QUALITY ASSESSMENT OF SOME MEAT PRODUCTS MANUFACTURED IN TRANSYLVANIA AREA FOR PUBLIC COMSUMPTION

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Abstract

Meat products are a part of food industry that has become increasingly important in the diet of consumers. Meat products are consumed mainly due to increased nutritional value but also to other aspects such as the ready to eat, increased shelf life, cost, etc. In order to ensure the hygienic quality of meat products, the quality of raw materials and the hygiene practices during all manufacturing steps must be strictly controlled. The aim of the study was to evaluate the chemical composition and hygienic quality of some meat products manufactured in the central area of Transylvania by three processing companies (A, B, C). The research material was represented by 45 samples of meat products collected between February and June 2018 from the different hypermarket located in Transylvania. All the samples were analyzed for moisture, protein, fat, and collagen with FoodScan equipment. Aerobic plate count, Enterobacteriaceae, and E. coli were analyzed using standardized methods and PCR method were used for specie identification. The main chemical compositional non-compliances were identified at the moisture parameter at which all categories of products analyzed showed higher values, especially for B and C and protein, respectively, where lower values were found in the case of the Parizer obtained by manufacturer B. Fresh sausages exhibited the highest level plate count, Enterobacteriaceae and E. coli, while the raw, dried and smoked sausages exhibited the lowest level of contamination. Enterobacteriaceae and E. coli were not found in any of the raw, dried and smoked sausages samples. Salmonella spp. was not isolated from any of the samples. The percentage of fraud products was 13%, mainly in the case of pork and poultry meat products.

Keywords*: meat products, chemical composition, microbial contamination, specie identification*

Introduction

Meat products are a growing market, transformation and scale-up of product categories in terms of increasing consumer demands. Meat products are a part of food industry that has become increasingly important in the diet of consumers. Under the influence of growing consumer demands, meat products have developed as a result of finding new ingredients, and manufacturing technologies. The meat industry have seen a real development, especially in recent years, during which new and improved equipments and technologies have been put in place to ensure the production of high quality products (Sălăgean and Ţibulcă, 2010; Mihaiu *et. al*., 2011; Drăghici *et al*., 2014). Quality defects encountered in meat products are most often associated with inappropriate formulation, processing or handling at different stages of the technological process. In order to ensure the hygienic quality of the meat products and their integrity, the stages of the technological flow must be strictly observed, as well as the control of the raw and auxiliary materials, the semi-finished products and the finished product (Mihaiu *et. al*., 2011; Purcărea *et al*., 2015). Meat products are consumed mainly due to increased nutritional value but also to other aspects such as the ready to eat, increased shelf life, cost, etc. In order to ensure the hygienic quality of meat products, the quality of raw materials and the hygiene practices during all manufacturing

steps must be strictly controlled. The aim of the study was to evaluate the chemical composition and hygienic quality of some meat products manufactured in the central area of Transylvania by three processing companies (A, B, C).

Material and methods

The research material was represented by 45 samples of meat products collected between February and June 2018 from the following types: raw pork sausages, raw dried and smoked sausages, heat treated smoked salami, and heat treated smoked ham. From each group of meat products, similar assortments were produced, produced in 3 different processing units (A - unit sold on the regional market, B - unit selling on the national market, C - unit sold on the local market). In order to obtain relevant results, 3 samples were taken from each assortment of meat product. All the samples were analyzed for moisture, protein, fat, and collagen with FoodScan equipment. Aerobic plate count, Enterobacteriaceae, and E. coli were analyzed using standardized methods and PCR method were used for specie identification. Statistical analysis of the rsults was realized using Origin 8.5 software program by comparison of means by analysis of variance through ANOVA test.

Results and discussions

Gross chemical composition of meat products

From analysis of the results obtained with heat treated smoked ham, it was found that: moisture was between 64.54g ± 0.32g for producer A and 76.01g ± 0.05g for producer C. It was found that the maximum accepted limit of 70g% was exceeded by manufacturers B and C ($p < 0.05$). In terms of fat, the values were between 1.43g ± 0.01g for manufacturer C and 3.22 ± 0.03g for manufacturer B (Fig. 1).

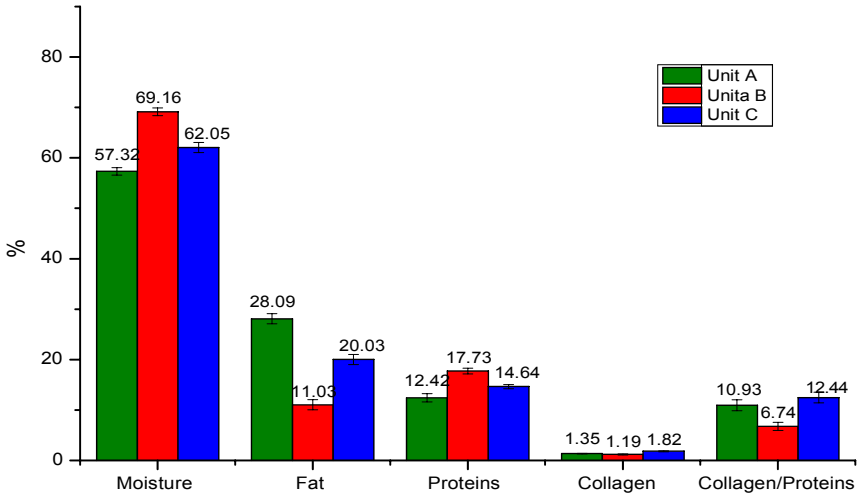

Figure 1. Average chemical composition (±SEM) of heat treated smoked ham manufactured in A, B and C units (n=5)

The highest protein value was recorded at manufacturer A, which is 26.58 ± 0.1g and the lowest value of 17.46 ± 0.03 g is associated with producer C. The collagen values were between

0.7 ± 0.02g for manufacturer B and 0.76 ± 0.02g for manufacturer C. The collagen / protein ratio for heat treated smoked ham, has shown the following values: 3.69 ± 0.07g for producer B, this being the lowest value and 4.35 ± 0.05 g% for manufacturer C, representing the highest value obtained (fig. 1).

Based on the results of the analysis of samples of the Salam Victoria, it was found that the maximum accepted value for moisture (68 g%) in the case of heat-treated smoked products was exceeded by producer A, having a moisture content of 71.45 ± 0.50g, but also by manufacturer C (69.8 ± 0.75g), while producer B fell within the normal range with a value of 56.02 ± 0.50g. In terms of fat content, manufacturers A, B and C complied with the maximum limit of 38 g%, with the following values: 6.5 ± 0.47g, 21.09 ± 1.01g and 8.04 ± 0.50g.The same situation was found for proteins: manufacturer A (16.5 ± 0.50g%), manufacturer B (15.31 ± 0.85g) and manufacturer C (16.24 ± 0.86g%), the minimum limit of 12g% protein being respected. In the case of collagen, where the limit is 20g%, the maximum value of 3.5g ± 0.52g 5 was found in producer B, while producers A and C had lower values: 1.35 ± 0.50g (A) and 1.56g g ± 0.12g (C). Collagen/protein ratio revealed the following results: 23.15 ± 4.53g for manufacturer B, this being the maximum value of the ratio obtained for Victoria salami, 9.64 ± 1.27g for manufacturer C, and 8.2 ± 0.55g for producer A (Figure 2).

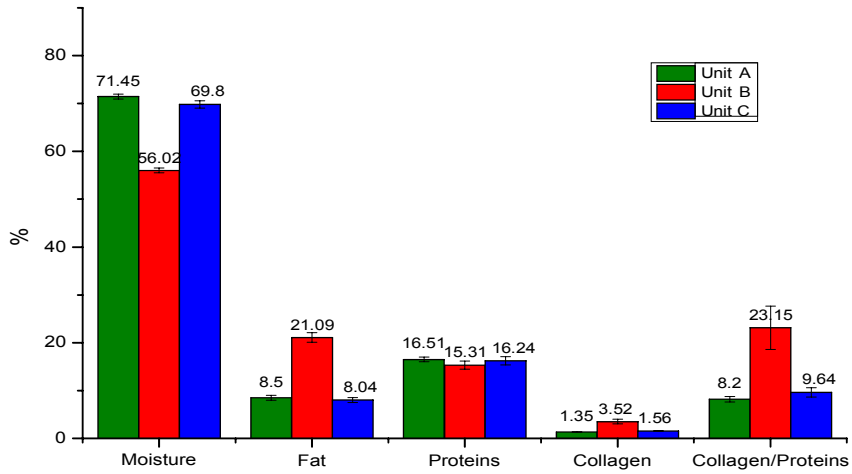

Figure 2. Average chemical composition (±SEM) of heat treated smoked salami manufactured in A, B and C units (n=5)

Similar results were found in a study by Mazahred *et al.* (2009), who reported similar results to proteins (14.4 g%), fat (19.9 g%) and also moisture (59.5 g%). Also, Gomes Basso Los *et al.* (2014) in a study conducted in Brazil presented similar results. The moisture was 74.66 ± 0.11g%, the amount of protein was slightly below the admissible limit, being 11.53 ± 0.51 g%, and the fat was recorded with a value of 0.89 ± 0.01g%.

Regarding raw dried smoked sausages, it was found that the maximum value of the moisture (30g%) was exceeded by producer A (50.04 ± 0.65g) and producer C (40.29 ± 0.84g) ($p < 0.05$), while producer B complied with the maximum admitted limits (17.13 ± 1.02g). the fat do not

exceed the maximum admitted levels (55 g%), so the maximum value we recorded was 41.14 ± 1.03g for the producer C, the other producers having lower results (29.05 ± 0.9g for A and 36.34 ± 1.9g for C).

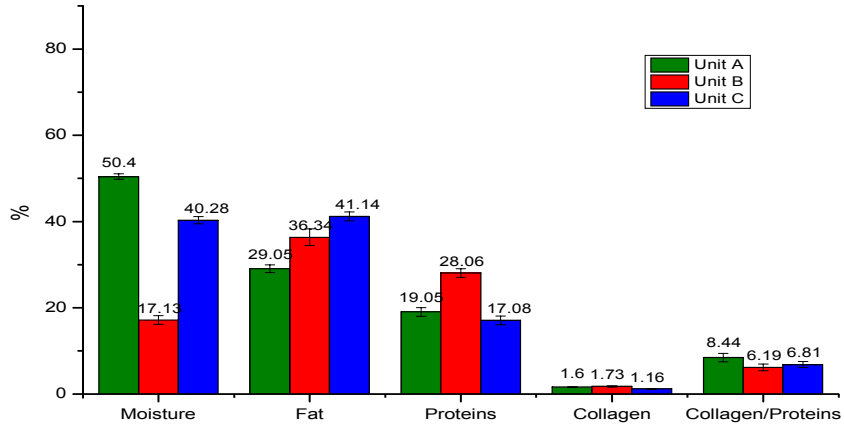

Figure 3. Average chemical composition (±SEM) of raw dried smoked sausages manufactured in A, B and C units (n=5)

The highest value of collagen was found in manufacturer B (1.73 ± 0.15 g%), the other two producers having similar results, as follows: 1.6g ± 0.10g% (producer A), respectively 1.16g ± 0.05g% (manufacturer C). The collagen/protein ratio for this product revealed the following results: 8.44g ± 0.97g%, for manufacturer A, 6.19g ± 0.77g% for manufacturer B and 6.81g ± 0.69g% for manufacturer C (Figure 3). Different results were presented by Romero *et al.* (2013), regarding the analysis of raw-dried-smoked sausages in case of fat content (18.50g ± 10.35g%), but similar in case of moisture 50.25g ± 8.25g% and protein 21.33g ± 6.30g%.

Microbial analyses of meat products

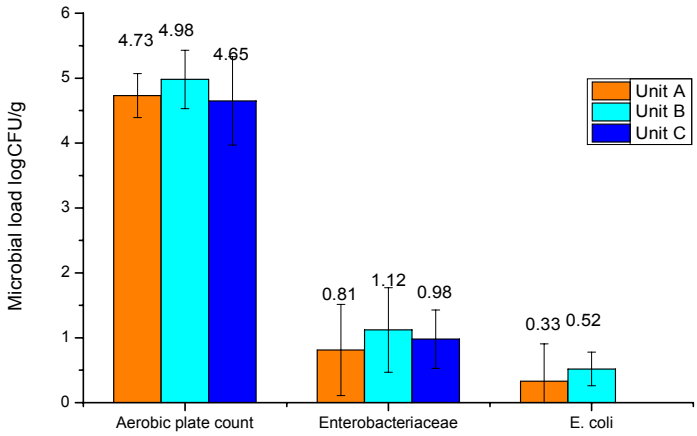

Figure 4. Average microbial load (±SEM) of APC, Enterobacteriaceae and *E. coli* in heat treated smoked ham manufactured in A, B and C unit (n=5)

According to the current legislation, protein value for raw-smoked-dried sausages must not fall below 16g%. In all collected samples the protein values were higher than the minimum level (19.05 ± 1.04 g% - unit A, 28.06 ± 1.11 g% - unit B, 17.08 ± 1.21 g% - unit C).

From the analysis of the results obtained with the evaluation of the germ contamination, it was found that the aerobic plate count (APC) ranged between 4.65 ± 0.68 log cfu/g for manufacturer C and 4.98 ± 0.45 log cfu/g for manufacturer B. The Enterobacteriaceae load presented values between 0.81 ± 0.70 log cfu/g for unit A and 0.98 ± 0.45 log cfu/g for the CE unit was between 0.33 ± 0.57 log u / g for unit A and 0.52 ± 0.26 log u / g for unit B (Figure 4). Of the total samples examined for *E. coli*, 33% were negative (Figure 4). Lower microbial load were reported by Park *et al.* (2014) in the case of heat treated ham samples, ranging from 1.63 to 1.85 log cfu/g. *E. coli* was not identified in his survey.

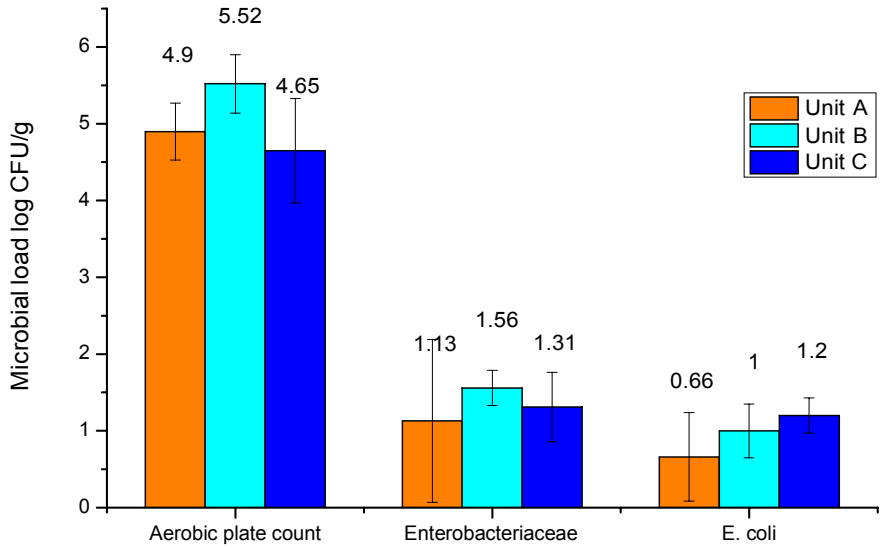

Figure 5. Average microbial load (±SEM) of APC, Enterobacteriaceae and *E. coli* in heat treated smoked salami manufactured in A, B and C unit (n=5)

As a result of the tests performed on the heat treated smoked salami samples, APC ranged from 4.65 ± 0.68 log cfu/g for manufacturer C and 5.52 ± 0.38 log cfu/g in case of manufacturer B. Regarding Enterobacteriaceae, the samples collected from manufacturer A recorded the minimum load (1.13 ± 1.05 log cfu/g), and for manufacturer B the maximum (1.56 ± 0.23) log cfu/g. *E. coli* count ranged from 0.66 ± 0.57 log cfu/ g for manufacturer A and 1.12 ± 0.23 log cfu/g in case of manufacturer B. Out of total samples of *E. coli*, 33% were negative (Figure 5). Lower microbial count were presented by Huang *et al*. (2014), respectively $2.5x10^4$ cfu/g for NTG and no *E.coli* was isolated.

In case of raw dried smoked sausages, it was found that the maximum value of APC was found in unit C (4.35 log cfu/g), while producer A recorded the lowest value (3.98 ± 0.51 log cfu/g). Enterobacteriaceae and *E. coli* were not isolated in any sample collected from the three producers (Figure 6). Similar results were reported in a study by Gunor *et al.* (2008), who obtained the following results: bellow 1.0 log cfu/g for the *E. coli* of raw-smoked-sausages and 3.93 ± 0.1 log

cfu/g regarding APC. Another study by Ciekure *et al*. (2016) showed also lower contamination with *E. coli* and Enterobacteriaceae (bellow 1 log cfu/g).

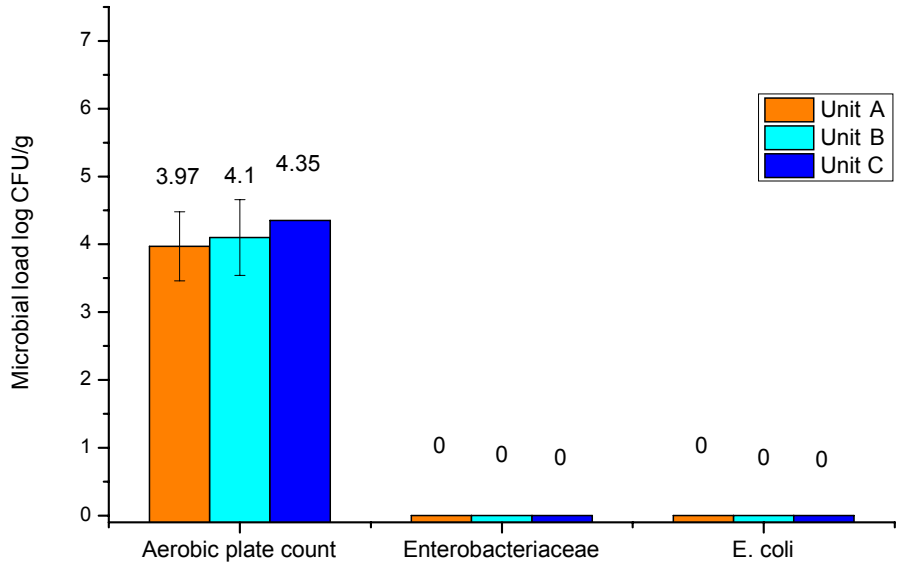

Figure 6. Average microbial load (±SEM) of APC, Enterobacteriaceae and *E. coli* in raw dried sausages manufactured in A, B and C unit (n=5)

Conclusions

The main chemical compositional non-compliances were identified at the moisture parameter at which all categories of products analysed showed higher values, especially for B and C and protein, respectively, where lower values were found in the case of the heat treated smoked salami manufactured in B processing plant. Heat treated ham and salami presented the highest levels of microbial load, in regard of aerobic plate count, Enterobacteriaceae and *E. coli*, while the raw, dried and smoked sausages exhibited the lowest level of contamination. Enterobacteriaceae and *E. coli* were not found in any of the raw, dried and smoked sausages samples. Also, *Salmonella* spp. was not isolated from any of the collected samples. Based on our results, there is a need of increased official controls of competent authorities in order to protect consumers' interests.

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