PE4.95 Changes of sensory properties during ripening of Petrovská klobása (traditional dry-fermented sausage) 335.00

Marija Jokanovic (1) marijaj@tehnol.ns.ac.yu, Ljiljana Petrovic(1), Vladimir Tomovic 1, Snezana Savatic 1 Tatjana Tasic 2 Natalija Dzinic 1 Predrag Ikonic 2
(1)Faculty of Technology, University of Novi Sad, Serbia
(2)Institute for Food Technology, University of Novi Sad, Serbia

***Abstract* – The changes of sensory properties of traditional dry-fermented sausage *Petrovska klobása* during ripening were evaluated. Sausages were prepared in two batches: staffed in natural (T1, I1) and in collagen casing (T2, I2), further T1 and T2 were processed in traditional way, and I1 and I2 in industrial way. Drying process in industrial plant was in some degree faster, what was negatively reflected at external appearance of sausage and appearance and composition of cut surface. According to results of sensory analyses samples T1 and T2 had very good final sensory scores (overall acceptability – 4.95 from maximal 5), better than samples I1 and I2 (4.5; 4.3, respectively). Sample I1 had better sensory scores, probably because of smaller diameter of natural casings and better binding of meat and fat particles. In order to provide industrial production of *Petrovská klobása* with specific sensory properties it is necessary to modify parameters of ripening, e.g. temperature, relative humidity and air velocity.**

M. R. Jokanovic (corresponding author, marijaj@tehnol.ns.ac.yu), Lj. S. Petrovic, V. M. Tomovic, S. B. Savatic and N. R. Dzinic, Faculty of Technology, University of Novi Sad, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia.
T. A. Tasic and P. M. Ikonic, Institute for Food Technology, University of Novi Sad, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia.

***Index Term - Petrovská klobása,* fermented sausage, ripening, sensory properties**

I. INTRODUCTION

Fermented sausages are the result of biochemical, microbiological, physical and sensorial changes occurring in a meat mixture during ripening under defined conditions of temperature and relative humidity. A great variety of fermented sausages produced in European countries have been granted PDO (Protected Designation of Origin) and PGI (Protected Geographical Indication) labels. Although many fermented sausages are commonly produced in industrial plants, there still are regions in Europe where these products are obtained through traditional technologies without added starter culture. In that case, the required microorganisms originate from the meat itself or from the environment, and constitute a part of the so-called ‘‘house-flora’’ [1].

In general, the qualitative characteristics of naturally fermented sausages are known to be largely dependent on the quality of the ingredients and raw materials, the specific conditions of the processing and ripening, and the composition of the microbial population [2].

Petrovská klobása, Serbian dry-fermented sausage, with protected designation of origin at national level, is produced in a large amount in an area nearby City of Bački Petrovac in the Autonomous Province of Vojvodina (Northern Serbia). *Petrovská klobása* is usually manufactured traditionally, according to original recipe of the ancestors. *Klobása* is produced from pork meat and pork backfat, with addition of spices, salt and sugar, however, with no chemicals (nitrate, nitrite, GDL, ascorbic acid, tocopherol, and other additives) nor starter culture addition. Specific spices added to *klobása* are: red hot pepper powder and caraway. Minced meat, minced fat, salt and spices are mixed by hand and filled into natural casings, then dried under environmental (non-hygienic) conditions.

Petrovská klobása is produced in three stages: first stage is the smoking, followed by the fermentation phase and finally with drying. Smoking is with cold smoke from specific kind of wood. Fermentation is providing by inoculation from the raw material or environment during the manufacturing, and drying of the *klobása* is under the climatic condition. Combination of these stages is known as the ripening period, which usually last for not lees than 120 days, depending on the climatic conditions. In village households, this sausage is made in the end of November and during December, when temperatures are around 0°C or lower. The main physical and chemical changes take place during ripening period, and desired sensory quality attributes of *klobása* (colour, flavour, odour and texture) are mainly developed in this period. At the end of ripening *Petrovská klobása* is characterised by specific savoury taste, aromatic and spicy flavour, dark red colour and hard consistency.

The manufacture of traditional sausages is more an art depending on the skill and experience of the meat

manufacturer rather than a process fully based on scientific and technological means. These traditional practices lead to a great variability in the quality of the products [3].

Sensory analysis is a widely used method in order to test the organoleptic properties of food products. In this study, the criterion demanded was that industrial way of sausage processing, with controlled conditions, should either maintain or improve the sensory characteristics of traditional dry fermented sausage - *Petrovská klobása.*

The aim of this work was to define differences of sensory properties (external appearance of sausage, appearance and composition of cut surface, colour and colour maintenance on the cutting, odor and taste, texture and juiciness) of *Petrovská klobása* produced in traditional way, according to original recipe, with ripening period in household under climatic condition, and *Petrovská klobása* produced in traditional way, according to original recipe, with ripening period in controlled conditions (temperature, relative humidity and air velocity) within a hygienic environment in industrial plant.

II. MATERIAL AND METHODS

A. Material

Dry fermented sausages (*Petrovská klobása*) were manufactured in traditional way in rural household. The sausage formulation included 80% lean pork and 20% pork fat tissue. Other ingredients added per kg of pork meat and fat were: red hot pepper powder, NaCl, garlic, caraway and sugar.

After chopping and mixing the mixture was divided into two batches. One batch was manually stuffed into a natural casing from the cleaned large intestines (colon), in units of 35 – 45 cm length (T1, I1) and the other one into 55 mm diameter collagen casing (T2, I2). The sausages were stored in a cold room, and after a resting day, placed in smoking/drying chamber.

Drying, smoking and ripening, of one half of each batch, took place in the household, in naturally ventilated storerooms (T1, T2). Sausages were smoked in a traditional way and with specific kinds of wood. After 10-15 days of smoking (with pauses), sausages were placed in draying and ripening chamber till, approximately 90th day of processing.

Other parts of each batch (I1, I2) were placed in an industrial type of smoking/drying chamber. Sausages were cold smoked, and drying and ripening were under controlled (industrial) conditions of temperature, relative humidity and air velocity.

When the moisture in all analysed samples came down under 35% (according to Serbian legislation quality requirements for dry fermented sausages [4]) the products were vacuum packaged in order to prevent from further drying. Sausages T1 and T2 were packaged after 90 days, and sausages I1 and I2 after 45 days of ripening.

Samples for the sensory evaluation from groups T1 and T2 were taken on 30, 60 and 90th day, and from groups I1 and I2 on 30 and 45th day.

D. Methods

Sensory evaluation of *Petrovská klobása* was performed by panel consisting of 7 trained differently aged members. Evaluations were performed according point system of analytical descriptive test [5], using scale from 0 to 5, with sensitivity threshold of 0.25 points. Each mark means distinctive quality level, described as follows: 5 – extraordinary, typical, optimal quality level; 4 – observable deviations or insignificant quality defects; 3 – drawbacks and defects of quality; 2 – distinct to very distinct drawbacks and defects of quality; 1 – fully changed, nontypical properties, product unacceptable; 0 – visible mechanical or microbiological contamination, untypical product and similar. Individual sensory quality characteristics with following factors of significance (fs) were evaluated: external appearance of sausage (fs=2), appearance and composition of cut surface (fs=5), colour and colour maintenance on the cutting (fs=3), odor and taste (fs=7), texture and juiciness (fs=3). The overall sensory quality of sausages was evaluated according to the following expression: Overall sensory quality = (external appearance of sausage x 2 + appearance and composition of cut surface x 5 + colour and colour maintenance on the cutting x 3 + odor and taste x 7 + texture and juiciness x 3) / 20.

III. RESULTS AND DISCUSSION

Sensory properties of subjected sausages are presented in Figures 1 - 4. After 30 days of processing only external appearance of sausages was evaluated with higher grades (4.5). The rest characteristics, especially odor and taste of sample T1 (3.42) and texture of both samples processed in household were evaluated with lover marks (Fig. 1 and Fig. 2). During next 30 days of processing important changes occurred in colour, taste and texture, as it was expected. Average marks ranged from 4.67 (external appearance) to 5 (colour on the cutting). As it can be seen the mean scores of the observed parameters for the sausages processed in household (climatic conditions) have been higher in the course of time, reaching their maximum

after 90 days of processing, when it was estimated that sausages have reached very high sensory quality. Both samples, staffed in natural and collagen casings scored maximal for almost all sensory characteristics. The overall acceptability was evaluated with 4.95 of maximal 5. It could be concluded that the climatic conditions were optimal during experimental period, and that the process was managed very good.

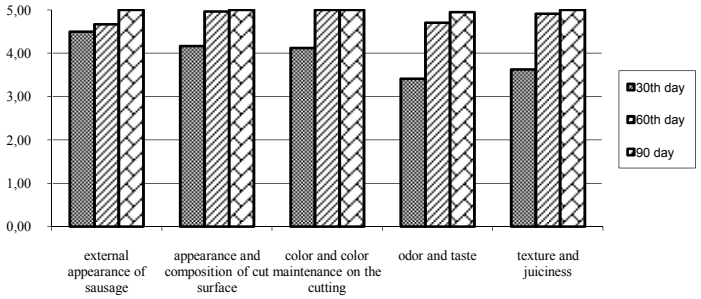

Fig. 1. Sensory score of *Petrovská klobása* T1 (staffed in natural casing and processed in rural household)

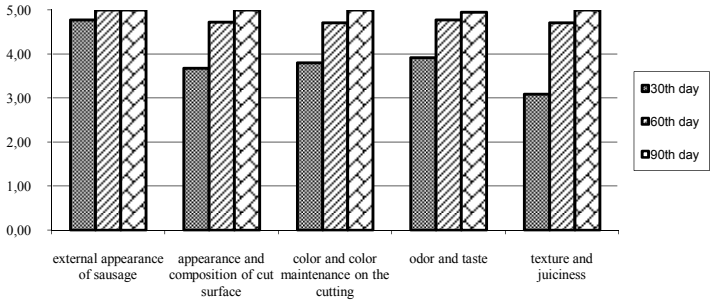

Fig. 2. Sensory score of *Petrovská klobása* T2 (staffed in collagen casing and processed in rural household)

As it can be seen at Figures 3. and 4. sausages I1 and I2 after 30 days of processing had a bit lover marks for all analysed sensory properties, comparing to samples T1 and T2, and they were evaluated between 3.5 and 4. The least marks were for external appearance of sausage and appearance and composition of cut surface. Owing to a bit faster drying processes some deformations - wrinkles on the surface of sausages were perceived. At cut surface a periphery dark red ring approximately 2-3 mm wide was noted, also as a result of fast drying, and fast water lost. In the middle part meat and fat particles were not totally banded and some cavities were observed.

Industrial processing enable reaching defined content of moister (<35%) after 45 days of processing and at that moment all sensory properties (Fig. 3-4) were improved and scores ranged from 3.8 to 4.6. Samples in natural casings (I1) exhibited higher marks for appearance and composition of cut surface than samples in collagen casing (I2). Natural casings, showed lower permeability characteristics, so the drying process was in some degree slower, and provided more intensive ripening processes that lead to better binding of meat and fat particles and uniform colour.

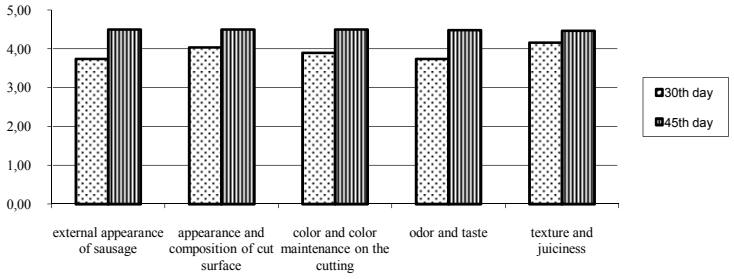

Fig. 3. Sensory score of *Petrovská klobása* I1 (staffed in natural casing and processed in industrial plant)

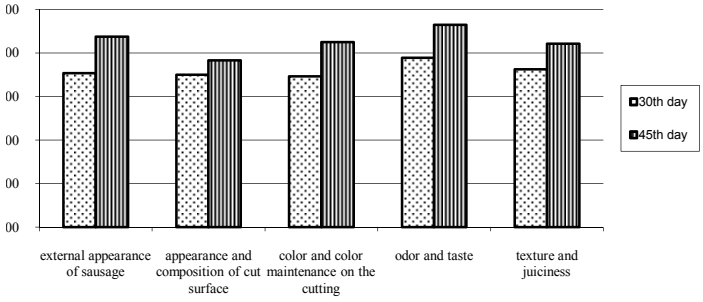

Fig. 4. Sensory score of *Petrovská klobása* I2 (staffed in collagen casing and processed in industrial plant)

The better sensory evaluation of the *Petrovská klobása* after 90 (T1, T2) days of processing is fully understandable, if we keep in mind that this sausage is a slow fermenting product characterized with low NaCl content and absence of additives or supplements that enable shorter periods of drying and ripening, i.e. faster formation of colour, faster binding and firming.

It should be mentioned that all analysed samples had relatively high marks for color of the surface although

nitrite and nitrate were not added into *Petrovská klobása* and that is probably the consequence of high share of red hot pepper powder in a basic formulation of sausage.

The overall acceptability of analysed sausages indicate that sausages processed in traditional way were evaluated with better finally mark of 4.95 (T1, T2), comparing to 4.5 and 4.3 for I1 and I2, respectively.

IV. CONCLUSION

According to results of sensory analyses of samples processed in traditional and in industrial way it can be concluded that the drying process in industrial plant was a bit faster, and that is why some sensory characteristics were evaluated with lover marks. In order to provide industrial production of *Petrovská klobása* with specific and characteristic sensory properties it is necessary to modify parameters of ripening, e.g. temperature, relative humidity and air velocity.

ACKNOWLEDGEMENT

This study was suppored by the Ministry of Science and Technological Development of the Republic of Serbia, Project No. TR20037.

This research is part of the Project No. 114-451-00644/2009 which is financially supported by the Provincial Secretariat for Science and Technological Development of Vojvodina.

REFERENCES

[1] Casaburi, A, Aristoy, M-C., Cavella, S., Di Monaco, R., Ercolini, D., Toldra, F., Villani, F. (2007). Biochemical and sensory characteristics of traditional fermented sausages of Vallo di Diano (Southern Italy) as affected by the use of starter cultures. Meat Science, 76, 295-307.

[2] Aquilanti, L., Santarelli, S., Silvestri, G., Osimani, A., Petruzzelli, A., Clementi, F. (2007). The microbial ecology of a typical Italian salami during its natural fermentation. International Journal of Food Microbiology, 120, 136-145.

[3] Talon, R., Leroy, S., Lebert, I. (2007). Microbial ecosystems of traditional fermented meat products: The importance of indigenous starters. Meat Science, 77, 55-62.

[4] Serbian Regulations (2004). Quality requirements for meat products, Vol. 33 (pp. 1–15).

[5] Radovanovic, R., Popov-Raljic, J. (2001). Senzorna analiza prehrambenih proizvoda. Poljoprivredni fakultet, Beograd-Zemun, Tehnoloski fakultet, Novi Sad.

.