

THE REDUCTION OF SALT IN MEAT PRODUCTS BY USING COLLAGEN HYDROLYSATES

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INTRODUCTION

Because of the close relationship between blood high pressure of human beings and the uptake of sodium ions the reduction of salt (sodium chloride) in human food is strongly recommended (Nicholls, 1984; Tröger, 1985).

A certain content of salt in meat products, however, is necessary to maintain shelflife, water holding capacity and the flavour (Wirth, 1988). The present study deals with the problem of improving the sensory quality of meat products which are reduced in the salt content.

A suitable substitute for table salt has to fulfil several requirements: It must not influence the taste, the flavour and the emulsifying properties of the meat products in a negative way, and its use has to be without any risk for human health. A promising new substitute for sodium chloride, which can possibly satisfy these preconditions, is a special collagen hydrolysate, called Gelita-Sol^R (trademark, produced by

Deutsche Gelatine-Fabriken, D-6930 Eberbach). This product contains a mixture of amino acids and peptides with an average molecular weight of 3000 dalton.

The effectiveness of substitutes depends usually on several influencing factors, especially on the composition of the corresponding products. In order to check the applicability of Gelita-Sol as a partial substitute for sodium chloride, several types of meat products and convenience foods were tested in this study systematically.

MATERIAL AND METHODS

Three types of meat products (liver sausage, hot dogs, luncheon meat) and convenience foods (liver dumplings, hamburgers, goulash soup) were prepared after recipes described in detail by Hofmann and Marggrander (1989).

Sensory analysis were carried out by test panels with 10 - 17 members. Products containing a reduced amount of sodium chloride (1.0 - 1.7% NaCl) and 2% Gelita-Sol were tested in comparison with samples without Gelita-Sol. In all cases the duo (paired difference) test (see Jellinek, 1981) was used because in preliminary investigations this test proved to be more reliable in finding out significant differences in the intensity of salty taste than the trio (triangle) test.

In order to control the composition of the products tested in several cases chemical and physical investigations were carried out (see table 1).

Table 1: Analytical data of several products investigated by sensoric analysis

Product	Gelita-Sol %	NaCl added %	NaCl found %	pH-value	H ₂ O %	fat total %	protein total %	collagen* %
Liver sausage	0.0	1.4	1.8	6.27	51.5	28.7	16.9	1.8
	2.0	1.4	2.0	6.23	46.3	31.7	17.4	3.4
Luncheon	0.0	1.5	1.6	6.44	63.5	22.1	11.8	1.7
	2.0	1.5	1.6	6.29	60.4	24.5	13.0	3.0
meat	0.0	1.7	1.9	6.09	64.6	20.0	12.7	2.1
	2.0	1.7	1.8	6.09	62.4	20.0	14.4	3.8
Hamburger	0.0	1.4	2.3					
	2.0	1.4	2.2					
Liver dumplings	0.0	1.4	1.8					
	2.0	1.4	1.9					

*)calculated by the content of hydroxyprolin

RESULTS

The results of the chemical and physical investigations are shown in table 1.

The amount of NaCl found was in all cases higher than the added amount of NaCl which is intelligible because the estimation of NaCl was based on the analytical determination of the chloride content. The raw meat and the additives (water, spices) contain also chloride ions to a certain degree.

The results of the sensoric analysis are listed in table 2.

A frequency of e.g. 82% positive judgement means that 82% of the taste panel's members found the "sample" (containing

2% Gelita-Sol) to be more intensive in flavour than the "control" (without Gelita-Sol).

First of all one can realize from the data in table 2 that the evaluation of the investigated products containing Gelita-Sol depends on the type of product: In the case of liver sausage and hot dogs the addition of 2% Gelita-Sol caused not only a more intense salty taste but also a more intense meat aroma. This result was statistically highly significant (statistical assurance 99%). A significant amplification of the taste was also found with goulash soup (statistical assurance 95%).

A clear positive effect of Gelita-Sol but with a lower statistical assurance, was found in the case of liver dumpling and hamburgers. In contrast to these results there was no distinct or significant effect of Gelita-Sol on the taste of luncheon meat.

Table 2 Statistical results of the sensory analysis (paired difference test) of different meat products containing a reduced amount of sodium chloride (NaCl) and Gelita-Sol in comparison with samples without Gelita Sol

Product	Frequency of positive judgement	Statistical assurance	Number of testers	NaCl %
Liver sausage	82%	highly significant	17	1.4
Hot dogs	88%	highly significant	16	1.5
Luncheon meat	44/50%	not significant	16	1.7/1.5
Liver dumplings	73/80%	level of significance	15/10	1.4/1.3
Hamburgers	69%	< 95%	13	1.5
Goulash Soup	83%	significant	12	1.0

In total: The results listed in the table indicate that in five of six cases the addition of Gelita-Sol to the salt-reduced meat products had a significant positive effect on its sensory quality.

CONCLUSION

In general the addition of Gelita-Sol caused not only a more intense salt taste but also a more intense meat aroma. This synergistic effect depends obviously on the composition or type of meat product, especially on the amount of "free water" which is important for the perception of taste.

Therefore in the case of luncheon meat which can be regarded as a relatively "dry" product, the effect of the addition of Gelita-Sol was rather low.

Thus, in most cases the collagen hydrolysate proved to be a flavour potentiator (a

substance that enhances the flavour of other substances without itself imparting any characteristic flavour of its own; see Täufel et al. 1979; Niederauer, 1988).

In addition it was found that the fluid phase of the ready to eat meals (liver dumplings, hamburgers, goulash soup) tasted considerably more intensive than the solid phase which contains the same concentration of salt. This shows again the important role of "free water" for the perception of taste.

It can be concluded that Gelita-Sol is able with regard to taste to substitute partially sodium chloride in meat products. It has not only a synergistic effect on the taste of salt, but also on the whole meat aroma and the spices used. The intensity of the salt taste is usually influenced by the fat content of a product (masking effect). Therefore, in general meat products with low fat content are more intense in salty taste than those with higher fat content if their salt content is

equal (Hammer, 1981). However, in the present study no relationship between the fat content of the products investigated and the flavour enhancing effect of Gelita-Sol could be stated.

The results of chemical analysis were - as far as investigated - in agreement with the composition of the meat products and convenience foods given by the recipes used. However, the analysed salt content was higher than the amount of table salt added because the materials and residual additives (especially water) for the preparation of the products contained also chloride, which was based in the calculation for the content of sodium chloride.

As to be expected the products containing Gelita-Sol were higher in their calculated content of collagen than those produced without Gelita-Sol.

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