properties of "plasticine" or, conversely, become incoherent, crumbly, brittle.

CONCLUSION

Forecasting the storage capacity of cheeses at the enterprise is an important task of the technological service. A thorough analysis of all factors affecting the preservation of quality during storage and the shelf life of cheese will avoid the risks of premature distortion of product identification indicators in accordance with the requirements of regulatory documentation, and will ensure the high quality of cheese during sale.

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