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THE QUALITY EVALUATION OF SOME ASSORTMENTS OF CANNED PORK

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Abstract

The purpose of the study was the appreciation of the quality of some assortments of canned pork marketed in Romania, following the sensory, chemical (including energy value) and aesthetic characteristics. Three types of canned pork were taken in the study (pressed pork, pork in its own juice and hook meat). Were analysed 30 samples (coded A, B and C, ten samples for each assortments). Sensory characteristics were analysed by tasting, using the scoring scales method and the content of water, dry matter, proteins, lipids and salt was determined by standardized classical methods; the results obtained were compared with the values declared on the label. Following the sensory analysis, two products was included in the category of good and one in very good quality class. After laboratory analysis, the amount of protein was the closest (between 14.16% (for product A) and 15.06% (for product C), the amount of water varied between 61.05% (for product A) and 70.25% (for product C), that of lipids between 12.75% (for product C) and 22.80% (for product A) and that of salt between 2.05% (for product B) and 1.73% (for product A). The analysis showed very small differences in the chemical composition compared to the values indicated on the product label, but larger differences could be observed between the studied products, probably based on the different chemical composition of the raw material used.

Key words*: canned pork, energy value, lipids, proteins.*

INTRODUCTION

Food of animal origin is among those products that provide many important nutrients. The food industry employs numerous technologies which allow manufacturing of products with diversified shelf life. Canned products are characterized by a long shelf life, do not need to be kept at low temperature, and do not require special treatment during transport or distribution (Dave & Ghaly, 2011; Kapica & Weiss, 2012; Kowalska et al., 2020).

Canned pork is one of the widely sold meat products. The majority of canned meats are commercially sterilized and are processed to the point at which most microorganisms and their spores are killed. This capability allows to increase canned meat shelf life to a certain extent, provided it is kept sealed, but the product is markedly different from fresh meat, both chemically and physically in the course of time (Ferysiuk et al., 2020).

In the production of pork-type canned meat in its own gravy, the meat is grinded and then mixed, which could lead to the unification of the quality of meat batter; thereby, minimizing the risk of the development of point quality defects of the product (Florowski et al., 2017).

Sensory assessments of canned meat depend on other parameters, such as the quality of cans and raw materials, which need to be continuously examined to provide consumers safe products (Stojanović et al., 2021).

According to the 2006 Directive no. 52 and 2011 Order no. 1129 of European Commission (Commission Regulation EU), the maximum allowed limit of nitrite is 100 mg/kg in sterilized meat products.

In January 2016, upon the request of the European Commission, Food Chain Evaluation Consortium concluded in its report that an average dose of 80 ppm of added nitrite would be sufficient for sterilized meat products without significant effect on color, flavor and microbiological safety (Food Chain Evaluation Consortium, 2016).

The purpose of the study it was the appreciation of the quality of some assortments of canned pork marketed in Romania, following the sensory, chemical (including energy value) and aesthetic characteristics.

MATERIALS AND METHODS

Three types of canned pork (pressed pork, pork in its own juice and hook meat) randomly coded A, B and C, ten samples for each assortment) were taken in the study. Sensory characteristics were analyzed by tasting, using the scoring method; the lipid content was determined by the Soxhlet method, the protein one by the Kjeldahl method, and the moisture and the dry matter by the drying method in the oven (at 105°C).

The evaluation of the sensory quality of canned pork was carried out in a sensory analysis laboratory of USAMV Iasi by the participation of a group of twenty-four students in food engineering, each receiving an individual sheet. Prior to analysis, the samples were brought to a temperature of 18-21°C, according to the provisions of the professional/product standards. The analysis of shape, appearance and color is performed in natural, diffuse light. The *appearance and color* were examined on the outside of the products, then on the inside and the *consistency* was analyzed on the outside and then in the products section with the touch analyzer, by chewing and visually. The *odor analysis* was performed by simple inspiration. The *tasting* of the samples was done carefully, without haste, with relaxation breaks of about 2 minutes between the portions of the sample; 5-10 g of product were taken for tasting. Before and after tasting each sample, the tasters rinsed the oral cavity with drinking water to eliminate the remaining taste. The evaluation of each organoleptic characteristic (SP 3196-83) was performed by comparing with scoring scales of 0-5 points, by obtaining the total average score for all the characteristics examined by the group of tasters and by comparing it with a scale from 0 to 22 points for weighted average score obtained after tasting (Table 1). The samples were prepared in the same way for all tasters and distributed in equal quantities, in identical vessels (according to STR 1125-85 Organoleptic characteristics for canned meat).

As a result, the arithmetic mean obtained from the score given by all tasters for each characteristic was taken. Examination of organoleptic characteristics specific canned pork followed: appearance, color, consistency, taste and smell.

RESULTS AND DISCUSSIONS

After the **sensory analysis** the total score determined for the products analyzed was between 19.86 and 20.31 points (good and very good quality class); however, the total average (20.01), includes all the analyzed canned pork in the category of very good products; two products were included in the good quality class, but with a very high score (19.90 and 19.86) close to the very good product that obtained 20.31 points (Table 2)

Table 1. Classification of the products in the appropriate quality class according to standards

Total average score	Quality class/grade obtained
20.1-22	Very good
17.6-20	Good
13.1-17.5	Satisfactorily
7.1-13	Unsatisfactory

Table 2. Total score obtained for the sensory analysis of the canned pork

Products	Total score	Qualifying
A	20.31	Very good
B	19.86	Good
C	19.90	Good
Average	20.02	Very good

The average score of sensory characteristics determined by tasting highlights differences between products, but not with very high values (Figure 1.).

The highest average score was obtained for appearance (4.83) for product C and the lowest for consistency (3.78) for product B.

The summed score for canned pork was between 23.23 (for product A) and 22.07 points (for product B).
The three analysed products summed the following score for organoleptic characteristics: 14.22 for appearance, 13.92 for color, 13.86 for taste 13.33 for smell, and 12.75 for consistency, highlighting the highest value for appearance (14.22), color (13.92) and taste (13.86) for all studied canned pork.
On average was obtained the following values for all products: 4.74 for appearance, 4.25 for consistency, 4.64 for color, 4.44 for smell and 4.62 for taste.

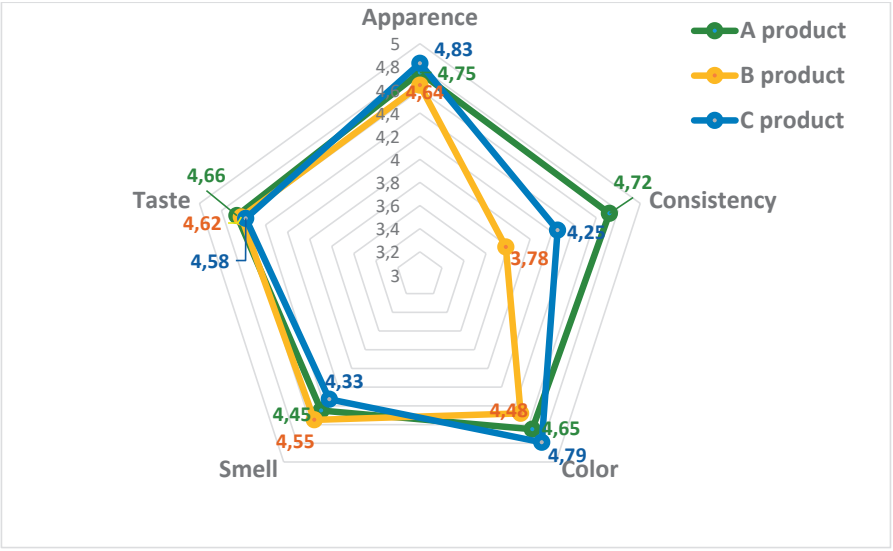

Figure 1. The average score of sensory characteristics determined by tasting for canned pork

The weighted average score obtained after tasting for the canned pork summed 27.72 points for taste, 16.00 for smell, 5.69 for appearance, 5.57 for color and 5.10 for consistency. The average score was 9.24 for taste, 5.33 for smell, 1.90 for appearance, 1.70 for consistency and 1.86 for color (Figure 2).

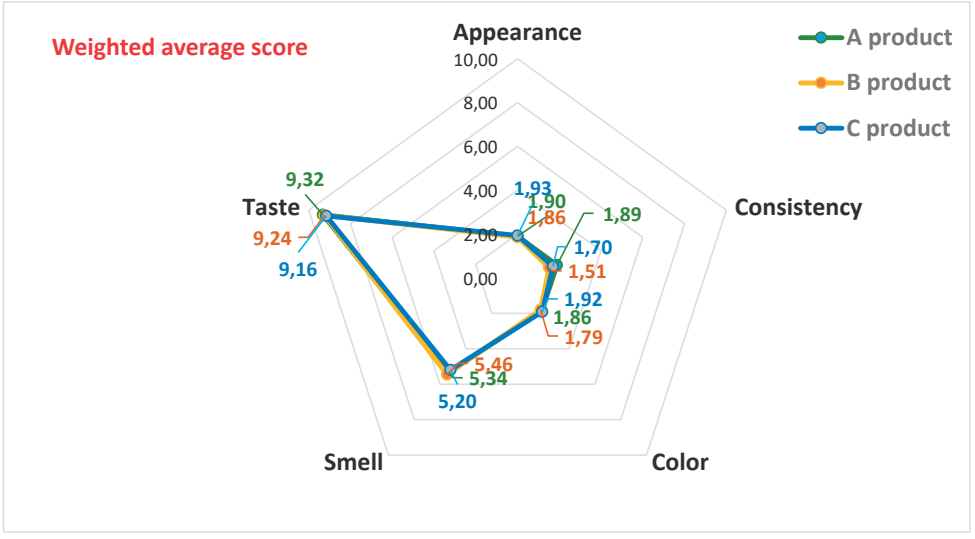

Figure 2. Weighted average score obtained after tasting for the canned pork

The average content determinate in laboratory of chemical composition for all canned pork taken in the study was: 65.91% for water, 17.41% for lipids, 14.29% for proteins, 1.87 for salt and 0.52 for carbohydrates, with *very* small differences between the values from the label (Table 3).

The energy value of analysed products was on average 221.02 kcal per 100 g (ranging between 177.18 – 262.39 kcal) on the label; the highest energy value (262.39 kcal per 100 g) was observed in the product which also contain the highest amount of lipids (23.01%).

Table 3. Chemical composition and energy value of the canned pork (values on the label and determined in laboratory)

Content / Product	Water	Lipids (%)		Proteins (%)		Salt (%)		Carbohydrates (%)		Energy			
										kcal/100g		kJ/100g	
	D*	L*	D*	L*	D*	L*	D*	L*	D*	L*	D*	L*	D*
A	61.05	23.01	22.8	14.31	14.16	1.78	1.73	0.21	0.26	262.39	267.13	1097.84	1117.65
B	66.43	17.5	16.68	14.44	13.66	2.00	2.05	2.06	1.18	223.50	213.35	928.0	892.65
	70.25	12.9	12.75	15.16	15.06	1.93	1.82	0.11	0.12	177.18	179.78	736.89	752.18
Average	**65.91**	**17.8**	**17.41**	**14.63**	**14.29**	**1.90**	**1.87**	**0.79**	**0.52**	**221.02**	**220.08**	920.91	920.83

**L - on the Label; *D - Determinated in laboratory.*

The largest variation was identified in case of lipids content (on the average, difference of 10.11 percentage points, between 12.9% and 23.01%), followed by water content (difference of 9.2 percentage points, between 70.25% and 61.05%).

For the protein content was observed relatively small differences of 0.85 percentage points (between 15.16% and 14.31%), for salt 0.22 percentage points, however for carbohydrates was identify differences of 1.95 percentage points (between 2.06% and 0.11%).

Product ingredients was:

-pork, salt, stabilizer (sodium diphosphate), antioxidant (ascorbic acid), dextrose, spices and spice extract, yeast extract, flavor enhancer (sodium monoglutamate), preservative (sodium nitrite) -***for product A***;

- pork, salt, onion, flavor enhancer (sodium monoglutamate), glucose syrup, flavors, stabilizer (sodium diphosphate), antioxidant (ascorbic acid, sodium ascorbate, citric acid), preservative (sodium nitrite)- ***for product B***;

- hook meat, salt, glucose syrup, antioxidant (sodium ascorbate), spices and spice extracts, *flavors*, stabilizer (sodium diphosphate), yeast extract, preservative (sodium nitrite) –***for product C.***

All three products contain sodium nitrite as a preservative and two of them contain sodium monoglutamate as a flavor enhancer. Unfortunately, a discovery the carcinogenic N-nitrosamines (NA) in fried bacon made in the 1971 raised concerns about the safety of nitrite use which remains unanswered to date (Sindelar et al., 2012). This led to a wide interest in the formation of NA in meat products and their influence on human health. NA can be generated during the usual processes applied to the products at home (e.g., cooking, frying), or in the products formed during the production process, or in the gastrointestinal environment through endogenous reactions. A common factor involved in the generation of NA is the reaction between a secondary amine and a nitrosating agent (Riviera et al., 2019; FAO, 2017). Moreover, a very high intake of nitrite can also lead to methemoglobinemia, a condition in which nitrite binds to hemoglobin and impairs the oxygen transport to cells (Gassara, 2016).

The current directive 2006/52/EC and the Regulation No. 1333/2008 state that the maximum amount of nitrite that may be added to the sterilized meat products is 100 mg/kg (Ferysiuk & Wojciak, 2020).

CONCLUSIONS

The canned pork studied have on average a very good score on a sensory point of view (at lower limit, 20.02 points), rated for five categories of characteristics: two of them obtaining over 19.8 points (19.86 and 19.90), and one product being very close to this (20.31 points). two products was included in the category of good and one in very good quality class. After laboratory analysis, the amount of protein was the closest (between 14.16% (for product A) and 15.06% (for product C), the amount of water varied between 61.05% (for product A) and 70.25% (for product C), that of

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REFERENCES

Commission Regulation EU No 1129/2011 of 11 november 2011 amending annex II to regulation (EC) No 1333 /2008 of the european parliament and of the Council by establishing a union list of food additives text with EEA relevance. https://eur-lex.europa.eu/legalcontent/EN/TXT/?qid=1551265897176&uri=CELEX:32011R1129. Food Chain Evaluation Consortium (2016). Study on the monitoring of the implementation of Directive 2006/52/EC as regards the use of nitrites by industry in different categories of meat products Final report. 1–284.

Dave, D., & Ghaly, A.E. (2011). Meat spoilage mechanisms and preservation techniques: a critical review. *American Journal of Agricultural and Biological Science*, 6(4), 486–510.

Directive 2006/52/EC of the European Parliament and of the Council of 5 (July 2006). Available online: https://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:204:0010:0022:EN:PDF .

Ferysiuk, K., & Wojciak, K.M. (2020). The Possibility of Reduction of Synthetic Preservative E 250 in Canned Pork. *Foods*, 9(12), 1–20. doi: 10.3390/foods9121869.

Ferysiuk, K., Wojciak, K.M., Materska, M., Chilczuk, B., & Pabich, M. (2020). Modification of lipid oxidation and antioxidant capacity in canned refrigerated pork with a nitrite content reduced by half and addition of sweet pepper extract. *Lwt-Food Science and* Technology, 118, 1–10.

Florowski, T., Florowska, A., Chmiel, M., Adamczak, L., Pietrzak, D., & Ruchlicka, M. (2017). The effect of pale, soft and exudative meat on the quality of canned pork in gravy. *Meat Science*, 123, 29–34.

Food and Agriculture Organization of the United States/World Health Organization. Report of the 49th Session of the Codex Committee on Food Additives. 2017. Available online: http: //www.fao.org/fao-who-codexalimentarius/shproxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.faoorg%252Fsites%252Fcodex%252FMeetings%252FCX-711-49%252FReport%252FREP17_FAe.pdf

Gassara, F., Kouassi, A.P., Brar, S.K., & Belkacem, K. (2016). Green Alternatives to Nitrates and Nitrites in Meat-based Products - A Review. *Crit. Rev. Food Sci. Nutr.*, 56, 2133–2148.

Kapica, C., & Weiss, W. (2012). Canned fruits, vegetables, beans and fish provide nutrients at a lower cost compared to fresh, frozen or dried. *Journal of Nutrition & Food Sciences*, 2(4), 2–5, 2012.

Regulation (EC) No 1333/2008 of the European Parliament and of the Council of 16 December 2008 on food additives. Available online: https://eur-lex.europa.eu/eli/reg/2008/1333/2016-05-25

Rivera, N., Bunning, M., & Martin, J. (2019). Uncured-Labeled meat products produced using plant derived nitrates and nitrites: Chemistry, safety, and regulatory considerations. *J. Agric. Food Chem*., 67, 8074–8084.

Sindelar, J.J., & Milkowski, A.L. (2012). Human safety controversies surrounding nitrate and nitrite in the diet. *Nitric Oxide*, 26, 259–266.

Stojanović, B., Vasilev, D., Stojanović, Z., Parunović, N., Janković, S., Stanojević, S., Balaban, M., & Antić, V. (2021). Determination of sensory properties and levels of trace elements during storage of canned meat products. *International Journal of Food Science & Technology*, 45(3), e15278.

***STR 1125*-85 *Organoleptic characteristics for canned meat*