MUSCLE TISSUE CONTENT ESTIMATIONS IN MORTADELLA SAUSAGES AND LUNCHEON MEAT

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INTRODUCTION

MUSCLE protein content is the most reliable characteristic in evaluating qualitatively meat products. German regulations are already based on standards of muscle protein content, expressed as a percentage of the total meat protein. It is determined either chemically or histometrically. Muscle tissue content (estimated in volume) is what in fact measured as muscle protein, in case the histometrical technique is used. The two methods are reasonably correlated with each other within certain limits (Hildebrandt, 1979).

In order to suggest standards for a certain product, it must be first evaluated the existing level of the parameter to be standardized, in the various brands of the product being available to the consumer. To this end, a study was conducted for the estimation of existing levels of histometrically assessed muscle tissue content in mortadella sausages and luncheon meat offered in the Greek market.

MATERIALS AND METHODS

THE MATERIAL was supplied from the market of Athens. There were examined 50 samples of mortadella and 33 samples of luncheon meat. Each sample was divided in ten pieces. A cryostat section was prepared from each piece. The sections were routinely stained by HXE and were examined in a moderate magnification. Muscle and connective tissue content were histometrically calculated. For this a "point counter" was used as it is described by many workers (Glagolev, 1933, 1934; Prändl, 1960, 1961; Eberlein, 1961; Baxevanis, 1962; Wegener, 1962; Mathias, 1969; Rantsios, 1972). Care was taken that from each sample at least 1200 points were counted.

For each group of measurements the mean value, standard deviation and standard error were calculated. One way analysis of variance was conducted for searching the differences within and between groups.

RESULTS

IN TABLES I and II the mean values for muscle and connective tissue, for each of the examined brands of mortadella and luncheon meat, are shown. Statistical significance of the variations was tested by using one way analysis of variance. Data of this analysis are presented in tables III, IV, V and VI. As it can be judged by the F values there are no statistically significant differences between the various producers of either of the products.

TABLE I

Muscle and connective tissue content in luncheon meat (Histometrical estimations. Mean values ± standard error).

PRODUCERS	MUSCLE TISSUE	CONNECTIVE	% OF MUSCLE TISSUE IN MEAT TISSUES
I	2.08 ± 2.13	86.15 ± 0.28	2.36
II	1.10 ± 1.70	89.40 ± 0.30	1,22
III	1.48 ± 1.66	85.75 ± 0.28	1.70
IV	2.85 ± 1.40	84.90 ± 0.05	3.25
V	1,05 ± 2.10	79.60 ± 0.05	1.40
TOTAL FOREIGN	1.88 ± 1.58	85.14 ± 0.30	2.16
VI	3,88 ± 0.46	86.98 ± 0.77	4,27
VII	4.22 ± 0.80	84.93 ± 0.87	4.73
VIII	4.50 ± 1.04	87.56 ± 0.52	4.89
TOTAL LOCAL	3.90 ± 1.00	85.97 ± 0.40	4.34
GRAND TOTAL	2.64 ± 0.43	85.45 ± 1.01	3.00

TABLE II

Muscle and connective tissue content in mortadella. (Histometrical estimations. Mean values ± standard error).

PRODUCERS	MUSCLE TISSUE	CONNECTIVE	% OF MUSCLE TISSUE IN MEAT TISSUES
I	6,32 ± 1.79	63.37 ± 2.50	9.07
II	7,91 ± 1.38	70.53 ± 2.69	10,08
III	2.42 ± 0.63	64.26 ± 5.39	3.63
IV	5.59 ± 1.14	60,40 ± 2.15	8.47
TOTAL	6.02 ± 0,78	64,64 ± 3,18	9.31

TABLE III

Table of one way analysis of variance for muscle tissue content in mortadella

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F Value
Treatments	3	180.4693	60.1564	2,1131
Error	46	1309.5215	28.4678	
Total	49	1489.9908	30.4079	N.S.

TABLE IV

Table of one way analysis of variance for connective tissue content in mortadella

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F Value
Treatments	3	257.4284	85.8094	0.41721
Error	46	9454.8965	205.5412	
Total	49	9712.3242	198.2107	N.S.

TABLE V

Table of one way analysis of variance for connective tissue content in luncheon meat

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F Value
Treatments	7	138.0855	19.7265	1.1854
Error	26	432.6478	16.6403	
Total	32	552.7431	17.2732	N.S.

TABLE VI

Table of one way analysis of variance for muscle tissue content in luncheon meat

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F Value
Treatments	7	88.7232	12.6747	1.7385
Error	26	189.5465	7.2902	
Total	32	268.9369	8.4240	N.S.

DISCUSSION

THE TOTAL mean values and standard deviations for muscle tissue content are for mortadella 6.02 ± 5.51 and for luncheon meat 2.64 ± 2.48. The low percentage of muscle tissue content in the products, in relation with the magnitude of standard deviations, is prohibiting for establishing lower acceptable levels for muscle tissue content. On the other hand the lack of significant differences between different producers for both examined products, suggests against adopting separation in quality classes.

However the need for improvement in nutritional quality of the products under consideration, in view of the existing low level of muscle tissue content, cannot be overlooked. If we add one standard deviation in the aformentioned means of muscle tissue content, the result is 11.53 for mortadella and 5.12 for luncheon meat. If we put, therefore, the limits of 10 and 5%, for the two products respectively, for two quality classes, only 15% of the population will be within the limits of the first quality, which can be considered as a reasonable pressure to producers for improving the quality and a reward for existing better quality products. Nevertheless considerable effort is needed by the producers to normalize the standards of their products as it can be deduced by the variations which are shown in tables I and II (σ=se.$\sqrt{n}$).

Two methods can be used for determining the muscle protein content in a meat product. They are the chemical and histometrical method, of equal value (Hindebrandt, 1979). In applying the chemical method muscle protein is calculated by substracting from total meat protein the collagen content on the basis of hydroxyprolin content. In order to calculate the total meat protein one must first find the total protein content. Out of it, foreign proteins content (such as soya, egg and milk protein) must be substracted after appropriate determination. One can readily accept that this procedure is time consuming and very laborious. On the contrary we believe that histometrical technique is more easy to be applied, although certain experience in using the method and in recognizing the different constituents of the meat product is needed. From the point of view of laboratory equipment a routine histology laboratory with a "point counter" fitted to a microscope is all what is needed. For the determinations in one sample, 30 - 60 minutes are adequate. In addition, at the same time and on the same histologic sections a thorough histological examination for all the constituents of a meat product takes place.

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