

PE9.08 Nutritional characteristics of Spanish manchega lamb burgers 40.00

Maria Belen Linares (1AND 2) Herminia.vergara@uclm.es, Maria Fernandez(1), Maria Dolores Garrido (2)
Herminia Vergara (1)

(1)University Castilla-La Mancha

(2)University Murcia

Abstract— Nutritional composition, assessed by moisture, ash, protein and fat (Soxhlet) values and fatty acid indexes (PUFA, n-6/n-3 and PUFA/SFA) were evaluated at initial time (0 days post-packing) for Spanish Manchega breed lamb burgers. Burgers were prepared with two types of formulas (Type I, only hindleg vs Type II, 2/3 hindleg+1/3 neck and breast). In both formulas three groups of burgers were obtained according to the spice added [(0.1% Garlic powder, 0.1% Rosemary powder and Control (without spice)]. The effect of both factors (formula and spice added) on nutritional composition were determined. Moisture and fat content inversely varied due to the effect of the formula. In Type I were described higher moisture values ($P < 0.001$) and the consequently lower fat content than in Type II. In addition, Type I also showed the highest fatty indexes ($P < 0.001$, 0.01 and 0.001 for PUFA, n-6/n-3 and PUFA/SFA, respectively). In general, burgers made with garlic showed a higher n-6/n-3 index (0.61 and 0.53 for I and II, respectively) than the other two groups, which could contribute to the beneficial cardioprotective effect of the product on consumer health.

M.D. Garrido and M.B. Linares are at the University of Murcia, Department of Food Science and Technology, Campus of Espinardo, 30100, Espinardo, Murcia, Spain. H. Vergara, M.B. Linares and M. Fernández are at the University of Castilla-La Mancha, Department of Agroforestry Science, Technology and Genetics, Campus of Albacete, 02071, Albacete, Spain (corresponding author to provide Herminia.Vergara@uclm.es)

Index Terms— Burger, lamb meat, spice, nutritional composition

I. INTRODUCTION HUMAN

requirements for protein are currently estimated in 55 and 45 g per day for adult men and women, respectively [1]. Meat is an important concentrated source of protein and amino acids of high biological value which act as complements to other vegetable proteins [2]. In addition muscle food is a good source of iron, zinc, A and several B vitamins [3]. Fat is

contained in a relatively high level in meat, 5-10%, depending on the species, with the saturated fatty acids (SFA) strongly related to certain human disorders [4]. However the beneficial properties of the essential polyunsaturated fatty acids (PUFA) linoleic (18:2, n-6) and linolenic (18:3, n-3) [5] are well known. Thus the recommended ratio of PUFA /SFA should be above 0.4 and the n-6 /n-3 less than 4 in order to ensure the prevention of some diseases such as different types of cancers or coronary alterations [4] [6]. In the case of lamb meat a higher n-3 concentration has been described in comparison with pork or beef, which promote a healthier diet [4] [7]. On the other hand the diversification of the product range made with meat from sheep species could prove of interest for consumers, in addition to improving the present situation of this sector. Furthermore consumer interest in food, including “natural” ingredients, is increasing due to the beneficial properties of natural spices as preservatives in patties products instead of using synthetic compounds [8]. For these reasons the aim of the present work was to evaluate the effect of the type of spices added and the type of raw meat (formula) on burgers from Spanish Manchega lamb breed.

II. MATERIALS AND METHODS

Three different parts of Spanish Manchega lamb (25 kg slaughter weight) carcasses were utilised in this experiment, i.e. legs (1st class), neck and breast (both 3rd class) in order to prepare two types of burgers (Type I, completely made from hindleg lamb meat and Type II with 2/3 hindleg and 1/3 neck and breast meat). In both types the meat was ground and divided into three batches according to the spice added: Garlic powder, Rosemary powder (0.1% concentration, for both respectively) and no-spices (Control). After mixing for 5 min with salt (1%, w/w) the burgers were shaped and packed at 4°C under aerobiosis conditions until analyses were carried out. Moisture, ash, protein and fat percentage (Soxhlet) were determined [9]. Fatty acid composition was evaluated [10]. Meat samples (10 g) were homogenized with 200 ml of chloroform-methanol (2:1 v/v) solution for 3 min. After blending

50 ml of chloroform and 80 ml of a 10% aqueous NaCl solution were added to separate the methanol-water phase. After 12 hours the lipid extracts were collected and the solvents evaporated (Rotavapor R-200 Buchi). Methyl esters were prepared by methylation with sulfuric acid and analyzed using a gas chromatograph (HP6890N) fitted with a flame ionization detector. Samples were injected in a capilar column HP5 (30 mm length, 0.32 internal diameter, 0.25 μ m thickness). Temperatures for the injector and the detector were 280 and 300°C respectively. The carrier gas was helium (1ml/min). Fatty acid identification was based on the comparison with the retention times of peaks from samples with standards. Data were calculated as normalized area percentages of fatty acids. A General Lineal Model (GLM) was used to determine the effect of the formula (Type I and Type II) and the type of spice (Garlic, Rosemary, Control (non spice)) on the nutritional (moisture, ash, protein, fat) and fatty acid composition (PUFA, PUFA/SFA, n-6/n-3) of lamb burgers.

III. RESULTS AND DISCUSSION

Table 1 shows that the presence or absence of spices (Garlic, Rosemary or Control) had no effect on meat composition [11] while the formula (Type I and II) affected the moisture and fat percentage ($P < 0.001$ both) possibly related with the different muscle groups used in the formulas [12]. Moisture and fat content were inversely related since a higher fat level implies a lower moisture value [13], which agrees with our results. Some authors [14] showed that fat content significantly differs among muscles, which influences the fatty acid composition. In this sense burgers including 1/3 of neck/breast muscles (third category) had more fat than those that were made only with hindleg (first category) in accordance with the fat percentage reported in the present work (4-6 for Type I; 9-11 for Type II). Formula affected the fatty acid composition with the highest index values in Type I ($P < 0.001$, 0.01 and 0.001 for PUFA, n6/n3 and PUFA/SFA ratios respectively) as shown in Table 2. The PUFA concentration was higher in both groups (18% in Type I; 15% in Type II) than that reported by other authors [15] in lamb meat patties (9-12%). The rate n6/n3 was lower in burgers analysed in this experiment (0.4-0.6 range) in comparison with other studies on lamb meat (1.86 [16]; 1.3, [12]; 1.37 [17]) even so it is in a beneficial and acceptable threshold for human nutrition. In this sense the PUFA/SFA ratio in

lamb burgers was similar to other studies on lamb meat [15] and therefore closer to the 0.4 which is reported in the bibliography as healthier for preventing cardiovascular disorders [12]. Finally, samples with added garlic presented a higher n-6/n-3 ratio ($P < 0.001$) than in the other two groups (0.61 and 0.53 for I and II, respectively) which confirms the positive effect of garlic burgers in the prevention of some disorders i.e. atherosclerotic and many other coronary diseases [18].

IV. CONCLUSION

The burgers made from first category lamb meat (Type I, only hindleg) was less greasy than those from the third category and also registered the highest polyunsaturated fatty acid concentration. Burgers with added garlic showed a higher n6/n3 index, which could contribute to an important cardioprotective effect of the product. V.

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Table 1. Effect of the spice and formula on nutritional composition of lamb meat burgers

Nutricional composition (as %)	Formula	Spice			Significance		
		Control	Garlic	Rosemary	Spice	Formula	Spice*Formula
Moisture	I	72.2±0.4	72.7±0.6	71.3±0.8	NS	***	NS
	II	69±1	68.3±0.3	66.9±0.1			
Ash	I	1.9±0.0	1.7±0.0	1.9±0.0	NS	NS	NS
	II	2±0.0	1.7±0.0	1.7±0.0			
Protein	I	19.3±0.4	18.8±0.3	18.8±0.6	NS	NS	NS
	II	18.8±0.0	18.8±0.0	18±0.0			
Fat	I	4±0.7	6.1±0.6	6.1±0.4	NS	***	NS
	II	10.8±0.6	9.6±0.3	11.5±0.3			

Formula I: 100% hindleg meat lamb (First category); Formula II: 2/3 hindleg +1/3 neck meat lamb (Third category)
 NS: not significant; *** Indicate significance level at 0.001

Table 2. Effect of the type of the spice and formula on fatty acid composition (%) of lamb meat burgers

Fatty acid composition (as %)	Formula	Spice			Significance		
		Control	Garlic	Rosemary	Spice	Formula	Spice*Formula
PUFA	I	18±0.1	18.36±0.4	18.35±0.1	NS	***	NS
	II	15.9±0.0	15.7±0.0	15.9±0.3			
n6/n3	I	0.46±0.0	0.61±0.01	0.51±0.01	***	**	***
	II	0.49±0.0	0.53±0.0	0.49±0.0			
PUFA/SFA	I	0.49±0.0	0.4±0.0	0.4±0.0	NS	***	NS
	II	0.34±0.0	0.33±0.0	0.33±0.0			

Formula I: 100% hindleg meat lamb (First category); Formula II: 2/3 hindleg +1/3 neck meat lamb (Third category)
 NS: not significant; **, *** Indicate significance level at 0.01 and 0.001