PORTUGUESE TRADITIONAL SAUSAGE, ALHEIRA, MADE WITH DIFFERENT MEAT: SENSORY EVALUATION AND TEXTURE.

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Abstract - At a portuguese traditional meat plant 6 different formulas were used to produce "alheira", a portuguese traditional fermented sausage, from the north region, usually made with chopped meat from pork and poultry. Formulas were different only due to the type of meat (formula A - beef meat; formula B - poultry meat; formula C - Alentejano pig breed meat; formula D - Alentejano pig breed meat and beef meat; formula E - Alentejano pig breed meat and poultry; formula F - Alentejano pig breed, beef and poultry meat). Five sausages per formula were used to realise sensorial and textural analysis. A descriptive quantitative analysis was chosen to performed sensorial evaluation, using a trained panel. Textural analysis consisted on Texture Profile Analysis (TPA) test. Results from TPA suggest that texture of "alheiras" made with meat from poultry (more common) or Alentejano pig breed (never done before) are similar while "alheiras" made with extreme beef meat showed different textural characteristics comparing with the others. Considering sensorial analysis results, no differences were found between studied formulas. However taste intensity was higher in "alheiras" made with extreme meat beef and also in those made with the mixture of Alentejano pig breed and poultry meat.

Key Words – Traditional Portuguese fermented sausage, Texture profile analysis, Sensory analysis

I.   INTRODUCTION

"Alheira" is a fermented sausage produced traditionally at the northeast of Portugal in a region named Trás-os-Montes. It´s production remotes to XV century, after the expulsion of Jewish people from Portugal and Spain during the inquisition period. During this period, the permanence in Portugal only was permitted for Jewish converted to Christians. So Jewish people to look like Christians invented "alheira", a sausage similar to others but without pork meat.

Afterwards, traditionally "alheira" was produced with meat from pork, and others (chicken, turkey, duck, veal and partridge), wheat bread, olive oil, pork fat and spices, contained in a natural casing [1] and smoked during a period between 2 and 8 days [2].

Nowadays traditional "alheira" is made, mainly, with pork (industrial breeds) and poultry meat, however recently appeared several types of "alheira" using non usual products, instead of meat, like codfish and legumes.

Some studies were done concerning "alheira" [3, 4, 2, 5, 1], however only one considering simultaneously sensory or textural methods and measurements [6].

Considering all these facts, the goal of the present study was to study the influence of beef (unusual) and Alentejano pig breed meat (never used) in sensory and textural characteristics of "alheira".

II.   MATERIALS AND METHODS

In a traditional meat plant located at Alentejo region (southeast of Portugal) 6 different formulations were prepared in order to produce 6 types of "alheira": Formula A (66% of beef meat; 20% of traditional wheat bread; 7% of water; olive oil; garlic paste; pimiento paste, spices); Formula B (66% of poultry meat; other

ingredients similar to formula A); Formula C (66% of Alentejano pig breed meat; other ingredients similar to formula A); Formula D (33% of Alentejano pig breed meat and 33% of poultry meat; other ingredients similar to formula A); Formula E (33% of Alentejano pig breed meat and 33% of poultry meat; other ingredients similar to formula A); Formula F (22% of Alentejano pig breed meat, 22% of poultry meat, 22% of beef meat; other ingredients similar to formula A). Meat was previously boiled. Fermentation period occurred at a traditional smoked-house during 3 days.

The sensory evaluation was a descriptive and quantitative analysis, considering a scale from 1 to 100, and 10 trained panellists. Before sensory evaluation the sausages were placed on a hot plate at a temperature of 100 degrees approximately during 3 minutes each side. Each sample weights 15g. The attributes considered were: Aspect, Odour Intensity, Off Odours, Firmness, Fibrousness, Mastigability, Taste Intensity, Off Taste, Salt Intensity, and Global Evaluation. For Fibrousness and Salt Intensity 50 was considered the optimum classification, above or below 50 classification was considered in excess or in deficiency, respectively, in comparison with the optimum value.

A Texture Profile Analyze (TPA) was performed using a Stable Micro System TA-Hdi with a compress platen (made with steel, flat, 10cm diameter) in order to define the texture and compare the results with the sensory evaluation. The samples for TPA were cylindrical with 3.5cm of diameter and 1cm of height and were compressed twice to 50% of the initial height. Each of the five units tested was analyzed in four different points so there were 20 entries for each formula.

For statistical data treatment, an ANOVA was performed, using Statistica 5.1 program, and means were compared using HSD Tukey method.

III. RESULTS

Analysis of variance demonstrated significant differences for all TPA parameters except for "resilience". "Alheiras" produced with formula A showed higher significant values, except in comparison with those produced with formula D, for "hardness", "gumminess" and "chewiness" (Table 1). Products made with formulas E and F had the lowest registers for "hardness", "springiness", "gumminess" and "chewiness". Highest values of adhesivity were obtained with formula F products.

Table 1–Means and standard deviation for rheological evaluation considering six formulas for "alheira" production.

Formula	Firmness (N)	Adhesiveness	Cohesiveness	Springiness (cm)	Gumminess (N)/cm2	Chewiness (N/cm)	Resilience
A	15,259a ±4,404	-0,608a ±0,609	0,421 ±0,0477	0,558a ±0,103	6,270a ±1,384	3,562a ±1,165	0,156 ±0,041
B	11,276b ±3,821	-0,924a ±0,862	0,394 ±0,022	0,507ab ±0,093	4,456b ±1,587	2,385b ±1,349	0,136 ±0,017
C	10,939b ±3,170	-1,430ab ±0,942	0,422 ±0,036	0,484ab ±0,090	4,634b ±1,443	2,332b ±1,024	0,146 ±0,021
D	13,309 ab ±4,076	-0,615a ±0,573	0,408 ±0,036	0,496ab ±0,072	5,454ab ±1,820	2,791ab ±1,262	0,147 ±0,018
E	10,523b ±2,457	-1,227ab ±0,946	0,396 ±0,049	0,436b ±0,069	4,230b ±1,342	1,903b ±0,832	0,141 ±0,029
F	10,004b ±3,433	-1,943b ±1,084	0,431 ±0,036	0,473b ±0,055	4,295b ±1,461	2,091b ±0,884	0,141 ±0,013

Considering the analysis of variance for sensorial evaluation results, only were found significant differences for the attribute "salt intensity" (p<0.01).
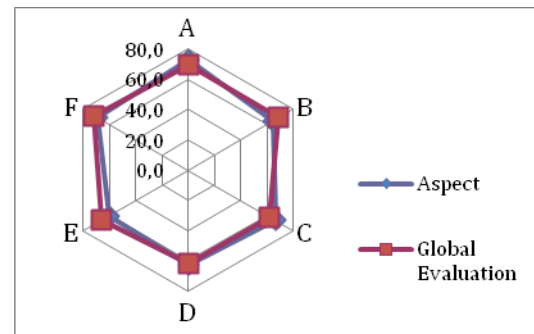

Figure 1 – Mean values for "aspect" and "global evaluation" attributes, considering six formulas studied (A, B, C, D, E and F).

There was a close relationship between "aspect" and "global evaluation" (Figure 1). Highest classifications were obtained for formulas A and F while lowest were for formulas D and E for "aspect" and C and D for "global evaluation".
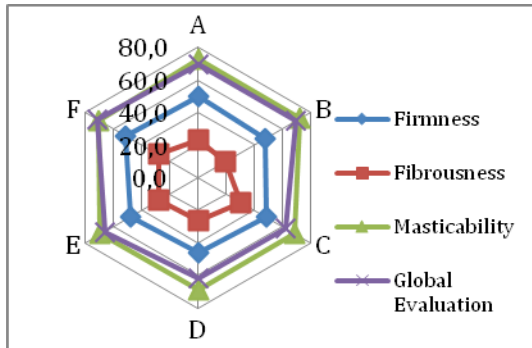

Figure 2 – Mean values for "firmness", "fibrousness", "masticability" and "global evaluation" attributes, considering six formula studied (A, B, C, D, E and F).

The results for "firmness" were very similar for samples from different formulas (Figure 2), therefore higher values (more closely of optimum value – 50) were observed in products of formulas A (49.78), C (48.22) and F (48.11). The lowest value of "fibrousness" were verified in formula B (19.56) and the highest in formula C (30.44). There are a strong correspondence between "masticability" and "global evaluation" values. High values of classification in masticability (72.56 for formula A; 72.11 for formula B) correspond a high classification in "global evaluation" (69.22 for formula A; 69.00 for formula B) denoting an evident relation between the easy way which the samples were chewed and its global evaluation. So the masticability strongly influenced the global evaluation of the samples.
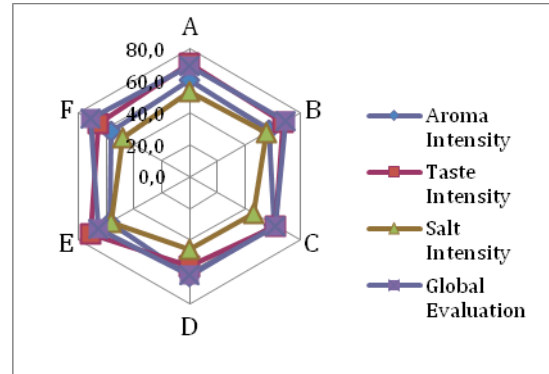

Figure 3 – Mean values for "aroma intensity", "taste intensity", "salt intensity" and "global evaluation" attributes, considering six formula studied (A, B, C, D, E and F).

It seems there was a negative correspondence between aroma and taste intensity once lower classifications in one of those attributes correspond to higher classifications on the other (Figure 3). Considering "salt intensity" attribute, samples from formula F (with mean classification of 48.56) were the most closely to optimum value (50.00) and those samples obtained the highest classification for "global evaluation attribute" (71.89), followed from formulas A (69.22) and B (69.00) samples.

Concerning texture and sensorial characteristics of "alheira" sausage, only one referred study were found [6] stating that Texture measurements (hardness and adhesiveness) presented an high variability. Author's stated that hardness was influenced by moisture content and also by protein and carbohydrate contents. However other factors were considered for texture variability, such as meat type (pork, chicken or beef), the intensity of boiling and the size of meat peaces. The results of quantitative descriptive analysis evidence that mean scores for only four of the studied characteristics had higher than mid-scale values: visual evaluation of the amount of bread, overall intensity of aroma, clammy texture and overall intensity of flavor.

IV.   CONCLUSIONS

Attending to rheological results, "alheiras" made with formula A presented highest hardness, springiness, gumminess and chewiness values. These results suggested

that consumers spent more energy and more time until the product state ready for swallowing. On the other hand, formula F products exhibited the lowest "hardness" and "adhesiveness" evaluation.

Considering the results from sensory evaluation, formula F obtained the highest values for "global evaluation" (71.89). For that "global evaluation" ratings nearby were obtained for formulas A (69.22) and B (69.00). "Masticability" highest values were registered in formulas A (72.56), B (72.11) and F (70.33). Those results showed the relevance of two referred attributes, "aspect" and "masticalbility" in the global evaluation of "alheira", in the present study.

ACKNOWLEDGEMENTS

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