Moisture, fat and protein content in various types of animal marketing meats

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Abstract

This experiment was conducted in the laboratory of Animal Nutrition and Anatomy Department of Veterinary at the Shaqlawah Technical Institute in Erbil. Samples of various types of poultry meat (breast and wings) and sheep meat (ribs and thigh parts) were used with four repetitions to estimate the moisture, fat and protein percentage in each type of meat. The results showed a higher value of moisture in chicken breast (72.8%), while the lowest was found in foreleg lamb meat (55.09%). The percentage of fat was higher in foreleg lamb (33.55%). The lowest value was observed in chicken breast (6.74%). The highest content of protein was found in chicken breast meat (20.02%), with a smaller amount in foreleg lamb (11.04%). A reverse relationship was concluded from this research between moisture and protein versus fat. The differences were significant ($P \leq 0.01$).

Dark meat, fat and protein, moisture, white meat

Introduction

The quality of meat in terms of physical characteristics and chemical content, as well as the type of animal (whether the meat is from ruminants or poultry), reflects the taste of the consumer and his health benefits – the possible utilisation of the components of meat (fat and protein).

Atherosclerosis and cholesterolemia are two serious human diseases. These diseases are assumed to be influenced by diets rich in highly saturated fatty acids and cholesterol. Attempts have therefore been made to produce low-cholesterol meat and eggs (Suchon et al. 2005).

The duty of professionals in the examination of meat and meat products is to provide acceptable quality to the consumer and protect the consumer health against diseases that may affect the individual (Mala 2004).

Poultry meat is one of the important indicators of the extent of the welfare and advancement of peoples and nations (Rose 1997). Poultry adipose cells differ from those of farm animals since they have only a limited capacity for lipogenesis – forming new triglycerides within the cell. Thus, they rely mainly on the capture of circulating lipids that have been synthesized in the liver or released by digestion in the gut. There are marked differences in adipose cell numbers and diameters between layer-type and broiler-type poultry, with the lean broiler-type birds having fewer and smaller cells. The early restriction of nutrient intake, although it inhibits adipose cell hypertrophy, has only a slight effect on adipose cell hyperplasia. Thus, adequate cell numbers for fat deposition are present in birds once they are returned to an ad libitum diet. Growth of the abdominal fat pad in chickens is the result of a combination of adipose cell hyperplasia and hypertrophy up to about 12 to 14 weeks, after which it continues mainly by hypertrophy.

Lambs have little prenatal development of subcutaneous fat, although it develops rapidly immediately after birth.

Poultry meat, as is the case for the meat of other livestock animals, consists of proteins, carbohydrates, fats, vitamins, enzymes, mineral elements and water. The value of poultry

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meat from the biological standpoint is extremely high, "and this is determined through the relationship between protein to high protein value-lying, which in poultry is 1:13, while in cows it is 1:4.3. This is reflected in the proportion of protein in poultry which in members of the human body is 19%. As for fatty substances, these are distributed regularly on the bodies of birds (Mahmoud 1988). When comparing the chemical composition of laying hens and chicken meat, the content of water, fat, protein and ash was found to be (63.4, 13.7, 19.0, 1.0%) and (67.5, 11.5, 19.8, 1.2%) for laying hens and chicken meat, respectively (Naji and Fayad 1989). Poultry meat has a nutritional value higher than other types of meat. These meats are economical and easy to prepare and contain essential nutrients for human nutrition which are characterized by a low content of energy and possess all the essential fatty acids for human nutrition (Horbanczuk 2003).

Hasan and Abboud (2005) showed that the quality and type of poultry meat is evaluated by the distribution of fat in muscle tissue. The nutritional composition will vary according to the breed feeding regimen, the season and the meat cut. In general, lean red meat has a low fat content, is moderate in cholesterol and rich in protein, and incorporates many essential vitamins and minerals. The aim of this study was to find the effect of each type of meat on the main organic parameters that reflect on human health.

Materials and Methods

Four models of fresh samples of different types of meat, consisting of chicken breast, lamb breast, lamb foreleg and chicken wings were obtained randomly from the local market and used for the determination of certain organic chemical compositions. Four replicates from each sample were used. The content of moisture, fat and protein was estimated in each model.

Samples were weighed by an electronic balance (Mettler Toledo 204) with sensitivity ± 0.1 g. The moisture percentage in the samples were determined by using oven, percentage of moisture = amount of moisture / weight of the original sample × 100). Estimation of fat was performed using the ether extraction method and a Universal extraction unit model b-811 (Buch, Germany) was used (% of fat = amount of fat / weight of the original sample × 100).

Nitrogen determination was performed by the Kjeldahl system method with the apparatus Digestion Unit Model K-424, distillation unit Model K-355 and Scrubber Unit Model B-414.

The data from all experiments were subjected to ANOVA procedures appropriate to a completely randomized design, and the significance of differences between the means estimated Duncan's test (Duncan's new multiple range test) was applied. The probability level of $P < 0.01$ was selected. Values in percentages were subjected to the transformation of arc sin × 100. All statistical analyses were performed using the software SPSS.V.23. for Windows® (SPSS Inc., Chicago, IL).

Results and Discussion

Moisture is considered one of the important physiochemical attributes in meat because it plays a basic role in the palatability of meat.

The results of moisture content determination (Table 1 and Fig. 1) showed that there are insignificant ($P > 0.01$) differences between chicken parts (breast and wings), while significant differences were observed between lamb breast and foreleg. These results mean that there was a similar amount of moisture in parts of white meat (72.8% and 71.54%) in breast and wing respectively, and there were widely differing amounts of moisture in dark meat (59.56% and 55.09%) in lamb breast and foreleg. However, higher proportion of moisture make lean meat easy for cooking and digestive further that less of fat percentage and increase of protein level meat (Naji and Fayade 1989). This could be attributed to the fact that red meat contains a high amount of tallow in which the reverse relationship was found between the moisture and fat content of red meat (Mala 2004). Al Aswaad and Basheir (2000) and Miček et al. (2009) reported that there is a reverse relationship between the fat content of the meat on one hand and moisture and protein on the other.

Table 1. Mean ± SE of percentage moisture, fat and protein components of chicken breast, lamb breast, lamb foreleg and chicken wing

Samples	Parameters [%]		
	Moisture	Fat	Protein
Chicken breast	72.8 ± 0.44 [c]	6.74 ± 0.19 [a]	20.02 ± 0.09 [d]
Chicken wing	71.54 ± 0.28 [c]	15.30 ± 0.18 [b]	16.27 ± 0.06 [c]
Lamb breast	59.56 ± 0.27 [b]	24.26 ± 0.18 [c]	14.16 ± 0.39 [b]
Lamb foreleg	55.09 ± 1.34 [a]	33.55 ± 0.37 [d]	11.04 ± 0.46 [a]

Means ± SE: 4 samples - 4 replicates, values within columns with different superscripts differ significantly ($P < 0.01$)

The data on fat content showed significant differences ($P < 0.01$) between groups. A higher value was found in lamb foreleg (33.55%) and a lower value in chicken breast meat (6.74%). This can be explained by type of red meat, which is a kind of marble meat (more accumulate fat between tissue, which is not found in white meat (Al Aswaad and Basheir 2000).

The values of protein percentages between groups showed significant differences ($P < 0.01$). The protein content in the meat in all groups showed the same pattern as moisture related to the difference between chicken meat and lamb meat. The highest value was found in chicken breast meat and the lowest in lamb foreleg.

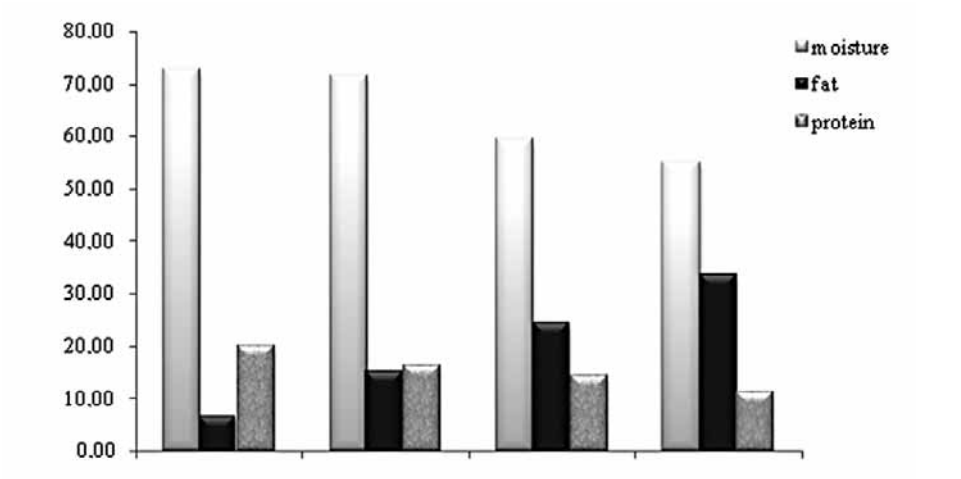

Fig. 1. The percentage of moisture, fat and protein components in chicken breast and wing and lamb breast and foreleg

Conclusions

The results of this research indicate that there is a reverse relationship between the fat percentage in meat on one hand and moisture and protein on the other. There are also significant differences between chicken meat and lamb meat in all the parameters studied.

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