RESEARCH ON TECHNOLOGIES FOR OBTAINING NATURAL AND SAFETY MEAT PRODUCTS

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Abstract
In order to improve the health and quality of citizens' lives by ensuring a superior quality of food, this paper proposes a series of researches to establish the scientific and technological bases needed to obtain meat preparations with natural additives without chemical additives as an alternative to the conventional meat products. The purpose of this study is to analyze special technologies that eliminate the use of chemical additives in order to obtain natural meat products. Vegetable preparations such as red beet juice, carrot juice, red grape marc powder were tested. The following meat products were obtained: pork sausages, chicken sausages, chicken frankfurter with oil, marinated bacon in carrot juice. New foods are an alternative to highly processed and added meat products on the market by replacing some chemical additives (synthetic dyes and antioxidants), technological processes or application in combination with vegetable additives (smoking is replaced / associated with the maturation of beef in red beet juice and bacon in carrot juice).The quality analysis was performed by sensory and instrumental methods. For the sensory analysis a scoring scale of 5 points was used. Instrumental methods aimed at controlling chemical composition and assessing the freshness of tested products compared to conventional meat products. All meat products analyzed had scores between 4 and 5, receiving the "very good". From the chemical point of view, they presented the optimal parameters and the shelf life was comparable to the classical products.

Keywords: meat products, antioxidants, vegetable additives, natural dyes

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1. INTRODUCTION

The main condition for ensuring the health of the population lies in the consumption of safe foods. The danger that a food becomes potentially harmful to humans results from its contamination or pollution with organisms or chemicals. The main causes that influence the hygienic quality of food can be presented succinctly, such as: natural toxicity, contamination or physical, chemical or biological pollution. Although the production of meat products is extremely diverse, the modern food industry has to meet a number of challenges such as preventing lipid oxidation, replacing synthetic antioxidants with natural ones, balancing the ratio between energy value and nutritional value of products, sustainable development in this economic field.

Replacement or combination of traditional methods of preservation (drying, smoking) with a bio-preservation method using biologically active substances of plant origin is a way of avoiding technological barriers, especially the development of altering microorganisms and lipid oxidation. Numerous studies have shown that the shelf life and quality of meat products can be improved by the use of natural antioxidants at certain stages of meat production.

Many spices and plant extracts have been shown to have a high antioxidant capacity, such as some plants of the *Lamiaceae* family, for example, rosemary (*Rosmarinus officinalis L.*), oregano (*Origanum vulgare L.*) and sage (Salvia officinalis L.). The antioxidant activity of these plants is attributed to their content in phenolic compounds, especially essential oils. (Djenane et al., 2003; Fasseas et al., 2007; Velasco and Williams, 2011; Muhlisin et al., 2013).

For the antioxidant and dye effect some colored fruits and vegetables are also used. The antioxidant effect of the fruits is due to the

content of ascorbic acid, α-tocopherol, beta-carotene, flavonoids. (Robbins, 2008; Pennington and Fisher, 2009). The inclusion of natural antioxidants in the diet has beneficial effects on human health as they protect important biological cellular components (DNA, proteins, membrane lipids) and stop the reactivity of oxygen attacks. (Velasco and Williams, 2011).

Natural vegetable and plant extracts enhance the natural colour of the meat and can be used to give a good look to meat products. In this sense juice and red beet powder are used. The color of the meat is influenced by the type of muscle, the state of myoglobin and hemoglobin, by the presence of oxygen. Typical meat colour for pork is greyish pink and for poultry is grey-white to dull red (Meat Science and Nutrition). Large-scale synthesis dyes such as tartrazines, sunset yellow, brilliant blue are used. Also, of the natural dyes are used Cochineal carmine, betanin (beet red), Paprika oleoresin, fermented rice. (Feiner, 2016).

Natural dyes have the disadvantage that they are not stable at thermal treatment, in the presence of oxygen and by changing the pH.

Rohlík et al. (2010) tracked the effect of natural antioxidants on the color of the dry sausages and concluded that they stabilize the color and eliminate the differences in shades in the product section. The cumulative antioxidant and preventing the discoloration effect had it fraction of oleoresin (rosemary extract).

In the conducted study to obtain hypochaloric products the pork was replaced with chicken and back fat was completely or partially replaced with oil or avocado.

Chicken meat is distinguished by: protein content (100 g chicken without skin and bone has 31 g protein); Mineral salts: iron, zinc, magnesium; Vitamins: B3, B6, B7, B12; Lipids: white chicken 1.3%, chicken red meat 7.3%. Chemical composition, pH, water holding capacity, drip loss, colour and texture are influenced by age of capons (Diaz et al., 2010; Oblakova et al., 2016).

Avocados are a rich source of essential fatty acids, have strong antioxidant properties due to the carotenoids and vitamins contained. Also, helps raise high-density cholesterol (HDL) and reduce low-density cholesterol (LDL) (Dreher and Davenport, 2013).

Red beet is a source of vitamins (B, C), minerals (magnesium, potassium, iron, phosphorus), fibers, antioxidants. The red beet juice remarks by its content of microelements, betain, asparagin, glutamic acid, pectic substances. Betain has a beneficial effect in hepatitis, in hepatic cirrhosis, in the toxic phases of the liver (Buruleanu et al., 2009; Wruss et al., 2015; Kazimierczak et al., 2014).

The carrot juice is distinguished by its high content of beta-carotene, a source of vitamin A, high content of B complex vitamins such as folate, and many minerals including calcium, copper, magnesium, potassium, phosphorus and iron.

Garlic contains mineral salts, inulin, microelements, a complex of vitamins (A, B, PP, C) and phytoncides (allicin and garlicine).

Is widely used to prevent cardiovascular disease, to prevent cancers (lung, prostate, breast, stomach, rectum, and colon) (Martins et al., 2016). He has antiseptic effect, can destroy bacteria like *E. coli* or *Salmonella (*Chekki et al., 2014).

This study consists of testing of vegetable products with a coloring, antioxidant and antiseptic role, in order to obtain natural dietary meat products.

2. MATERIALS AND METHODS

2.1. Materials

The meat products were prepared with the addition of different natural dyes. Chicken meat and bacon - raw animal materials - was purchased from the specialized, veterinary-controlled shop.

Vegetable raw materials and auxiliary materials were purchased from the hypermarket, with the quality guarantee confirmed by the analysis bulletins.

The vegetables were conditioned by washing, scrubbing and removing non-edible pieces. Getting the fresh vegetable juices were made with an extractor household appliance, after which the juices were thermal treated at 80 deg.

C/10min with a view to destroy the undesirable microorganisms and cooled to 4 deg.C.
The marc powder was obtained as follows: after pressing the grapes and separating the juice, the remaining residue was dried at 20-25 degrees C, then ground with an electric stirrer. After obtaining the powder was stored in hermetically sealed glass containers, protected from sunlight and heat.

2.2. Experimental methods for obtaining meat preparations

The following meat products were obtained: pork sausages, chicken sausages, chicken frankfurters, marinated bacon in carrot juice, marinated pulp in beet root juice.
The pork sausages were obtained in three variants: no vegetable supplements (S1), with red beet juice (S2) (figure 1), with red grape marc powder (S3).
The chicken sausages were obtained in two variants: with avocados (S4) (figure 2) and with back fat (S5). The avocados was used 20%, same and the fat.
The chicken frankfurters were obtained in two variants: with fat (S6) and oil (S7) (figure 3). The fat was used in a proportion of 30% and the oil 20%.
The marinated bacon was prepared in carrot juice (S8) and smoked (S9). The bacon was initially salted by the dry method. The marinated pulp was prepared in beet root juice (S10) and smoked (S11).

2.3. Analyses

According to ISO 8402, quality represents' the totality of the attributes and characteristics of the product or service, based on the ability to meet declared or implicit desires. The methods used for quality assessment are instrumental and sensory.
For the sensory analysis a scoring scale of 5 points was used. Instrumental methods aimed at controlling chemical composition and assessing the freshness of tested products compared to conventional meat products.
The control of chemical composition was performed by determination of moisture, proteins and lipids content.

Fig. 1 Technology to obtain a pork sausages with red beet juice

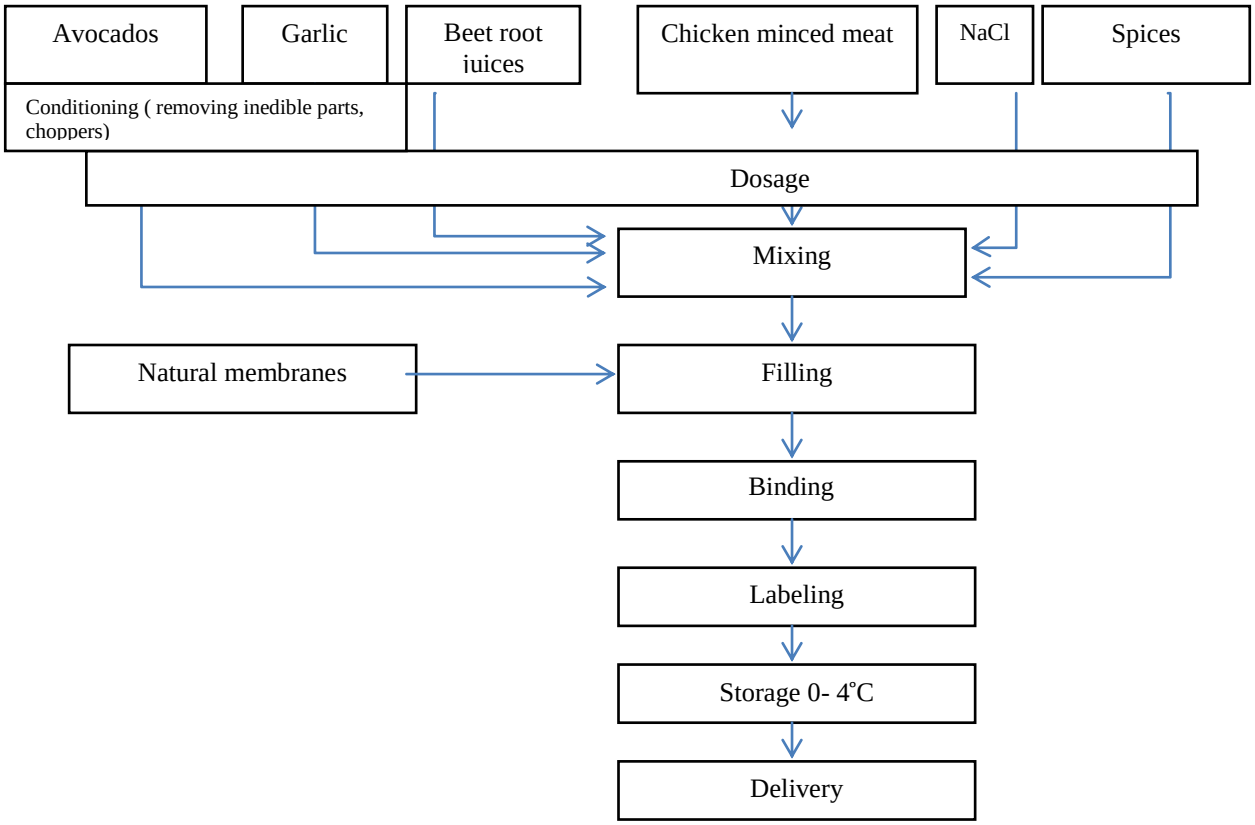

Fig. 2 Technological scheme for obtaining avocado chicken sausages

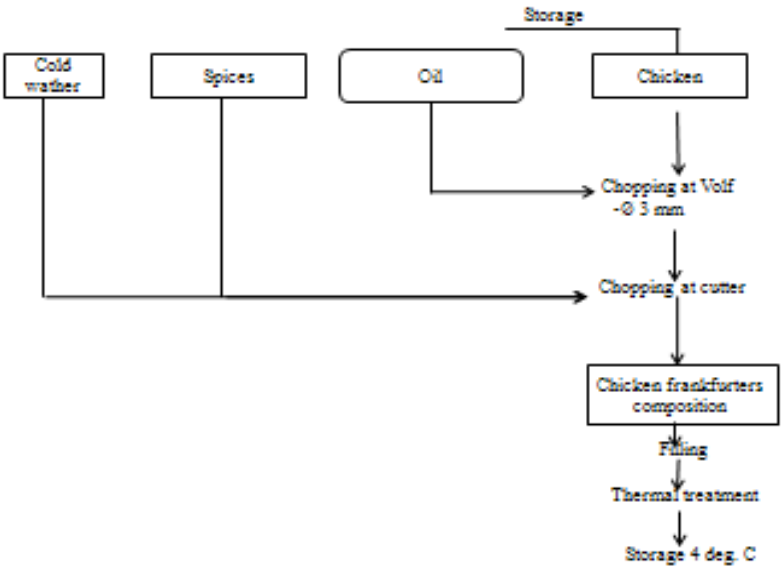

Fig. 3 Technological scheme for obtaining chicken frankfurters

Moisture was determined by drying at the oven. The protein content was determined by the Kjeldahl method.
The value of the freshness was performed by NH_3 dosing, Nessler test, peroxide index determination.
NH3 was dosed by distillation and titration of excess acid with NaOH solution.
The peroxide value (PV) is used for determining the peroxide oxygen (especially hydroperoxides). It is expressed in milliequivalents of active oxygen per kg of fat, according with AOCS Standard Method.
For the sensory analysis a scoring scale of 5 points was used. Exterior appearance (EA), appearance on the section (SA), color (C), consistency (CS), taste (T), smell (S) were analyzed.

3. RESULTS AND DISCUSSION

The results of the analyzes which indicate the chemical composition are shown in figure 4. Moisture had the highest value for S10, because maturation was carried out in beet root juice. Pork sausages obtained with marc powder had the lowest moisture 53.76%, compared to S2, 65.82% and to S1, 64.34%. Chicken sausages with avocados had higher moisture than those obtained with bacon, but the protein content was 20.8% higher. The protein content varied between 14.42% to S2 and 24.64% to S4.
The chicken sausages obtained with avocados (S4) had a higher water content because avocados contain up to 80% water (Dreher and Davenport, 2013).

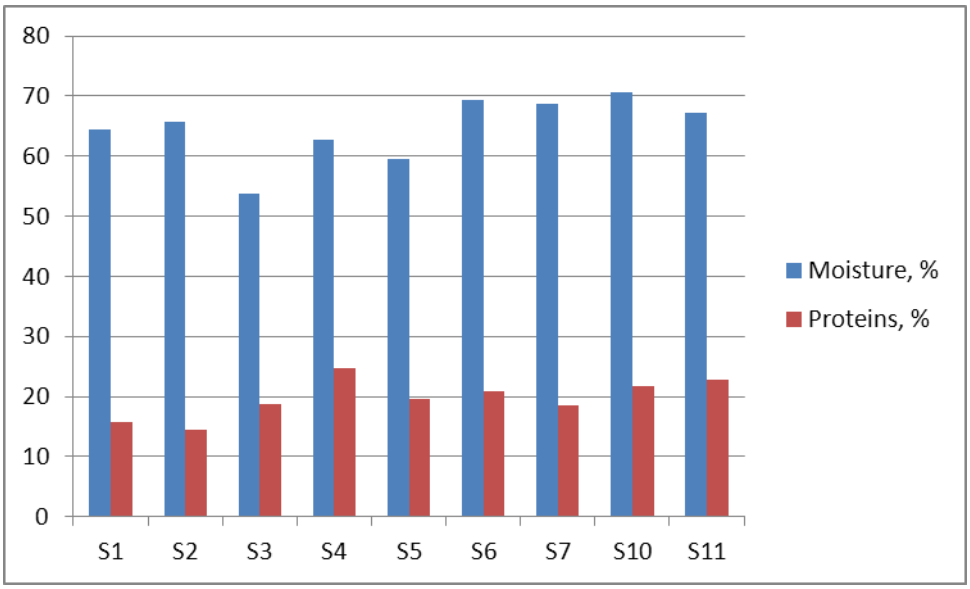

Fig. 4. The chemical composition of the analyzed samples

Table 2. The freshness tests for the analyzed samples

Samples	Nessler test	NH_3, **mg %**	Peroxide index, g I_2 %
S1	partial positive	26.4	0.075
S2	negative	20.3	0.045
S3	negative	21.9	0.043
S4	negative	23.6	0.024
S5	partial positive	28.7	0.083
S6	negative	28.4	0.047
S7	negative	26.5	0.052
S8	negative	-	0.026
S9	negative	-	0.032
S10	negative	16.9	0.027
S11	negative	18.6	0.033

The meat products were stored for 3 days at 4 deg. C, after which the freshness tests were performed (Table 1).

The pork sausages obtained without vegetable supplements and the chicken sausages obtained with back fat showed partial positive reactions to the Nessler test. Also the ammonia content was at S1 comprised between the values indicated by Stanescu (1998) 20-42 mg% for the relatively fresh meat of pork. The sample S5 has its own value relative freshness status for poultry meat namely 25-35 mg%.

The peroxide index value was above the value indicated by Stanescu, which characterizes fresh meat, at samples S1 and S5. All other samples showed characteristic values of fresh or relatively fresh meat, between 0.024 g I_2 % and 0.052 g I_2 %. The values that characterize very fresh meat are less than 0.03 g I_2 % and for fresh meat are between 0.03-0.08 g I_2 %.

Sensory evaluation is the scientific discipline that evokes, measures, analyzes, and interprets human reactions to the characteristics of foods that can be perceived through the senses of sight, smell, taste, touch, and hearing. Scientific sensory evaluation should be done under carefully controlled conditions to reduce the environmental impact, personal subjectivity to the test.

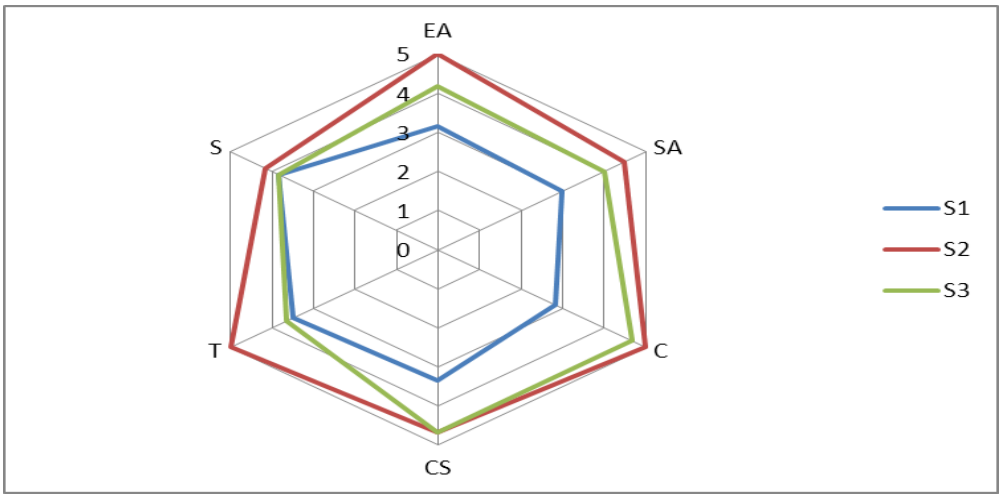

Fig. 5 The diagram of sensory analysis for pork sausages

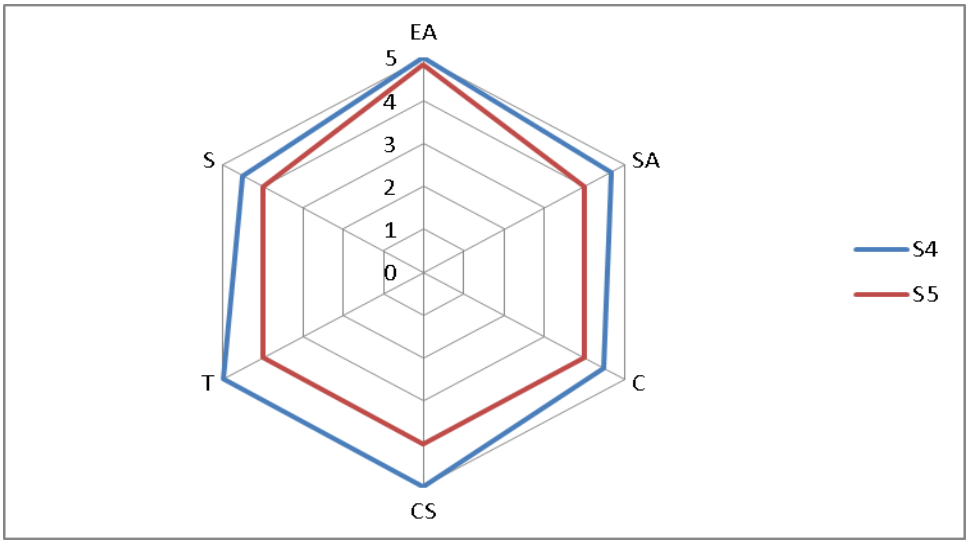

Fig. 6 The diagram of sensory analysis for chicken sausages

Subjectivity and prejudice can be significantly reduced by thoroughly preparing and using appropriate, structured and standardized descriptions and classifications.

The score given to pork products reflects the role of vegetable additives on color, appearance and section, but also on consistency (Figure 5).

The taste and color of the blank (without vegetable additions) and sausages with red beet juice and marc powder are roughly evaluated by the tasters. The main role of dyestuffs in plant products is seen on the color of finished products, which is a quality parameter with an impact on consumers.

From the chart of sensory analysis for chicken sausages (Figure 6) it is noted that both assortments received superior qualifiers, which means that chicken is agreed by consumers, both in terms of flavor and nutritional composition. Sample S4 had consistency, taste, smell, appearance, superior to sample S5.

In figure 7 is represented the diagram of sensory analysis for chicken frankfurters where it is observed that the sample obtained with bacon has a lower score than that with oil, but its consistency is superior the frankfurters with oil.

In figure 8 is the sensory analysis for bacon, where it is observed that the bacon sample matured in carrot juice was appreciated by the tasters. The color of sample S8 was slightly yellowish, and cold smoked fat S9, was yellowish brown.

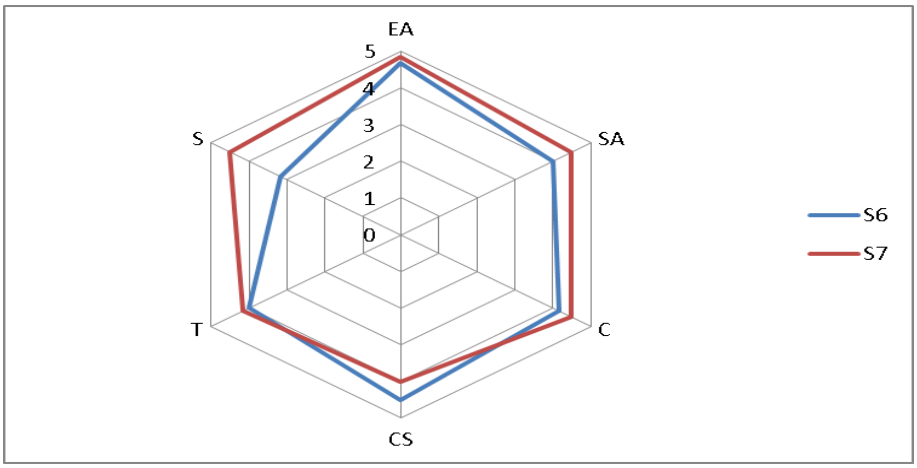

Fig. 7 The diagram of sensory analysis for chicken frankfurters

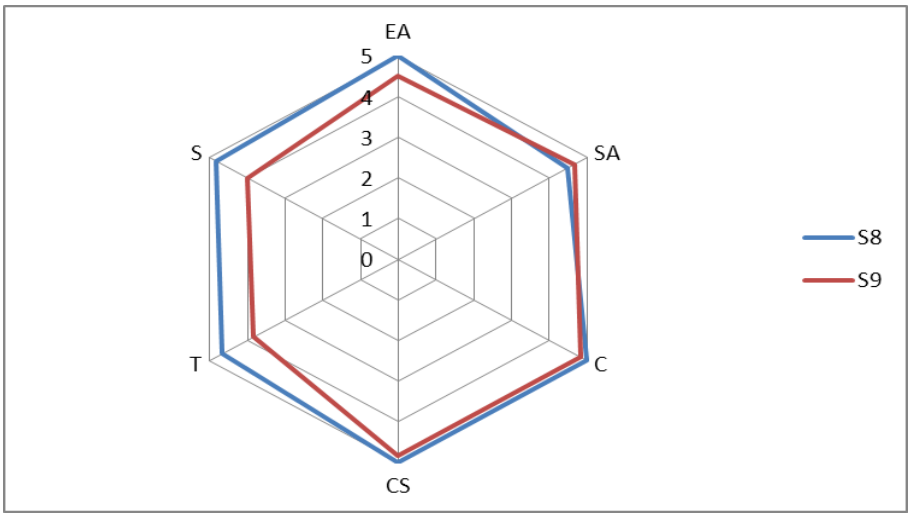

Fig. 8 The diagram of sensory analysis for pork fat

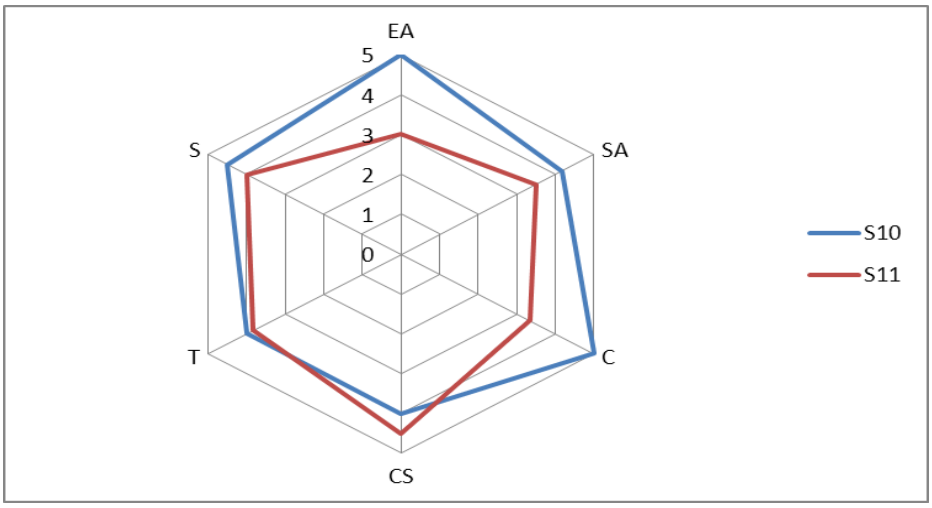

Fig. 9 The diagram of sensory analysis for pork pulp

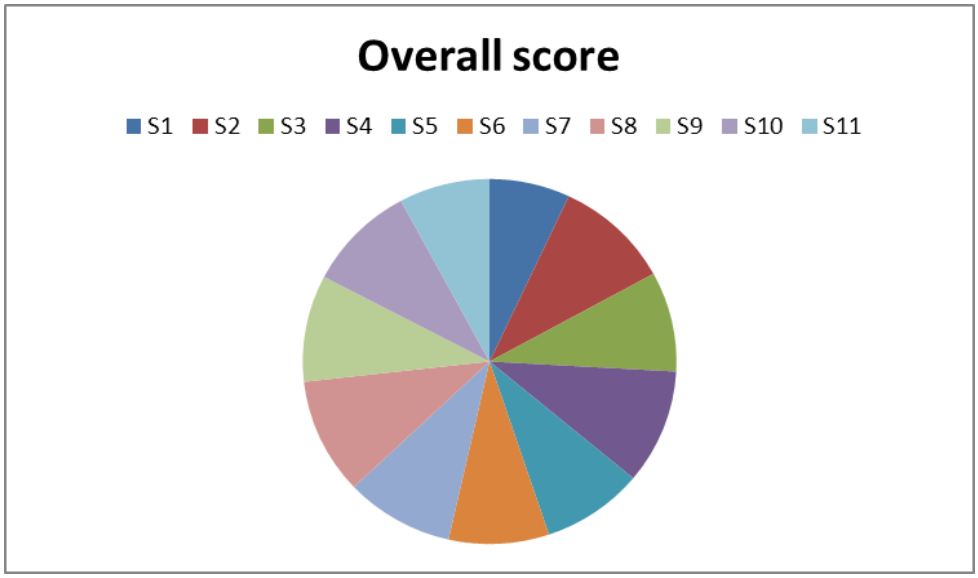

Fig. 10 The overall score for analyzed samples

The sample S8 was less dotted than S9 in color and consistency, but it is known by smoking can diffuse harmful substances, some carcinogens (aromatic polycyclic aromatic hydrocarbons), so maturing in carrot juice can be an alternative to smoked meat products.

In the diagram of sensory analysis for pork pulp is observed that the marinated pulp sample in beetroot juice (S10) was sensory net superior to the smoked pulp sample (S11) (Figure 9). The external appearance and the color were the sensory characteristics rated with maximum points.

The sample S10 had a lower score than S11 in terms of consistency, because by ripening in red beet juice, the moisture of the meat increases, as also resulted from chemical analysis (Figure 4), and consistency is less firm. However, ripening in red beet juice is a total or partial alternative to cold smoking, as the finished product will have an intense color and will be safe from the point of view of toxicity.

Analyzing the overall scores presented in the diagram in Figure 10.

It is observed that all products obtained with vegetable additives have values close to the maximum value 5. The highest values in descending order had their samples S8 (4.83), S4 (4.77), S2 (4.72). The lowest values in ascending order were S1 (3.27), S11 (3.69), S6 (4.08).

4. CONCLUSIONS

Regarding the chemical composition, the analyzed products are characterized by parameters that are within the limits of the quality standards applicable to raw meat products.
All products with vegetal additions are sensitively appreciated and do not contain synthetic additives. They can be considered as functional foods, because they have a special nutritional value, by the percentage of protein, by the antioxidant substances from avocados and beet juice, through garlic phytoncides and mineral salts of raw materials.
Under refrigeration storage, finished products retain their sensory and physico-chemical qualities for three days. The polyphenolic substances in carrots, red beets, positively influence both the color of the meat products and the freshness status, respectively the shelf life.
By replacing pork bacon with vegetable oil and avocados respectively, are obtained meat products with a lower calorie content and saturated fatty acids.

5. ACKNOWLEDGEMENT

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