

CHANGE OF COMPONENTS OF MEAT FLAVOURING AROMA DURING STORAGE

Andreenkov V.A.

All-Russian Meat Research Institute, Talalikhina 26, 109316, Moscow, Russia

Misharina T.A., Medvedeva I.B.

Institute of biochemical physics of Russian Academy of Sciences, Moscow, Russia

Volatile compounds that are responsible for the aroma of meat products and poultry have been the object of extensive studies during many years. Volatile components of natural meat products (1-3), model systems (4-7), meat flavourings (8-12) are being studied. These investigations are important for the understanding of the mechanisms of formation of volatile compounds and production of food additives, identical by their aroma to natural products. As a result of these investigations it was found that a number of sulfur-containing heterocyclic and carbonyl compounds (1-3) generate the aroma of meat products. Precursors of these substances in meat products are cystein, thiamine, amino acids and lipids (7-12). As a result of reactions between amino acids and carbohydrates (Maillard reaction) food flavourings with the aroma of the cooked meat products are obtained. Meat flavourings after carrying out Maillard reaction are usually aqueous solutions, containing a large amount of amino acids, proteins, lipids and carbohydrates. Such systems can't be stored without conservation and are not convenient in use. The conversion into a dry form allows to significantly increase storage life of meat flavourings. Dry flavourings can be stored under usual conditions up to 1 year. No data are available in scientific literature about processes occurring in the flavourings during storage.

The aim of investigations. Study of changes in the content of the most important aroma forming components of meat flavourings produced in this country during their storage.

MATERIALS AND METHODS

One of the meat flavourings produced in this country and obtained by the Maillard reaction with the use of extracts of natural meat raw materials was chosen for investigations. Five days after production the flavouring was dried with the addition of the inert food carrier by spray drying. The dried flavouring was stored at 4 °C. The initial meat flavouring was stored before analyses at -18 °C. Differences in the composition of volatile compounds were studied for the following samples: 1 - initial liquid flavouring, 2 - fresh dry meat flavouring, 3,4,5 - dry meat flavouring, stored during 1, 3 and 6 months, respectively.

The extraction and concentration of volatile substances and the gas-chromatography analysis of the obtained concentrates were carried out according to (12). The compounds that determine the aroma of flavourings were revealed by sniffing analysis, i.e. by the determination of the aroma of the eluted chromatographic zones.

RESULTS AND DISCUSSION

The list of the identified compounds and description of the aroma of the corresponding chromatographic zones of the eluate are presented in the Table.

As can be seen from the Table, there are a number of compounds with meat aroma in the flavouring. Such compounds are called the key compounds. These compounds are responsible for the meat aroma of the flavouring and the meat products. The sulfur containing compounds (NN 8, 13 and 26) are present in the studied flavouring in the maximum concentration. The first of them - 2-methylfuranthiol-3 is the main, most important key compound in the aroma of meat products (8-12). The second and the third heterocycles are the products of reaction of sulfur-containing precursors with monosaccharides. In spite of a considerable content in the flavouring their contribution into the aroma is not large, because the threshold concentrations of the odour of these compounds are by a factor of 2-3 higher than those of the main key compounds. 2-Methyloxolan-3-one is a probable precursor of the key compounds - 2-methylfuranthiol-3 and its symmetric disulfide (12). Three disulfides (NN-31-33) that are related to the most important key components of the meat flavouring are present in it. Their presence in the flavourings ensures stability of the meat aroma because these compounds have low volatility.

Aliphatic aldehydes (NN 5,9, 14, 17, 20, 22, 24, 25, 27-29) are found in the flavouring. These compounds don't have a meat flavour, but are related to odour active ones. They are present in all the natural meat products and being in a particular concentration, together with the key sulfur containing heterocyclic compounds form a full-value meat aroma (1, 12). All the compounds identified in the flavourings are present in natural meat products, and their concentration in the flavouring is by a factor of 2-3 higher, than in natural meat (7). Thus, the investigated meat flavour is identical to natural meat products.

Comparison of the compositions of volatile compounds in the samples 1 and 2 has shown that drying of the liquid flavouring doesn't lead to a change of the quality composition, but the losses of the main odour active compounds by 5-20 % have been marked depending on their volatility. During storage of the dry flavour the quality composition of volatile compounds remains constant, but their concentration changes. Thus, the content of the key substances with mercaptogroup (NN 8, 10 and 16) increases up to 3 months of storage, as well as the concentration of the compound N. 31, and then practically doesn't change. The content of the other key compounds, as well as heterocyclic compounds, changes insignificantly during the whole period of storage, except furfural, the content of which increases during storage of dry meat flavouring. These results agree with probable conversions of volatile compounds in meat flavourings which were described in (4-12) for model reactions. Concentration of aldehydes increases during storage of a dry flavouring. Thus, the content of hexanal during six months increases 4-fold, 2-decenal - 6-fold, and the rest of the aldehydes up to 3-fold. This suggests that during storage of flavourings containing the extracts of natural meat raw materials, the reactions of oxidative degradation of lipids takes place. Such processes were not revealed in storage of meat flavourings obtained from protein hydrolysates (9) where the aldehydes are the products of Strecker degradation of amino acids. The main factor limiting the storage life of flavourings is the oxidation of lipids in meat and especially in chicken flavourings.



Volatile compounds found in meat flavouring

N of peak	Compound	SE-30	Aroma of chromatographic zone
1.	Pentanedione	666	Butter
2.	Pentanal	680	Plant
3.	2-Methyloxolan-3-one	716	Pronounced
4.	3-Furanthiol	746	Meat, pronounced
5.	Hexanal	780	Fresh greens
6.	Furfural	804	Food
7.	2-Methyl-4,5-dihydrothiophene	830	Pronounced
8.	2-Methylfuranthiol-3	849	Cooked meat
9.	Heptanal	873	Greens
10.	Furfurilmercaptan	888	Fried, meat, coffee
11.	Thiolane-3-one	920	Sulfuric
12.	2-Heptenal	934	Fatty greens
13.	2-Methylthiolane-3-one	947	Pronounced, sulfuric
14.	Octanal	981	Fatty
15.	4-Methyl-5-ethylthiazole	986	Plant
16.	2-Methylthiolane-3-one	946	Pronounced, sulfuric
17.	2-Octenal	1036	Greens
18.	2-Methylthiolanthiol-3	1042	Prepared meat
19.	2-Acetylthiophene	1060	Almond, sulfuric
20.	Nonanal	1082	Greens
21.	Methylacetylthiazole	1087	Sulfuric
22.	2-Nonenal	1135	Fresh, cucumber
23.	Ethyl acetylthiazole	1087	Sulfuric
24.	Decanal	1178	Oily
25.	2,4-Nonadienal	1190	Fatty
26.	3-Acetyl-1,2-dithiolane	1212	Sulfuric
27.	2-Decenal	1249	Fresh greens
28.	2-Undecenal	1340	Oily
29.	Dodecanal	1378	Oily
30.	n-Tetradecane	1400	
31.	bis (2-methylfuryl-3)-disulfide	1507	Fried meat
32.	(2-methylfuryl-3)-(2-methylthienyl-3)-disulfide	1680	Fried meat
33.	Bisfurfuryldisulfide	1710	Fried meat

CONCLUSION

Our findings about composition and ratio of volatile compounds in the meat flavouring and their change during storage have shown that the flavouring by its composition of volatile components is close to natural beef broth. During a 6 months storage the concentrations and ratio of volatile organic compounds are preserved without significant changes, that provides for the quality stability of the meat flavouring. All the identified compounds are found in natural products of the cattle and poultry meat, and the offered flavouring can be considered as an identical one to natural products.

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