A STUDY OF SENSORY TEXTURE PROFILE OF DRY CARSO HAMS

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SUMMARY

Dry hams were produced by four treatments: hams salted with and without a salt equalization period were dried/ aged in a natural and an artificial climate for 9 months. An experienced taste panel tested *m.semimembranosus, m.biceps femoris, m.quadriceps femoris* and ham fat according to a preliminary sensory texture profile including: 11 components for slices of muscles (adhesiveness, surface smoothness, fatness and moistness, grittiness, chewiness, oral sensation during chewing, moisture absorption of mass, easiness to swallow, mouth coating with particles, connective tissue residue), 7 components for cubes of muscles (surface smoothness, fatness and moistness, deformation, tenderness, adhesiveness, grittiness) and 4 components for fat slices (adhesiveness, tenderness, surface smoothness, connective tissue residue).

Sensory values between muscles for slices and cubes within the treatments were significantly different in 16 components and in 49.0% of the differences tested; values between the same muscles from different treatments were significantly different in 5 components and in 12.6% of the differences tested; combined muscle values between the treatments were significantly different in 10 components and in 21.3% of the differences tested; values for fat slices were significantly different in 3 components and in 33.3% of the differences calculated. The following components of sensory texture profile appear the most discriminating (in order of their frequency of significant differences): muscle slice: surface moistness, chewiness, moisture absorption, easiness to swallow, connective tissue residue; muscle cube: surface moistness, deformation, tenderness, adhesiveness of mass; fat slice: connective tissue residue, surface fatness, adhesiveness.

INTRODUCTION

In the group of dry meat products,a dry pork ham is very important one. This products are gastronomically highly appreciated owing to their characteristic sensory properties: colour, odour, flavour and texture of meat and fat. A little investigations were done about the texture of dry hams and other kinds of dry meat, which are perceived during consuming and contribute significantly to whole eating and/or gastronomic quality. For attainment the best texture quality of dry hams or to evaluate the effect of different arrangements in production on the texture in further development of producing procedures, a good knowledge of sensory texture and their components is necessary. It will be advantageous to establish which of components from sensory texture profile are the most discriminating in determination of characteristic quality of this product. Finally, this is the main aim of our investigation.

Table 1. Analysis of variance between components of sensory texture of muscles QU, BF and SM

groups	SN			PN			SC			PC		
properties	QU BF	QU SM	BF SM	QF BF	QF SM	BF SM	QF BF	QF SM	BF SM	QF BF	QF SM	BF SM
slice												
adhesiveness	**	-	**	-	-	**	**	-	-	-	-	-
surface moistness	**	**	**	**	**	**	**	**	**	**	**	**
surface smoothness	*	-	-	-	**	-	**	-	-	**	-	-
surface fatness	-	-	**	-	-	**	*	-	*	-	-	**
grittiness	-	-	-	-	-	-	-	-	-	-	-	-
chewiness	**	-	**	**	-	**	**	-	**	**	**	**
oral sensation	*	-	-	-	-	-	**	**	-	**	-	**
moisture absorption	**	-	**	**	-	**	**	*	**	**	-	**
easiness to swallow	**	-	**	**	-	**	**	-	**	**	-	**
mouth coating with partic.	-	-	*	-	-	-	-	*	-	-	-	-
connect.tissue residue	**	-	**	**	-	**	**	-	**	**	-	**
cube												
surface moistness	**	**	**	**	**	**	**	**	**	**	**	**
surface fatness	-	-	*	-	-	-	-	-	-	-	-	-
surface smoothness	**	-	**	*	-	-	-	-	-	-	-	-
deformation	**	**	**	**	-	**	*	**	**	-	**	**
tenderness	-	**	-	-	*	*	-	**	*	-	*	**
adhesiveness	**	-	**	**	-	**	-	-	*	-	-	**
grittiness	-	-	-	-	-	-	-	-	-	-	-	-

**P ≤ 0.01 high significant
*P ≤ 0.05 significant
- unsignificant
SN salting and drying in natural climate
PN salting with salt equalization and drying in natural climate
SC salting and drying in controlled climate
PC salting with salt equalization and drying in controlled climate

Table 2. Analysis of variance for components of sensory texture of QU, BF and SM - presented properties with occurrance of only significant differences between expetimental groups

muscle / properties	groups	SN-PN	SN-SU	SN-PU	PN-SU	PN-PU	SU-PU
QU-slice							
adhesiveness		-	*	*	-	*	-
surface moistness		-	-	**	-	*	-
chewiness		-	-	**	-	**	-
moisture absorption		-	**	**	**	**	-
-cube							
surface moistness		-	-	*	-	-	-
adhesiveness		-	-	**	-	**	-
BF-slice							
surface smothness		-	-	-	**	**	-
chewiness		-	-	**	-	**	-
oral sensation		-	-	-	*	*	-
moisture absorption		-	-	**	-	**	-
conective tissue residue		-	-	-	*	-	-
-cube							
adhesiveness		-	-	*	-	**	-
SM-slice							
adhesiveness		-	**	**	**	**	-
surface moistness		-	-	**	-	**	-
chewiness		-	*	**	*	**	-
miosture absorption		-	**	**	*	**	-
-cube							
adhesiveness		-	-	**	-	**	-

**P ≤ 0,01 high significant Abbreviations as in table 1
* P ≤ 0.05 significant
- unsignificant

The texture is the most complex perception of food quality in comparison with all sensory perceptions (Christensen, 1984), which are a sum of visual, tactile and kinaesthetic senses, and sometimes sense of hearing too (Jowitte, 1974). Civille (1978) pointed out the importance of descriptive expressions (terms), which are of high importance to understand sensory texture properties. All the texture properties could divide through classification of Civille and Szczesniak (1973) on the mechanical (connected with reactions of food and compression), geometrical (size and shape of food particles) and other properties connected with chemical composition of food.

The literature gives more information about different types of dry hams, especially about connection between physico-chemical properties of fresh hams (legs) and ripened dry hams, analyses of dehydration dynamics, analyses of composition and effects of microorganisms and biochemical changes during drying (ripening). There is little information about complex analysis of sensory texture profiles of dry hams.

By description of texture of dry hams are used different terms such as:"tender, kneadable, properly hard, easy to cut and chew (Matic et al., 1974),too much dry, dry ham surface (Rencelj, 1979), chewiness, connective tissue residue, whole impression of texture, brittleness, tenderness, number of bits (Zlender et al., 1983 and 1984), elasticity, juiciness" (Joksimovic et al., 1980). The effects of some technology factors on the texture of dry hams are very different. Zlender (1985) has established the worse texture scale from 1 to 7 scores. More expressive property is scored with higher value (Anonymous 1981). Texture profile is based on fundamental accession to analysis of texture profile of food generally (Civille, 1979; Anonymous,1981), and texture profile of beef meat (Cover et al., 1962; Flestenjak, 1983; Bucar, Zlender and Froehlich, 1984/85).

Texture profile

Eighteen texture properties were analysed on the muscles of dry hams and thus on the slice (adhesiveness, surface moistness, surface fatness, grittiness, chewiness, oral sensation, moisture absorption, easiness to swallow, mouth coating with particles, connective tissue residue), and on the cube (surface moistness, surface fatness, surface smoothness, deformation, tenderness). On slices of fatty tissue were analysed: adhesiveness, tenderness, fatness and connective tissue residue.

Statistical analysis

Analysis of variance between muscles inside experimental groups, in the same muscles between different groups and between values of combined muscles between groups were performed.

RESULTS AND DISCUSSION

The results show, that the developed and used sensory texture profile has been, appropriate for testing.

Statistical test of differences between different muscles inside experimental groups (table 1) were significant ($P \leq 0.01$ and 0.05) for 16 components of sensory texture; for 216 differences which have been tested, 106 (49%)

Table 3. Analysis of variance for components of sensory texture of combined muscles (QU + BF + SM) differences between experimental groups

properties	groups					
	SN-PN	SN-SC	SN-PC	PN-SC	PN-PC	SC-PC
slice						
adhesiveness	-	**	**	**	**	-
surface moistness	-	*	-	-	-	-
surface smoothness	-	-	-	*	-	-
surface fatness	-	-	-	-	-	-
grittiness	-	-	-	-	-	-
chewiness	-	-	**	-	**	-
oral sensation	-	-	-	**	-	-
moisture absorption	-	**	**	**	**	-
ease of swallow	-	-	-	-	-	-
mouth coating with particles	-	-	-	-	-	-
connective tisue residue	-	-	-	*	-	-
cube						
surface moistness	-	-	-	-	-	-
surface fatness	-	-	-	-	-	-
surface smoothness	-	*	-	**	*	-
deformation	-	-	-	-	-	-
tenderness	-	-	-	-	-	-
adhesiveness	-	**	**	**	**	**
grittness	-	-	-	-	-	-

*P ≤ 0,05
**P ≤ 0,01
Abbreviations as in table 1

Table 4. Analysis of variance for sensory texture of fatty tissue

properties	groups					
	SN-PN	SN-SC	SN-PC	PN-SC	PN-PC	SC-PC
adhesiveness of slice	-	**	-	-	-	-
tenderness	-	-	-	-	-	-
fatness	-	-	*	*	**	-
connective tissue residue	-	*	**	**	**	-

Abbreviations as in table 1

were significant. Differences for grittiness component were not significant. Muscle BF differed from QU and SM significantly in majority (60%) of tested texture components. Whilst QU and SM were in sensory texture profile more similar and differed significantly only in 26% of tested properties.

Analysis of texture profile between the same muscles from different procedures (table 2) showed 41 (12.6%)significant differences from 324 tested. The most discriminating texture components are: adhesiveness, surface moistness, easiness to swallow and moisture absorption at the slice and adhesiveness at the cube. Significant differences in the texture profile between the same muscles were found out only between samples dried (ripened in natural and/or artificial climate). Different salting procedures did not affect significantly the sensory texture of muscles ripened in natural or artificial climate. This results differ from findings of Bucar (1983 and 1984) and Zlender (1984), that dry hams produced with salt equalisation possess better texture.

Statistical tests of differences between values of combined muscles (table 3) between experimental groups showed that processing art affected on 10 components significantly; for 108 differences 23 (21.2%) resulted as significant. No significant and much dried surface of dry hams after ripening at higher temperature (20°C). The use of different kinds of salts (marine, mineral) had no effect on the texture of dry hams, but the whole impression of texture was significantly better in dry hams produced according to the technology of salt equalisation. The significant differences were in the texture between different muscles (SM, BF) of dry hams (Bucar, 1983 and 1984; Zlender, 1984).

The initial quality of muscles of fresh hams effects the texture too. Dry hams produced from PSE quality of meat showed harder texture, but dry hams produced from normal and DFD quality of meat did not differ in texture properties (Froehlich et al.,1983). Acceptable texture of light weight hams developed two to four months earlier, however the total sensory quality of heavy weight hams after longer drying/ripening was better (Zlender, 1983)

EXPERIMENTAL

Plan of experiment

Sixty chilled pork hams (48 hours post mortem) with normal $pH_{GM} \leq 5.8$ and weight (7.5 - 8.5 kg) are divided in four groups of 15 samples and prepared in carso dry hams to the following technology.

Group SN: salting, salt equalisation and drying/ ripening in natural climate conditions;
Group PN: salting, salt equalisation and drying/ ripening and natural climate conditions;
Group SC: salting and drying/ ripening in artificial (controlled) climate conditions;
Group PC: salting, salt equalisation and drying/ ripening in artificial climate conditions;

After drying/ ripening was finished (7 months) the muscle QU, BF, SM and ham fatty tissue were evaluated by sensory texture profile. Combined muscles of dry hams present the sum of estimations of all three muscles divided with number of estimations.

Methods

Salting: 18 days at 3 - 4°C and relative humidity RH = 80 - 90%.

Salting with equalisation: normal salting 18 days at 3 - 4°C and than equalisation 35 days at 0 - 3°C and RH 75 - 85%.

Drying/ ripening in natural climate of Slovene Carso at temperature 4 - 21°C and RH 55 - 85% during 7 months.

Drying/ ripening at artificial (controlled) climate at temperature +8°C (initial) to 14°C (final) and RH 65 - 85% during 7 months.

Sensory analysis

Sensory analytical panel used a descriptive testing method of profiling sensory texture the muscles and ham's fatty tissue. For quantitative evaluation of properties is used unstructured score difference has been calculated for slice component, i.e. surface fatness, grittiness, swallowing ease; cube - surface moistness, deformation and tenderness. Data for combined muscles show that different salting methods did not affect significantly on texture properties of muscles but a significant drying/ ripening procedure effect is evident.

Statistical testing for fatty tissue texture components (table 4) between groups showed 8 significant from 24 tested differences. No significant difference has been calculated for component tenderness. Different salting methods did not affect on fatty tissue similar to that one using at the muscles.

At mostly discriminative, the following sensory components appear (classified in order to their frequency of significant difference): slice: moistness, chewiness, moisture absorption, swallowing ease, connective tissue residue; cube: surface moistness, deformation, tenderness and adhesiveness.

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