Abstract
Meat species in processed food products have been gaining an increasing interest mainly due to public health, economic and legal concerns, but also due to religious reasons. In the recent years there was an increasing demand for healthier meat products. Formulation of healthier meat products based on processing strategies is one of the most important current approaches to the development of potential meat-based functional foods. The main objective of the study was to characterize different type of meat and to use that to obtain a meat product-smoked sausage. The physico-chemical analyses highlighted the moisture content (drying-oven at 105 °C), protein (Kjeldahl method) and fat (Soxhlet method) content and sodium chloride content (Mohr method) of the meat and the final product. Sensory analyses of the samples as well as control sample were evaluated by 17 untrained panellists using a 9 point hedonic scale. Following this study, it was noted an improvement of organoleptic characteristics (texture and appearance) as well as physico-chemical and sensorial properties of the new product compared with the limits stipulated.

Keywords: smoked sausage, pork meat, deer meat, nitrite, physico-chemical quality parameters, sensory analysis

INTRODUCTION
Authenticity of food is becoming a key issue in most production chains and food niche markets. Consumers are increasingly becoming concerned about healthy and safe products and the demand for these products is escalating. The development of products to provide beneficial effects on health is a new trend and reflects the increasing acceptance of the role of diet in reducing the risk of chronic diseases (Salanta et al., 2014) Consumers expect the meat products on the market to have the required nutritional value, be wholesome, fresh, lean and to have adequate juiciness, flavour and tenderness (Hoffman et al., 2006) In the last years, game meat consumption has been increasing due to several motivations, such as its particular and more intense taste and flavour, its healthier composition (with lower fat and cholesterol contents) and the attraction of some people for the new and exotic food experiences. For these reasons, game meat, generally considered as delicacy products, are expensive compared to other types of meat, thus being susceptible targets for frauds. Game meat is still used in traditional recipes, but nowadays, new and reinvented gastronomic delicacies are being proposed by the meat industry. Food authenticity assessment of processed meat products encompasses several issues, including the detection of fraudulent substitution of higher commercial valued meat species by less expensive ones, the presence of undeclared species, the substitution of animal by vegetable proteins and fraudulent mislabelling (Ballin, Vogense et al., 2009). Deer meat has considerable nutritive value, rich in proteins and heme iron, with a low subcutaneous and infiltrated fat content. Pork and its products show a high nutritive value and good sensory properties. Currently, the meat processing industry is one of the largest agricultural and food-processing industries in the world. Thus, there
is clearly an urgent need for cost-effective, non-destructive online quality control systems that enable measurements to be made quick, accurate, and simple (Kamruzamma et al., 2015).

Quality is a set of characteristics of a product or service which gives it the ability to meet user expressed or implied requirements (Dobrinas et al., 2013).

It is known that by grinding and combining technological processes, the sensorial properties of a final product can vary between wide limits. Also, as the raw material is more finely minced, the final product properties are not so strictly dependent on the properties of raw material as in the case of products made from pieces of meat, which are more dependent on raw material quality, determined by the anatomic region from which are taken, by its appearance, by the ratio of different tissue components, the intimate structure of tissues, their colour – factors which cannot be modified too much during processing. The taste and smell of raw material contribute to the taste and smell of the final product, with changes more or less dominant given by the salt and spices used. (Sălăgean et al., 2012). Indeed, determination of quality, safety and authenticity has always been essential for the industry because consumers are constantly demanding superior quality meat and meat products, for which they are willing to pay relatively high prices.

In reality, high quality is a key factor for the modern meat industry in today’s hypercompetitive marketplace. On the other hand, with improvements in lifestyle, consumer demands have changed in the last decades for safe, high-quality products. In this digital era, consumers have greater access to information, thus they are now more concerned about the meat that they eat, especially their quality, safety, and authenticity (Kamruzamma et al., 2015).

**MATERIALS AND METHODS**

The analyzed samples, pork meat, were purchased from local butchery (Cluj-Napoca, Romania). Deer meat was obtained from special venison market. The final products were produces after a traditional recipe adding 70% pork and 30% deer meat. The physico-chemical analyses were performed at the Faculty of Food Science and Technology, Cluj-Napoca, Romania.

### Determination of fat content (Soxhlet extraction methods)

Standard SOX extraction method keeps the sample in contact with the solvent for a longer time. Petroleum ether was the solvent, fraction 40–60 °C and the parameters for samples were 6 hours. The volume of solvent was 80 ml during the extraction process. Before the solvent extraction step can begin the sample must be dried. Three g of sample were weighed into the thimble and 1 - 1.5 g of sand were added and mixed with a glass rod. The glass rod was wiped with a piece of cotton wool and this was placed in the top of the thimble. After the thimble was inserted in a Soxhlet liquid/solid extractor a clean, dried 150 mL round bottom flask was accurately weighed and about 80 mL of solvent were introduced into the flask. The assembled extraction unit was heated over an electric heating mantle until the solvent in the flask boils. The extraction continued for 6 hours.

\[
\text{\% Crude fat} = \frac{(W_2 - W_1) \times 100}{S}
\]

where \( S \) = Sample weight

\( W_2 = \text{Weight of flask after extraction} \)

\( W_1 = \text{Weight of flask prior to extraction} \)

### Determination of protein content (Kjeldahl method)

The amount of the protein is calculated from the nitrogen concentration of the food. The Kjeldahl method is divided into three steps: digestion, neutralization and titration. The analyzed food sample (1g) was weighed into a digestion flask and then digested by heating it in the presence of concentrate sulfuric acid (20 ml), copper sulphate (1g) and potassium sulfate (10g). After the digestion has been completed the digestion flask is connected to a receiving flask by a tube. The solution in the digestion flask is then made alkaline by addition of sodium hydroxide 30%. The ammonia gas that is formed is liberated from the solution and moves out of the digestion flask and into the receiving flask - which contains an excess of sulfuric acid 0.1 N and indicator phenolphthalein. The nitrogen content is then estimated by titration of sodium hydroxide 0.1 N (Muste et al., 2011).

\[
P\% = \frac{V_{\text{H}_2\text{SO}_4} - V_{\text{NaOH}} \times 0.0014 \times 5.7}{100 mL}
\]

Where \( V_{\text{H}_2\text{SO}_4} \) - volumes of sulphuric acid

\( V_{\text{NaOH}} \) - volume of sodium hydroxide used at titration
**Determination of moisture content**

Determination of moisture content consists in drying 5g of sample can at 103±2 °C until it reaches constant weight.

\[ DW = \frac{G_2 - G_1}{G} \times 100 \]

Where DW – dry weight

\[ G_2 – \text{mass of the sample after drying} \]

\[ G_1 – \text{mass of the sample before drying} \]

\[ G – \text{mass of the sample} \]

MC – moisture content

**Determination of chloride by the Mohr Method**

Individual samples (10g) were weighed into 250 mL Erlenmeyer flasks and dissolved in about 100 mL of distilled water. Small quantities of NaHCO₃ were added until effervescence ceased. About 2 mL of K₂CrO₄ was introduced and the solution was titrated to the first permanent appearance of red \( \text{Ag}_2\text{CrO}_4 \). An indicator blank was determined by suspending a small amount of chloride free CaCO₃ in 100 mL of distilled water containing 2 mL of K₂CrO₄.

**Sensory analysis - Acceptance test**

Hedonic test of the sausage sample was conducted within 3 days after the sausage was prepared, in the sensory evaluation laboratory of the Faculty of Food Science and Technology, Cluj-Napoca. A group of 17 panellists performed sensory profiling of sausage sample. The panellists evaluated sausage obtained from pork and deer meat for colour, aroma, taste, texture and overall acceptability using a 9-point hedonic scale with 0 being “dislike extremely” and 9 being “like extremely”.

**RESULTS AND DISCUSSION**

The results of the physico-chemical analyses of the raw materials (pork, deer meat) are shown in Table 1.

The physico-chemical analyses of raw samples showed that the deer meat contains higher protein and less fat content than the pork meat. The content of dry matter in both kind of meat varied from 50.91% to 65.15%, the content of fat varied from 0.65% to 11.28%, and the content of protein varied from 16.05% to 19.21%. All of the quality parameters comply within the limits stipulated.

Using the both kind of meat, sausages were produced after a traditional recipe. The sensorial and the physico-chemical characterization of the product are given in Figures 1 and 2.

Following the results obtained for the chemical composition of the analyzed sausage samples, it

![Fig. 1. Physico-chemical characterization of the sausage](image-url)
can be stated that it is high in protein and low in fat content. These results are also sustained by other studies Amaral et al. (2014), Hoffman et al. (2006), Salagean et al. (2013).

Sensorial Analysis
In light of the above, the sensorial analysis was conducted for deer and pork sausage samples. The sensorial quality of food products is a key factor in consumer’s decision-making process. Hedonic testing is often used to determine consumer’s attitude towards the food by measuring the degree of acceptance of a new product or improving the existing food product (Meilgard et al., 1991).

Figure 2 representation of the sensory evaluation for the intensity of sensory characteristics of deer and pork sausage.

Sensory evaluation analysis showed that consumers were familiar with this sausage and they highly appreciate the taste and smell of the final product.

CONCLUSION
It is apparent that game and pork meet most of the criteria demanded by a discerning consumer. Recent trend regarding consumer’s orientation towards meat products prepared abased on a traditional recipe can be observed. As for stability, the sausage showed good sensorial quality and met the regulation requirements. It was also noted that the composition of the final product in the main nutrients (proteins and lipids) is directly correlated with the quality of the raw material in respect to origin and chemical composition.

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