Organoleptic and microbiological alterations in turkey Baader meat

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Conference report

Sažetak

For the last few years in poultry industry there was increased the use of mechanically separated meat, meat of lower quality value, which is the product obtained by removing meat from poultry carcasses or by removing meat from flesh-bearing bones after boning. In this process, the loss or modification of the muscle fiber structure occurs. Since such meat has lower quality value, it is necessary to use organoleptically and microbiologically safe meat in order to achieve an adequate food product. The aim of this work was to test organoleptic and microbiological characteristics of turkey Baader meat, a type of mechanically separated meat which does not contain bones and for which the majority of producers claim to have a shelf life of 12 months if stored at – 18 °C. The analysis of organoleptic and microbiological characteristics was made at receipt of the meat and it was repeated after eight, nine, ten months of storage as well as at the end of the declared shelf life of 12 months. The testing included analysis of defrosted and cooked samples of meat. During the analysis period, some slight organoleptic changes have been noticed in the ninth month of storage, while significant changes were evident after the tenth month of storage. In spite of evident organoleptic changes, the results of microbiological analysis of turkey Baader meat made in the same testing periods, as well as the chemical analysis at the end of the research indicated that the meat was hygienically adequate product.

Key words: *mechanically separated poultry meat, Baader meat, shelf life, organoleptic characteristics*

Intoduction

The population and economic growth and development in many countries nowadays set new challenges for the industry of food production. One of the most significant demands is ensuring availability of sufficient quantity of meat for human nutrition. In the aim of fulfilling these demands, the modern industry tries to use different raw materials in food production, including the raw materials of lower quality for the production of certain foodstuffs. The technological progress has enabled the application of machines for mechanical meat deboning which enable the use of meat of good technological and economical characteristics for further processing and production in meat industry.

In the process of separating meat from bones during the modern meat production, there is a significant quantity of meat remains around bones, so as larger portion of meat as possible is tried to be used by using different machines and mechanical procedures (to separate the maximum quantity of meat from bones) in order to have as smaller unusable share of bones per animal as possible. By using the described procedure, a new source of usable protein is obtained and market value of the whole production is increased as well.

Mechanically separated meat (MSM) is a general term for the meat produced by deboning regardless of the deboning procedure and it includes the product which is obtained by a mechanical separation of meat, both from poultry carcasses or from flesh-bearing bones (it mostly applies to meat of other animals), in which process there appears the loss or a modification in the structure of muscle fibers.

For the meat produced by a mechanical deboning, mechanically separated meat (MSM), there are several synonyms and they are: mechanically deboned meat (MDM), mechanically deboned tissue (MDT), and mechanically recovered meat (MRM). In the Republic of Croatia, it is called mechanically separated meat (MSM) and it is obtained by a hard separation – the procedure of separating hard parts so that meat can be separated by a mechanical procedure from bones which it is attached to. The meat produced by the so-called soft separation – the procedure of mechanical separation of soft parts in which process there also appears separation of the tendons and connective tissue, is called

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Figure 1 **Appearance of "Baader meat" at receipt of raw material**

mechanically deboned meat (MDM). Even though the listed terms indicate to different products considering the production procedure and original raw material, end product is basically the same, except for the fact that there are some slight differences in organoleptic characteristics of such meat (EC 853/2004; EC, 2010).

Mechanically separated meat (MSM) is basically produced of pork and beef bones (breast ribs) which contain a lot of meat after primary processing (separating meat from bones). Mechanically separated poultry meat is produced of carcasses where the parts of meat such as wings, breasts, drumsticks and thighs are previously removed, or whole carcasses can be used too. During the production process, bones and carcasses are delivered to the chamber of the machine where they are put through a sieve with holes of 0.5 to 5 mm diameter under high pressure. At the same time, parts of bones remain within the tube which is emptied separately in order to avoid the mixing of soft tissues and separated bones. Nowadays, at the market of meat industry there are a few kinds of machines and working principle is the same for all of them (Schulte- Sutrum and Horn, 2003).

Mechanically deboned meat (MDM) is produced of lean trimmings which contain a high percentage of connective tissue and cartilage. Production procedure proceeds in several steps. First, lean trimmings are minced to meat pieces of 13 to 200 mm diameter, and then they are put into a machine which separates connective and cartilage tissue based on the difference in firmness and structure of the tissue. During that process, lean meat which retains its structure goes through slot openings of the rotary tube and it comes out as a product, whereas connective tissue and ligaments are separated from the meat and they stay in front part of the machine. They are then removed without mixing with meat. In doing so, a higher usability of such meat is achieved. After separation, it can be used in the production of boiled sausages (salami, frankfurters and pâté). Thus obtained meat is also known as "Baader meat" according to the name of the machine which it is produced by. "Baader meat" contains a high percentage of protein ranging from 15 to 17% where 70 to 80% of protein comes from muscles. The ability of binding added water of thus produced meat is significantly higher than of the mechanically separated meat (MSM), which makes the mentioned meat an economically and nutritionally valuable foodstuff and nowadays it is used more as a raw material in further meat production and processing.

The quality of feedstock (carcasses and bones), production process and storage conditions have an important role during the production of mechanically separated meat of adequate organoleptic and microbiological quality. Such product, the same as minced meat, represents an ideal medium for the growth and development of microorganisms, which gives the crucial importance to hygienic procedures in the production and to the quality of feedstock. Except for the listed, total microbial count in mechanically separated meat also depends on the kind of meat, and as a rule, it is higher in poultry and pork meat than in beef (del Rio et al., 2006).

Most countries have legally regulated production procedures of mechanically separated meat. For example, bones and carcasses have to be stored at 0 to 2°C within 24 hours before the production. In case that bones and carcasses cannot be used within one day, they have to be frozen and used for the production only within next eight days. Also, mechanically separated meat has to be used within 24 hours or frozen at the appropriate temperature (Official Gazette 99/2001, EC 2010). In the Republic of Croatia, this criterion applies to mechanically separated meat (MSM) produced by the techniques listed in Annex III, Section V, Chapter III, Item 3 of the Ordinance on *hygiene rules* for *food of animal*

Figure 2 **Appearance of "Baader meat" after storage of eight months**

origin (*Official Gazette* No. *99/07*).

Aside from production procedures, microbiological criteria of mechanically separated meat are also legally regulated and it is done by the *Regulation on microbiological criteria* for foods (*Official Gazette 74/2008*) which is used to take over provisions of the Regulation (EC) No. 853/2004 which is used to determine special rules of hygiene of the food of animal origin. The listed criteria include determining the presence of bacteria of the genus *Salmonella*, *Listeria monocytogenes,* aerobic mesophilic bacteria and bacteria *Escherichia coli*. According to the need, any entity in food business can also include microbiological controls which include the analysis of other significant pathogenic microorganisms such as *Staphylococcus* spp. and sulphite reducing bacteria.

Considering the fact that most countries use mechanically separated meat in the production of pâtés, sausages and frankfurters, it is necessary to pay attention to chemical characteristics of this product. Even though there are no significant differences in the share of fat and the ratio of fat and protein in poultry, pork and beef meat, fat content in poultry MSM can differ significantly. Protein content in MSM is from 12 to 15%, where 60 to 70% of protein is from muscle tissue (Steinhauserová and Steinhauser, 2000). Still, regardless of the protein content from muscles, this product has no significant ability of binding added water and it is because of breaking muscle structure during the process of mechanical deboning. Mechanically separated meat is characterized by a thick and soft consistency because of degradation of muscle tissue and, if it is used in the production of sausages and frankfurters, such products will not have elastic consistency. Also, mechanically separated meat is characterized by high pH values in the range from 6.2 to 6.4, and it can result in a negative effect on the development of color in cooked products. Out of the remaining parameters of MSM and mechanically deboned meat, a share of calcium in a fresh product is important, which must not be higher than 0.1% (100 mg/ 100 g or 1000 ppm) according to the Regulation EU 853/2004 and 2074/2005 Anex IV (Nagy et al., 2007; EC, 2010). All the listed indicates to certain parameters which should be controlled during the use of such meat for the production of other food products.

Shelf life

Shelf life of mechanically separated meat depends on many factors such as: the total microbial count in raw material, the way of storing raw materials, the way of storing finished products, as well as freezing and storing frozen products. Most producers on the market limit the shelf life to 12 months at -18°C. In that process, any change in the temperature regime can shorten the shelf life. For example, storing mechanically separated meat at -12°C shortens the shelf life from 12 to 5 months (Ionescu et al., 2003). The experience has shown that these changes are also connected to the kind of meat. Thus, mechanically separated chicken meat has less expressed organoleptic alterations in comparison to mechanically separated turkey meat of the same production date.

Whether we speak of fresh or frozen products, significantly shorter shelf life of mechanically separated poultry meat in comparison to beef, the same as of pork, is explained by a high percentage of unsaturated fatty acids which can cause decay. Except for the listed, the presence of bone marrow which contains metals such as iron, magnesium and copper, can also affect oxidation processes and therefore shorten the shelf life (Horáková and Lukačka, 1984).

"Baader meat", similarly as mechanically separated meat, has declared shelf life of 12 months at -18°C. Considering the fact that there are certain similarities with the production of mechanically separated meat, the question arises whether there are any organoleptic alterations in "Baader meat" which could affect the quality of products such as pâté, sausages and frankfurters in further production procedures. The aim of this paper was to research organoleptic and microbiological characteristics of "Baader meat" during the declared shelf life of 12 months.

Material and methods

The research was conducted on turkey "Baader meat" produced on January 20, 2010, received on April 20, 2010, which was packed in an opaque film, formed in blocks of 15 kg in average and approximately 20 cm thick. Blocks of the product were placed on a pallet and wrapped in film. Each pallet had an appropriate producer declaration with information on the kind of product, producer, quantity, date of production, shelf life and the way of storing. Turkey "Baader meat" was stored at -18°C. During monitoring, there were noted aberrations in storing temperature from 0.1 to 0.5 °C which occurred because the door of deep freeze chamber were opened during each handling with the product.

Upon the receipt of the product in a storage, there was analyzed a chemical composition (total protein, share of fat, share of water, calcium concentration and connective tissue proteins) and the obtained results were compared to the values at the enclosed specification. A chemical analysis which included the same parameters was also made at the end of monitoring, after the expiration of shelf life date of 12 months. For determining chemical parameters there were used standard methods and they were: the method HRN ISO 937 for determining protein levels, the method HRN ISO 1443 for determining the share of fat, the method HRN ISO 6869 to determine calcium concentration and the method ISO 1442 for determining moisture content.

In the goal of estimating microbiological safety of "Baader meat",

Figure 3 **Appearance of "Baader meat" after storage of nine months**

there was conducted a microbiological analysis in accordance to the requirements of the Regulation on microbiological criteria for foods. The analysis included determining the presence of bacteria of genus *Salmonella* and *Listeria monocytogenes,* determining the presence of bacteria *Escherichia coli*, sulphite reducing clostridia and aerobic mesophilic bacteria. All microbiological researches were conducted by standard methods and they are: HRN EN ISO 6579 for determining the presence of salmonellae, the method HRN EN ISO 16649 for determining *E. coli*, the method HRN ISO 15213 for sulphite reducing bacteria, the method HRN ISO 4833 for aerobic mesophilic bacteria, and the method HR EN ISO 11290 for determining the presence of *L. monocytogenes.* Microbiological safety of stored "Baader meat" was checked on the eighth, ninth and tenth month of storage as well as at the end of the declared shelf life of 12 months.

Organoleptic observation was started at the eighth month of storage and it was repeated once a month until the appearance of strongly expressed organoleptic alterations, the same as on the product which was 12 months old. Five sensory analysis panelists made an organoleptic analysis of a frozen product, in which process color and odor were observed, as well as changes on its surface and cross section. The appearance, color, odor, taste and consistency of a cooked product were also observed, and all the noticed observations were noted.

Results and discussion

By an organoleptic examination of received raw material, it was determined that the meat was of pale pink color and coarse-grained structure which expressed pieces of adipose tissue more strongly. There were no visible signs of oxidation processes on the surface and cross section. Odor and color of the cooked sample did not aberrate from the parameters proscribed by the producer's specification. Taste was characteristic for the used raw material of turkey meat and consistency was loose. A chemical analysis was used to determine proteins in the concentration from 18 to 19%, fat in the content from 13 to 14%, water in the content from 63 to 65%,

Figure 4 **Appearance of "Baader meat" after storage of ten months**

calcium in the concentration from 0.01 to 0.03% (100 to 300 mg/kg) and connective tissue proteins in the concentration from 0.58%. Based on the results of microbiological analysis of researched samples, raw material met health safety standards (the results are not presented), i.e. it complied with the requirements of the Ordinance on *microbiological criteria* for food (Official Gazette 74/08). The appearance of turkey "Baader meat" at the receipt of raw material is shown in Photo 1.

The second organoleptic examination was made on September 20, 2010 when turkey "Baader meat" was stored for eight months. On the block's surface there were visible grey areas which were the consequence of oxidation process on adipose tissue. The product was pale pink with coarse-grained structure which expressed pieces of adipose tissue more strongly. There were no visible signs of oxidation on the surface and cross section. During the observation of a cooked product, there were also no visible oxidation signs. Odor and color of the cooked sample did not aberrate from the producer's specification. Taste was characteristic for turkey meat and consistency was loose. Microbiological analysis of "Baader meat" samples which were stored for eight months gave the following results: aerobic mesophilic bacteria 7.2 x 10^3 CFU/g, *Escherichia coli* < 10^2 CFU/g, *Staphylococcus aureus* < 10^2 CFU/g, *sulfite-reducing bacteria* < 10^2 CFU/g, *Salmonella* spp. 0 in 25 g, *Listeria monocytogenes* < 10 CFU/g. According to the obtained results, the analyzed samples were safe, i.e. they complied with requirements of the Ordinance on *microbiological criteria* for food (Official Gazette 74/08). The appearance of turkey "Baader meat" stored for eight months is shown in Photo 2.

On October 20, 2010, when turkey "Baader meat" was stored for nine months, there was made the third organoleptic examination, as well as the microbiological analysis. By the organoleptic examination there were determined visible grey areas which were the consequence of oxidation. The raw material was pale pink with coarse-grained structure which expressed pieces of adipose tissue more strongly. There were visible oxidation signs which were approximately 0.5 cm thick at the cross section, along the edge of the surface. There were no visible oxidation signs on the cooked sample. Odors and color of the cooked sample of meat did not aberrate from the producer's specification. Taste was mildly changed, mildly bitter and the consistency was loose. Microbiological analysis of "Baader meat" samples which were stored for nine months gave the following results: aerobic mesophilic bacteria 1.2 x 10^4 CFU/g, *E. coli* < 10^2 CFU/g, *Staphylococcus aureus* < 10^2 CFU/g, *sulfite-reducing bacteria* < 10^2 CFU/g, *Salmonella* spp. 0 in 25 g, *Listeria monocytogenes* < 10 CFU/g. According to the obtained results of the microbiological analysis, the analyzed samples were safe, i.e. they complied with requirements of the Ordinance on *microbiological criteria* for food (Official Gazette 74/08). The appearance of turkey "Baader meat" stored for nine months is shown in Photo 3.

The fourth examination of turkey "Baader meat" was made when it was stored for 10 months. By the organoleptic examination there were visible much expressed grey areas which were the consequence of oxidation. The meat was pale pink with coarse-grained structure which expressed pieces of adipose tissue more strongly. There were visible oxidation signs which were approximately 1 cm thick at the cross section, along the edge of the surface. There were no visible oxidation signs on the cooked sample. Odor and color of the cooked sample of meat did not aberrate from the producer's specification i.e. characteristics of that kind of meat. Taste was significantly changed, mildly bitter and sourish, and consistency was loose. Microbiological analysis of "Baader meat" samples which were stored for ten months gave the following results: aerobic mesophilic bacteria 6.0 x 10^3 CFU/g, *E. coli* < 10^2 CFU/g, *Staphylococcus aureus* < 10^2 CFU/g, *sulfite-reducing bacteria* < 10^2 CFU/g, *Salmonella* spp. 0 in 25 g, *Listeria monocytogenes* < 10 CFU/g. According to the obtained results of the microbiological analysis, the samples were safe, i.e. they complied with requirements of the Ordinance on *microbiological criteria* for food (Official Gazette 74/08). The appearance of turkey "Baader meat" stored for ten months is shown in Photo 4.

The fifth examination of turkey "Baader meat" was made on January 20, 2011, when its shelf life expired. By the organoleptic examination there were visible much expressed grey areas on the surface of the block, which was the consequence of oxidation. The meat was pale pink with coarse-grained structure which expressed pieces of adipose tissue more strongly. There were visible oxidation signs that were approximately 1 cm thick at the cross section, along the edge of the surface. There were no visible oxidation signs on the cooked sample, the color did not aberrate, whereas the odor was mildly sourish and the taste was significantly changed – it was very bitter and sour. Consistency was loose. Microbiological analysis of "Baader meat" samples which were stored for 12 months gave the following results: aerobic mesophilic bacteria 4.8 x 10^3 CFU/g, *E. coli* < 10^2 CFU/g, *Staphylococcus aureus* < 10^2 CFU/g, *sulfite-reducing clostridia* < 10^2 CFU/g, *Salmonella* spp. 0 in 25 g, *Listeria monocytogenes* < 10 CFU/g. Based on the results of the microbiological analysis, the sample of turkey "Baader meat" which was stored for 12 months was safe, i.e. it complied with requirements of the Ordinance on *microbiological criteria* for food (Official Gazette 74/08).

There was examined a chemical composition as an indicator of quality after the expiration of shelf life of the stored meat. The chemical analysis determined the protein concentration of 18 to 19%, concentration of fat from 13 to 14%, water content from 63 to 65%, calcium concentration from 0.01 to 0.03% (from 100 to 300 mg/kg) and connective tissue proteins in the concentration of 0.58%. The obtained results of chemical analyses were in accordance with the values of the producer's specification, according to which the quality of the tested products was satisfactory. The listed chemical characteristics of such meat during the process of storing are in accordance with the results of other authors (Steinhauserová and Steinhauser, 2000; Schulte-Sutrum and Horn, 2003; Zara et al., 2003; Trindade et al., 2004). The obtained results of microbiological analyses are also in accordance with the results of other authors (Horáková and Lukačka, 1984). The appearance of turkey "Baader meat" stored for 12 months is presented in Photo 5.

Figure 5 **Appearance of "Baader meat" after storage of twelve months**

Conclusions

Based on the results obtained during the observation of turkey "Baader meat", it can be concluded that 12- month storage of frozen meat, according to the producer's recommendation, ensures a chemically and microbiologically safe product, but organoleptic alterations become visible after nine months of storage. The listed indicates to frozen meat of organoleptically questionable quality which is not recommendable for use in further production of meat products such as sausages, pâtés and other. Therefore, during the use of "Baader meat", the storage of nine months since the date of production at the most is recommended.

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Organoleptische und mikrobiologische Veränderungen auf baader Truthahnfleisch

Zusammenfassung

In den vergangenen Jahren hat sich der Verbrauch sowohl des durch Maschinen entknochten Geflügelfleisches, als auch des qualitativ minderwertigeren Fleisches vergrößert, welches Fleisch von ganzen Geflügelrumpfen hergestellt wird, oder durch Absondern des Fleisches von Knochen, auf denen noch gebundenes Fleisch ist. Dabei wird durch die Maschinenbearbeitung die Struktur der Muskelfaser vernichtet oder geändert. Um trotz der minderwertigeren Qualität des so hergestellten Fleisches die Herstellung der zufriedenstellenden Nahrungserzeugnisse zu sichern ist es notwendig, dass solches Fleisch organoleptisch und mikrobiologisch in Ordnung ist. Das Ziel dieser Arbeit war, organoleptische und mikrobiologische Charakteristiken des baader Truthahnfleisches zu untersuchen, des durch Maschinen entknochten Fleisches, welches keine Knochen enthält, für welche die meisten Hersteller eine Dauerfrist von 12 Monaten von der Herstellung deklarieren, unter der Bedingung, dass das Fleisch bei Temperatur von - 18° C gelagert wurde. Die organoleptische und mikrobiologische Untersuchung begann im neunten Lagermonat, sie umfasste die Untersuchung der entfrorenen und gekochten baader Fleischmuster. Die Beobachtung verlief während der Inempfangnahme des Fleisches und wurde im achten, neunten und zehnten Lagermonat sowie nach dem Verlauf der deklarierten Frist von 12 Monaten wiederholt. Während der Beobachtung wurden kleine organoleptische Veränderungen schon im neunten Monat bemerkt, viel bedeutendere aber nach dem zehnten Lagermonat. Trotz der organoleptischen Veränderungen zeigten sowohl die Resultate der mikrobiologischen Untersuchungen von baader Truthahnfleischmustern in allen Intervalen als auch die chemische Analyse am Ende der Untersuchung einen richtigen und korrekten Nahrungsmittelstoff in allen Untersuchungsperioden.

Schlüsselwörter: *durch Maschinen entknochtes Geflügelfleisch, baader Fleisch, Dauerfrist, organoleptische Eigenschaften*

Cambiamenti organolettici e microbiologici della carne di tacchino "Baader"

Sommario

Negli ultimi anni cresce l'uso della carne di pollame separata dall'osso usando la macchina. Si tratta di carne della qualità più bassa prodotta dall'addome intero del pollame oppure separando la carne dall'osso su cui c'è tessuto connettivo. Con la lavorazione da macchina la struttura del tessuto muscolare viene distrutta o cambiata. Nonostante che si tratti della carne di qualità più bassa prodotta in questo modo, per ottenere un prodotto soddisfacente nel senso alimentare è necessario che questa carne sia adattata ai criteri organolettici e microbiologici. Lo scopo di questo lavoro era esaminare le caratteristiche organolettiche e microbiologiche della carne di tacchino "Baader". È il tipo della carne separata dall'osso con la macchina e perciò non contiene ossa. Per questa carne la maggior parte dei produttori stabilisce la data di scadenza di 12 mesi, partendo dalla data di produzione, a patto che sia deposta a temperatura di - 8°C. L'esaminazione delle caratteristiche organolettiche e microbiologiche è stata cominciata il nono meso del deposito e includeva il controllo dei campioni della carne "Baader" sgelati e quei cotti. La carne è stata osservata appena arrivata e poi il procedimento è stato ripetuto l'ottavo, il nono e il decimo mese del deposito nonchè dopo la dichiarata data di scadenza di 12 mesi. Osservando la carne i cambiamenti organolettici insignificanti sono stati notati già dopo il nono mese del deposito e quei notevoli dopo il decimo mese del deposito. Malgrado i cambiamenti organolettici notati, sia i risultati dell'analisi microbiologica della carne di pollame "Baader" fatta negli stessi intervali che l'analisi chimica fatta alla fine dell'esaminazione hanno mostrato che durante tutti i periodi dell'osservazione si tratta della materia di qualità di salute.

Parole chiave: *carne di pollame separata dall'osso usando la macchina, carne "Baader", data di scadenza, caratteristiche organolettiche*

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Production and quality of home - made Istrian dry sausages

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conference report

Summary

This paper presents the procedures of traditional production of home-made Istrian sausages. Procedures and recipes for sausage production at home differ depending on the household and family tradition. During the sausage making, all households stick to the basic production norms aiming at quality, shelf life and safety. The paper presents the results of sensory, chemical and microbiological research of Istrian sausages.

Key words: *autochthonous meat products, sausage quality*

Introduction

Different kinds of sausages and other meat products are produced in rural households and family farms in the area of central Istria. These are traditional products which should become recognizable Croatian products after the procedure of protected designation of origin and geographical indication, which has been started by The Association of Istrian Prosciutto Producers and other county institutions. In the area enclosed by this research there were registered households that produce pigs of white, meaty breeds of Large White, Landrace and their crossbreeds, and traditional Istrian sausages. The aim of this work was to present the production technology, as well as quality and safety of Istrian sausages. Sausages for personal needs are produced in households while respecting minimum standards. After the products are protected and in compliance with the regulations, there is an aspiration for them to be produced in registered facilities for treatment, processing and storage of products of meat origin, located within rural households. Products will be marketed over different distribution channels in market- halls, by a direct sale in a household or by an offer within rural tourism.

Material and methods

Samples of sausages originated from 15 family farms which are involved in traditional production and feeding of pigs, and production of home- made Istrian sausages. The sausages were sampled after the end of the production, on the 30th day of ripening. Sausage samples were analyzed in the Department of Hygiene and Technology of Animal Foodstuffs of the Faculty of Veterinary Medicine, University of Zagreb and Veterinary Institute, Rijeka. Sensory, bacteriological and chemical researches of home- made Istrian sausage samples (n=15) were performed. Sensory traits were assessed by a sensory panel by taking into consideration the consistency, odor, taste, cross-section appearance and technological processing of a finished product. We calculated the basic chemical composition, water (ISO 1442), fat (HRN ISO 1443), calculated the content of proteins (HRN ISO 8968-2), then ash (HRN ISO 936) and salt (AOAC, Anon., 2002) in chemical research. In bacteriological research there was determined the presence of *Salmonella* spp. (HRN ISO 6579) and *Listeria monocytogenes* (HRN ISO 11290-1), then the number of *Staphylococcus aureus* (HRN ISO 6888-1), Enterobacteriaceae (HRN ISO 5552), sulphite-reducing clostridia (HRN ISO 15213), *Escherichia coli* (Coli ID (bioMerieux) 37 °C 24 hours), and *Enterococcus* spp. (KEA (Merck) 37 °C 48 hours).

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