DETERMINATION OF TOTAL PROTEINS IN SOME MEAT PRODUCTS

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Keywords: total proteins, meat product, human nutrition.

Abstract: The main purpose of this paper was to establish the quantity of total proteins for two different types of meat products and establish if the protein content is between the limits imposed by law.

INTRODUCTION

Meat is an excellent source of proteins and essential amino acids, with its contributions to the human dietary needs being recently reviewed by Pellet and Young (1998).The conclusion was that the high content of dietary lysine in meat makes it and meat products particularly in meeting the needs for this indispensable amino acid in cereal-based diets. As a generic molecular species, protein is a linear polymer of different amounts of twenty amino acids. The possible combinations and permutations of the linear sequence of amino acids are immense, but from a dietary perspective only the total mass of protein in a unit weight of food and amino acid profile – the relative proportion of the amino acids – are important. Sequence is usually not important because protein is hydrolyzed the digestive system to amino acids, which are used to build proteins specific to the consuming organism.

The amino acid profile is important because some amino acids cannot be synthesized by humans and must be obtained from diet. Meat is rich in so-called essential amino acids –lysine, leucine, isoleucine, and sulfur-containing amino acids – and this sense meat is a high-quality protein.

Generally proteins from meat and meat products are 95-100% digestible while plant protein may be as low as 65-75% digestible.

MATERIALS AND METHODS

The biological material consisted of two different types of meat products (“Summer Salami” and “Roses Sausage”) and were made 14 determinations.

For protein dosing we used Kjedahl method, the most common procedure for the determining of meat proteins .

In the middle of the nineteenth century, the discovery of the amino acids and their effects on growth and wellbeing led to development of routine methods for determining amino acids and total proteins.

Nitrogen is present in all amino acids, so most methods for determining proteins measure the quantity of nitrogen present in meat products and use a multiplication factor to calculate the quantity of protein. However, the relationship between nitrogen and protein depends on the amino acid composition: the percent of nitrogen in individual amino acids ranges from 8,6 for tyrosine to 35,9 for arginine. Fortunately, relatively constant proportions of actine and myosin dominate meat proteins, and together contain approximately 16% nitrogen. Therefore a multiplication factor of 6,25 is commonly used for meat products or raw meat.

As long as the correct nitrogen-protein conversion factor is applied, proteins determination by nitrogen measurement is considered the most accurate and reliable method currently available

Using Kjedahl method, the protein is digested at high temperature with concentrated sulphuric acid, sodium sulphate, and a metal catalyst, to convert nitrogenous substances in the meat in ammonium salts. Addition of concentrated alkali then converts the ammonium salts in free ammonia that is distilled with steam and collected with either hydrochloric acid or dilute boric acid solution containing suitable coloured with pH indicators. In the hydrochloric acid procedure, excess hydrochloric is back-titrated to neutral with sodium hydroxide solution. The ammonia can alternatively be measured as coloured ammoniacal complexes.

Reagents: 1. H_2SO_4 0,1 N;
2. NaOH 30%;
3. NaOH 0,1 N;
4. $CuSO_4$;
5. K_2SO_4 ;
6. Methyl Red 1% Alcoholic Indicator Solution.

Towards obtaining information regarding the products homogeneity degree as well as regarding the statistic signification level of the differences between the two types of products we have calculated some statistical parameters w (Snedecor, 1968): $\overline{X}$ = average; *S*= standard deviation and *Es*=standard error.

1. Average

$$\overline{x} = \frac{\sum xi}{n}$$, where: Σxi = values sum; n = number of values

Estimating the value's average implies standard error and average $\left(S_{\overline{x}}\right)$ calculation, according to the sample's variability (Varvara et. al., 2001).

2. Estimating standard deviation

$$S = \sum x^2 - \frac{\left(\sum x\right)^2}{n}$$, where: Σx^2 = average of squares' sample mean;

$(\Sigma x)^2$ = square of means' samples average;

n = number of values

This indicator characterizes the precision of measurement. As the standard deviation is smaller, the method we used is more precise.

3. Standard error

$$S_{\overline{x}} = \sqrt{\frac{S^2}{n}} = \frac{S}{\sqrt{n}}$$

S^2=variance

4. Coefficient of variation

In probability theory and statistics, the coefficient of variation (CV) is a measure of dispersion of a probability distribution. It is defined as the ratio of the standard deviation σ to the mean:

$$CV = \frac{\sigma}{x}.100$$

The coefficient of variation is a dimensionless number that allows comparison of the variation of populations that have significantly different mean values. It is often reported as on a scale of 0 to 100% by multiplying the above calculation by 100%.

The coefficient of variation is often used when discussing the normal distribution for positive mean values with the standard deviation significantly less than the mean. This application may be reasonable for many models, but breaks down theoretically unless the distribution is known to be positive valued, since there is a nonzero probability that the distribution will assume a negative value.

RESULTS AND DISSCUSIONS

The average for both types of products is over the limit imposed. The values for standard deviations are both small, and this means the precision of these determinations is high. Variation coefficient indicates a low dispersion for salami (under 10%), and a medium dispersion for sausage (over 10%).

Tabel 1. Calculated statistical parameters for meat products

Product	n	Average	Standard deviation	Standard error	Variation coefficient%
salami	14	16,521	±0,65065	±0,04648	3,93825
sausage	14	14,114	±1,42119	±0,10151	10,06916

From the results presented in Figure 1, we can observe that the total protein quantity for salami is bigger than that for sausage, and this happens for all values. The smallest value that we obtained for total protein quantity was 12,2% (sausage, the 6th determination).The highest value for proteins was 17,5% (salami, the 7th determination). So, values are situated between 15,2% and 17,5% for salami, and between 12,2% and 15,6% for sausage.
The limits imposed by law are 13% for salami and 11% for sausage.

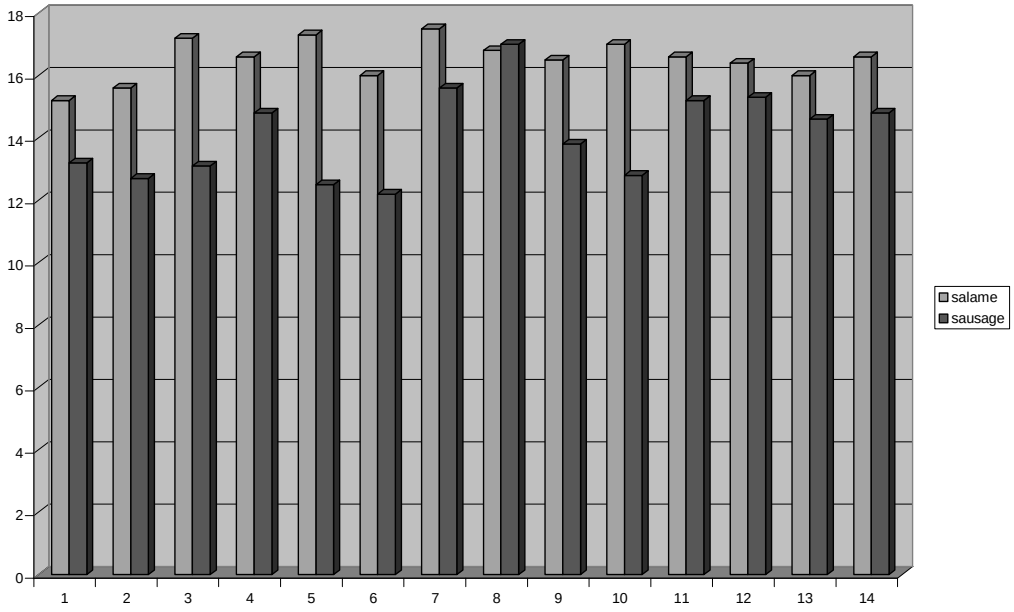

Figure 1. Total proteins quantity variations from two meat products (salami and sausage).

CONCLUSIONS

The quantity of total protein is bigger for salami that means salami is a better source of proteins for human diet.
All the measurement revealed that both products’ total proteins content is between the limits imposed by law, so both products are indicated as a good source of essential amino-acids for human nutrition.

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