PHYSICO-CHEMICAL CHARACTERISTICS OF RESTRUCTURED BEEF STEAKS WITH ADDED WALNUT AS AFFECTED BY COOKING METHODS

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Introduction

Consumers are currently more health conscious and as a result demand healthier products. Meat processing can be used to modify the composition of meat products reducing, increasing, adding and/or replacing different components (from animal and plant sources) with potential functional effect (Jiménez Colmenero *et al.*, 2006). Modification of the ingredients used for the preparation of meat products has been tested in various ways with a view to enhancing health-beneficial components (Anandh *et al.*, 2003; Fernández-Ginés *et al.*, 2005). Different studies have shown that the frequent consumption of walnuts reduces the risk of cardiovascular disease, since it lowers serum cholesterol and favourably modifies the lipoprotein profile (Sabaté, 1993). In order to promote walnut intake, restructured beef steaks with added walnuts have been formulated resulting in products with acceptable physicochemical and sensory properties (Jiménez Colmenero *et al.*, 2003; Cofrades *et al.*, 2004), frozen storage stability (Serrano *et al.*, 2006) and potential health benefits (Serrano *et al.*, 2005).

Restructured beef steaks undergo cooking prior to consumption. It is well known that meat product composition and cooking techniques are the main factors which affect the final quality attributes of the product (Berry and Leddy, 1984; Dal Bosco *et al.*, 2002). This study was conducted to determine how three different cooking techniques (oven, grill and pan) affect some physicochemical characteristics of restructured beef steak.

Materials and Methods

Preparation of two different restructured beef steaks was performed as described by Jiménez-Colmenero *et al.*, (2003) and the formulation of the these products are shown in Table 1. Three different cooking methods were evaluated: oven, grill and pan. In each case, the final cooking temperature of 70°C, (in the core of the sample) was determined beforehand by inserting thermocouples connected to a temperature recorder.

Table 1: Formulation of different restructured beef steaks[1].

Samples denomination	Beef (g)	NaCl +STP (g)	Walnut (g)	Beef fat (g)	MTG (g)	Caseinate (g)	Water (g)	Total (g)
Control (C)	2800	60+12	0	660	28	40	400	4000
20 % added walnut (20W)	2660	60+12	800	0	28	40	400	4000

[1]STP, sodium tripolyphosphate. MTG, microbial transglutaminase

Protein, moisture and fat content of the raw products were evaluated. After the cooking process and the cooling step (for 30 min at 20-22°C), the steaks were manually wiped with a paper towel to remove visible exudate. Cooking loss was calculated as weight loss (%). Bind strength (BS) and Kramer shear force (KSF) of the raw and cooked restructured steaks were performed as described by Jiménez Colmenero *et al.*, (2003). Data was analysed using Statgraphics Plus 2.1 for one-way and two-way ANOVA.

Results and Discussion

Proximate composition of raw restructured beef steak (Table 2) are consistent with the meat product formulation (Table 1). Addition of walnut reduced ($P<0.05$) cooking loss (Table 3). Similar results have been described by Jiménez Colmenero *et al.*, (2003) in restructured beef steak with added walnut. Irrespective of the type of restructuring, the effect of the cooking method seems not to be relevant (Table 3). Cooking methods and type of restructured steak had an effect ($P<0.05$) on textural parameters. BS and KSF of the raw and cooked products containing walnut were lower than those observed in the control samples (Table 3). Softer textures have been reported in restructured beef steaks containing walnut (Jiménez Colmenero *et al.*, 2003) and could be due to the addition of walnut reducing the cohesiveness among meat pieces, so less applied force (BS and KSF) was required. Generally products with high KSF and BS also result in greater cooking loss (Table 3). No clear effect was observed in the texture due to the different thermal treatments applied, however the products cooked by means of pan cooking tend to have softer textures (Table 3).

Table 2: Proximate composition (%) of the raw products.

(%)	C	20W	SEM
Moisture	63.72^{1}	61.25^{2}	0.58
Protein	17.16^{1}	19.38^{2}	0.08
Fat	13.03^{1}	12.57^{1}	0.3
Ash	2.97^{1}	3.44^{1}	0.01

[1]Different numbers in the same column indicate significant differences (P<0.05). SEM = Standard error of the mean.

Table 3: Cooking loss and textural parameters of the different restructured as affected by cooking method.

Sample		Cooking loss (%)	BS (N)	KSF (N/g)
C				
	Raw		4.28^{1}	3.54^{1}
	Oven	31.74_{ab}^{1}	24.89_{ab}^{1}	16.14_{a}^{1}
	Grill	33.16_{a}^{1}	27.23_{a}^{1}	19.40_{b}^{1}
	Pan	27.27_{b}^{1}	20.77_{b}^{1}	16.75_{ab}^{1}
20W				
	Raw		2.20^{2}	2.91^{2}
	Oven	12.52_{a}^{2}	19.71_{a}^{2}	9.60_{a}^{2}
	Grill	13.48_{a}^{2}	14.32_{b}^{2}	11.31_{a}^{2}
	Pan	11.46_{a}^{2}	13.31_{b}^{2}	11.58_{a}^{2}
SEM		1.27	1.23	0.77

[1]Different letters indicate significant differences (P<0.05) between cooking treatments and different numbers indicate significant differences (P<0.05) between samples. SEM = Standard error of the mean.

Conclusions

Our results suggest that the different cooking methods did not a clear influence on the physico-chemical characteristics studied. The incorporation of walnut in restructured beef steak improves, the binding properties in comparison to the incorporation of animal fat, producing products with softer textures.

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