

SENSORY EVALUATION OF WHITE SAUSAGES

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INTRODUCTION

Nitrates and nitrites are used in the curing mixture of different meat products. The function of these salts is multiple since they develop a characteristic colour in the meat when nitrosilmyoglobin is formed; they act as an inhibiting agent for the growth of *Clostridium botulinum*, and they contribute to the flavour of the meat products (Badui, 1988).

Independently of the purposes mentioned above, it is important to point out the health risks that ingesting this kind of compound represents. Epidemiological and clinical studies in man have demonstrated that the principal manifestation of toxicity derived from the ingestion of nitrates and nitrites is methemoglobinemia (WHO, cited by Garcia, 1988). Methemoglobinemia is a brownish pigment incapable of transporting oxygen, thus reducing the body's ability to transport oxygen from the lungs to the tissues and, as a consequence, possibly causing death from anoxia (Bodansky, cited by Garcia, 1988). This has caused concern about the consumption of nitrates and nitrites, especially in the meat industry where the formation of nitrosamines in cured meat products was demonstrated (Garcia, 1988). Nitrosamines result from the interaction between nitrates and the secondary and tertiary amines present in food. These compounds, whose effects have been demonstrated in laboratory animals, are potent carcinogens (Hardisson, 1988).

Today, in some European countries types of white sausages are consumed. These do not contain nitrates or nitrites and they may represent an alternative which could eliminate the risk represented by the consumption of meat products cured with these additives. Because this type of product has not been developed in Mexico, the objective of this study was to produce a white sausage and evaluate its acceptance.

MATERIALS AND METHODS

The preparation of the sausages was based on six German-style white sausage recipes taken from Koch (1988). These underwent a series of modifications until a standardization was achieved. In Table 1 the formulation of the modification recipes is shown. All of the recipes were prepared with the same procedure. First, the meat and fat were separately ground and the meat was mixed with salt and spices and allowed to stand at a temperature of approximately 4°C for 16 hours. Then it was ground in a cutter adding the fat and the rest of the ingredients until a fine, uniform paste was obtained. The paste was then stuffed into synthetic tripe number 27 and scalded for 20 minutes at 65°C. Finally, the sausages were cooled and stored.

In the selection of judges, the test of identification of basic flavours and the interval test described by Pedrero (1990) were used with certain modifications. Seven judges were selected from fifteen candidates. Training of the judges was carried out through a series of tests with a commercial frankfurter for which the following characteristics were considered: appearance, consistency, odour and flavour.

In order to carry out the sensory analysis three replications were carried out, and a new batch was prepared with each replication. A hedonic scale from 1 to 6 based on that utilized by Chisholm (1989) was used for each of the following parameters: appearance, consistency, odour and flavour. This evaluation scale is shown in Table 2 where 1 represents a product of very bad quality and 6 one of excellent quality.

RESULTS AND DISCUSSION

The results obtained in each one of the replications were averaged, and with these averages a statistical analysis using the Quade Test, described by Conover (1980) was carried out for each parameter (i.e., recipes) were found to be significantly different ($P < 0.05$) based on the observed differences in acceptance levels. For the parameters appearance, odour and flavour, the null hypothesis (H_0) was rejected. This indicates that for each of these parameters at least one of the recipes is different.

However, the consistency parameter, the null hypothesis was not rejected. Thus, it can be deduced that the recipes tend to have the same consistency and very good acceptance by the judges who gave high scores.

The results of the multiple comparisons are represented in Table 3. Here, the recipes were placed in order of lowest to highest quality and acceptance. In Table 4 is represented a numerical score for quality, based on the results of the statistical analysis.

By observing Tables 3 and 4, it can be deduced that the best recipes were A, B and E because they obtained the best scores, and were well accepted by the judges. The results shown in Table 4 would eliminate recipes C, D and F.

CONCLUSIONS

It can be concluded that recipes A, B and E were the most acceptable, and of these B and E were considered the best for their higher level of acceptance in the parameters of appearance and flavour. This is an indication that this kind of product could be well accepted in the Mexican market.

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Table 1. Formulation of recipes (for one kilogram).

Ingredient (in grams)	Recipes					
	A	B	C	D	E	F
Meat with a maximum of 5% visible fat	400	550	650	650	650	650
Meat with a maximum of 50% visible fat	450	200	-	-	-	-
Raw bacon with meat	-	100	200	200	200	200
Ice	150	150	150	150	150	150
Salt	18	18	22	18	22	22
Pepper	2	2	-	2	2	2
Nutmeg flower	1	1	-	1	1	1
Ginger	1	1	-	1	1	-
Marjoram	1	-	1.5	-	1	1.5
Ground cumin	1	-	-	-	1	1
Lime powder	1	1	-	1	1	1
Ascorbate	0.3	0.3	0.3	0.3	0.3	0.3
Tenderizer	-	3	-	-	-	-
Soybean protein	40	40	40	40	40	40
Accoline	4	4	4	4	4	4
Eggs	-	29	30	-	-	-
Curcuma	-	-	0.5	-	-	-
Flavouring 5572*	-	-	8	-	-	-

* Produced by PESA.

Table 2. Hedonic scale for odour and flavour.

Numerical score	Parameters	
	Odour	Flavour
6	Distinctive, aromatic, satisfactory, complete and clean spicing	Distinctive, very aromatic, complete, clean, sufficient salt
5	Meat aroma slightly weak and spices not entirely manifested but clean	Meat aroma slightly weak and spices not entirely manifested but clean, salt is notorious
4	Weakly aromatic, spicing partial (too much or too little) not completely clean	Weakly aromatic, partially spiced (too much or too little) salt very clean, dry, somewhat fibrous and with visible fat
3	Not characteristics, almost no aroma, too much or too little spicing, strong atypical smell	Not characteristic, flavour not typical, almost without aroma, too little or too much spicing, too salty, fibrous, visible fat
2	Not aromatic, strange, sour, hint of rancidity	Not aromatic, strange, totally salty
1	Decomposed, very rancid and in bad taste	Decomposed, rancid and in bad state

Table 3. Results of multiple comparisons.

Appearance	Odour	Flavour
C	C	C
F	F	F
D	B	D
E -	D	A
B	E	E
A	A	B

Table 4. Numerical scores for quality.

	Recipes					
	A	B	C	D	E	F
Appearance	1	1	3	1	1	2
Consistency	1	1	1	1	1	1
Odour	1	2	3	1	1	3
Flavour	1	1	4	2	1	3

Note: A lower number represents better quality.