RESEARCH ON THE EXTENSION OF THE VALIDITY PERIOD FOR BOILED - SLICED MEATS, MANUFACTURED BY THE NATIONAL MANUFACTURER IN ACCORDANCE WITH THE NORMATIVE ACTS IN FORCE

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Abstract

Currently, the issue of food quality and safety has become a key factor in meeting consumers' requirements. Samples from the category of sliced boiled sausages were inspected: Parizer "Doctorskaia" boiled, of high quality, sliced, non-edible artificial casing, packed in a protective(modified) atmosphere, with three different manufacturing dates (three batches). The investigations were based on complex research in dynamics of physico-chemical and microbiological quality indices, to study the possibility of extending the shelf life up to 30 days at t°C = 0 + 6°C and the relative humidity of the air max.- 75%, of meat products, manufactured according to the company standards and the technological instructions in force of the meat processor. Thus, there were obtained very good results, related to the organoleptic characteristics physicochemical and microbiological indices since they have not changed considerably over time, remaining within the normative requirements even at the end of the shelf life, not affecting the quality of the product.

Keywords: *Parizer „Doctorskaia", normative acts, organoleptic indices, physico-chemical, microbiological.*

Introduction

In the current socio-economic environment, quality has become a strategic tool of global enterprises' management as well as a determining element of their competitiveness. However, by making products for large communities, specialists and producers in the food industry become responsible for the health of the population, participating in one of the most effective ways to health protection and promotion (Nicoleta Stanciuc, 2009; Pop Cecilia, 2011). Food quality and sanitation have direct effects on life, and the issue of food quality is always in the center of attention of the bodies set up to ensure its safety and to protect the interests of consumers and most of all their health. Today, quality has become a key factor in meeting consumers' demands. Of particular interest is the manufacture of products with high organoleptic characteristics which have a long term sales perspective, with long shelf life, without changing the quality of the product (Laslo C. et al., 2008, Oprea A., Vasilica R., 2010). Maintaining the prescribed quality of foodstuffs, including meat products, refers to their ability to retain their original characteristics over time (qualitative and quantitative) and to their resistance to storage, handling and transport. The stability of foodstuffs is limited in time, being determined by the substances in the composition of the products with varying degrees of lability, both in terms of interactions with other constituents and in terms of environmental factors, but which must be ensured throughout the food chain from producer to consumer, (Banu C. et al., 2007; Pop Cecilia, 2004).

Material and Methods

The research on the topic of the bachelor's thesis was conducted in the Agri-Food Testing Laboratory of the Center for Applied Metrology and Certification (CMAC). Samples from the category of sliced boiled sausages were investigated: Parizer *Doctorskaia* packaged in non-edible artificial casing. 3 product samples were taken in part from three different manufacture dates (three batches) - 21.09.21; 22.09.21; 23.09.21. The research was based on the complex study in dynamics of physico-chemical and microbiological quality indices in order to establish the shelf life: 30 days at t ° C = + 0 + 6 ° C and the relative humidity of air of max. = 75%. Thus, quality indexes were determined - organoleptic, physico-chemical, harmlessness and rancidity indices, for all samples taken during the storage period, in accordance with the normative acts in force - GD no. 624/2020 on the approval of quality requirements for meat preparations and products.

The protein was determined by the Kjeldhal Method - the classic method for determining proteins, which is based on the principle of determining total nitrogen and converting it into protein equivalent using the appropriate multiplication factor. The sample to be analyzed is mineralized by heating with concentrated sulfuric acid in the presence of a catalyst.

The fat content was determined by the Soxhlet method - the fat in the research sample is extracted with organic solvents and after removing the extraction solvent, it is weighed and expressed as a percentage. In order to ensure complete extraction, the sample is previously subjected to a heat treatment at a moderate temperature through which the dehydration and destruction of the protein membrane or film of the microstructure in which it is embedded is achieved.

The content of phosphates and nitrites were determined by spectrophotometry, and the content of chlorides, starch by volumetric determinations.

Results and Discussion

The meat product, *boiled Parizer "Doctorskaia*", of high quality, sliced, packaged in modified atmosphere, initially met the requirements of the normative documents in force (GD no. 624 and SF) and presented clean, dry slices of parizer without damage. The appearance in the cut shows a composition of pink color, finely chopped, evenly mixed, without gaps and gray spots. Taste and smell were characteristic of the given type of product, with nuances of spices. Elastic consistency. Pleasant taste, suitably salted, without foreign taste and smell. At the end of the storage period, the organoleptic characteristics of the product did not change. The packaging was airtight, the walls were dry, no broth within the packaging, and the slices of parizer had a clean, dry, damage-free, non-sticky surface. In the cut without color changes, without gaps and gray spots. Pleasant odor, characteristic of the product type, no foreign odor. Pleasant taste, suitably salted, slightly spicy, without foreign taste and smell. Therefore, at the end of the storage period (30 days), the organoleptic properties of *Parizer "Doctorskaia"* boiled, of high quality, sliced, packaged in modified atmosphere, did not change: the appearance, color, taste and smell remained the same. As a result of the quality indices investigations - the mass fraction of protein, fat, starch, chlorides, phosphates and nitrites, in the samples of cooked meat - *Parizer "Doctorskaia*", sliced, of high quality, packaged in modified atmosphere- there was found their compliance with the requirements of the regulations, which indicates that the products can be consumed within the period of validity initially established.

Table 1. Quality indices in Parizer „Doctorskaia"

Examened indices	**Test method**	**Admissible requirements (HG nr.624/SF)** **Obtained results**	**Conformity**
		Parizer „Doctorskaia", sliced, h/q (n=3)	
		X ± Sx	
Mass fraction of protein, %, min.	-ISO 937	**(8 / 10)**	Conformable
		11,63 ± 0,088	
Mass fraction of fat, %, max.	- SM SR ISO 1443:2012	**(35,0 / 35,0)**	Conformable
		33,16 ± 0,10	
Mass fraction of starch, %, max.	-GOST 10574	**7,0/ Not allowed**	Conformable
		Not found	
Mass fraction of chlorides, %, max.	-GOST 9957-73	(1,0-3,5 / 3,0)	Conformable
		2,0 ± 0,057	

Thus, it should be noted that the indices related to the mass fraction of phosphates and the mass fraction of nitrites also showed results that fall within the requirements of the regulations in force for this category of products (Table 2).

Table 2. Quality indices in Parizer „Doctorskaia"

Examined indices	**Test method**	**Admissible requirements (HG nr. 229/SF)** **Obtained results**	**Conformity**
		*Parizer „Doctorskaia", sliced, c/s***,** pack.. MAP**,** (n=3)	
		X ± Sx	
Mass fraction of phosphates, mg/kg, max	ISO 13730	**5000/5000**	Conformable
		4298,33 ± 10,928	
Mass fraction of nitrites, mg/kg, max	GOST 8558.1-78	**150/50**	Conformable
		40,830 ± 0,065	

Thus, following the initial investigations, it has been established that the products correspond to the requirements of the normative documents: RT "Quality requirements for meat preparations and products" GD No. 624, GD no. 221 of 16.03.2009 "Rules on microbiological criteria for food" and company standards for this category of products. It has been found that the products can be stored for further research. Subsequently, at intervals determined by time, in the samples from three manufacture dates: 21.09.2021; 22.09.2021 and 23.09.2021, the physico-chemical index was analyzed in dynamics - the mass fraction of humidity, %.

Table 3. Dynamics of physico-chemical indices - *humidity,%* in the samples investigated during the storage period (39 days)

Nr.	**Sample**	**Storage period, days**	**Normative requirements HG nr. 624/SF**	**Humidity, % SM SR ISO 1442:2014**		
Manufacture date				21.09.2021	22.09.2021	23.09.2021
***Parizer* sliced, packaged in modified atmosphere (MAP):**						
1	***„Doctorskaia",* h/q**	Iniţial date	max. 75,0/70,0	**68,2**	**67,4**	**69,2**
		10		**68,2**	**67,4**	**69,0**
		20		**68,1**	**67,3**	**68,9**
		30		**68,0**	**67,3**	**68,9**
		39		**68,0**	**67,0**	**68,8**
Difference between the initial date and 39 days of storage				**0,2**	**0,4**	**0,4**
X ± Sx				68,10±0,082	67,28±0,134	68,96 ±0,124

It can be seen that for *Parizer "Doctorskaia*", sliced, packaged in modified atmosphere, the initial humidity ranged from 67.40% - 69.2% at all reference dates, values that fall within the permissible limits of regulatory requirements in force for samples with different manufacture dates. At the end of the storage period, after 39 days, these values were between 67.0% - 68.8%, these data show an insignificant decrease in the mass fraction of humidity at the end of the storage period. This process is characteristic to meat products during storage period. However, at the end of the storage period the samples had average values of humidity between 67.28 - 68.96%, which correspond to the requirements of the normative document GD no. 624 of 19.09.2020 and the Company Standard for these products. The change in humidity values, with a slight insignificant decrease of 0.2 -0.4% at the end of the storage period, for *Parizer "Doctorskaia*", sliced, h/ q, packaged in modified atmosphere, did not affect the samples' quality. The decrease in moisture did not affect the consistency of the samples or the appearance of the slices until the end of the storage period. Along with the humidity content, which may increase or decrease during storage period, rancidity indices were also appreciated, the determination of which is necessary during the establishment of the shelf life (Table 4-6).

Table 4. Dynamics of physico-chemical indices - *peroxide index*-in the samples investigated during the storage period (39 days)

Nr.	**Sample**	**Storage period, days**	**Peroxid index, mmol/kg $^1/_2$O, MI 2586 p.7**		
Manufacture date			21.09.2021	22.09.2021	23.09.2021
***Parizer* sliced, packaged in modified atmosphere (MAP):**					
1	***„Doctorskaia",* h/q**	Iniţial date	**1,62**	**1,58**	**1,58**
		10	**1,69**	**1,65**	**1,66**
		20	**1,78**	**1,74**	**1,75**
		30	**1,86**	**1,80**	**1,82**
		39	**1,93**	**1,86**	**1,89**
Difference between the initial date and 39 days of storage			**0,31**	**0,28**	**0,31**
X ± Sx			1,776±0,095	1,726±0,092	1,740 ±0,101

The peroxide index evaluated for *Parizer "Doctorskaia*", sliced, h / q and packaged in modified atmosphere, initially shows variations between 1.58 - 1.62 mmol / kg, at all reference data, values that fall within the permissible limits of the regulatory requirements in force for samples with different manufacture dates. At the end of the storage period, after 39 days, these values were between 1.86 - 1.93 mmol / kg, data that show an insignificant increase of the peroxide index at the end of the storage period with average values between 1,726 - 1,776 mmol / kg. This process is characteristic to meat products during the storage period and it did not exceed a maximum of 10 ½ O mmol / kg, according to the admissible requirements of the data in the specialized and scientific literature. The change in the values of the peroxide index, with a slight insignificant increase of 0.28 -0.31 mmol / kg at the end of the storage period for *Parizer "Doctorskaia*", sliced, h /q, packaged in modified atmosphere, did not affect the samples' quality. The appearance, consistency, taste and smell did not change until the end of the storage period.

Table 5. Dynamics of physico-chemical indices - *acidity index*, in the samples investigated during the storage period (39 days)

Nr.	**Sample**	**Storage period, days**	**Acidity index, mg KOH/g MI 2586 p.8**		
Manufacture date			21.09.2021	22.09.2021	23.09.2021
***Parizer* sliced, packaged in modified atmosphere (MAP):**					
1	***„Doctorskaia"*, h/q**	Initial date	**1,28**	**1,18**	**1,26**
		10	**1,35**	**1,26**	**1,32**
		20	**1,42**	**1,33**	**1,40**
		30	**1,47**	**1,38**	**1,49**
		39	**1,52**	**1,42**	**1,56**
Difference between the initial date and 39 days of storage			**0,24**	**0,24**	**0,30**
X ± Sx			1,408±0,077	1,314±0,078	1,406±0,099

The acidity index estimated for *Parizer "Doctorskaia*", sliced, h/q and packaged in modified atmosphere, initially shows variations between 1.18 - 1.28 mg KOH / g, at all reference data, values that fall within the limits permissible by regulatory requirements in force for samples with different manufacture dates. At the end of the storage period, after 39 days, these values were between 1.42 - 1.56 mg KOH / g, data which show an insignificant increase in the acidity index at the end of the storage period with average values between 1,314 - 1,408 mg KOH / g. This process is specific to meat products during storage that didn't exceed a maximum of 4 mg KOH / g, the permissible requirements of the data in specialty and scientific literature. Changing the values of the acidity index, with a slightly insignificant increase of 0.24 -0.30 mg KOH / g. at the end of the storage period, for *Parizer "Doctorskaia*", sliced, h/q, packaged in modified atmosphere, did not affect its quality. Taking into account the fact that the packaging of *Parizer "Doctorskaia*", sliced, h/q, was made in modified atmosphere (MAP), i.e. natural gas (N2; CO2) was used, the same as we breathe, but at concentration levels. In order to control the bacteria that cause damage to the products, the carbon dioxide content, %, was also assessed in the samples examined during the storage period (39 days).

Table 6. Dynamics of *carbon dioxide* content,% in the samples investigated during the storage period (39 days)

Nr.	**Sample**	**Storage period, days**	**Normative requirements IT**	***Carbon dioxide, % Instruction nr. 145.277***		
Manufacture date				21.09.2021	22.09.2021	23.09.2021
***Parizer* sliced, packaged in modified atmosphere (MAP):**						
1	***„Doctorskaia",* h/q**	Iniţial date	max. 30	**30,0**	**30,0**	**29,0**
		10		**30,0**	**30,0**	**29,0**
		20		**30,0**	**29,0**	**28,0**
		30		**29,0**	**28,0**	**27,5**
		39		**29,0**	**28,0**	**27,5**
Difference between the initial date and 39 days of storage				**1,0**	**2,0**	**1,5**
X ± Sx				29,60 ±0,450	29,0 ±0,816	28,20±0,619

Thus, the results presented in the table show us that the carbon dioxide content, %, for *Parizer "Doctorskaia*", sliced, h /q and packaged in modified atmosphere, initially shows variations between 29.0 - 30.0%, at all reference data, values which fall within the permissible limits of the regulatory requirements in force for samples with different manufacture dates. At the end of the storage period, after 39 days, these values were between 27.5 - 29.0%, the data show an insignificant decrease in the carbon dioxide content, %, at the end of the storage period, with average values between 28.2 - 29.60%. The change in carbon dioxide content, %, with a slightly insignificant decrease of 1.0 - 2.0%, at the end of the storage period for *Parizer "Doctorskaia*", sliced, h/q packaged in modified atmosphere did not affect the samples' quality.

The microbiological investigations were carried out in accordance with the normative documents in force GD no. 221 of 16.03.2009 "Rules on microbiological criteria for food" and CS for the given product both at the beginning of the shelf life and over 10, 20, 30, and 39 days. During the storage period, Listeria monocytogenes, Bacteria coliforme, E. Coli, yeast and mold were not detected in the examined meat product. At the same time, during the storage period of the meat product under study *Parizer "Doctorskaia"*, sliced, h /q, packaged in modified atmosphere, there is a gradual increase in the amount of MMAFA. In the samples kept at the regulated temperature the growth of mesophilic-aerobic and optionally anaerobic microorganisms practically does not differ from the samples kept at advanced temperature. But in both cases the growth of microorganisms does not exceed the limit of one degree, and the obtained values are below the allowable limit. To a large extent, the minimal changes in the studied samples are due to the fact that the carbon dioxide content in the package has decreased very little. The evaluation of the microbiological indices shows the lack of their negative dynamics during the 39-day storage process for *Parizer "Doctorskaia*", sliced, h /q, packaged in modified atmosphere, which presents a positive criterion in justifying the shelf life of the product under investigation. This fact demonstrates the possibility of setting the 30-day shelf life, as requested by the local manufacturer, for *Parizer "Doctorskaia*", sliced, h /q, packaged in modified atmosphere, provided they are stored in a cold room with a temperature of 0 to 6^0 C and relative air humidity of 75%.

Conclusions

The stability of the organoleptic indices during the storage period (30 days) indicates good quality of the product, as there were no changes in the taste qualities or in the appearance of the slices of the Parizer.

The physico-chemical parameters have not changed considerably over time, remaining within the normative requirements even at the end of the shelf life. The insignificant changes in the peroxide index, the acidity index, the decrease in the amount of moisture did not affect the consistency of the samples or the appearance of the slices. The product quality was not affected.

Throughout the storage period of the product (30 days), the microbiological indices corresponded to the requirements of the normative documents, and the obtained results show us the lack of negative dynamics of the microbiological indices during the 30-day storage process, for *Parizer "Doctorskaia*", sliced, h /q, packaged in modified atmosphere, which gives us a positive criterion in justifying the shelf life of the product under investigation.

The research shows the possibility of establishing the validity period of 30 days, requested by the local producer, for *Parizer "Doctorskaia*", sliced, h/ q, packaged in modified atmosphere, provided it is kept in the cold room at a temperature from 0 to at 6^0 C and a relative humidity of 75%.

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