

NUTRITIONAL PROPERTIES OF DONKEY MEAT PRODUCTS

R. Marino, A. della Malva, M. Caroprese, A. Santillo, A. Sevi, M. Albenzio

Department of Agricultural Food and Environmental Sciences , University of Foggia, 71121, Foggia, Italy

Abstract – Nutritional properties of bresaola and salami from donkey meat were evaluated and compared with respective conventional products. In particular, chemical, fatty acids profile and aminoacids content were assessed at the end of ripening time. Donkey bresaola and salami showed higher content of protein and lower content of fat than beef bresaola and pork salami. Significant differences in the unsaturation level of fatty acids were found. Particularly, donkey meat products showed lower saturated fatty acids, higher polyunsaturated fatty acids content and better nutritional indices than conventional beef bresaola and pork salami. Furthermore, donkey meat products, especially bresaola, showed the highest content of essential amino acids. These results showed that a clear potential exists to produce meat products using alternative meat to the traditional pork or beef

Key Words – donkey meat, essential amino acids, fatty acids profile

I. INTRODUCTION

Donkey (*Equus asinus*) rearing plays a central role for eco-sustainable development of internal and marginal areas in many countries of the world. In particular, the use of autochthonous donkey breeds has the advantage that these animals are closely related to the environment and maintain the biodiversity. Although the interest in donkey milk, due to its beneficial nutritional properties for infant nutrition [1] has increased in the last years, on the other hand, the consumption of donkey meat and especially meat products is relatively unknown.

For this reason, the production of typical processed meat products could be a tool to

increase the value of donkey meat. Particularly, bresaola and salami are very popular meat products that have already found a niche both in national and international markets, therefore it raises the possibility to use donkey meat to prepare similar products.

Therefore, the aim of this research was to evaluate nutritional features of donkey meat products as bresaola and salami and to compare these properties with those of traditional products according to the healthier concept.

II. MATERIALS AND METHODS

The bresaola and salami from donkey meat were prepared in a sausage industry using a traditional protocol production. To make a comparative evaluation of these products a equal number of samples of conventional bresaola and salami from cattle and pork meat, respectively, were manufactured.

A total of 36 bresaola and salami were produced. Cured and fermented products were analyzed at the end of their respective ripening period to evaluate chemical and nutritional properties. Lipids were extracted according to Bligh and Dyer [2], duplicate samples of chloroform extract, were methylated according to ISO-IDF. Gas-chromatograph analysis for fatty acids methyl esteres determination was performed using an Agilent 6890N instrument equipped with a HP-88 fused-silica capillary column (length 100 m, internal diameter 0.25 mm, film thickness 0.25µm). Individual FAMES peaks were identified by comparing their retention times with those of standards (Matreya). Atherogenic and thrombogenic indices were calculated according to Ulbricht and Southgate [3].

Analysis of amino acids were performed combining both the derivatization reaction and HPLC chromatographic separations, using an

HPLC system Agilent Technologies 1100. Individual amino acids peaks were identified by comparing their retention times with those of standards. Results are expressed as mg amino acids/g total amino acids. Furthermore, the amino acids score (AAS) was calculated by a comparison of the content of the amino acid in the protein in relation to the reference on pattern protein proposed by FAO/WHO/UNU [4].

Data were subjected to an analysis of variance, using the GLM procedure of the SAS statistical software [5]. Least squares means were evaluated using the PDIF and STDERR options of SAS. Sensory values were normalised standardising each assessor by his standard deviation in order to reduce the effect of the different use of the scale.

III. RESULTS AND DISCUSSION

Donkey bresaola and salami showed higher content of protein and lower fat ($P < 0.01$) than cow bresaola and pork salami, respectively.

Table 1 shows fatty acids profile of donkey bresaola and salami compared to respective conventional products. The use of “alternative” meat to produce bresaola and salami caused significant differences in the unsaturation level of fatty acids. Bresaola and salami manufactured with donkey meat showed lower SFA ($P < 0.05$) and higher PUFA ($P < 0.01$) percentage with higher fatty acids $\omega 3$ ($P < 0.01$) than conventional bresaola and salami. In particular, both donkey meat products showed the lowest content of miristic ($P < 0.01$) and palmitic acids ($P < 0.05$) and the higher content of stearic C18:0 ($P < 0.05$), linolenic C18:3 $\omega 3$ ($P < 0.01$), eicosapentenoic ($P < 0.01$) and docosahexenoic DHA ($P < 0.05$) acids. As consequence bresaola and salami manufactured with donkey meat showed better nutritional indices compared to their conventional meat products, showing the lowest $\omega 6/\omega 3$ ($P < 0.01$) and lowest atherogenic (AI) and thrombogenic (TI) indices ($P < 0.05$).

Lipids are among the bioactive components those that have received most attention in the last years, in quantitative and qualitative terms, with respect to the development of healthier meat products.

Table 1- Fatty acid composition (%) of donkey bresaola and salami compared to respective conventional products (means \pm SEM).

	Bresaola			Salami		
	Ass	Cow	SEM	Ass	Pig	SEM
C12:0	0.62 ^A	1.55 ^B	0.14	1.12	1.28	0.10
C14:0	1.45 ^A	2.51 ^B	0.19	1.02 ^A	1.95 ^B	0.12
C16:0	23.45 ^A	28.55 ^B	0.58	22.85 ^a	25.36 ^b	0.43
C18:0	8.68	9.45	0.37	15.43 ^b	14.08 ^a	0.34
C16:1	2.08 ^a	3.35 ^b	0.34	2.93	2.61	0.20
C18:1 $\omega 9$	37.20 ^b	33.95 ^a	0.45	41.21 ^a	42.58 ^b	0.39
C20:1	2.44	2.14	0.18	0.95	0.77	0.13
C18:2 $\omega 6$	15.94	15.45	0.58	11.85	10.68	0.42
C20:4 $\omega 6$	3.42 ^b	1.75 ^a	0.36	0.55	0.25	0.11
C18:3 $\omega 3$	1.55 ^b	0.88 ^a	0.19	1.05 ^B	0.35 ^A	0.17
C20:5 $\omega 3$	2.08 ^B	0.64 ^A	0.15	0.45 ^B	0.05 ^A	0.09
C22:6 $\omega 3$	0.32	0.09	0.08	0.35 ^b	0.09 ^a	0.05
S $\omega 6$	19.36	17.20	0.76	12.40	10.93	0.42
S $\omega 3$	3.95 ^B	1.61 ^A	0.22	1.76 ^B	0.49 ^A	0.21
SFA	34.21 ^A	42.06 ^B	0.99	39.98 ^a	42.67 ^b	0.70
MUFA	41.72	39.44	1.14	45.09	45.96	0.86
PUFA	23.31 ^B	18.81 ^A	0.86	14.25 ^B	11.42 ^A	0.63

a,b = $P < 0.05$; A, B= $P < 0.01$.

In the present study, the remarkable nutritional result was that in both donkey meat products, myristic and palmitic acids account for approximately 24% of total fatty acids compared with 32% in cattle bresaola and 28% in pork salami, respectively. It is known that polyunsaturated fatty acids are considered protective factors being involved in the reduction of risk of human coronary heart disease [6]. The highest percentage of PUFA and especially $\omega 3$ PUFA in donkey meat products could be due to outdoor rearing system for donkeys with a greater availability of fresh grass to the diet with a predominance of C18:3 $\omega 3$ (precursor of the $\omega 3$ series) in grass lipids. It is worth to note that both donkey meat products had a higher content of long chain (LC) fatty acids, such as eicosapentaenoic and docosahexaenoic acids. The highest percentage of these fatty acids is indicative of nutraceutical properties of donkey meat. Among the $\omega 3$ PUFA, LC fatty acids have a wide range of biological effects, which are beneficial for human health [7].

Amino acids score for each of essential amino acids of bresaola and salami is reported in table 2. In donkey bresaola all essential amino acids, except for valine and tyrosine + phenylalanine,

Table 2 - Amino acids score of donkey bresaola and salami compared to respective conventional products (means±SEM).

	a.a. requirement g/100g	Bresaola			Salami		
		Ass	Cow	SEM	Ass	Pig	SEM
HIS	1.5	110.67 ^B	94.00 ^A	1.85	65.33	69.95	1.76
ILE	3.1	54.33 ^b	48.00 ^a	1.55	45.33 ^b	36.67 ^a	2.05
LEU	5.9	44.92 ^b	36.78 ^a	2.22	33.05	31.86	0.94
LYS	4.5	113.11 ^B	60.00 ^A	2.44	54.44 ^B	44.00 ^A	1.93
MET	1.6	43.13 ^b	36.88 ^a	1.68	38.13 ^b	30.00 ^a	2.08
TYR +PHE	3.8	51.05	45.79	1.77	41.05	39.47	1.11
THR	2.3	47.83 ^b	41.30 ^a	1.98	38.26	36.96	0.97
VAL	3.9	42.82	38.46	1.58	37.18	37.95	1.34

a,b = P< 0.05; A, B= P< 0.01.

showed higher values of amino acids score than beef bresaola. On the other hand, in donkey salami were found the highest isoleucine, lysine and metionine values compared to pork salami. The highest content of protein and of essential amino acids found in both donkey meat products has an undisputed nutritional value. According to the revised estimates of the amino acid requirements for adults proposed by FAO [3], donkey bresaola, in particular, appears to be an excellent source of high biological value proteins because it contains essential amino acids with the highest nutritional qualities. Essential aminoacids are basic in the diet, particularly, for certain population groups with specific needs like children, sick and old people [8]. Furthermore, some of the amino acids present in highest percentage in donkey bresaola may produce additional benefits as glutamine which has relevance for metabolic processes and potential preventive effects for certain diseases and leucin and isoleucine that have been associated with recovery from physically exhausting activity [9].

IV. CONCLUSION

Our investigation demonstrates the possibility of processing donkey meat into bresaola and salami with a high nutritional value to meet the consumers' growing demand for healthy products. Thus donkey meat can give an additional resource to local farmers in addition to milk production and typical products with the

opportunity to create their own niche in the marketplace.

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