Studii şi Cercetări Ştiinţifice 2013, **14** (1), pp.029 – 040
Chimie şi Inginerie Chimică, Biotehnologii, Industrie Alimentară

Scientific Study & Research
Chemistry & Chemical Engineering, Biotechnology, Food Industry *ISSN 1582-540X*

ORIGINAL RESEARCH PAPER

QUALITY CONTROL OF SOME TRADITIONAL MEAT PRODUCTS

S. Dobrinas, A. Soceanu*, V. Popescu, G. Stanciu, S. Suliman

Ovidius University, Chemistry and Chemical Engineering Department, 124, Mamaia Blvd., 900524, Constanta, Romania

*Corresponding author: asoceanu@univ-ovidius.ro

Received: November, 14, 2012
Accepted: February, 22, 2013

Abstract: In this paper, we present the characterization of six traditional meat products: smoked file, smoked bacon, pork sausages, sausage prepared from swine's entrails, pork pastrami, sheep sausages. Organoleptic tests (the aspect and shape, the aspect of freshly cut in the section, smell, taste and consistency), physico-chemical and microbiological determinations (NTG, *Salmonella*, *Listeria monocytogenes* and *Escherichia coli*) were performed. These analyzes are a part of quality control that must be done in order to obtain a certificate from the Ministry of Agriculture for a traditional product. After identification of H_2S and starch and according to fat oxidation degree it was concluded that analyzed samples didn't contain counterfeiters and all parameters analyzed are within the maximum limits allowed by law. Considering all the procedures for manufacturing, characteristics of raw and auxiliary materials, organoleptic properties of final products analyzed in this study, it can be concluded that analyzed meat specialties meet the requirements of Ministry Order no. 690/28.09.2004 for the traditional products certification.

Keywords: *Escherichia coli, Listeria Monocytogenes, NTG, physico-chemical determinations, Salmonella, traditional meat products*

INTRODUCTION

Meat is an excellent source of proteins and essential amino acids, with its contributions to the human dietary needs.
The traditional product means the product that must be produced from traditional raw materials, that must have a traditional composition or a mode of production and/or processing reflecting a technological process of production and/or traditional processing that distinguishes clear of similar products of the same category [1]. Certification of traditional products is under Ministry Order no. 690/28.09.2004 for approving the Norms concerning the conditions and criteria for certification traditional products [2].
Quality is a set of characteristics of a product or service which gives it the ability to meet user expressed or implied requirements.
Organoleptic evaluation consists in describing the attributes of meat products that can be perceived by the sense organs. The attributes to be evaluated are appearance, color, texture and consistency, smell and taste. Physical test methods focus either on the actual condition of meat products, or on the conditions around the product, for example in storage rooms, packages, etc. Chemical characteristics of meat products are related to the product itself and refer primarily to the content of specific substances, which are important from the point of view of keeping quality, flavor, nutritional value, etc., or which may also represent harmful residues. Microbiological examination cannot be carried out without laboratory equipment, because they require sample preparation under sterile conditions, incubation of the samples under constant temperatures and sufficient microbiological knowledge on the part of the personnel involved to interpret the results. However, the application of microbiological methods is the only way to obtain information about the hygienic status of places, equipment and foods. It is true that unclean conditions will always indicate high microbiological contamination and one could argue that a thorough cleaning-up rather than a further microbiological analysis would be needed in those cases. But there could be need detecting the source of permanent contamination (for example, through the water, movement of personnel, raw material delivered, etc.) or of food poisoning bacteria. Under these circumstances microbiological examinations can often be very helpful and solve immediate problems [3].
Several authors have been discussed about the toxicology of histamine, nitrates and nitrites and their detection in food, with particular emphasis on meat [4-7].
In this paper, we present the characterization of six traditional meat products: smoked file, smoked bacon, pork sausages, sausage prepared from swine's entrails, pork pastrami, sheep sausages. Organoleptic tests (the aspect and shape, the aspect of freshly cut in the section, smell, taste and consistency), physico-chemical determinations (identification of H_2S and the starch, determination the stage of oxidation of the fat, determination of nitrogen readily hydrolyzable, determination of water, the content of sodium chloride, *p*H measurement, determination of ash, total protein substances, the fat content, nitrite content) and microbiological determinations (NTG, *Salmonella*, *Listeria Monocytogenes* and *Escherichia coli*) were performed. These analyzes, were a part of quality control that must be done in order to obtain a certificate from the Ministry of Agriculture for a traditional product.

MATERIALS AND METHODS

Six traditional meat products: smoked file, smoked bacon, pork sausages, sausage prepared from swine's entrails, pork pastrami, sheep sausages were analyzed.

Organoleptic evaluation

It consists in describing the attributes of meat products that can be perceived by the sense organs. The attributes to be evaluated are shape, external and cross-sectional appearance, smell, taste and consistency.
The external appearance and the shape were visually and by touch examined. To determine dimensions, product was placed on a flat surface and measured with a graduated line. We examined cross-sectional appearance visually, immediately after cutting. The smell was estimated at surface immediately after cutting the slices. To determine the taste, slices or pieces of sample are chopped by mastication, and the bowl formed in the mouth moves to come in contact with the entire surface of the tongue. Consistency was determined by mastication. To check cross-sectional appearance, pieces of meat products were cut perpendicular on longitudinal axis into slices [8, 9].

Physico-chemical determinations

Identification of H_2S

This analysis was performed to check if analyzed products are altered. Collected sample according to current legislation was analyzed within 2 hours of receipt. During this time the sample was kept cold (maximum 5 °C). The sample was homogenized by passing twice through the meat grinder with a maximum diameter of 4 mm sieve holes, and then proceeds immediately to analysis. In the case of the artificial membrane, it was removed in advance. Sample was maintained with a filter paper soaked in lead acetate solution. In the presence of hydrogen sulfide, lead sulfide was formed (color intensity depends on the degree of sample alteration) [10].

Identification of the starch

Starch from the studied samples was identified by the blue coloration given in the reaction with iodine - potassium iodide. It was make a fresh section of the analyzed meat and spot on its surface 2 or 3 drops of iodine-potassium iodide solution [11].

Determination the stage of fat oxidation

It consists in fat extracting from the sample and its treatment with phloroglucinol in the presence of hydrochloric acid. 10 g chopped were placed in a test tube and maintained 15-20 minutes at a temperature of 105 °C ± 3 °C. Fat was decanted after melting. If meat samples contain less fat, this can be extracted with ethyl ether, then removed the solvent by heating on the bath boiling water. In a clean test tube was inserted 1 mL of extracted fat then was added 1 mL of hydrochloric acid. It was homogenized by stirring and 1 mL phloroglucinol was added. Shake to mix contents of tube layers and monitors the liquid coloring. The reaction is considered, negative "when the liquid remains

colorless". The reaction is considered, weak positive "if there is any pink color of different intensities" and the reaction is considered, positive "if there is any red stains purplish hue" [12].

Determination of easily hydrolysable nitrogen

a) Identification of ammonia

The sample was homogenized by passing twice through the meat grinder with a maximum diameter of 4 mm sieve holes, and then proceeds immediately to analysis. In the case of the artificial membrane, it was removed in advance. The sample thus prepared was placed in a glass container completely filled, tightly closed and kept cool to avoid altering or changing the composition. Sample was analyzed within 12 h after homogenization. Ammonia with Nessler reagent forms a precipitate with a high power dye, identifying traces of ammonia. 10 g of meat were put in a beaker with 100 mL water at room temperature for 10-15 minutes and were mixed several times with a glass rod. After that was filtered through quantitative paper in a clean dry Erlenmeyer flask. The extract obtained was used for the analysis. In a clean test tube 1 mL of extract was inserted and was added 1 to 10 drops of Nessler reagent. The tube was stirred after adding each drop and coloring solution was monitored. The reaction is considered negative if after adding 10 drops of reagent the extract clarity does not change. The reaction is considered weakly positive if after the addition of at least 6 drops of reagent appears a precipitate and an intense yellow coloration. The reaction is considered positive if after adding the first drops of reagent appears visible slurry and an intense yellow coloration, and after adding the last drops of reagent was formed an abundant yellow-orange precipitate.

b) Determination of easily hydrolysable nitrogen by direct titration with hydrochloric acid

Easily hydrolysable nitrogen, released as ammonia, is submitted at steam distillation and collected in a boric acid solution and is determined by titration with hydrochloric acid. 10 g of sample were passed into the distillation flask with 300 mL water. 25 mL boric acid solution and 4 drops of Tashiro indicator were added. In the distillation flask were added 1 - 2 g of magnesium oxide and 5 - 10 mL paraffin oil to avoid foaming. During titration, the indicator turns from blue violet acid temp to green alkaline temp. At this point hydrochloric acid is added in drops until the indicator returns to acid tempt. Continue the distillation and titration until the violet blue acid temp is maintained for at least 5 minutes. Easily hydrolysable nitrogen content, expressed as ammonia, in mg/100 g, is calculated as:

$$\text{Easily hydrolysable nitrogen } (NH_3) = \frac{0.00017 \cdot V \cdot 1000}{m} \cdot 100 \text{ [mg/100g]} \quad (1)$$

where:

0.00017 - amount of ammonia, g, corresponding to 1 mL 0.1 N hydrochloric acid;

V - volume of 0.1 N hydrochloric acid used to titrate the distillate, in mL;

m - mass of the sample taken for determination, in g [13].

pH measurement
The samples *p*H measurement was conducted using a Consort 530 *p*H-meter. A hole in the sample was made with a knife and the electrode was inserted carefully [14].

Determination of nitrite content
Determination of nitrite ion is based on its reaction with primary aromatic amine to form a diazonium salt. If this salt is condensed with another primary amine, a colored complex is formed. In the presence of nitrites and acetic mixture of alpha-naphthyl-amine and sulphanilic acid, azoderivatives with a pink-red color are formed and spectrometric measured.
For the determination of nitrite in meat products, 5 mL of sample and 5 mL Griess reagent were added in 50 mL volumetric flasks and completed to the mark with distilled water. The absorbance of solutions was measured at 529 nm wavelength, and concentrations were determined by interpolating the calibration curve [15].

Determination of water content
It is based on the loss of mass by heating at 103 ± 2 ° C to constant weight after forming a homogeneous mixture of the sample, sand and alcohol. In a weighing vial with cover and glass rod was inserted 10 - 15 g calcinated sea sand and dried for 30 minutes in an oven at 103 ± 2 °C temperature. After cooling in desiccator until room temperature, the vial and glass rod were weighted with precision of 0.001 g. 5 g of sample were added in the vial and reweigh and finally were added 5 mL of alcohol. The alcohol from vial was evaporated on a water bath. The oven temperature was set at 103 ± 2 ° C and the vial and its contents were heated for 2 hours at this temperature. After cooling to ambient temperature, the vial is weighed accurately to 0.001 g.
Water content is calculated as:

$$\% \text{ water} = \frac{m_1 - m_2}{m_1 - m} \cdot 100 \qquad (2)$$

where:
m - vial mass with glass rod and sand, in g;
m_1 - vial mass with glass rod and sand before drying, in g;
m_2 - vial mass with glass rod and sand after drying, in g [16].

The content of sodium chloride
It consists of adding silver nitrate solution and the excess was titrated with potassium thiocyanate solution SR ISO 1841-1:2000.
Sodium chloride content is calculated as:

$$\% \text{ NaCl} = \frac{0.005844 \cdot (20 - V)}{m} \cdot \frac{200}{20} \cdot 100 \qquad (3)$$

where:
0.005844 – amount of sodium chloride, in grams, corresponding to 1 mL of 0.1 N silver nitrate solution;
V – solution volume of 0.1 N potassium thiocyanate, used for titration, in mL;
m – sample weight taken for analysis, in g [17].

Determination of ash content
It is based on sample calcination at 550 ^{0}C in the presence of magnesium acetate, until a constant mass.
Ash content is calculated as:

$$\% \text{ Ash} = \frac{m_2 - m_0 - m_3}{m_1 - m_0} \cdot 100 \qquad (4)$$

where:
m_0 – empty capsule mass, in g;
m_1 – capsule mass with the sample, in g;
m_2 – capsule mass with residue after burning, in g;
m_3 – mass of magnesium oxide providing from added magnesium acetate solution, in g [18].

Determination of total protein substances
Total nitrogen from the sample is converted to ammonium ions, sulphate in sulfuric acid medium and potassium sulphate under the catalytic action of copper sulphate. Ammonia released by alkalizing was distilled and captured in a boric acid solution and determined by titration with hydrochloric acid.
Nitrogen content in percent mass is calculated as:

$$0.01401 \cdot T \cdot (V_1 - V_0) \cdot \frac{100}{m} = \frac{1.401 \cdot T(V_1 - V_0)}{m} \qquad (5)$$

where:
T – normality of hydrochloric acid solution used for titration;
V_0 – volume of hydrochloric acid solution used for the blank, in mL;
V_1 – volume of hydrochloric acid solution used for determination, in mL;
m - mass of the sample, in g.

To obtain the amount of protein substances nitrogen content is multiplying by 6.25, the coefficient of conversion of total nitrogen into protein. The percentage of protein substance was obtained reported at the amount of studied sample [19].

Determination of fat content
It is based on fat content extraction with an organic solvent using Soxhlet apparatus. Dehydrated and defatted sample was weighed and the fat content was calculated by difference.

$$\text{Fat}\% = \frac{m_2 - m_1}{m} \cdot 100 - A \qquad (6)$$

where:
m_1 - mass of empty flask, in g;
m_2 - mass of flask with fat, in g;
m - mass of studied sample, in g;
A – water content of the analyzed sample determined by drying in an oven, in percentage [20].

Microbiological determinations

The number of colonies obtained at 30 ^{0}C (NTG)

It is based on seeding deep of one defined culture medium cast into two sterile Petri boxes, with a specified quantity of the sample. The boxes were incubated at 30 ^{0}C, aerobically for 72 hours.

Number of organisms per milliliter or gram of product, N, is calculated as a weighted average, with the following formula:

$$N = \frac{\sum C}{(n_1 + 0.1 \cdot n_2)d} \qquad (7)$$

where:

ΣC – sum of colonies counted in all retained boxes;

n_1 – number of boxes held at the first dilution;

n_2 – number of boxes held at the second dilution;

d – dilution factor corresponding to the first dilution.

Result is the number of microorganisms / milliliter or per gram of product, expressed as a number between 1.0 and 9.9 multiplied by 10x where x is the power attributed to 10 [21].

Determination of Salmonella

Determination of Salmonella requires four successive stages: enrichment in selective liquid media APT; enrichment in liquid media RV, MKTTn; isolation and identification; confirmation of identity [22].

Determination of Listeriae monocytogenes

Detection of *Listeria monocytogenes* requires four successive phases: primary enrichment in a selective enrichment liquid medium with low concentration of selective agents; secondary enrichment in a selective enrichment liquid medium with normal concentration of selective agents; striated and identification; confirmation [23].

Determination of Escherichia coli

Two medium plates with Tryptone-ball-glucuronide (TBX) are inoculated with specific amounts of sample for analysis or initial suspension. Plates are incubated for 18 to 24 h at 44 °C ± 1 °C and then examined for the presence of colonies. Regarding their characteristics, are considered to be colonies of *Escherichia coli* p-glucuronidase positive. The number of forming units colony (CFU) of *Escherichia coli* p-glucuronidase positive per gram or per milliliter of sample was calculated.

The number of CFU of *Escherichia coli* p-glucuronidase positive in the present sample, per milliliter or per gram, the average of two successive dilutions was calculated using the following equation:

$$N = \frac{\sum a}{V \times (n_1 + 0.1 n_2)d} \qquad (8)$$

where:

$\sum a$ - The amount of CFU counted on all plates held in two successive dilutions of at least one contains a minimum of 15 CFU blue;

n_1 - number of plates held in the first dilution;
V - volume of inoculum on each plate, in milliliters;
n_2 - number of plates retained in second dilution;
d - dilution factor corresponding to the first retained dilution [d = 1 if the sample is retained for directly inoculated analysis (liquid)] [24].

RESULTS AND DISCUSSION

In Table 1 are presented the organoleptic characteristics (shape, external aspect, section aspect, taste and smell and consistency) of studied samples:

Table 1. *Organoleptic characteristics of studied samples*

Sample	Shape	External aspect	Section aspect	Taste and smell	Consistency
Smoked file	cilindrical	clean (no mold), non-sticky, specific color assortment	compact pieces of color and form specific anatomical parts used	pleasant, specific components and spices used	frail, semihard
Smoked bacon	boneless breast pieces, approximately rectangular	clean (no mold), non-sticky, specific color assortment	compact pieces of color and form specific anatomical parts used		frail, semihard
Pork sausages	length: 16 to 18 cm and diameter of 20-22 mm and 28-30 mm.	brown to reddish color, clean, non-sticky surface, undamaged	homogeneous mass, mosaical, pink-red fine paste -specific raw meat with white fat		soft
Sausage prepared from swine`s entrails	approximately spherical shape	clean, non-sticky surface, undamaged, adherent to the composition	compact composition, no bone fragments, without agglomerates of fat and spices		elastic
Pork pastrami	slices irregularly shaped	clean (no mold), non-sticky, specific color assortment	compact pieces of color and form specific anatomical parts used		frail, semihard
Sheep sausages	Length: 13 to 15 cm and diameter of 20-22 mm.	brown to reddish color, clean, non-sticky surface, undamaged	homogeneous mass, pink-red fine paste - specific raw meat with white fat		soft

The results from Table 1 show that all analyzed meat products were within the conditions of eligibility [25-28].
In Table 2 are presented some physico-chemical characteristics of studied samples (H_2S, starch, stage of fat oxidation, ammonia, nitrogen readily hydrolysable, *p*H, and nitrite content).

Table 2. *Physico-chemical characteristics of studied samples*

Sample	H_2S	Starch	Stage of fat oxidation	NH_3	Readily hydrolysable nitrogen [mg/100g]	*p*H	Nitrite content [mg/100g]
Smoked file	negative	negative	negative reaction	weakly positive reaction	27.56	5.8	0.158
Smoked bacon					32.03	5.7	0.197
Pork sausages					29.87	5.8	0.225
Sausage prepared from swine`s entrails					17.34	5.6	0.342
Pork pastrami					22.62	5.7	0.067
Sheep sausages					31.15	5.7	0.218

In any of the analyzed products, hydrogen sulfide was not identified, which would have indicated a possible alteration of the product.
For preparations of meat, starch is added generally to improve some organoleptic properties. The presence of starch is evidenced by the appearance of blue coloration of extract solution. The analyzed samples do not show positive reactions, so it doesn't contain starch.
Following the analysis performed to determine the stage of fat oxidation was observed that none of the examined products did not react with phloroglucinol. This indicates freshness of analyzed samples.
After Nesler reagent adding, studied samples gave a weakly positive reaction. This confirms the existence of small amounts of ammonia in analyzed meat samples.
From the results, it can be observed a correlation between the presence of ammonia and easily hydrolysable nitrogen values. Easily hydrolysable nitrogen values for any of the analyzed products did not exceed the maximum provided by law: 45 mg/100 g for specialties cooked and double smoked and 30 mg/100g product for sausage prepared from swine`s entrails [25-28].
Analyzed products present a weak acid *p*H value between 5.6 and 5.8. The maximum value allowed for these types of products is 7 *p*H units [25-28].
In all analyzed preparations, the nitrite was far below the maximum prescribed by regulations [25-28]. For cooked and double smoked products, this value should not exceed 7 %.
In Figure number 1 are presented some physical-chemical characteristics of studied meat products (water content, NaCl content, ash content, total protein substances, fat content).

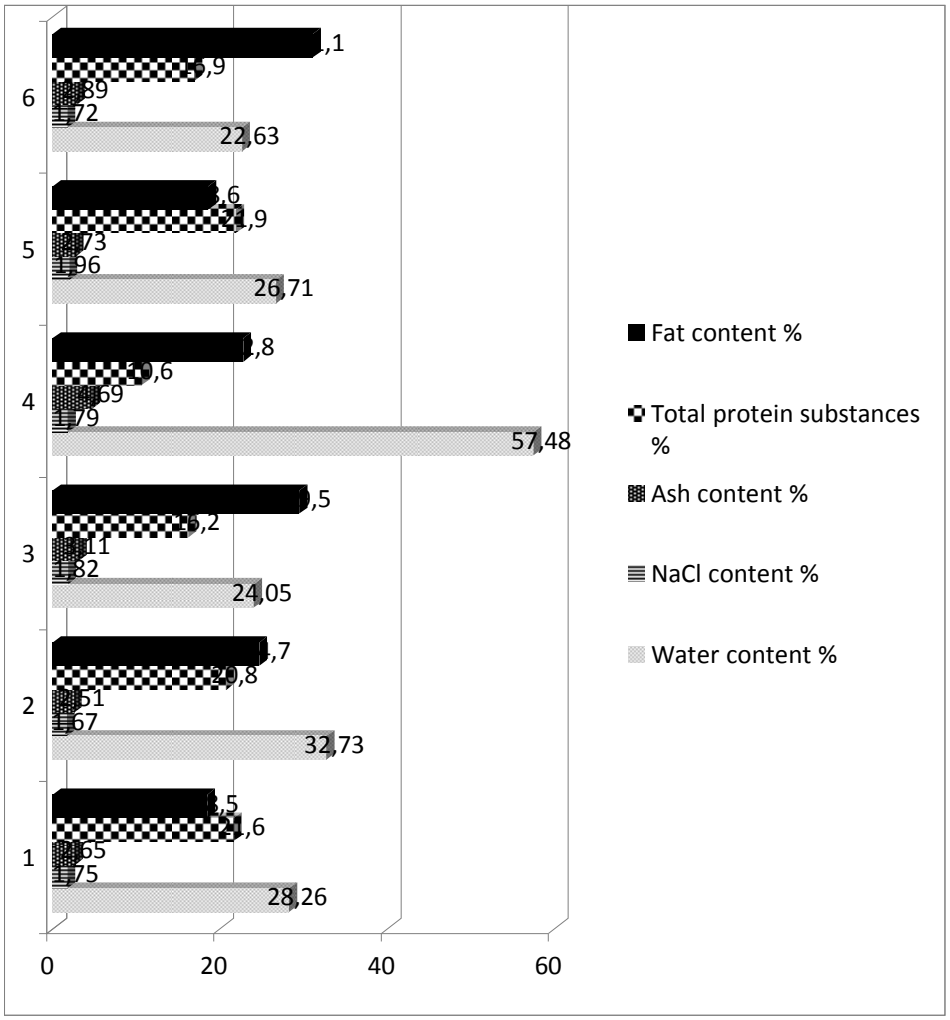

Figure 1. *Physical-chemical characteristics of studied meat products (1- Smoked file; 2- Smoked bacon; 3- Pork sausages; 4- Sausage prepared from swine`s entrails; 5- Pork pastrami; 6- Sheep sausages)*

After analyzes it was observed that water content values are within the maximum allowed by regulations [25-28]. The highest value was determined for sausage prepared from swine's entrails, but that is far below 70 %, the admitted maximum.
Maximum for NaCl content in meat products is 3 %, value that wasn't exceeded for the analyzed products.
Determination of ash content is a starting point for minerals content. Thus, a larger amount of ash indicates a larger amount of metals. Sausage prepared from swine's entrails had the highest value for ash 4.69 %, while smoked bacon had the lowest value 2.51 %.
Total protein substances fit with the values provided by regulations [25-28], the minimum value for this parameter being 11 %.
Sheep sausages have a higher fat content than the pork sausages. Smoked specialties have low fat values, except bacon. All analyzed products were within the values required by regulations [25-28], no more than maximum 38 %.
In Table 3 are presented some microbiological characteristics of studied samples.

Table 3. *Microbiological characteristics of studied samples*

Sample	**Colonies obtained at 30 ^{0}C (NTG/g)**	***Salmonella***	***Listeriae Monocytogenes***	***Escherichia coli* (ufc/g)**
Smoked file	6.2 x 10^3	negative	negative	1200
Smoked bacon	7.1 x 10^3			1600
Pork sausage	5.9 x 10^3			2300
Sausage prepared from swine`s entrails	8.4 x 10^3			3400
Pork pastrami	5.5 x 10^3			1800
Sheep sausages	5.7 x 10^3			2200

From the results, we can see that the number of colonies is within normal limits [25-28]. For some preparations, this value is 1 x 10^4.
As it can be observed from the table above, the examination to identify *Salmonella* from meat products have been considered negative. Food regulations emphasizes that examination results should be negative, otherwise preparations are considered inedible.
The results carried out on meat products to identify *Listeriae monocytogenes* are negatives. European regulations and standards [25-28] provide a negative result for this analysis, so products are in accordance with these regulations.
Values obtained for *Escherichia coli* have not exceeded the permissible standards and regulations, being in the range 500 - 5000 cfu / g.

CONCLUSIONS

Analyzed meat products are prepared according to old recipes of Romanian households and comply with hygiene available regulations of the European Union. After identification of H_2S and starch, and according to fat oxidation degree, it was concluded that analyzed samples didn't contain counterfeiters and are not altered. The chemical analyzes showed that all analyzed parameters are within the maximum limits allowed by law. According to the microbiological determinations NTG values are considered within normal limits, *Salmonella* and *Listeria Monocytogenes* were not identified in the analyzed products, and the value of *E. coli* didn't exceeded the maximum permissible values.
Considering all the procedures for manufacturing, characteristics of raw and auxiliary materials, organoleptic properties of final products analyzed in this study, it can be concluded that analyzed meat specialties meet the requirements of Ministry Order no. 690/28.09.2004 for the traditional products certification.

REFERENCES

1. Banu, C.: *Industrial processing of meat* (in Romanian), Tehnic Publisher, Bucharest, **1999**, 25-56;
2. ***Ministry Order no. 690/28.09.2004 for approving the Norms concerning the conditions and criteria for certification traditional products, *Official Monitory* (in Romanian) nr.938/14.10.**2004**;

3. Gergescu, Gh., Banu,C.: *Treaty of production, processing and use of meat* (in Romanian), Ceres Publisher, Bucharest, **2000**, 33-84;
4. Cemek, M., Akkaya, L., Bulut, S., Konuk, M., Birdane, Y.O.: Histamine, Nitrate and Nitrite Content of Meat Products Marketed in Western Anatolia, Turkey, *Journal of Animal and Veterinary Advances*, **2006**, **5**(12), 1109-1112;
5. Tokusoglu, Ö., Ünal, M. K.: Fat Replacers in Meat Products, *Pakistan Journal of Nutrition,* **2003**, **2**(3), 196-203;
6. Lo, L.-Y., Wu, C.-C., Jang, S.-J., Chiou, S.-T., Hwang, D.-F.: Simultaneous Gas Chromatography Analysis of Preservatives in Chinese Traditional Meat Products Collected from Ilan County, *Journal of Food and Drug Analysis*, **2001**, **9**(4), 215-219;
7. Shanthi, D., Balakrishnan, V., Kalaikannan A., Radhakrishnan, K.T.: Presence of Heavy Metals in Pork Products in Chennai (India), *American Journal of Food Technology*, **2008**, **3**(3), 192-199;
8. STAS 11061-2, **1978**;
9. STAS 11061-3, **1978**;
10. SR 9065-11, **2007**;
11. STAS 9065/6, **1974**;
12. SR 9065-10, **2007**;
13. SR 9065-7, **2007**;
14. SR ISO 2917, **2007**;
15. STAS 9065/9, **1974**;
16. SR ISO 1442, **1997**;
17. SR ISO 1841-1, **2000**;
18. STAS 9065/1, **1971**;
19. STAS 9065/4, **1981**;
20. STAS 9065/2, **1973**;
21. SR ISO 4833, **2003**;
22. SR EN 6579, **2003**;
23. SR ISO 11290 – 1 – 2, **2000**;
24. SR ISO 16649 – 2, **2007**;
25. SF-AUR-13/**2004**;
26. SF-AUR-07/**2004**;
27. SF-AUR-11/**2004**;
28. ***Ministry Order no. 339/2006 for rules approving for the marketing of meat products, *Official Monitory* (in Romanian) nr.10/08.01.**2007**.