CHANGES IN CONSUMER PROPERTIES OF NEW PICKLED CHEESES DURING THEIR MATURATION AND STORAGE

Ryabchenko Nataliya, Rydavska Ganna.
Kyiv National University of Trade and Economics, 19, Kyoto, Kyiv, Ukraine
e-mail: Nata431@yandex.ru

In the article the results research of changes in consumer properties of new pickled cheeses during their maturation and storage. Made analysis of influence dietary additive *Lamidan* and serum proteins on consumer properties of new soft pickled cheeses.

Keywords: soft pickled cheeses, consumer properties, maturation, storage.

INTRODUCTION

Cheese is considered to be highly nutrimental foodstuff. Due to its bioavailability cheese is included in all nutrition budgets of alimentary therapy and dietetic nutrition. All the nutrient materials as well as biologically active substances of milk are present there in concentrated form. Nutritive value of pickled cheese is explained with its chemical composition as well as complex of organoleptical properties. During maturation and storage of pickled cheeses biochemical reactions are taking place resulting in acquisition of some characteristic properties [1, 2].

The study purposes were determination of changes in consumer values in the process of maturation and storage of new soft pickled cheeses produced with *Lamidan* dietary additive and serum proteins.

The subject of inquiry was new pickled cheeses produced with *Lamidan* dietary additive, namely: *Morskoy* and cheese called *Morskaya Khvilya* - with *Lamidan* dietary additive and serum proteins. Serum proteins have been obtained with thermal-acid method from serum resulting from cheese preparation. Cheese prepared under laboratory conditions of the manufacturer without any additive was considered to be a reference product.

Lamidan dietary additive produced by way of low-thermal treatment of brown marine seaweed was introduced into the cheese curd so as to fortify the product with iodine and selenium. Additives were introduced into the cheese curd prior to commencement of cheese formation. Investigation of changes taking place during maturation and storage of cheeses has been out with time interval of 3, 7, 15, 30 and 60 days from the moment of preparation. The temperature during maturation was in the range of 12...14 °C, during storage - 2...4 °C.

Weight percentage of moisture, titrating and active acidity, lactose and sodium chloride content as well as cheese maturity degree by Shilovich's scale have been determined in cheese under investigation and reference cheese.

RESULTS AND DISCUSSION

Water is important component of foodstuffs which preconditions their rheological properties. However, weight percentage of moisture indicates its amount only and throws no light

upon relation to chemical, biochemical and microbiological changes in pickled cheeses. Therefore, we conducted investigation of changes in weight percentage of moisture and amount of associated water during maturation and storage of pickled cheeses. According to established procedure content of associated water has been analyzed in samples under investigation [3]. Inherent is associated moisture of stable cohesion with different chemical components: proteins, lipids and carbons owing to chemical and physical bonds. The change in weight percentage of moisture and amount of associated water in pickled cheeses during maturation and storage is shown on Figure 1.

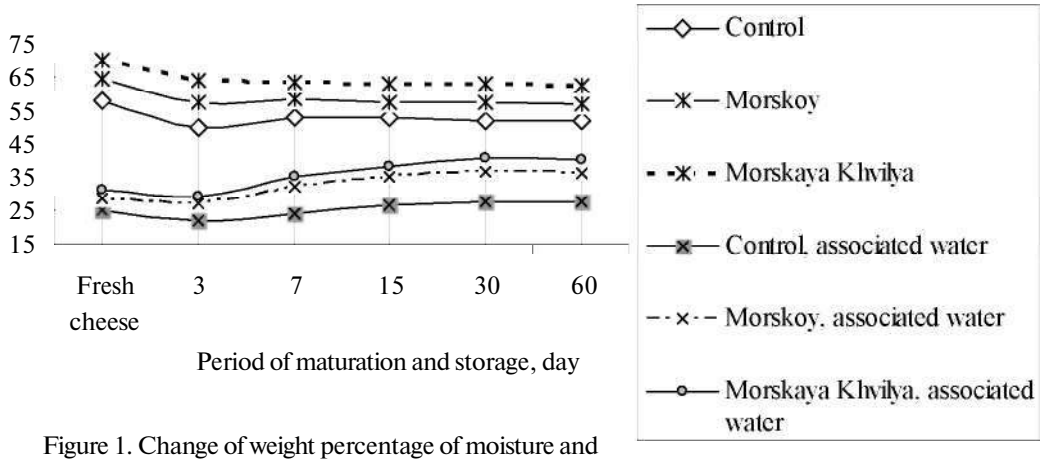

Figure 1. Change of weight percentage of moisture and associated water in pickled cheeses during maturation and storage

As seen from these data (Figure 1) weight percentage of moisture in pickled cheeses has decreased in the course of maturation and storage. Moisture content of *Morskoy and Morskaya Khvilya* cheeses was higher than that of reference cheese, i.e. amounted to 65,5 and 65.8% for the former cheeses and 61.5% for the latter, respectively. During maturation and storage moisture content of *Morskoy and Morskaya Khvilya* cheeses has lowered be 12.4 i 12.61 % while it has become lower by 13.2 % for reference cheeses. Moisture content in pickled cheeses becomes lower more intensively within the first 3-5 days of cheese maturation. Later on, slowdown of this process takes place.

Introduction of *Lamidan* dietary additive and serum proteins makes for less moisture losses during maturation and storage of cheese. At the same time introduction of *Lamidan* increases the amount of associated water in the product owing to its cohesion with alginic acid contained in *Lamidan*. In its turn, it produces a positive impact on consistency of pickled cheese. The biggest content of associated water before maturation was registered for n *Morskaya Khvilya* cheese under investigation (31 %), the smallest - for reference cheese (25%). During maturation and storage of cheese the amount of associated water in the product is becoming higher and has been equal to 30.6 % for reference cheese, 36.2% - for *Morskoy* and 39.4 % - for *Morskaya Khvilya* cheese under investigation by the end of storage period.

No profound hydrolysis of proteins during maturation and storage of pickled cheeses has been reported. However, exposure to sodium chloride provokes physical and chemical changes in protein base of the cheese impacting its structural and mechanical properties. Conversion of protein substances is restricted with swelling of paracasein in sodium chloride solution. As of beginning of maturation process, concentration of common salt in the cheese is 0.2 %. During the first two days of storage there is a gradual increase in common salt content with concurrent reduction of pickled cheese weight. This can be explained with salt diffusion into a cheese curd while water and serum is released into brine from the cheese curd. Meanwhile, the amount of salt penetrating the cheese is by far lower than the amount of serum to be released [4]. After 60 days of storage the concentration of common salt in a reference cheese amounted to 3.0 % and 2.9% in both cheeses under investigation.

Acid-alkali balance is an important parameter for monitoring production of pickled cheese [5]. As seen from Figure 2 titrating acidity of cheese has grown during its storage and maturation. Intensive splitting of milk sugar and increased acidity occurs in first days of cheese maturation. Titrating acidity of reference cheese before placing it to storage equals to 50 °T while it is 53 i 60 °T for reference cheeses .

As seen from Figure 2, maximal titrating acidity of reference cheese and cheeses under investigation is observed on the 30-th day and after it gradually comes down owing to accumulation of alkali after cleavage. As of the day of preserving the value of titrating acidity of reference cheese was 130 °T, 102 °T for *Morskoy* cheese and 70 °T for *Morskaya Khvilya* cheese.

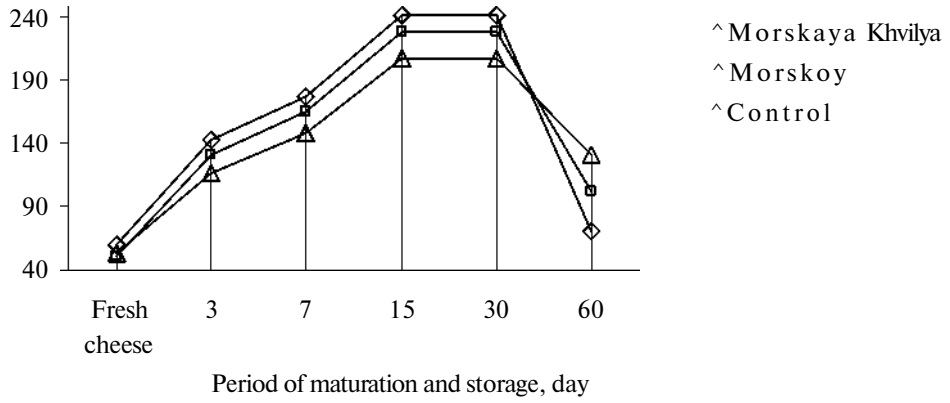

Figure 2. Change of titrating acidity of pickled cheeses during maturation and storage

The value of active acidity produces an impact on pickled cheese's consistency. When affected by introduced supplements, the level of active acidity of cheeses under investigation comes down right away after their preparation (Figure 3).

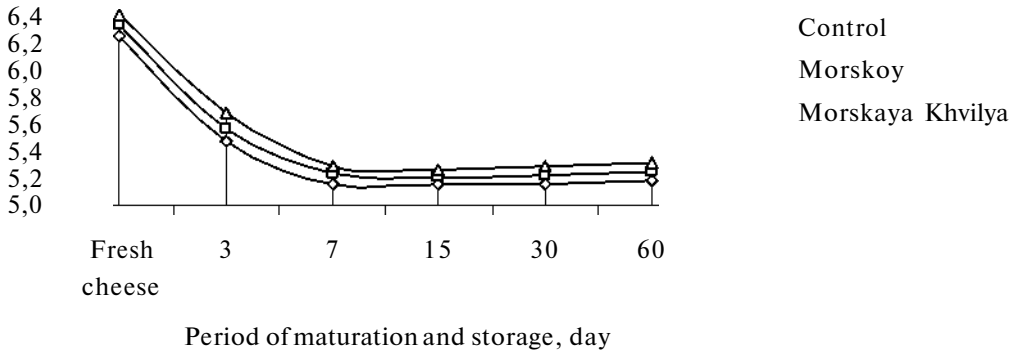

Figure 3. Change pH of pickled cheeses during maturation and storage

Active acidity of a reference pickled cheese before maturation is 6.35 while that of *Morskoy* and *Morskaya Khvilya* cheeses – 6.25 and 6.3, respectfully. The maximum value of active acidity of a pickled cheese is observed in the beginning of maturation which contemporized with the period of intensive life activity of lactic-acid bacteria. Once generation of lactic acid stops, titrating acidity of pickled cheese becomes practically steady on the base level. Its minor increase is observed as of the end of cheese storage period. After maturation and storage of pickled cheese for 60 days active acidity of a reference pickled cheese amounted to 5.2, and *Morskoy* and *Morskaya Khvilya* cheeses under investigation - 5,3.

The replacement of milk sugar in the pickled cheese commences from moment of milk inoculation and cheese curd processing [6]. Intensive splitting of milk sugar as well as acidity

growth takes place within the first days of cheese maturation. As seen from Figure 4, milk sugar is fermented almost completely within 15-day period. Fermentation of milk sugar in *Morskoy* and *Morskaya Khvilya* cheeses under investigation takes place more intensively as compared with reference cheese.

The specific characteristic of pickled cheeses is availability of some lactose after 60 days of storage which is explained with the impact of common salt. The salt penetrates cheese curd decelerating development of lactic-acid bacteria and lactose splitting thereto related. Intensiveness of lactic-acid bacteria development is important at the first stages of pickled cheese preparation. Introduction of *Lamidan* dietary additive and serum proteins facilitates development of lactic-acid bacteria and lactose splitting which is proved with regularities of changes occurring in milk sugar and cheese acidity (Figure 4).

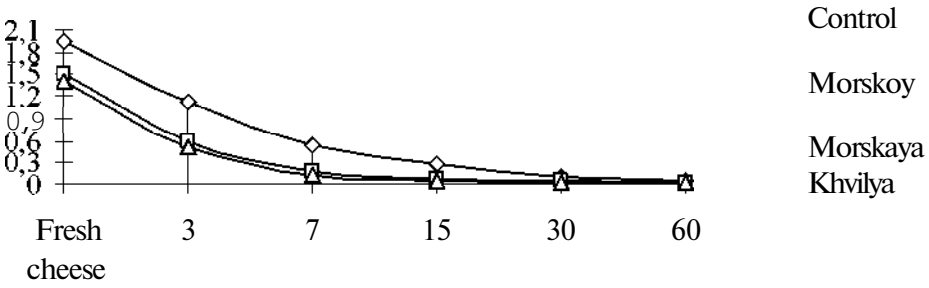

Figure 4. Change of lactose of pickled cheeses during maturation and storage

In testimony where of Figure 5 shows dynamics of microbial flora changes in the process of maturation and storage of pickled cheeses. The represented data once more prove positive impact of *Lamidan* and serum proteins upon intensiveness of microbiological processes during maturation. Intensity of microbiological processes occurring during the first

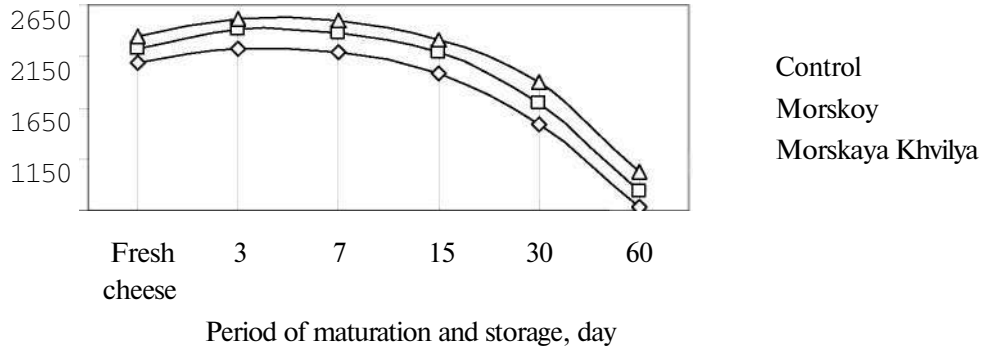

Figure 5. Change of microbial flora of pickled cheeses during maturation and storage

stage of cheese maturation indirectly leads to its accelerated maturation at the next stage. Complete fermentation of cheese leaves lactic-acid bacteria no chance to continue their vital activity, therefore, bacterial die-off is observed. Proteolytic enzymes acting inside cells only in the lifetime of lactic-acid bacterium are herewith released from cork cells (as a result of autolysis). These are enzymes that speed up cleavage of cheese curd proteins and cheese maturation accordingly. Maturity degree of cheese characterized with level of protein cleavage can be measured using Shilovich's scale with value of buffering capacity of protein components. The profounder is the protein cleavage, the higher is the buffering capacity and maturity degree of cheese. At the age of 60 days the highest maturity degree of 89 °Ш is observed for *Morskaya*

Khvilya cheese (Figure 6) and the lowest of 76 °Ш - for reference cheese. *Morskoy* cheese is somewhere in the middle between the two (with its maturity degree of 83 °Ш). Introduction of serum proteins speeds up the process of protein proteolysis.

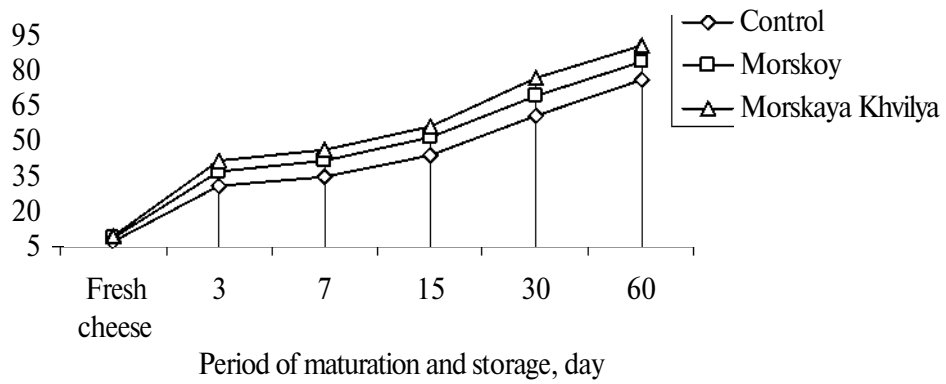

Figure 6. Change of maturity degree of pickled cheeses during maturation and storage

Thus, the use of *Lamidan* dietary additive and serum proteins in making soft-ripened cheeses makes for intensification of biochemical processes during maturation of pickled cheese as well as improvement of consumer properties of finished products. The amount of associated water in pickled cheeses is increased with their consistency improving as well.

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