Relationships between sensory, physical and chemical parameters of a portuguese traditional sausage - "Alheiri

L. Patarata, I. Judas, J.A. Silva, A. Esteves & C. Martins Universidade de Trás-os-Montes e Alto Douro - Secção de Indústrias Alimentares Apartado 202, 5000 Vila Real, Portugal

Introduction

"Alheira" is a meat product with a large tradition of production and consumption in North east of Portugal. It is admited that its origin is to the permanency of the Hebraic community in the region, when they were persecuted by the christian kings. These persons made a subsimilar to those made by the christians, but without pork, proscribed by their religion (Martins & Fernandes, 1990).

Nowadays this product is made with meat from different species (chicken, pork, beef, turkey and, some times, game) previously boiled size of meat is reduced and the broth is used to moisten bread slices. Both parts are mixed and olive oil and/or pork fat is added. The sease admit several spices, however garlic is usually used (it is in the origin of the name "alheira"; in portuguese, "alho" means garlic). The stuff filled into cattle gut and the product is subjected to the drying effect of the smoke for a few days (Martins, 1984).

This product is highly appreciated by the consumer and, as it is a product which pattern of production admits a large heterogenem characteristics of the final product, it is necessary to develop instruments to guarantee its quality, particularly aiming sensory attributes model of quality guarantee becomes more important as "Alheira" is an object of a juridical protection, and the sensory aspects of products are the most appreciated by the consumer.

The possibility of having relationships between sensory attributes and chemical and physical parameters could be an interesting instrumed use in the quality control of these products. Thus, it might be possible to obtain some information of sensory characteristics without the net a panel, which is usually very expensive and in some circumstances difficult to use (Touraille*et al*, 1993; Dellaglio *et al*, 1996).

In this work chemical and physical characteristics of 18 "alheiras" were correlated with sensory characteristics evaluated by 20 panelists

Material and Methods

Samples - Chemical, physical and sensory analysis was performed on "Alheiras" from 18 origins, covering different zones of Trás-os-M and producers with different dimension, from home-made scale to medium size industries. Samples were purchased anonymously a producers place or at the normal market. All the analysis were performed in the two days after purchase.

Sensory evaluation - The sessions of sensory evaluation were performed in a room with stabilised temperatures $(20\pm 2^{\circ}C)$ and any illumination with the same intensity in each place of testing; To guarantee conditions of repeatibility samples preparation was standard Traditionally this product is roasted in live coals or fried. Both of these cooking procedures are difficult to standardise, so, after set experiments it was chosen the following procedure: 2 minutes at the micro-waves (850W), 5 minutes at the oven (220°C), stabilisation temperature at 70°C. Each panelist had about 1/5 of one alheira (± 50g). In each session it was presented 4 samples to each panelist, ident with a random number of 2 digits. Water and bread were allowed between samples. The panel was composed by 20 semi-trained assessors had previous experience in sensory evaluation, although not specifically with "Alheira". The panelists were asked to test "Alheira" following characteristics: Aspect - colour, amount of meat, amount of fat, amount of bread; Aroma - global intensity, fermented; Termine clamminess, fibrousness, firmness; Taste - global intensity, saltiness, bread, fermented, fat and Overall acceptability. For each characterist was asked to score samples by using a scale form 1 (absence) to 9 (maximum).

Chemical analysis - The moisture, fat, protein, collagen and salt content were determined according to the AOAC procedures (^{IV} Carbohydrates were calculated by difference. The pH was measured directly on the paste with a pH meter (model micropH 2002, Crison). **Physical analysis** - The evaluation of mechanical parameters was performed with cylindrical blade attached to a Stevens, QTS 25. cylindrical blade (diameter 12,7 mm) was driven vertically 80% of the way through the sample. The blade was driven (100 mm/min) twice the sample. Penetrometer measurements were recorded as: Hardness (maximal force for first deformation), Cohesiveness (ratio between done during the second cycle and the first cycle) and Guminess (Hardness x Cohesiveness).

Colour was measured by a tristimulus colour analyser Minolta CR 310 with a standard illuminant D_{65} and using CIE L*a*b* colour space area of measuring was 50 mm diameter. As Alheira is a sausage thinner than the measuring area of the apparatus, and due to the heteroge of the paste, the colour was measured in a petri dish with compacted past previously minced. **Data analysis -** Pearson correlation matrix was performed with Systat 5.0.

Results and Discussion

The results of sensory evaluation are presented on table 1. It is possible to observe that for the most part of the characteristics evaluated mean values are near the center of the scale. The highest punctuations were given to the amount of bread, that is one characteristic deprect to the quality of the product, and for the global intensity of the aroma and taste.

According to the regulation of the juridical protection that is about to be implemented, this product must present at least 14% of protection the maximum of 50% of moisture and 18% of fat. Comparing these limits with the mean values of the samples analysed in this work, the parameter that is inside the limits is the amount of fat. The mean value for the amount of protein observed is particularly low, even we compared with previous works with "Alheira" (Martins e Fernandes, 1990, Patarata *et al.* 1993).

On table 3 are presented the simple correlations between sensory and physical-chemical parameters. It was observed that the colour evalue by the panel is correlated with the moistute (r = -0.61, $P \le 0.01$) and with L* and a* parameters (r = -0.50, $P \le 0.05$ and r = 0.53, $P \le 0.05$). The visual evaluation of the amount of meat is significantly correlated with the amount of protein (r = 0.58, $P \le 0.05$) and hardness (r = 0.47, $P \le 0.05$). The significant negative correlation between the visual evaluation of the amount of meat and level carbohydrates is due to the substitution of meat by bread viewing the reduce of production costs. The visual evaluation of the amount of a mount of and bread are correlated with the inherent chemical parameters (r = 0.52, $P \le 0.05$ and r = 0.50, $P \le 0.05$, respectively). the global intensities aroma is correlated with the moisture (r = -0.47, $P \le 0.05$) and with the salt content (r = -0.47, $P \le 0.06$) but not significant texture measured by the panel is correlated with phisycal-chemical parameters: claminess is related to hardness (r = -0.55, $P \le 0.05$); fibrous is related with protein content, hardness and guminess (r = 0.55, $P \le 0.05$; r = 0.50, $P \le 0.05$ and r = 0.47, $P \le 0.05$; respectively). The character is related to collagen content, hardness and guminess (r = -0.61, $P \le 0.05$; r = 0.50, $P \le 0.05$ and r = 0.52, $P \le 0.05$, respectively). The character is related to collagen content, hardness and guminess (r = -0.61, $P \le 0.01$, r = 0.66, $P \le 0.01$ and r = 0.52, $P \le 0.05$, respectively). The character is related to collagen content, hardness and guminess (r = -0.61, $P \le 0.01$, r = 0.66, $P \le 0.01$ and r = 0.52, $P \le 0.05$, respectively). The character is related to collagen content, hardness and guminess (r = -0.61, $P \le 0.01$, r = 0.66, $P \le 0.01$ and r = 0.52, $P \le 0.05$, respectively). The character is related to collagen content, hardness and guminess (r = -0.61, $P \le 0.01$, r = 0.66, $P \le 0.01$ and

of taste are related to some chemical parameters. Thus, the taste of bread and fat are correlated with the amount of protein (r = -0.54, P ≤ 0.05 and r = -0.49, P ≤ 0.05 , respectively). The fermented taste, wich is one characteristic depreciative to the product, as it is not a fermented product and the formula the formula taste of taste of the formula taste of the formula taste of the formula taste of tast and the fermentation could be an indicative of problems in the conservation process, is correlated with the level of carbohydrates calculated (r=0.49, P=0.05, respectively). The fermentation could be an indicative of problems in the conservation process, is correlated with the level of carbohydrates calculated (r=0.81, r=0.81, r=0.81). $(r = 0.48, P \le 0.05)$. The highest correlation found in this work is between the saltiness evaluated by the panel and the conten of salt (r = 0.81, P \le 0.01). The highest correlation found in this work is between the saltiness evaluated by the panel and the conten of salt (r = 0.81, P \le 0.01). $P_{\leq 0.001}$). As stated before, the quality of this product is largely influenced by the amount of bread, principally because it might be used in substitution. substitution of meat; it is confirmed by the negative correlation found between carbohydrates content and the overall acceptability (r = -0.55, $P_{S0.0C}$) P≤0.05).

Table 1 - Mean, minimum, maximum, standard deviation and per cent coefficient of variation of sensory evaluation of 18 Alheiras from different origins

Table 2 - Mean, minimum, maximum, standard deviation and per cent coefficient of variation of chemical and physical variables evaluated

Variables	Mean	Min	Max	SD	CV% Variables		Mean	Min	Max	SD	CV%
Aspect			100.00	Hell of	in gain						
Colour	4.45	2.52	0.05	1.54	34 73	Chemical	55 07	16.05	60.75	3 55	6.57
Amount of most	4.45	2.53	8.05	1.04	29.06	Moisture (%)	55.07	40.05	00.75	2.54	20.02
Amount of for	4.50	3.00	6.89	1.30	20.90	Fat (%)	16.99	11.65	23.95	3.54	20.85
Amount of L	4.58	3.05	6.53	1.00	21.91	Protein (%)	9.94	4.70	13.85	2.40	24.16
Aroma Aroma	5.82	4.00	7.11	1.03	17.04	Carbohydrates (%)	17.06	11.99	23.22	2.92	17.09
Global intensity	5 84	5.00	6.95	0.64	10.92	Collagen (%)	5.00	3.24	8.04	1.30	26.05
Termented	4.52	2.95	6.74	1.14	25.22	Salt (%)	1.70	1.11	2.45	0.38	22.25
Clamminess Fib-	4.85	3.26	6.12	0.79	16.24	pH	5.12	4.34	6.07	0.53	10.43
Fire	3.97	2.05	2.74	1.18	29.62						
Tasto	4.56	2.71	6.63	1.15	25.24	Physical				dectrs in	
CI .						Hardness	2.55	1.40	3.84	0.73	28.80
Salt: Salt	5.65	4.70	6.74	0.56	9.86	Cohesiveness	0.44	0.36	0.66	0.08	18.52
Bread	4.87	3.70	6.21	0.67	3.80	Guminess	1.15	0.63	2.13	0.44	38.19
Ferm	4.76	2.75	6.24	8.84	17.61	T *	61 60	53 48	67 10	3.97	6.44
Fat	4.42	2.84	7.00	1.38	31.29	L+	01.09	50.10	15.01	1.00	16.04
Overall	3.79	2.55	5.33	0.84	22.25	a*	10.60	1.21	13.21	1.80	10.94
acceptability	3.66	1.95	4.95	0.93	25.46	b*	29.34	20.13	36.24	5.15	17.54

Mol

tion entition for

xtul

edi cia

in

e on

sil)

Table 3 - Simple correlations between chemical and physical parameters and sensory attributes.

	Aspect				Aroma		Texture			Taste					Overall
Moin	Colour	A meat	A fat	A bread	GI	Ferm.	Clam.	Fibr.	Firm	G.I.	Salt.	Bread	Ferm.	Fat	accep.
Fat	-0.61**	0 30 ^{ns}	-0.23 ns	-0.20 ns	-0.47*	-0.17 ns	-0.31 ns	0.24 ^{ns}	0.26 ^{ns}	-0.33 ns	0.03 ^{ns}	-0.13 ^{ns}	-0.24 ^{ns}	-0.25 ^{ns}	0.15 ^{ns}
Prot-	0.30 ^{ns}	-0.29 ^{ns}	0.52*	0.22 ns	0.32 ^{ns}	0.08 ^{ns}	0.29 ^{ns}	-0.31 ^{ns}	-0.37 ns	0.14 ^{ns}	-0.09 ^{ns}	0.18 ^{ns}	0.08 ^{ns}	0.53*	0.02 ^{ns}
Carbon	-0.04 ns	0.58*	-0.43 ^{ns}	-0.56*	-0.18 ns	-0.39 ^{ns}	-0.22 ^{ns}	0.55*	0.29 ^{ns}	-0.02 ^{ns}	0.26 ^{ns}	-0.54*	-0.31 ^{ns}	-0.49*	0.39 ^{ns}
Coll	0 38 ns	-0 53*	0.04^{ns}	0 50*	0.38 ^{ns}	0.47*	0.23 ^{ns}	-0.39 ^{ns}	-0.10 ^{ns}	0.22 ^{ns}	-0.26 ^{ns}	0.43 ^{ns}	0.48*	0.13 ^{ns}	-0.55*
Salt	0.24 ns	-0.30 ns	0.42 ns	0.15 ^{ns}	-0.06 ns	0.07 ^{ns}	0.48*	-0.29 ^{ns}	-0.61**	-0.27 ns	0.18 ^{ns}	0.33 ^{ns}	0.14 ^{ns}	0.50*	-0.05 ^{ns}
pH	0.08 ns	0.07 ^{ns}	-0.14 ^{ns}	-0.17 ^{ns}	-0.47*	-0.32 ns	-0.13 ^{ns}	-0.08 ^{ns}	-0.10 ^{ns}	0.21 ^{ns}	0.81***	-0.11 ^{ns}	-0.22 ^{ns}	-0.32 ^{ns}	0.38 ^{ns}
Hard	-0.14 ^{ns}	0.00 ^{ns}	-0.10 ^{ns}	0.05 ^{ns}	-0.26 ns	-0.45 ^{ns}	0.10 ^{ns}	-0.01 ^{ns}	0.00 ^{ns}	-0.40 ns	0.10 ^{ns}	0.22 ^{ns}	-0.53*	-0.01 ^{ns}	0.18 ^{ns}
Coheri	0.13 ^{ns}	0.47*	-0.21 ^{ns}	-0.30 ^{ns}	-0.18 ^{ns}	-0.46 ^{ns}	-0.55*	0.50*	0.66**	-0.08 ^{ns}	0.08 ^{ns}	-0.29 ^{ns}	-0.39 ^{ns}	-0.13 ^{ns}	0.30 ^{ns}
Gun	-0.04 ^{ns}	0.35 ^{ns}	-0.19 ^{ns}	-0.26 ^{ns}	-0.49*	-0.55*	-0.13 ^{ns}	0.22 ^{ns}	0.07 ^{ns}	-0.14 ^{ns}	0.30 ^{ns}	-0.30 ^{ns}	-0.47 ^{ns}	-0.21 ^{ns}	0.46 ^{ns}
L*	0.08 ^{ns}	0.49*	-0.25 ^{ns}	-0.32 ns	-0.38 ns	-0.61**	-0.44 ^{ns}	0.47*	0.52*	-0.13 ns	0.21 ns	-0.34 ^{ns}	-0.51*	-0.20 ^{ns}	0.45 ^{ns}
a*	-0.50*	0.15 ^{ns}	-0.24 ^{ns}	-0.01 ^{ns}	-0.26 ^{ns}	-0.22 ^{ns}	-0.05 ^{ns}	0.08 ^{ns}	0.04 ^{ns}	-0.17 ^{ns}	-0.03 ^{ns}	-0.26 ^{ns}	-0.17 ^{ns}	-0.27 ^{ns}	0.10 ^{ns}
b*	0.53*	-0.15 ns	0.28 ^{ns}	0.14 ^{ns}	0.03 ns	-0.18 ^{ns}	-0.04 ^{ns}	-0.10 ^{ns}	-0.08 ns	-0.28 ^{ns}	-0.11 ^{ns}	0.43 ^{ns}	-0.20 ^{ns}	0.44 ^{ns}	0.02 ^{ns}
A-ame	0.36 ^{ns}	-0.34 ^{ns}	0.31 ns	0.35 ns	-0.16 ^{ns}	-0.19 ^{ns}	0.01 ^{ns}	-0.29 ^{ns}	-0.20 ns	-0.43 ^{ns}	-0.18 ^{ns}	0.66**	-0.30 ^{ns}	0.44 ^{ns}	-0.03 ^{ns}
he dount Cr											a			1414	

Not significant; * $P \le 0.05$; ** $P \le 0.01$; *** $P \le 0.001$. G.I. - Global intensity; Ferm. - Fermented; Clam. - Claminess; Fibr. - Fibrousness; Firm. - Firmness; Salt - Saltiness; accep. - Acceptability

Conclusions

According to the results obtained in this work, there are a few phisical-chemical characteristics that have relationship with sensory parameters, hamely the hamely the visual evaluation of the amount of the three major constituints. Colour and texture has also correlations with the instrumental evaluation. According to Szczesniak (1968) if the e_{v_a} the visual evaluation of the amount of the three major constituints. Colour and texture has also constituents also constituents also constituents also constituents also constituents also constituents. According to Szczesniak (1968) if the coefficient However, the use of these indirect measures for texture should be used with caution. According to Szczesniak (1968) if the coefficient form the statistical standpoint, the objective measurement coefficient of correlation has not a very high number, even if it is highly significant from the statistical standpoint, the objective measurement Not be a good index of sensory texture. The atributes of aroma and taste found some relations on chemical parameters.

References

ADAC, 1990. Official Methods of Analysis. 15th edition. Assoc. of Official Analytical Chemists, Washington DC. Dellaglio, S. E. Casiraghi & C. Pompei, 1996. Chemical, physical and sensory attributes for characterization of an italian dry-cured sausage. M. Science. 42 (1): 25-35. Martins, C. 1985. A alheira: enchido típico trasmontano. Indústria alimentar, 4 (Mar/Abr): 9-13. Martins, C. 1985. A alheira: enchido típico trasmontano. Indústria alimentar, 4 (Mar/Abr): 9-13.

harting, C. 1985. A alheira: enchido tipico trasmontano. Indústria alimentar, 4 (Mar/Abr): 9-13. harting, C. & L. Fernandes, 1990. Chemical characteristics of "Alheira" - a traditional portuguese sausage. 36th ICoMST, Havana, Cuba. Vol III, 893-895. harting L. Fernandes, 1990. Chemical characteristics of "Alheira" - a traditional portuguese sausage. 36th ICoMST, Havana, Cuba. Vol III, 893-895. usage "Alheira". 39th ICoMST, Calgary, Canada. S7P24.WP.

ourraille, C., S. Issanchou, J.P. Dumont, 1993. Que peut-on attendre de l'analyse sensorielle. Vindes et produits carnés. 14 (3): 68-72.

Acknowledgements. This work was supported by AIR Program CT 93-112; For the suggestions on the sensory evaluation we thank Mr. J.F. Clement - ITG, nentec, Bourg-en-Bress, France