AMINO ACIDS COMPOSITION OF BEEF PATTIES ENRICHED WITH DIFFERENT PROTEINS

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Abstract – Meat is an excellence source of well-balanced essential amino acids, particularly sulphated ones, since it contains an abundance of proteins with high biological value. The effect of different sources of protein on the amino acid composition of beef patties was examined. A total of twenty beef patties [control (soybean protein) and modified batches (pea, lentil and seaweed proteins)] were used in this study. Beef patties enriched with *Chlorella* protein showed the highest values of the total amino acid content. On the other hand, there were significant differences in all amino acids except in cysteine. In all batches, glutamic acid was the most abundant followed by lysine, aspartic acid and leucine.

Key Words – *Chlorella,* lentil, pea

I. INTRODUCTION

Meat is considered the highest quality protein source not only due to its nutritional characteristics but also for its appreciated taste. The role of meat proteins is dual: contain all the essential amino acids closely resembling the human body making them highly nutritious and contribute to the food industry by imparting specific functionalities [1]. The nutritional value of meat products is mainly due to their high biological values of proteins and their vitamins and minerals. Vegetable proteins have a lower price than muscle proteins and, consequently, can reduce the cost of the meat product. High meat prices have prompted the food industry to produce nonmeat proteins. Legumes have been investigated regarding their potential use in developing meat functional foods. Gradually, interest has grown in the utilization of legume proteins for flour, isolates, and concentrates [2]. To improve the nutritional quality, texture, and other functional properties of any product, the use of plants and seaweeds protein products as food ingredients is increased. However, these applications are limited to proteins from soybeans, whereas, comparatively, other vegetable proteins are used less. Thus, the aim of this study was to evaluate the protein amino acid profile of beef patties elaborated with meat and enriched with protein from pea, lentil and *Chorella*.

II. MATERIALS AND METHODS

Four batches of beef patties enriched with different protein sources were manufactured. A total of 20 beef patties were elaborated: 5 control (1% soybean protein), 5 pea (1% pea protein), 5 lentil (1% lentil protein) and 5 seaweed (1% *Chlorella* protein). The hydrolysis of the protein, derivatization, and identification of hydrolyzed were carried out according to Lorenzo *et al.* [3]. ANOVA of one way using SPSS package (SPSS 19.0, USA) was performed and LSM were separated using Duncan's t-test ($P < 0.05$).

III. RESULTS AND DISCUSSION

The effect of protein source on the content of total, essential and non-essential amino acids is shown in Fig. 1. There were significant differences ($P < 0.05$) among the four beef patties studied, showing the highest level in patties manufactured with seaweed.

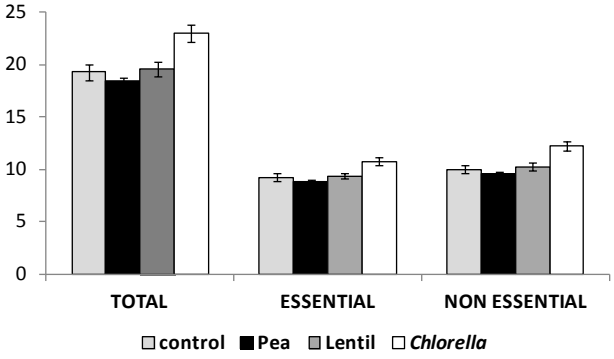

Figure 1. Total, essential and non-essential amino acids of beef patties

The hydrolyzed amino acid content of beef patties manufactured, expressed as g/100 g of wet tissue, is summarized in Table 1. Arginine was included within the essential amino acids fraction, as done by Hoffman et al. [4], because arginine is considered a conditionally essential amino acid [5]. In our study, we found significant different ($P < 0.05$) in all determinated amino acids except in cysteine. All batches manufactured exhibit the following profile: the major amino acid was glutamic acid (around 3.4 g/100 g of meat; around 16% of total amino acids) followed by lysine and aspartic acid (around 1.9 g/100 g of meat; around 9.5% of total amino acids) and leucine (around 1.64 g/100 g of meat; around 8.2% TAA). In all cases, beef patties manufactured with *Chlorella* protein showed the highest values, except for glycine and histidine that presented the same values that beef burger with lentil and control.

Table 1. Amino acid concentration (g/100 g) of beef patties

	Control	**Pea**	**Lentil**	***Chlorella***	**SEM**	**SIG**
Essential (E)						
Arginine	1.58	1.51	1.60	1.78	0.03	**
Histidine	0.65	0.60	0.63	0.70	0.01	*
Isoleucine	0.89	0.85	0.90	1.04	0.02	**
Leucine	1.58	1.51	1.62	1.87	0.04	***
Lysine	1.83	1.76	1.86	2.21	0.05	**
Methionine	0.08	0.06	0.08	0.12	0.01	**
Phenylalanine	0.80	0.76	0.81	0.88	0.01	**
Threonine	0.94	0.86	0.91	1.02	0.02	*
Valine	0.92	0.87	0.93	1.10	0.03	**
Non essential (NE)						
Alanine	1.33	1.23	1.32	1.64	0.05	**
Aspartic acid	1.88	1.72	1.81	2.19	0.06	*
Glutamic acid	3.30	3.14	3.30	3.85	0.08	**
Glycine	1.24	1.15	1.22	1.50	0.05	*
Proline	0.87	0.83	0.94	1.16	0.04	**
Serine	0.91	0.88	0.87	1.10	0.03	*
Tyrosine	0.50	0.48	0.59	0.62	0.02	*
Cysteine	0.18	0.16	0.18	0.20	0.01	n.s.
E/NE	0.92	0.90	0.92	0.88	0.01	n.s.

SEM: Standard error of the mean
SIG: Significance: *** (P<0.001), ** (P<0.01), * (P<0.05), n.s. (not significant)

IV. CONCLUSION

The results obtained in this work displayed that enrichment with different protein sources affected the amino acid profile of beef patties, being *Chlorella* protein which showed the highest values of the total amino acid content including both essential and non-essential amino acids. This result could be interesting in order to elaborate new food with high protein content especially for target groups of population (sportsmen and senior).

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