Studies on the possibilities to improve the flavour of meat products by adding a melanoidine-type flavour substance

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Abstract

Studies were made of the changes in the sensory qualities of frankfurters manufactured using a melanoidine-type flavouring. The frankfurters were prepared by a standard technology, from beef and pork, and their sensory qualities were determined using flavour profiles by a 5-point system of scoring.
The aim of the present work was to detemine the dependence of product sensory qualities on the different concentrations of the flavouring introduced and the changes that occurred in total carbonyl compounds, keto-glycerides, monocarbonyls and their subfractions. The results indicate an improvement in product flavour upon the addition of the flavouring at a concentration of up to 0,5%, with a significance of the differences found of 95%. Higher flavouring concentrations do not improve product quality.

The products of the Maillard reaction have been the subject of a great number of patents in the last years, aimed at obtaining complex flavour substances named after different meats (1, 2, 3, 4, 5, 6).
Some of the researchers described the flavour indices of the melanoidine product (7, 8), others gave information on the influence of the melanoidine flavour substance on different meat products: dietetic meals (9), sauces and soups (10).
One of the main problems of meat industry is to launch new products. However, their flavour indices are strongly injured by intensified processing technologies, according to Rothe (11)
The improvement of flavour can be sought in several directions, one of them being the use of the proper additives. The products of the Maillard reaction (melanoidines) are of interest as flavour enhancers.
The aim of the present investigations was to investigate the influence of melanoidine-type additives on the aroma and taste of frankfurter-type perishable sausages and the changes in the carbonyls of the flavoured samples.

Materials and Methods

A synthetic product (12), patent of the German Democratic Republic, 1980, was used as a flavouring substance. It was a product of the Maillard reaction among five amino acids (arginine, asparaginic acid, glutaminic acid, proline, cystein:HCl) and glucose in the following proportions: 3.71:0.76:3.82:3.71:1.00:39. The substances were dissolved to make a 50% solution at a pH of 5.8-6.0 and were heated at 130°C for two hours.

The frankfurter-type perishable sausages were prepared using 40% beef and 60% pork. The latter was ground and cut in a laboratory cutter. After getting a good homogenate, the necessary amounts of salt, black pepper, polyphosphate, sucrose and sodium nitrite were added to the control, according to the standard in this country. The flavouring substance in concentrations of 0.25, 0.50, 0.75 and 1.00% was added to the samples. The amounts of the other additives in the latter were reduced twice. The smoking and cooking of the sausages prepared in this manner were done by the standard procedure. The improvements of the aroma and taste of the samples in comparison with the control were evaluated organoleptically by the method of sensory profiles (13) on the second day after manufacture. The contents of the total carbonyls, ketoglycerides, monocarbonyls and their subfractions were analysed in both samples and control by the combined column chromatography and spectrophotometry method of Schwartz (14).

Results and Discussion

The investigations showed that the quantities of total carbonyls, ketoglycerides and monocarbonyls in samples with the flavouring substance increased in comparison with the control. Total carbonyls and ketoglycerides increased progressively with the concentration of the flavour additive (Fig. 1). The fate of monocarbonyls and their subfractions did not change in such a regular way (Fig. 3, 4, 5). Total monocarbonyls increased progressively in samples with 0.25, 0.50 and 0.75% concentrations of the flavouring substance but decreased at the 1.00% concentration of the latter. An interesting change was observed with the amount of saturated and unsaturated aldehydes (Fig. 5). The ratio of unsaturated and saturated aldehydes (Fig. 2) was the lowest when the 50% concentration of the flavouring substance was used. This index obtained experimentally had changed most dramatically and can be considered as an important one in regard to the 0.50% concentration of the flavouring substance in the samples. When the same index increased, the organoleptic qualities of the product decreased. The sensory patterns of the control and the sample showed an improving quality especially as far as the indices 'harmony', 'pleasantly burnt', and 'typical of meat' were concerned. The optimum sensory quality was established with the 0.50% concentration of the flavouring substance (Fig. 6) in the sample compared to the control. It corresponded to the lowest values of the unsaturated aldehydes found in samples. The latter compounds are known to have very low threshold concentrations. The optimum sensory indices were obtained in the sample with the 0.50% concentration of the flavouring substance and with the lowest ratio of unsaturated to saturated aldehydes (Fig. 2).

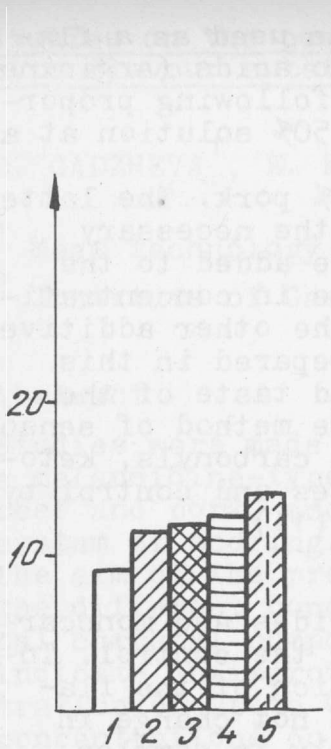

Fig.1: Content of ketoglycerides isolated from the sausages as 2,4-DNPHs (μM/g product)

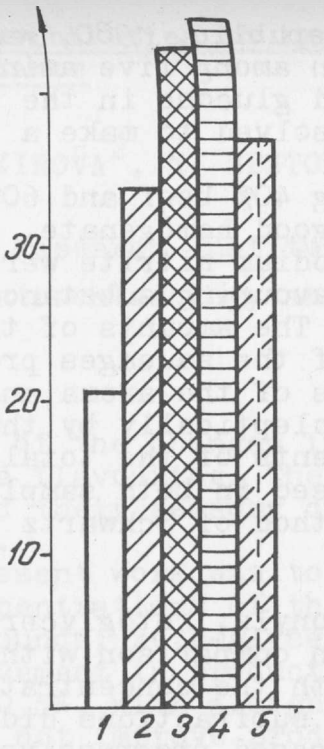

Fig.2: Content of methyl-ketones isolated from the sausages as 2,4- DNPHs (μM/g product)

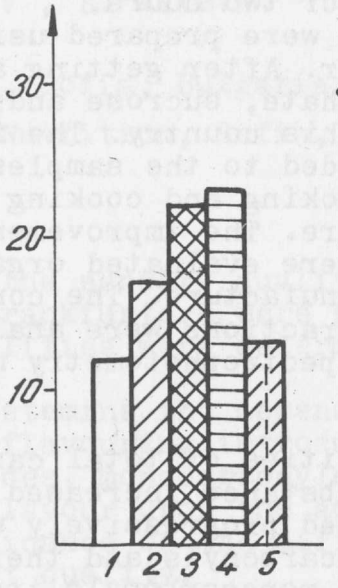

Fig.3: Content of alkanals isolated from sausages as 2,4-DNPHs (μM/g product)

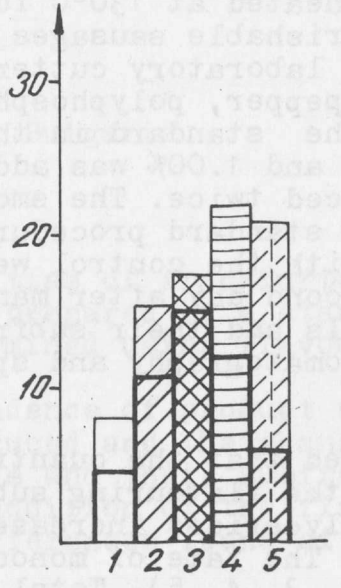

Fig.4: Content of unsaturated 2- enals and 2,4- dienals as 2,4-DNPHs (μM/g product)

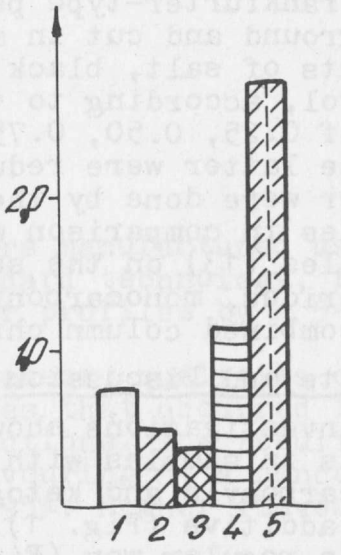

Fig.5: Ratio of unsaturated to saturated aldehydes

-1:control -2:0,25%- flavour substance -3:0,50%- flavour substance

- 4:0,75%- flavour substance 5:1,0%- flavour substance

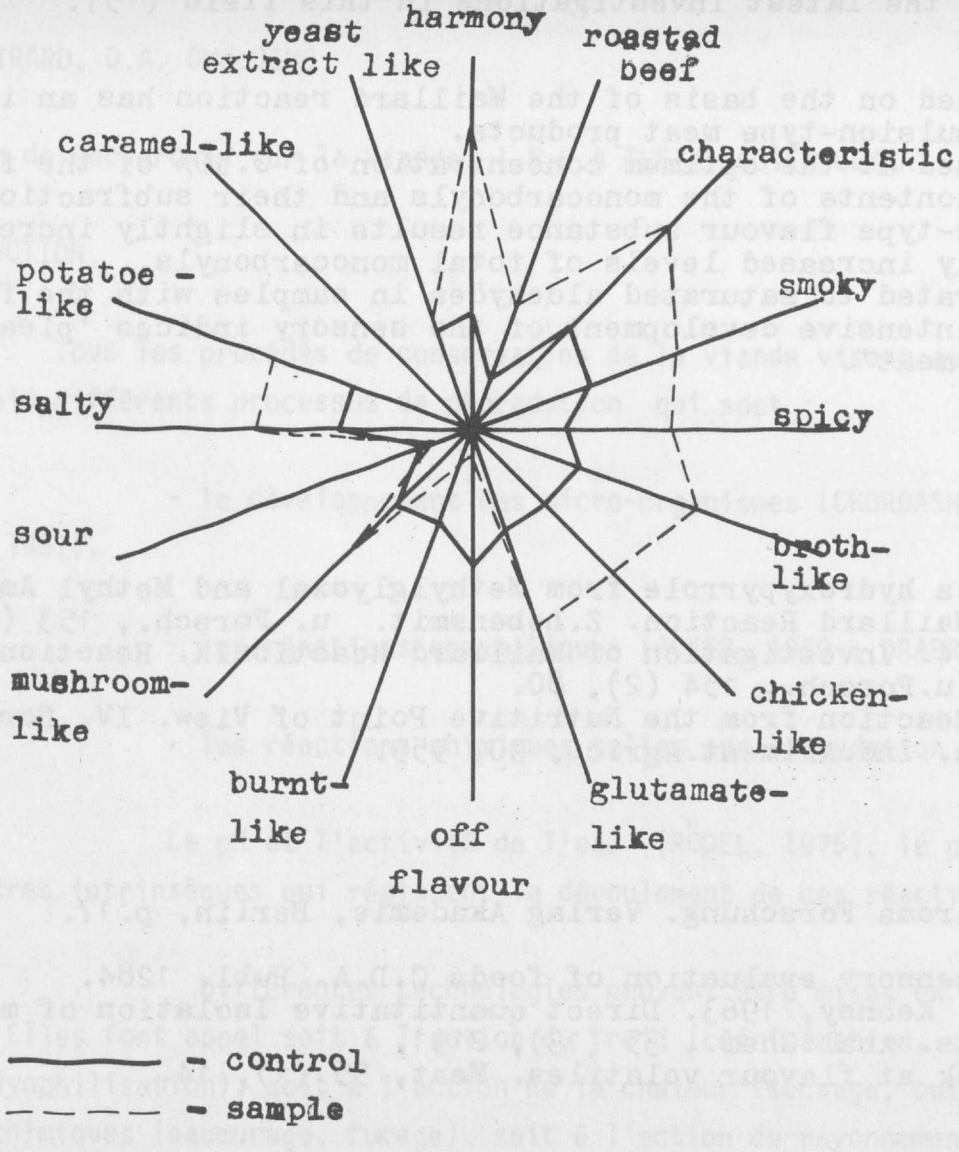

Fig.6: Sensory profile of control and sample, flavoured with 0,50% of flavouring substance

The results indicated that the improving action of melanoidines was due to the carbonyl compounds, which has been confirmed by the latest investigations in this field (15).

Conclusions

(1) The flavouring substance obtained on the basis of the Maillard reaction has an improving action on the taste and aroma of emulsion-type meat products.
(2) The flavouring effect is obtained at the optimum concentration of 0.50% of the flavour additive and is due mainly to the contents of the monocarbonyls and their subfractions.
(3) The addition of the melanoidine-type flavour substance results in slightly increased levels of ketoglycerides, and strongly increased levels of total monocarbonyls.
(4) The lowest ratio of the unsaturated to saturated aldehydes in samples with the flavouring substance corresponds to the most intensive development of the sensory indices 'pleasantly burnt', 'harmony', and 'typical of meat'.

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