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Effects of salt (NaCl) level and smoke application on chemical and sensory characteristics of *unam inung*, a cured Nigerian pork product

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A randomized complete-block experiment in a 4x2 factorial arrangement was designed to test the effects of NaCl level and smoke application on the chemical and organoleptic properties of *unam inung*, a cured Nigerian pork product. The results indicate that the moisture content dropped (with respect to the raw meat) in all treatments, higher drops being observed in the unsmoked samples. the total lipid and ash contents increased on curing, with the unsmoked samples showing up to a three-to four-fold increase in lipids. Changes in protein did not show a particular trend, but protein levels increased in products cured with 25% and 30% NaCl (unsmoked) and fell in all other treatments.

The analysis of variance revealed highly significant differences ($P<0.01$) in all sensory properties and overall acceptability of the products due to NaCl level and smoke application. The sample that received 25% NaCl (smoked) was rated best and was significantly different ($P<0.01$) from all other treatments. Positive correlations were found between flavour, juiciness, and tenderness and the overall acceptability of *unam*, smoked and unsmoked.

1 Introduction

Unam inung is a mass-consumer ready-to-eat cured pork product that is very popular in the southeastern states of Nigeria. *Unam*, as the product is popularly

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called, is most commonly served with cassava chips but may also be eaten with boiled yam and plantain. The product is traditionally prepared by heavily salting sliced pork, which is thereafter sun-dried and packed in a dry clay pot. The mast slices are packed in alternate layers with NaCl and the pot is covered and kept under ambient conditions. When required for consumption or for the market, the desired quantity is removed from the pot, washed, and boiled.

The production of *unam* is therefore still in its technological infancy. As noted by EKANEM (1984) and IGENE and EKANEM (1985) with regard to *suya* (another mass-consumer Nigerian meat product), the traditional production techniques have not been improved to cope with modern scientific requirements and with increasing demand. Consequently, the product enjoys a very limited consumer confidence due to non-standardization as well as to questions about hygiene and the problem of spoilage due to rancidity (SOLOMON 1989). *Unam*, on which virtually no published scientific information exists, needs upgrading and standardization. These require basic scientific data on the product and its processing techniques and requirements.

The objective of this study was to assess the effects of the NaCl level and the application of smoke on chemical changes in, and sensory characteristics of *unam*. Among other authors, DAUN (1975), FORREST et al. (1975), and MEYER (1978) have reported effects of NaCl and smoke on chemical and organoleptic properties of meat.

2 Material and methods

2.1 Preparation of *unam*

Pork belly, obtained from the University of Ibadan meat shop was used in the study. The belly was chosen because it is the most commonly used portion for the commercial preparation of the product. *Unam* was prepared with NaCl levels of 15, 20, 25, and 30% of the green (uncured) weight of the meat (1 kg for each treatment) and 0.4 mg/kg of sodium nitrite. The salt levels used were within those used by traditional processors. Curing was done by the dry-cure method in which the meat slices were treated with the cure mixture (NaCl + $NaNO_2$) and placed (in meat-ingredient alternate layers) at room temperature in plastic containers. Curing lasted for 8 days with the bellies turned over (to facilitate cure uptake) every 2 days.

After 8 days of curing, the product from each of the 4 NaCl treatments was divided into 2 portions. One portion from each was smoked (smoke obtained by burning hardwood) at 51°C for 6 hours, while the other portion was left in the container. Following smoking, the 2 sets (smoked and unsmoked) of product from each treatment (4x2) were cooled (for the smoked sample), further sliced, fried, and presented for taste-panel evaluation.

2.2 Chemical analysis

Samples of the raw and processed products were analysed for moisture, crude protein, total lipids, and ash. Each sample was separately ground using a Kenwood meat grinder with a 3 mm plate, mixed and labelled, and used for analysis. All determinations were carried out in triplicates.

The moisture content was determined by the method of AOAC (1975) using an air oven at 110°C for 12-18 hours.

Protein was determined by the Kjeldahl digestion and distillation system using the Tecator 1007 degestion unit and 1002 distillation unit (AOAC 1975).

The lipid content was determined using the method described for the Soxhlet system with the Tecator Sortex 1040 extraction unit. A mixture of chloroform and methanol at a ratio of 2:1 was used as the extraction solvent.

The method of AOAC (1975) using an Enrotherm furnace was employed for ash determination.

2.3 Taste-panel evaluation and statistical analyses

Unam samples were assessed on a 9-point hedonic scale (AMERINE et al. 1965) by a panel of 10 trained judges. The experimental design used was the randomized complete block in a 4x2 factorial arrangement, and the analysis of variance and regression and correlation analysis were performed according to the methods described by HARNETT (1982). Duncan's new multiple-range test (STEEL and TORRIE 1960) was used for separation of means.

3 Results

3.1 Chemical changes

The chemical composition of *unam* as influenced by the level of NaCl and smoke application is shown in Table 1. There was a general drop (with respect to the raw meat) in the level of moisture in the cured meat, increasing with the level of NaCl used. Unsmoked samples generally showed higher moisture drops than the smoked samples at corresponding levels of NaCl-use, giving a range of difference of 1.70% (between samples that received 30% NaCl) to 10.33% (between samples that received 15% NaCl). Within both groups (smoked and unsmoked), the moisture loss increased with NaCl level. Among adjacent NaCl levels, the highest difference in moisture loss (14.38) was found between 20% and 25% NaCl (smoked), while the lowest difference (0.47) was found between 25% und 30% NaCl (unsmoked).

Table 1: Effects of salt level and smoke application on chemical changes during the processing of *unam* (constituents given in % on wet basis)

Salt level (%)	Moisture	Protein	Lipid	Ash
Smoked samples				
15	55.96	14.70	24.00	2.30
20	48.56	17.30	26.00	2.50
25	34.18	18.00	42.50	2.70
30	33.37	19.30	44.10	3.00
Unsmoked samples				
15	45.63	18.40	32.90	2.00
20	40.57	18.80	31.70	2.40
25	32.07	19.70	44.50	2.30
30	31.60	20.20	42.00	2.90
Raw (unprocessed) sample	67.50	19.50	11.00	1.01

The total lipid and ash levels rose upon curing, with total lipid showing a proportionately higher riss. A mean two- to threefold increase in lipids was observed in the smoked products while the unsmoked samples showed a three- to fourfold increase. In both smoked and unsmoked products, close differences in lipid contents were observed between samples that received 15% and 20% NaCl on the one hand and those that received 25% und 30% NaCl on the other hand. Respectively, the differences amounted to 2.0 (smoked) and 1.2 (unsmoked), and 1.6 (smoked) and 2.5 (unsmoked). Sharper differences in fat contents were found between samples treated with 20% and 25% NaCl, amounting to 16.5 and 12.8 in the smoked and unsmoked products, respectively. On average, there was a two- to threefold increase in the ash contents of the products, with the smoked samples showing slightly higher levels.

Changes in protein contents due to curing did not show a particular trend as observed for moisture, lipid, and ash. The average per cent protein increased in products cured with 25% und 30% NaCl (unsmoked), but dropped in all other treatments. The percentage drop in protein varied between 1.03 for product treated with 30% NaCl (smoked) to 24.62 for product treated with 15% NaCl (smoked). Smoke appeared to have a marked detrimental effect on protein as the protein contents fell (relative to the unsmoked samples) at all levels of NaCl application following smoking.

3.2 Sensory evaluation

The results in Table 2 show the taste-panel assessment of the sensory characteristics of *unam*. The analysis of variance (Table 3) revealed highly significant differences (P<0.01) in all sensory characteristics and overall acceptability of the products due to NaCl level and smoke application. The sample treated with 25% NaCl (smoked) was rated best and significantly different (P<0.01) from all other treatments in overall acceptability. The sample that received this treatment (25% NaCl, smoked) was also significantly better (P<0.01) than all other samples in flavour and juiciness and equally rated best in tenderness and color (P 0.01) with smoked samples treated with 15% and 30% NaCl (for tenderness) and with 15% and 20% NaCl (for colour). There were also highly significant differences (P<0.01) in colour and overall acceptability between the smoked and unsmoked samples at all levels of NaCl application. Interactions between the level of NaCl and smoke application were higly significant (P<0.01) for juiciness, colour, and overall acceptability, but insignificant (P>0.01) for flavour and tenderness (Table 3).

Table 2: Sensory evaluation of cured pork *(unam inung)* using a 9-point hedonic scale: mean soures[1]

Salt level (%)	Flavour	Juiciness	Tenderness	Colour	Overall acceptability
Smoked samples					
15	5.3^{b}	3.7^{d}	4.3^{abc}	7.6^{a}	4.7^{c}
20	5.3^{b}	3.7^{d}	3.9^{cd}	7.0^{a}	5.6^{b}
25	6.3^{a}	6.3^{a}	4.9^{a}	7.2^{a}	7.3^{a}
30	5.1^{b}	4.8^{b}	4.6^{ab}	5.9^{b}	6.0^{b}
Unsmoked samples					
15	4.4^{bc}	4.3^{bcd}	3.6^{d}	4.5^{d}	3.8^{de}
20	4.2^{c}	3.9^{cd}	3.7^{cd}	5.1^{cd}	3.9^{cde}
25	4.7^{bc}	4.7^{bc}	4.0^{bcd}	5.0^{cd}	4.6^{cd}
30	4.7^{bc}	3.7^{d}	3.4^{d}	5.4^{bc}	3.6^{e}

1 Scores within the same columns with the same letters are not different at P = 0.01

Table 4 shows interrelationships among some sensory and chemical characteristics of *unam* based on regression and correlation analysis. There were high and negative correlations between moisture content and flavour of the unsmoked

Table 3: Analysis of variance for sensory assessment of cured pork (*unam inung*)

Sources of variation	Degrees of freedom	Mean squares Flavour	Juiciness	Tenderness	Colour	Overall acceptability
Salt level (A)	3	2.300**	11.679**	1.567**	0.879**	10.346**
Smoke application (B)	2	10.000**	2.256**	5.625**	37.056**	37.056**
Interaction (AB)	6	0.617	2.723	0.442	2.906**	1.606**
Error	108	0.606	0.473	0.289	0.247	0.462
Total	119					

** (P<0.01)

Absence of an asterisk on a mean square indicates non-significance at P = 0.05

products and between moisture content and the juiciness and overall acceptability of the smoked products with the moisture content accounting for 63.6%, 67.2%, and 72.1% of their variabilities, respectively. While the relationships between moisture content and flavour and juiciness were significant (P<0.05), that between moisture content and overall acceptability was not (P>0.01). Only 0.01% of the variation in juiciness of the unsmoked product was due to moisture content. The correlations between fat content and the flavour, juiciness, and overall acceptability of both the smoked and unsmoked samples were all positive. The contribution of the fat content to the variations in these characteristics varied between 9.2% for juiciness of the unsmoked product and 90.0% for flavour in the unsmoked product. The relationships between flavour, juiciness, and tenderness and the overall acceptability of *unam* (smoked and unsmoked) were also positive. Close to 95% of the variability in the acceptability of the unsmoked product was due to tenderness, while only 7.9% of the variability in acceptability of this (unsmoked) sample were attributed to flavour.

4 Discussion

4.1 Chemical changes

The moisture content of the fresh meat obtained in this study fell within the range of 65-80% reported by FORREST et al. (1975). It fell however, outside the range of 73-75% for pork obtained by DRANSFIELD and CASSEY (1982). According to LAWRIE (1979), the moisture content of fresh meat (like of any other constituent) is influenced by the age, nutrition, and pre-slaughter manipulation of the animal and by environmental conditions at the time of slaughter, just after slaughter, and during storage. The effects of these considerations may therefore account for the

Table 4: Interrelationships among some sensory and chemical attributes of *unam*

Independent Variable (X)	Dependent variable (Y)	Product condition	Regression equation	Correlation coefficient (R)	Coefficient of determination (R^2)	Significance of R^2
Moisture content	Flavour	Smoked	Y= 6.304-0.019X	-0.383	0.147	P>0.10
		Unsmoked	Y= 5.572-0.029X	-0.797	0.636	P<0.05
Moisture content	Juiciness	Smoked	Y= 8.537-0.091X	-0.820	0.672	P<0.10
		Unsmoked	Y= 4.118+8.619X	0.013	0.0001	P>0.10
Moisture content	Overall acceptability	Smoked	Y= 9.455-0.083X	-0.849	0.721	P>0.01
		Unsmoked	Y= 4.735-0.020X	-0.318	0.101	P>0.10
Fat content	Flavour	Smoked	Y= 4.858+0.019X	0.369	0.136	P>0.10
		Unsmoked	Y= 3.126+0.036X	0.953	0.909	P<0.001
Fat content	Juiciness	Smoked	Y= 1.327+0.097X	0.833	0.693	P<0.05
		Unsmoked	Y= 3.361+0.021X	0.303	0.092	P>0.10
Fat content	Overall acceptability	Smoked	Y= 3.142+0.081X	0.794	0.630	P>0.05
		Unsmoked	Y= 2.776+0.032X	0.469	0.220	P>0.10
Flavour	Overall acceptability	Smoked	Y=-2.725+1.568X	0.786	0.618	P>0.05
		Unsmoked	Y= 1.725+0.500X	0.282	0.079	P>0.10
Juiciness	Overall acceptability	Smoked	Y= 2.086+0.825X	0.940	0.884	P<0.001
		Unsmoked	Y= 0.423+0.856X	0.873	0.762	P>0.01
Tenderness	Overall acceptability	Smoked	Y=-2.101+1.808X	0.715	0.511	P>0.10
		Unsmoked	Y=-2.248+1.693X	0.973	0.947	P<0.001

differences between the results of this study and those earlier reported. KRAMLICH et al. (1973) and FORREST et al. (1975) reported an inverse relationship between the moisture and fat contents of meat. The relatively low moisture content of the fresh meat may thus be due in part to the high lipid content (Table 1). For the products, the observed trend of a decreased moisture content with increase in NaCl level agreed with that observed by YU et al. (1982). The higher moisture content of the smoked samples may have been due to the high relative humidity in the smoking chamber and the absence of the effect of wind, both situations of which retarded the moisture evaporation from the product. Glossing the meat with aldehyde-phenol condensed resins and coating the surface with a film of fat that oozes out of the meat due to the effect of heat may also have reduced moisture loss from the product through drip. MEYER (1978), DRANSFIELD and CASSEY (1982), and YU et al. (1982) have reported findings supporting these explanations. Partial solubilization of collagen (due to heat) might also have taken place in the smoked products, resulting in an increase in the water-holding capacity of the product (FORREST et al. 1975).

The level of protein found in the raw meat was within the range of 16-22% reported by FORREST et al. (1975). The drop in protein in most of the cured samples was in agreement with earlier findings. Application of curing agents and smoke to meat, as observed by DAUN (1975) and MEYER (1978), results in losses of salt- and watersoluble proteins as well as vitamins and minerals through drip and destructive interaction of some of the smoke compounds with the meat constituents, respectively. As further observed by RICE and BEUK (1953), smoking after curing results in more losses of nutrients than due to curing alone. Heat, applied during the smoking process, may also have had a damaging effect on proteins (HAMM 1960). These explanations account for the generally higher levels of protein in the unsmoked samples than in those smoked after curing. The very low levels of moisture in the samples treated with 25% and 30% NaCl (unsmoked) may explain their apparent gain in protein due to higher concentration effects (IGENE and EKANEM 1985).

The results of lipid analysis obtained in this work were comparable with those reported by others. Fat levels of 9.5-12.0% have been reported for fresh pork (DRANSFIELD and CASSEY (1982), while FORREST et al. (1975) have reported levels of 1.5-13.0% generally for meat. The high fat content found in the fresh pork in this study may be explained by the relatively low moisture content since these two components relate inversely (KRAMLICH et al. 1973). The rice in lipid contents of the products upon processing may be due to the effect of concentration due to moisture loss. Heat applied during smoking melted part of the fat which got lost by drip, which is the most likely explanation for the higher levels of fat in the unsmoked products. The mean ash content of the fresh meat obtained in this study agreed with that found by EKANEM (1984) and IGENE and EKANEM (1985). These authors found that the ash content of meat increased with heat application, while DANY and GUSTAVO (1981) made the same observation as an effect of curing. The general increase in ash contents of the cured products (and relatively higher levels in the smoked samples to which heat was applied) therefore agreed with the observations of those earlier authors. Apart from the effect of concentration due to moisture removal, the increase in ash contents of the products was also partly attributable to the high ash content of the cure-mixture.

4.2 Sensory characteristics

The significant effects of NaCl level and smoke application on the organoleptic properties of *unam* (Tables 2 and 3) conformed with published information. At low concentrations, NaCl helps to improve the flavour and colour of meat (DAUN 1975, and MEYER 1978), but at higher concentrations, especially when used alone, NaCl gives a dry harsh, dark coloured, and unattractive product (KRAMLICH et al. 1973). According to ELLIS et al. (1968) and PEARSON et al. (1977), high concentrations of NaCl in meat also accelerate oxidate rancidity (affecting flavour development) because NaCl promotes the activity of lipoxidase in meat. Smoke application (especially hot smoking) brightens and stabilizes the colour of cured meat and also imparts an antioxidant effect to the product (HAMM 1977, TILGNER 1977). According to MEYER (1978), the colour effect is due to the denaturation of nitric oxide myoglobin (the cured meat pigment) which consequently forms the corresponding porphorin and denatured protein that becomes less reactive chemically, while the antioxidant effect is produced by phenolic compounds in the smoke. These effects of NaCl and smoke on meat explained the trends of the results of flavour and colour evaluation of *unam*. In addition to the direct effects of NaCl and smoke, the heating effect in the smoking chamber may have facilitated the release of flavour compounds like amines, ammonia, hydrogen sulphide, and organic acids, this accounding in part for the better ratings of flavour in the smokes samples. Also, antioxidants in the smoke may have moderated the prooxidant effect of NaCl on the meat fat, thereby minimizing flavour losses in the smoked products. It is possible that the flavour-enhancing effect of NaCl optimizes at the 25% level, this being a probable explanation for the significant difference in flavour (P) between the sample treated with 25% NaCl (smoked) and all other samples, smoked and unsmoked. Studies are desired to test the effects of permitted antioxidants such as propyl gallate and butylated hydroxy toulene on *unam*, since rancidity seems to constitute a serious problem in the handling of the product. The positive correlation between juiciness and fat content (Table 4) partially explained the results in Table 2. This observation agreed with the reports of SZCZESNIAK and TORGESON (1965) and FORREST et al. (1975) that marbling enhances organoleptic juiciness. The broad differences in tenderness between the smoked and unsmoked products may be explained by the effect of heat on the smoked products. According to MEYER (1978), warming of meat during smoking activates autolytic enzymes which hydrolyse connective tissue collagen (to gelation), causing tenderization of the meat.

The significant difference in overall acceptibility ($P<0.01$) between the smoked sample that received 25% NaCl and all other samples was due to the fact that this sample also rated best in all sensory properties (Table 2). FORREST et al. (1975) reported that the flavour of a product is responsible for many of the psychological and physiological responses (which determine acceptability) resulting from meat consumption and that the sensation of juiciness is primary in conveying the general impression of palatability to the consumer. As they further observed, irrespective of other good attributes of meat, lack of juice significantly limits its acceptability. Colour, according to the same workers, is the first impression the consumer builds for himself towards the acceptability of a meat product. LAWRIE (1979) noted that the average consumer rates tenderness higher than flavour or colour in his assessment of acceptability. The high positive correlations between overall acceptability and these sensory qualities (Table 4) confirmed these explanations. The negative correlations between moisture content and flavour and positive correlations between fat content and flavour of *unam*, smoked and unsmoked (Table 4), seemed to suggest that the general meaty flavour components which reside in the water soluble fraction (PEARSON et al. 1977) contributed less to the overall flavour rating than the species-specific flavour components which originate from the lipid fraction of the meat. IGENE and EKANEM (1985) obtained a negative relationship ($R = -0.50$) between moisture content and acceptability of *suya*. The result of the present study seemed to confirm the observation of these authors that Nigerians appear to prefer meat on the "drier side". More specific studies are required in this direction with regard to *unam*. Studies are also desired to specifically examine the relative effects of the general meaty flavour and the species-specific flavour on the acceptability of *unam*. As noted by PEARSON et al. (1977), boar flavour is undesirable among many pork consumers.

I. P. SOLOMON, E. O. EKANEM und A. O. OKUBANJO: Wirkungen der Behandlung mit verschieden hohem Salzniveau (NaCl) und Rauch auf chemische und sensorische Eigenschaften von *unam inung*, einem gepökelten nigerianischen Produkt vom Schwein

Ein randomisiertes Komplettblockexperiment in 4 x 2faktorieller Ausführung wurde verwendet, um Wirkungen von NaCl-Konzentration und Rauchanwendung auf chemische und organoleptische Eigenschaften von *unam inung*, einem gepökelten nigerianischen Produkt vom Schwein zu untersuchen. Die Ergebnisse verdeutlichen, daß der Feuchtigkeitsgehalt verglichen mit Rohfleisch in allen behandelten Varianten abfiel, wobei in den ungeräucherten Proben die Absenkung

höher war. Gesamtlipid- und Aschegehalte nahmen durch Pökeln zu, bezogen auf ungeräucherte Proben auf ein 3- bis 4faches Anwachsen der Lipide. Die Proteinveränderungen ließen keinen spezifischen Trend erkennen, jedoch waren die Proteinniveaus in ungeräucherten Produkten mit 25 und 30 % NaCl erhöht und fielen in allen anderen Behandlungen.

Die Varianzanalyse ergab hochsignifikante Unterschiede (P<0,01) in allen sensorischen Eigenschaften und generelle Akzeptanz der Produkte dank der NaCl-Niveaus und Räucherung. Die Variante mit der geräucherten und in 25 % NaCl gepökelten Produkte wurde am besten bewertet und differierte signifikant (P<0,01) von den anderen.

Positive Korrelationen fanden sich bei Geschmack, Saftigkeit, Zartheit sowie der Gesamtakzeptanz von geräuchertem oder nicht geräuchertem *unam*.

I. P. Solomon, E. O. Ekanem et A. O. Okubanjo: Effets du traitement avec un niveau de salinité différemment haut (NaCl) et la fumée sur les caractéristiques chimiques et organoleptiques d'*unam inung*, produit salé nigérian du porc

Une expérience bloc complet randomisée en exécution factorielle 4 x 2 a été employée pour étudier les effets d'une concentration NaCl et de la fumée sur les caratéristiques chimiques et organoleptiques d'*unam inung*, produit salé nigérian du porc. Les resultats en montrent que la teneur en humidité, comparée avec viande crue, tombe pour toute variante graitée, la baisse étent plus élevée dans les échantillons non fumés. Les teneurs totales en lipides et en cendre ont augmenté par le salage, vis-à-vis des échantillons non fumés une augmentation triple à quadruple des lipides. Les modifications protéiques ne laissaient reconnaître aucune tendance spécifique, mais les niveaux protéiques étaient élevés, dans les produits non fumés, avec 25 et 30 % de NaCl, et ils tombaient dans tous les autres traitements.

L'analyse de variance avait pour résultat des différences hautement significatives (P<0,01) dans toutes les caractéristiques organoleptiques, et une acceptation générale des produits grâce aux niveaux de NaCl et au fumage. La variante avec les produits fumés et salés en 25 % de NaCl a été estimée la meilleure, et elle a différé de façon significative (P<0,01) des autres. Des corrélations positives existaient quant au goût, la succulence, la tendreté ainsi que l'acceptation totale d'*unam* fumé ou non fumé.

I. P. Solomon, E. O. Ekanem y A. O. Okubanjo: Efectos del tratamiento de *unam inung* (un producto nigeriano de carne de cerdo salada) con diferentes concentraciones de sal (NaCl) y con humo, sobre sus propiedades quimicas y sensoriales

Se utilizó un experimento en bloque completo de pruebas al azar en una realización factorial de 4 x 2, para determinar los efectos de una concentración de NaCl y de la aplicación de humo en *unam inung*, sobre sus propiedades quimicas y organolépticas. Los resultados demuestran, que el contenido de humedad, en comparación con carne cruda, en todas las variantes tratadas disminuyó, tomando en cuenta que en las pruebas no ahumadas, la disminución fué mayor. El contenido total de lípidos y de ceniza aumentaron por medio del adobado (en comparación con pruebas no ahumadas, aumentaron los lípidos entre 3 a 4 veces). Los cambios en las proteínas no permiten reconocer una tendencia específica, pero los niveles protéicos en productos no ahumados con 25 y 30 % de NaCl fueron altos y decrecieron en todos los otros tratamientos.

El análisis de variancia mostró diferencias altamente significativas ($P<0,01$) en todas las propiedades organolépticas y una aceptación general de los productos, gracias al nivel de NaCl y de ahumado. La variante con los productos ahumados y adobados en NaCl (25 %) obtuvo las mejores notas y mostró diferencias significativas ($P<0,01$) en relación a las variantes restantes. Se comprobaron correlaciones positivas en cuanto al sabor, al contenido de jugo, a la fineza, como asitambién a la aceptación total de *unam* ahumado o no ahumado.

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