

A DESCRIPTIVE SENSORY PROFILE OF DRY FERMENTED SAUSAGES, RIPENED WITH THE ADDITION OF A BACTERIAL PROTEINASE

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BACKGROUND

Addition of a serine proteinase from *Lactobacillus casei* subsp. *casei* NCDO151 has been shown to accelerate the ripening process of dry fermented salami sausage (Næs *et al.* 1995, Hagen *et al.* 1996). However, the purpose of this addition was not to make a new product, but to make a traditional salami sausage in a shorter period of time. For this reason, reliable chemical and sensory methods were needed to evaluate the differences between sausages ripened with and without enzyme. Quantitative descriptive analysis was chosen as an appropriate method for studying sensory variations in such a complex food system as is the fermented sausage.

OBJECTIVE

The objective of this work was to develop a descriptive sensory profile to distinguish between dry fermented sausages with different degrees of maturity.

METHODS

Proteinase preparation: The serine proteinase from *Lb. casei* subsp. *casei* NCDO151 (=NCDO151 proteinase) was extracted according to Næs *et al.* (1995). 300 mL crude proteinase extract (sterilized by filtration) from 15 l cell culture was added to the sausage mixture, corresponding to 5 Arbitrary Units (AU) per gram sausage mixture as measured by degradation of ¹⁴C-methylated casein. The proteinase activities were determined at conditions comparable to those existing under sausage fermentation; pH=5.6 and temperature=20°C.

Preparation of sausages: A model salami (without spices and not subjected to smoking) was made with *Lb. sake* L45 as a starter culture (Næs *et al.* 1995). The ingredients were mixed and divided into 4 batches (12.5 kg each). The experiment was performed in parallel, with one factor (NCDO151 proteinase) at two levels (no and full level of enzyme addition). Batch 1 and 3 were the control batches into which no enzyme was added, only 300 ml extraction buffer. Proteinase extract from NCDO151 was added to batch 2 and 4. From each batch, 30 sausages of approximately 400 g were prepared. A replicate of this production was made on the same day so that in total there were 8 batches of sausages. The sausages were stuffed in artificial casings (50mm diameter) and placed in a ripening chamber (Næs *et al.* 1995) for 14 days (proteinase containing sausages) or 28 days (controls).

Sensory analysis: Sensory descriptive profiling was carried out by 11 trained assessors at 14 and 28 days after production. The assessors were selected and trained according to guidelines in ISO 6658-1985 and ISO/DIN 8586-1:1989. Evaluations were performed in a laboratory designed as described in ISO 8589-1988. Assessors developed a vocabulary by describing differences between extreme samples and agreed on a consensus list of attributes for profiling. These are listed in table 1. Assessors were trained in definition of sensory attributes prior to profiling and in use of rating anchors by pre-testing extreme samples. The samples were served in a randomised order within each replicate and with respect to each assessor. Assessors were instructed to use water (35°C) and unsalted crackers for palate cleaning between samples. They were also instructed to expectorate when finished. Each assessor evaluated the samples at their individual rate on a computerised system for direct recording of data (CSA Compusense, Canada). A continuous nonstructured scale was used for evaluation. The left side of the scale corresponded to the lowest attribute (value 1.0) and the right side corresponded to the highest intensity (value 9.0)

Statistical analyses: Statistical significances of observed differences among means of experimental results were evaluated by analysis of variance (ANOVA) using Minitab for Windows release 9 (Minitab Inc., Pennsylvania, USA). The two productions were used as blocks in the analysis.

RESULTS AND DISCUSSION

The sensory attributes that increased in the sausages upon addition of NCDO151 proteinase are all attributes that characterise mature sausages. The hardness of a sausage is of course a measure of the degree of maturation, describing the denaturation and gelation of meat proteins and the loss of water. The sausages with NCDO151 proteinase receive a higher score on hardness than the controls, indicating that the former sausages are more ripened than the latter. Maturity flavour is a concept developed by our sensory panel. It is based on the characteristics of a successfully matured salami sausage. The fact that this attribute is more pronounced in NCDO151 proteinase added sausages is a valid indication that these sausages have a higher degree of maturity. Acidic taste and odor are attributes sought in Salami-type sausages, whereas sourness may be regarded as a flavour defect. It is interesting to see that while the sausages with NCDO151 proteinase score higher than the controls on acidic notes, they have a lower score for sour notes, although these sausages have a lower pH and a higher content of lactic acid. The accelerated ripening of cheeses by proteinase addition has often resulted in bitter off-flavors in the cheeses caused by a higher occurrence of bitter-tasting hydrophobic peptides in these cheeses, as compared to traditionally ripened cheeses. In this experiment the NCDO151 proteinase added sausages actually receive lower scores for bitterness than the control sausages. Assessment of the sensory data revealed no flavour, odour or texture defects in sausages with NCDO151 proteinase added. On the contrary, the panel rated these sausages as more mature than the controls after 14 days. These results are consistent with the results from GC/MS measurements; a restricted number of compounds were modified by the NCDO151 treatment, and no significant effects were found on odor, rancid flavour and flavour intensity. After four weeks, the differences between all sausages had almost disappeared.

CONCLUSION

Sensory descriptive profiling is a precise tool for characterization of dry fermented sausages, allowing distinction between sausages with different degrees of maturity.

LITERATURE

- Næs H., Holck A.L., Axelsson L.T., Andersen H.J. & Blom H. (1995). Accelerated ripening of dry fermented sausage by addition of a *Lactobacillus* proteinase. *Intl. J. Food Sci. Tech.* 29: 651-659.
- Hagen, B. F., Berdagué, J.-L., Holck, A.L., Næs, H. & Blom, H. (1996). Bacterial proteinase reduces maturation time of dry fermented sausages. *J. Food Sci.*, in press.

Table 1: Description of sensory attributes. Evaluation of slices of sausages. Intensity measured on a scale from low (1) to high (9)

Attribute	Description
Intensity of odour	All odours of a newly cut slice of sausage
Acidic odour	Odour of fruity acids, fresh/acid/sweet/fruity odour. Analysed on newly cut sausage
Hue of fat only	Colour of yellowish red (1) to bluish red (9)
Whiteness	Scale from no whiteness (1) = black/grey/strongly pigmented - to all white (9)
Hue	Colour of yellowish red (1) to bluish red (9)
Colour intensity	Scale from no colour (1) = white/grey/black - to pure colour (9) of the given hue
Intensity of flavour	All flavours of the sample
Maturity flavour	Flavour of matured meat
Fresh flavour	Flavour of fresh meat
Acidic flavour	Flavour of fruity acids, fresh/acid/sweet/fruity flavour
Sour taste	Taste due to presence of organic acids, e.g. vinegar
Salty taste	Taste of sodium chloride
Bitter taste	Taste of bitter compound, such as quinine
Rancid flavour	Flavour of oxidised fat, combination of hay, grass, soap, oilbased paint
Hardness	Force required to give deformation of sausage, perceived by compressing sample between molars
Fatness	Perception of quantity of fat in the sausage
Juiciness	Perception of water released from the sausage after 4-5 chewings
Stickiness	Force required to remove sausage that adheres to the mouth

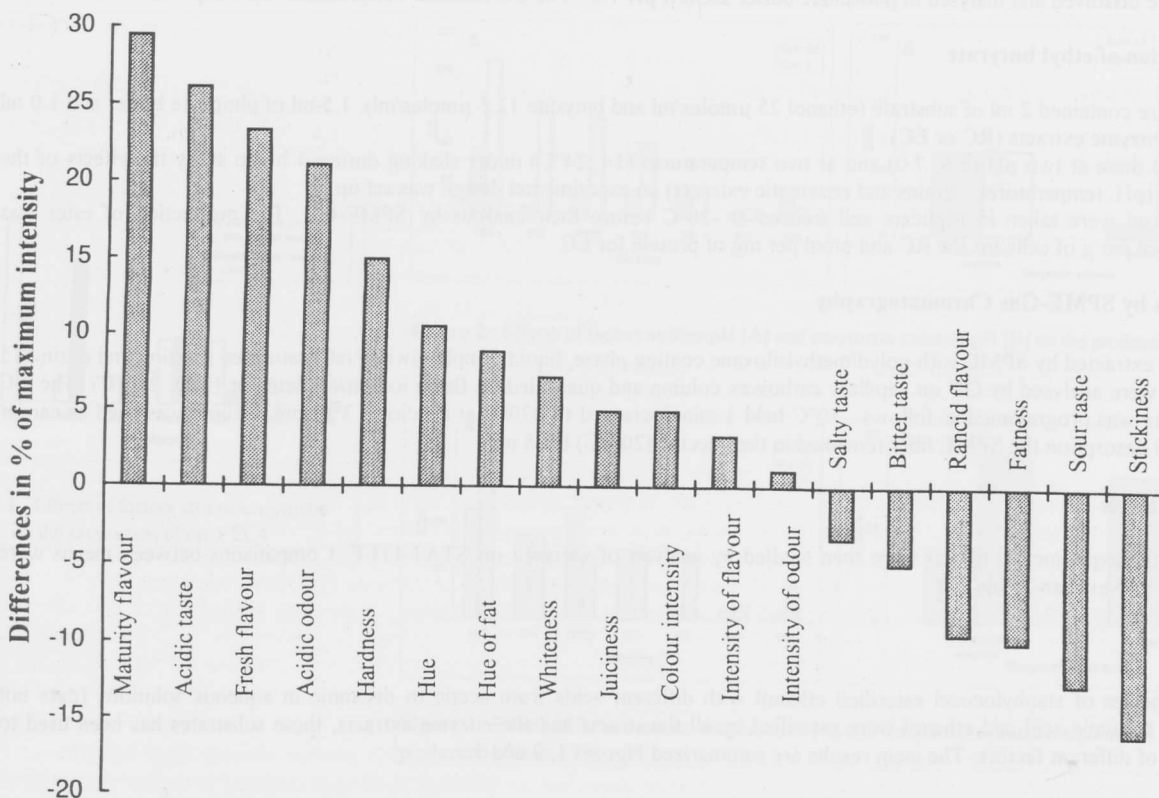


Figure 1: Differences in sensory attributes with and without proteinase addition. Positive values indicate higher sensory scores in sausages with proteinase, negative values lower scores.