

Seasoning in the production of frankfurters and sausages

Josef Jandásek

Raps GmbH & Co. KG

Kulmbach, Germany

Faculty of Veterinary Hygiene and Ecology

University of Veterinary and Pharmaceutical Sciences in Brno

Brno, Czech Republic

Abstract

The sensory properties of frankfurters and sausages are influenced by the seasonings and other flavourings used in their production. They are also significantly influenced by the composition of the ingredients used, the quality of these ingredients, the processing technology and casing materials used, by smoking and, not least, by their shelf life. In essence, seasonings and extracts standardise products in sensory terms and lend them an interesting taste sensation that makes the customer want to buy them again. Most of the familiar seasonings are used around the world in various meat products, generally in the form of ground, crushed and milled spices or even whole spices (particularly in sausages). As these products are generally consumed hot, the spices have the opportunity of developing within them and need not be used in such large quantities. This paper considers selected spices and seasonings used in the production of frankfurters and sausages.

Coriander, frankfurter, lemon zest, Munich white sausage, paprika, pepper, Vienna sausage

Introduction

Frankfurters and sausages are basic meat products all over the world. The majority are cooked during production, though others are produced raw for roasting, or are cooked and subsequently dried.

Meat products stuffed into the intestines of livestock animals are known from Ancient Greece, where the philosopher Epicharmus wrote comedy *The Sausage*. Aristophanes also wrote a play about a knight and sausage-seller who was elected leader. The sausage was spread largely by the Greeks and, first and foremost, the Romans who spread their knowledge of sausage-making among traditional tribes throughout Europe in their conquered territories. The most famous medieval sausage was the Italian Lucania (Basilicata). Sausages were associated with the sausage festival Lupercalia during the reign of Roman Emperor Nero.

The first notes of sausages as we know them today go back to 1487 when the chronicler Achilles Augustus von Lersner described the production of sausages from lean side meat (bráto) in Frankfurt am Main. The oldest known extant recipe dates back to 1749. It is interesting that until that time the batter for production of frankfurters served as a filling (stuffing) for roast beef. A variant on this world-famous frankfurter – the Vienna sausage – is more familiar in this country. We owe this to Johann Georg Lahner (1772–1845) who was born into a family of butchers in Gasseldorf (40 km southwest of Kulmbach) in Franconia. During the Napoleonic Wars, after studying in Frankfurt am Main, he moved to Vienna and opened his own shop at Neustiftgasse No. 111. There on November 13th in 1805, he made the first frankfurter-type sausages, which became widely known as Wiener Würstl or Vienna sausage, from pork and beef meat. The fact is that butcher's shops processing pork and beef meat were strictly separated in Frankfurt am Main at that time, though not in Vienna, which made the use of a recipe suitably combining pork and beef meat possible. Vienna sausages expanded to the Czech Lands and got a name for themselves thanks to the Satrapa plants in Studená and Kostelec. For the sake of interest, frankfurter production began expanding to Russia (the Soviet Union) in 1936 when Anastas Mikoyan signed an order to popularise new meat products.

Address for correspondence:

Ing. Josef Jandásek, Ph.D.
Raps GmbH & Co. KG
Adalbert-Raps-Straße 1
95326 Kulmbach, Germany

Phone: +491 733 993 448
E-mail: jandasek@email.cz
www.maso-international.cz

Ingredients for the production of frankfurters and sausages

Pork, beef, veal, poultry (chicken, turkey and ostrich), lamb and mutton, horsemeat (“saucisse de cheval”), goat, rabbit (“saucisse de lapin”), game (wild boar, venison, reindeer, etc.) and kangaroo (“kangaroo sausage”) meat is used most frequently in the production of frankfurters and sausages. Raw material from all classification categories of pork and beef meat according to the GEHA S1–S10 (V1–V10) and R1–R5 (H1–H5) system is used. This fact indicates the extraordinarily wide-ranging possibilities for the use of edible material from animal carcasses, from the best parts (leg, sirloin, neck) to mechanically separated meat (pork, poultry), skin and fat emulsions, offal, etc. Globally, however, frankfurters and sausages are generally products made from raw material remaining available to a non-specialised plant following production of all-muscle meat products. The use of high-quality material predominates in select high-quality premium products, while less valuable material predominates in products of lower quality. A number of products are protected by trademarks (such as the traditional Czech grilling sausage “Špekáček” – Traditional Speciality Guaranteed - TSG) or by national legislative standards such as Czech Decree No. 326/2001 Coll. This stipulates not merely chemical composition (minimum protein content, maximum fat content), appearance, consistency, structure and sensory parameters, but also the ingredients used (content of mechanically separated poultry meat, etc.).

Material of a lower value may be used in the preparation of industrial-quality products, and in extreme cases products may even be made without the use of meat (merely from MSM and emulsions). The main ingredients for the production of emulsified meat products in Europe are always pork and beef which account for a proportion of as much as around 85% in the recipes used. The proportion of beef has always been lower in view of its price, and also fell during two periods – after 1990 and following the bovine spongiform encephalopathy (BSE) affair. Beef meat has always lent products a redder colour and a fibrous structure with a specific consistency and taste. Use of a reduced amount of beef meat, or excluding it from recipes altogether, naturally has an influence on the taste and on the use of seasonings and aromatic substances. The maturity of meat does not influence the product quality to such an extent as it does in all-muscle products in view of the fact that the raw material is finely ground, particularly in frankfurters. Whole spices are blended into products at the end of chopping to preserve their desired structure. Added fat (pork fat, beef fat, oil) makes it possible to process both high-quality fat adding the formation of “crunch” or “knack” effect, and fat of lower quality such as internal fat, various trimmings, etc. during the emulsification process. To ensure production stability, fat of lower quality is processed into emulsions which are subsequently added to products. It must be noted that changes in meat quality (protein content, maturity, fat cover, taste properties) and changes to the quality and quantity of fat, in particular, have been seen over the course of recent decades. Economic aspects in particular (shortening livestock fattening periods) have contributed towards a reduction in the proportion of pork fat (lard) and intramuscular fat in pig carcasses and pork meat. This causes changes in quality which then affect product appearance (degree of emulsification), the occurrence of defects (bruising under the casing), consistency and, most importantly, sensory parameters. The proportion of fat in frankfurters and sausages is more or less the same in recipes all over the world (10 – 40%).

The technology development, such as machinery for obtaining mechanically deboned meat (MDM) or BAADER meat, has had a fundamental effect on the sensory quality of frankfurters and sausages. This raw material has made it possible to expand the range of products of industrial quality, primarily in view of the low cost of the final product. No particularly pronounced changes in product quality are seen if the MDM used does not contain large fragments of bone, if it is of good quality and if it makes up just a small part of the recipe. The BAADER meat (meat from which coarse connective tissue has been removed by a soft separation) can be considered a raw material of relatively

high quality if made in accordance with the correct principles. The development of colloid mills has also had a significant effect on the sensory quality of frankfurters and sausages. Things have gone to the extreme in Russia in this regard, with every small air pocket being reason for an immediate complaint. Air pockets are not viewed in such a negative light in Western Europe as they are on Eastern markets. Frankfurters made with the use of colloid mills have an extremely fine consistency and a high degree of processing, and in certain cases may almost lose their typical fibrous property that has such a positive effect on the juiciness and taste of the product, and consequently on the use of seasonings and aromatics. The use of liquid smoke in the smoking process, casing materials (alternatives to natural casings) and subsequent packaging and storage for the minimum shelf life (the length of which is taken to the extreme by contemporary commercial chain stores) have an influence on the traditional quality. Commercial entities demand that there is no pronounced change (or preferably no change at all) to product taste for a number of weeks. This all places extraordinary demands on the creation of seasoning mixtures and the use of additives.

Seasonings, spice extracts, aromatics and additives used in frankfurters and sausages

The taste of certain frankfurters and sausages may be either only very gently complemented (frankfurters and Vienna sausages) or augmented extremely markedly (e.g. Bratwursts – marjoram, curried sausages – curry spices, Munich white sausages – parsley) with the use of seasonings. A rather individual approach tends to be taken to each product according to regional customs that may differ enormously. Most of the known seasonings are used in various forms and combinations in frankfurters and sausages all over the world. This paper is restricted to interesting applications and combinations that are complemented with small amounts of various seasonings.

A combination of paprika and cumin, often complemented by pepper and garlic, is popular in the lands of the former Austro-Hungarian monarchy. Sausages and debrecener frankfurters in particular contain more fat which itself intensify the taste. Modern recipes appropriately combine the spiciness of hot paprika with various extracts such as chilli extract. Paprika sausages and debrecener frankfurters are typical products in the Czech Republic and Slovakia. The Beskids is a mountainous region where mutton is occasionally used, but paprika did not catch on here to such an extent as in other region - south of Moravia. Marjoram, pepper, garlic and cumin, gently supplemented with new spice, nutmeg, etc., tend to be used in sausages here. The Wallachian sausage is undoubtedly the most famous product from this region. North Moravia can also boast an extremely popular product – the Ostrava sausage which was created by butcher František Pekárek who worked in the meatpacking plant in Martinov. The surface of the sausage is coloured with caramel which gives the product a sweetish taste that combines well with the paprika, pepper, cumin and coriander used.

The border area with Germany (in the region Bohemia in particular) has always been influenced by the purchasing power of the population which was always greater on the other side of the border. Our neighbours thereby had an indirect affect on production and customs which we might characterise primarily as white sausages and wine sausages whose recipes contain marjoram, parsley, etc.

The Spiš sausage is a famous Slovak product that began to be made at the beginning of the 20th century. They were made in Spišské Podhradie by butcher Štefan Versanyi from beef and pork meat suitably seasoned with a combination of sweet and hot paprika. The Bratislava sausage, made with a combination of sweet and hot paprika, pepper and nutmeg, is another popular Slovak product.

Today's Austria has managed to take advantage of the taste experience dating back to the monarchy extremely sensitively and opportunely and to enrich it with the traditions

of its western neighbours (Germany, Switzerland) in spite of its conservative approach. The combination of paprika, pepper and other seasonings, complemented by smoking and drying, places Austrian frankfurters and sausages among products of the highest quality in the world that are accepted far and wide.

Germany is too large for a detailed specification. It is the world leader in terms of the volume and number of types of frankfurters and sausages made. Its products are characterised by far more marked seasoning than is the custom elsewhere in Europe. Currywurst have a distinct smell and taste of curry, while Weisswurst have the distinct taste and smell of parsley. Germany is the birthplace of the frankfurter – the most widespread type of emulsified meat product in the world. Pepper, nutmeg and mace, coriander and ginger processed to an extremely high standard are used predominantly in these products. High-quality seasoning extracts, which allow the desired taste intensity to be achieved at low quantities, are added as flavour enhancers. The taste of the seasonings and extracts used is heightened by the use of high-quality technological equipment by producers of seasonings and meat processors alike.

France, on the other hand, combines individual seasonings extremely opportunely to create a distinctive impression and, most importantly, a full flavour. French products are characterised primarily by harmony in which the taste of the individual ingredients (meat of high quality of various kinds) is preserved. Seasonings such as fenugreek are not used so often in the Czech Republic. A good consistency and the corresponding “knack” are also demanded. This term for “crunch”, taken from the name of the quality frankfurter Knack, is known to originate from the Alsace region. France was one the main colonisers of northern Africa and an indirect intermingling of culinary cultures occurred. The Merquez grilling sausage is extremely popular both in France and in Morocco, Algeria, Tunisia and Libya. It is made from beef and mutton, with the main seasoning used being hot and sweet paprika complemented by chilli, Roman cumin, marjoram, etc. A specific feature of emulsified meat products of northern Africa is the large amount of starch used in certain cases, amounting to as much as 18%. Seasoning such products is characterised by different requirements than we are accustomed to in Central Europe (with added starch of 1 – 3%). Products from northern Africa are seasoned with more distinctive seasonings such as turmeric, Roman cumin and other seasonings particularly popular in the Mediterranean (thyme, savoury, basil, sage, oregano), and also paprika, various peppers, etc. We find greater use of game, complemented by beef, in products in southern Africa. Coriander, cloves, nutmeg, garlic, new spice and other seasonings are used to flavour Boereworst, for example. The use of vinegar in the sausage mix, which extends product shelf life with the addition of salt at $16 - 18 \text{ g} \cdot \text{kg}^{-1}$, is another regional peculiarity.

Ukraine, Belarus, Russia and the other countries of the former USSR differ from other countries around the world primarily in that their recipes still use a number of allergens that we perceive with occasional hysteria – milk, cream and eggs which make emulsified meat products extraordinarily soft. The use of peppers, nutmeg, coriander, ginger, etc. is not seen as the single provider of taste, but as something that brings the product’s overall taste together in an appropriate way. This relates, first and foremost, to products made in accordance with the detailed quality standards GOST. Industrial-quality products are flavoured with larger quantities of seasonings, extracts and aromatics, as is the case all over the world.

Great Britain can boast a great many famous sausages, the most popular of which are undoubtedly Cumberland sausage and English breakfast sausage. Cumberland sausage is made from pork shoulder, side of pork, back fat and rusk (15 – 20%). The seasonings used generally include black pepper, nutmeg and sage. English breakfast sausage is made from lean meat, jowl, fat trimmings and 10 – 15% rusk. The principal seasonings are pepper, nutmeg and mace, complemented by marjoram, sage, thyme, etc.

In view of their close contacts with Europe, South Korea and Japan are countries in which production and consumption of emulsified meat products are continually on the increase. Their sensory preferences vary in spite of the fact that they are neighbouring countries. South Korea can accept a relatively large amount of garlic, complemented by hot paprika, chilli, pepper, etc. Japanese emulsified meat products are generally sweeter, containing soy sauce, and are less highly seasoned and less salty. The aroma of cherry or morello cherry wood obtained either by smoking with the given wood or by the addition of an aromatic, creates a typical and extremely pleasant taste profile in many products. In one case we can consider Japanese emulsified meat products as a global model – with the addition of around 1.4% salt they manage to achieve a product fullness and wholeness almost comparable with Western or Central European standards by means of the suitable combination of seasonings, aromatics, additives and smoke.

The global trend in the development of emulsified meat products over the last 25 years has been for increasing diversification and change. We could say that product quality has undergone precipitous development during this time, probably influenced most greatly by the economic situation, the invisible hand of free market, technological development, a shortage of production ingredients, the search for alternatives in the production of meat products, the shift from self-sufficiency toward consumerism among the population, etc. The use of meat substitutes and ingredients making meat products cheaper has had a fundamental impact on the composition, dosage and form of seasoning used. It is widely known that high-quality products need not be particularly highly seasoned. They look tempting anyway, have excellent “knack”, and their taste is well-balanced or typically intense. If, however, a product is made exclusively from emulsions (fat, skin, soya emulsions, etc.) with a large proportion of water and a large proportion of meat substitute, then it is not only the taste of the given product which need to be laboriously engineered. Also the negative taste of used ingredients (fat oxidation, an “old” taste) and additives (soya, starches, plant and animal proteins, hydrocolloids, celluloses, fibres, etc.) must be concealed.

An emulsified meat product should be characterised by the taste of meat and fat, the product should be fresh and well-balanced with a long and pleasant reverberation that should encourage the customer to consume more. The use of a larger quantity of taste-forming additives such as aromatics (meat, smoke, fat, lemon, etc.), taste enhancers (monosodium glutamate, ribonucleotides, yeast extracts, various sugars and sweeteners, etc.) is unavoidable in products of industrial quality. High-quality products can be made with lower quantities of high-quality seasonings. Products of medium quality are often a compromise in which, for example, only natural aromatics are used and glutamate accepted in certain cases. “Clean label” products are designed largely for more educated and wealthier customers who do not purchase the given products primarily for their taste. The general rule here is that their taste profile comes close to that of original products and sometimes even natural aromatics and seasoning extracts are not acceptable for use as flavouring.

Cheese (Javořice cheese frankfurters) and vegetables in the form of pieces of various sizes (red and green pepper, etc.) may be an attractive addition to emulsified meat products and sausages, and mushrooms or truffles may also be added. As far as the use of whole or ground spices is concerned, the use of whole, crushed or rubbed spices, which create an eye-catching mosaic on cut surface of sausages, is tolerated in the production of sausages. These “non-ground” spices are “well hidden” between pieces of meat or fat in the sausage structure and create the much-anticipated and enjoyable “hot spots” when one bites into the sausage. “Non-ground” spices could affect the desired fine structure in emulsified products.

The salt content plays a specific role in these meat products. The high content of salt added to certain recipes purposefully to reduce costs may be offset in terms of taste by aromatics,

sugars, etc. What has been said above about the saltiness of Japanese products also applies here – a product may be less salty, though it should be harmonious and interesting in taste. Certain saltiness is caused by the addition of phosphate, citrate and perhaps salt as part of seasoning blends. A nitrite salting mix (in contrast to kitchen salt) may also bring a specific taste impression to the product. On the other hand, there are extraordinary possibilities for the use of starches, sugars and dextrins today. The addition of seasonings cannot, then, be seen merely as a universal recipe for achieving a good taste in sausages and frankfurters. As we can see, a number of secondary factors must also be considered. The product itself may be slightly more distinctive in taste if it is part of a favourite dish in which it complements the anticipated gourmet experience. The hot dog is one notable example around the world. Hot dog is the name given in English-speaking countries to a frankfurter in a bun (in batter, etc.) which is made in a large number of combinations of seasonings, based largely on pepper and nutmeg, and also paprika, ginger, chilli, etc. for example. It is interesting to note that the hot dog got its name in New York, where Germany immigrants sold hot “Dachshund sausages” that were similar in appearance to the breed of dog in question. The cartoonist Tad Dorgan then gave the delicacy the name

Table 1. The use of seasonings in the production of the most famous Czech and Slovak frankfurters and sausages (THN 1977; Steinhauser 1991; Kolda et al. 1997; Bezděk 1999; Šedivý 1998 and 2003)

Product	Black pepper	Garlic	Paprika	Cumin	Nutmeg	Ginger
Lean frankfurters	X		X		X	X
Fine frankfurters	X				X	
Delicacy frankfurters	X		X		X	
Vienna frankfurters ⁵	X					
Frankfurt frankfurters ^{3,5}	X		X		X	
Prague frankfurters ⁵	X				X	
Liberec smoked sausages	X	X	X		X	
South Bohemia smoked sausages	X	X	X		X	X
Doudlevec smoked sausages	X	X	X	X		
Bratislava frankfurters ¹	X		X		X	
Tatra frankfurters	X		X		X	
Tourist frankfurters	X	X				
Spiš frankfurters ¹			X			
Debrecen frankfurters ¹	X	X	X	X		X
Tramp cigars ⁴	X	X	X	X		
Spa cigars	X				X	X
Špekáček	X	X	X		X	
Ostrava sausages ²	X	X		X		
Moravian Slovakia sausages	X	X	X	X		
Wallachian sausages						
Moravia sausages	X	X	X	X		X
Paprika sausages ¹	X	X	X	X		
Bohemia Forest sausages ⁶	X	X		X		
Hron sausages ¹	X	X	X	X		
Ipel' sausages ¹	X	X	X	X		X
Levoča sausages	X	X	X		X	X
Pohronie sausages ¹	X	X	X	X		

¹Sweet and hot paprika, ²caramel, ³mace, ⁴coriander, ⁵new spice, ⁶dried milk

Table 2. The use of seasonings in the production of famous German, Austrian and Swiss frankfurters and sausages (Scheid 1967; Koch 1990; Baumgartner 1995; Thalhammer 1997; Essien 2003; Feiner 2006; Caseova 2008 and Quirini et al. 2012)

Product	Black pepper	Garlic	Onion	Paprika	Cumin	Nutmeg/mace	Coriander	Ginger
Münchener Weisswurst ^{1,2}	X					X		
Curry Würstchen ³	X			X		X	X	X
Frankfurter Würstchen ⁴	X			X		X	X	X
Altdeutsche Würstchen	X		X		X	X		
Wiener Würstchen	X			X		X	X	X
Schinken Würstchen	X			X		X	X	X
Knackwürstchen	X			X		X	X	X
Bockwurst	X			X		X	X	X
Krakauer	X	X		X		X		
Augsburger ⁵	X					X		
Debreziner Würstchen ⁵	X	X		X				
Käsekrainer ^{6,7,10}	X							
Pfalzer Würstchen ²	X		X			X		
Stuttgarter Schützenwurst ⁷	X		X			X		
Regensburger								
Cabanossi	X	X		X				
Kaninchenwurst ^{2,8,9}	X					X		
Jausenwurst	X	X			X	X	X	
Cervelas	X			X		X	X	X
Emmentalerli	X				X	X	X	
Knackerli	X		X	X		X		X
Sankt Galler Bratwurst PGI	X				X	X	X	X

¹Parsley, ²lemon zest, ³curry, turmeric, ⁴cardamom, ⁵new spice, ⁶whole pepper, ⁷mustard seed, ⁸wine, ⁹egg white, ¹⁰cheese (Emmental)

“Hot Dogs!”. These products are usually eaten with ketchup or mustard, sometimes with horseradish, onion or gherkin (Scheid 1967; THN 1977; Koch 1990; Steinhauser 1991; Baumgartner 1995; Kolda et al. 1997; Thalhammer 1997; Šedivý 1998; Essien 2003; Šedivý 2003; Feiner 2006; Caseova 2008 and Quirini et al. 2012)

Famous frankfurters and sausages are given in the following Tables 1, 2 and 3 with a description of the main seasonings and additives used.

Sensory evaluation of selected frankfurters and sausages

The aim of the evaluation was to appraise selected frankfurters and sausages in sensory terms, primarily from the viewpoint of their acceptability to the Czech consumer.

Description of products

Munich white sausage (Münchner Weisswurst)

This sausage was first made in the butcher's restaurant Zum Ewigen Licht in Marienplatz, Munich by the butcher Josef Moser. A curious situation (a mistake) lay behind the creation of what is now practically Bavaria's national delicacy. With the restaurant full of guests, they ran out of sheep's intestine and the master butcher sent his apprentice for more. The apprentice, however, brought pork intestines instead of sheep intestines, and there was nothing the master butcher could do except stuff his bratwurst

Table 3. The use of seasonings in the production of famous frankfurters and sausages from around the world (Scheid 1967; Koch 1990; Baumgartner 1995; Thalhammer 1997; Essien 2003; Feiner 2006; Caseova 2008 and Quirini et al. 2012)

Product	Country of origin	Black pepper	Garlic	Onion	Paprika	Cumin	Nutmeg/mace	Coriander	Marjoram
Chicken sausage	Australia	X	X		X			X	
Barbecue sausage ^{24,25}		X					X	X	
Andouille (rolled tripe) ^{9,26}	France	X					X		
Boudin blanc ^{1,2,3,4}		X		X			X		
Knack		X			X		X	X	X
Saucisse de Strasbourg		X					X	X	
Merguez ⁵		X			X				X
Saucisse de lapin ^{7,18,19}		X							
Saucisse Viennoise ⁵	Italy	X						X	
Luganega ^{7,15,17,20,21}		X							
Zalzett tal-Malti ²²	Malta	X						X	
English breakfast sausages ^{7,11}	England	X							X
Irish pork sausage ⁷	England/	X							X
Cumberland sausage PGI ⁵	Ireland	X					X		
Lamb sausage ⁸		X							X
Lincolnshire sausage ^{9,10,11}		X					X		
Boudin blanc de Liège ^{12,13,14}	Holland	X		X					X
Medister pølse ^{10,15}	Norway	X		X					
Boerewors ^{10,15,16}	South Africa	X					X	X	
Salchichas parilleras ¹⁷	Argentina	X			X				
Fen chang ^{10,18,19}	China	X		X					X

¹Cream, ²edible chestnuts, ³truffles, ⁴mushrooms, ⁵Roman cumin, ⁶cayenne pepper, ⁷thyme, ⁸mint, ⁹ginger, ¹⁰new spice, ¹¹sage, ¹²egg, ¹³bread, ¹⁴milk, ¹⁵cloves, ¹⁶vinegar, ¹⁷wine, ¹⁸sesame oil, ¹⁹soya, ²⁰rosemary, ²¹tarragon, ²²cinnamon, ²³citrus, ²⁴parsley, ²⁵rusks, ²⁶barbecue aroma, ²⁷smoke, ²⁸mustard

matter in pork intestines, though he choose to boil the sausages for fear that they would split during grilling. Everything went well, and the apprentice's mistake became a great story that went far beyond the Bavarian borders. The Munich white sausage is generally consumed for breakfast. The casing is removed, and experts even "suck the content out" of the casing. The sausage is made without the use of nitrite salt, i.e. with just kitchen salt at an amount of 1.8 – 2.0%. According to the original recipes, the meat of young cattle (K3 veal – 40%), pork fat (S9 – 25%), boiled meat from the heads of young cattle (15%) and ice/water (20%) is used in production. We can also find newer recipes that use pork meat (S1, S2 – 42%), pork fat (S9 – 26%) and precooked skin (3%) with the addition of ice and water (29%). The products are generally seasoned with 2 g of pepper, 1 g of mace, 10 g of parsley, and 1 g of high-quality lemon zest powder. The veal (pork) meat and fat are chopped with ice and kitchen salt to form a fine mix to which first parsley and then precooked and minced veal head (skin) is added at the end. The batter is stuffed into

rubbed pork intestines of a 28 – 32 mm calibre and cooked to an internal temperature of 70 °C. When the product is reheated before consumption, it is not boiled but merely carefully heated to a moderate temperature to ensure that it does not split.

Curry sausage (Currywurst)

This sausage is similar to the Czech lean frankfurter in terms of appearance – made from pork (S2) with the possible addition of beef meat (R2), fat trimmings (S9), ice and water. The basic seasoning is curry powder with a high turmeric content (2 g) and pepper (1 – 2 g). As a spice, turmeric is characterised not merely by an extraordinary aroma, but most importantly by effects beneficial to the health – retarding tissue aging for example. This is not, then, just a high-quality sausage with the taste of curry, but also a sausage with seasoning beneficial to the health which is how it is seen by many customers.

Nuremberg sausage (Nürnberger Stadtwurst grob)

This popular coiled sausage in rubbed beef intestines is made from a fine mix of pork meat and side of pork with the addition of pepper, coriander, nutmeg, ginger and marjoram (rubbed). The product is smoked and cooked at a temperature of 70 °C (Scheid 1967; Koch 1990; Steinhauser 1991; Baumgartner 1995 and Thalhammer 1997).

Materials and Methods

Products of high quality were purchased on the retail network in Germany. These were cooked products packed in a protective atmosphere. A total of three kinds of sausage were evaluated – Munich white sausage (Münchner Weisswurst), curried sausage (Currywurst) and Nuremberg sausage (Nürnberger Stadtwurst). Products were heated in hot water. The sensory evaluation was performed in a special laboratory at the Faculty of Veterinary Hygiene and Ecology at the University of Veterinary and Pharmaceutical Sciences in Brno by twelve trained evaluators, of which three were men and nine women. The results were recorded on an evaluation form with the use of a 100-point unstructured graphic scale. The products were evaluated from the viewpoint of their pleasantness (hedonics) and intensity of impression. The vector was set from the left (less pleasant, less intense) to the right (pleasant, more intense). The evaluation vector was given as follows for the individual descriptors: colour hedonic (light to dark), intensity of colour (light to dark), aroma hedonic (unpleasant or negative to pleasant with no negative aromas), intensity of aroma (unpleasant or negative to pleasant with no negative aromas), intensity of consistency (soft to extremely tough), intensity of juiciness (dry to extremely juicy), seasoning hedonic (unsatisfactory or unpleasant to extremely pleasant), intensity of seasoning (insipid to extremely intense), taste hedonic (unpleasant with a bad taste to pleasant with no negative or bad taste), and overall impression (unpleasant to pleasant). The results were processed with the use of a basic statistical method (averaging) and are given in Table 4.

Results and Discussion

The Munich white sausage was adjudged as less intense and pleasant by the evaluators from the viewpoint of colour and as having a softer consistency. In contrast, its aroma, use of seasoning and product taste received a positive evaluation. The overall impression of the product was influenced, first and foremost, by its unusual consistency and white colour. Nevertheless, it received a positive evaluation with a point score of 65.

The Curry sausage received an above-average evaluation in relation to all parameters (with the exception of consistency) with its seasoning (intensity and pleasantness) again receiving a positive evaluation. The overall impression of the product was also relatively high (69 points).

The Nuremberg sausage received the best evaluation in all the studied parameters. The pleasantness of its seasoning, in terms of both aroma and taste, was seen in a particularly positive light. The product also received the best overall score, receiving 82 points.

Table 4. Sensory evaluation of selected frankfurters and sausages (Points)

Sensory evaluation	Munich white sausage Münchener Weisswurst	Curry sausage Currywurst	Nuremberg sausage Nürnberger Stadtwurst
Colour hedonic	35	58	70
Colour intensity	14	52	55
Aroma hedonic	52	65	84
Aroma intensity	52	66	75
Consistency intensity	38	49	58
Juiciness intensity	54	60	68
Seasoning hedonic	67	61	84
Seasoning intensity	74	73	79
Taste hedonic	72	72	82
Overall impression	65	69	82

Hedonic – sensory evaluation of pleasantness; intensity – sensory evaluation of intensity

Conclusions

Conclusion of the sensory evaluation

From the viewpoint of their acceptability to the Czech consumer, the products can be said to have been evaluated positively in terms of their aroma, the seasonings used and their taste. The soft consistency and white colour of the Munich white sausage was perceived as strange by the evaluators, who did not perceive it in a particularly positive light. The Nuremberg sausage received the best evaluation.

The enormous quantity of frankfurters and sausages made in various combinations of seasonings may be a good source of inspiration for widening the existing range of meat products in this country. Conservatism is not endless, and interesting varieties may arise if the technologist can take skilful advantage of the properties of another sausage to improve his own product or develop an entirely new product. The sensory evaluation of selected German meat products revealed that the Nuremberg sausage received the best evaluation. The Munich white sausage made without nitrite salt received a good assessment in terms of aroma and taste, though not for consistency or its unusual white colour.

References

- Baumgarten W 1995: Gewürze Fleischtechnologie Band I. Österreichischer Wirtschaftsverlag, 452 p (In German)
- Bezděk J 1999: Výroba uzenin, specialit a konserv. OSSIS - Ing. Václav Šedivý, 3rd Ed., 208 p (In Czech)
- Caseova F 2008: 1001 Foods You Must Try Before You Die. Cassell Illustrated, London, 1. Ed., 960 p
- Essien E 2003: Sausage manufacture. Woodhead Publishing Limited, Cambridge, 85 p
- Feiner G 2006: Meat products handbook. Woodhead Publishing Limited, Cambridge, 648 p
- Frey W, Gerhardt U 2010: Gewürze in der Lebensmittelindustrie. B. Behr's Verlag GmbH & Co.KG, 3rd Ed. 483 p (In German)
- Koch H 1990: Die Fabriktion diner Fleisch-und Wurstwaren. Verlaghaus Sponholz Frankfurt am Mein, 17. Ausgabe, 133-170 (In German)
- Kolda O, Zelinka K, Kubiček V 1997: Zpracování masa. Sobotáles, 101 p (In Czech)
- Quirini CB 2012: „Einfach Wurst!“. Eugen Elmer KG, Stuttgart, 144 p (In German)
- Scheid L 1967: Kochwurst-Sülzwurst. Hanz Holzmann Verlag, Bad Wörishofen, 1. Auflage, 443 p (In German)
- Schmidt KF 1996: Wurst aus eigener Küche. Blackwell Wissenschafts-Verlag, Berlin, 5th Auflage, 93 p (In German)
- Steinhauser L 1991: Zapomenuté receptury masných výrobků. LAST, 1st Ed., 122 p (In Czech)
- Šedivý V 1998: Spotřební normy pro masné výrobky. OSSIS-Ing. Václav Šedivý, 3rd Ed., 320 p (In Czech)
- Šedivý V 2003: Slovenské masné výrobky. OSSIS-Ing. Václav Šedivý, 1st Ed., 320 p (In Czech)
- Thalhammer F 1997: Gekonnt produzieren. Franz Thalhammer, Wels, 2nd Ed., 569 p (In German)
- THN 1977: Masné výrobky - Normativy obalů, normativy ztrát zmrazováním I. díl. Masný průmysl koncern, generální ředitelství (In Czech)