

PRELIMINARY RESEARCH OF SEVERAL NUTRIENTS ANALYZED IN DIFFERENT COMMERCIAL PORTIONS OF POULTRY MEAT

M. Costache^{1*}, Il. Van¹

¹University of Agricultural Sciences and Veterinary Medicine of Bucharest, Romania

Abstract

In this project, four different poultry species have been selected, for each two different commercial parts further on being included in the study: breast and thigh. The analysis included nutritive quality parameters such as: free fat, protein (nitrogen), water, ash, and collagen. The project used the following standardized methods of analysis: SR ISO 1442:2010, SR ISO 3496:1997/A1:1999, SR ISO 936:2009, SR ISO 1444:2008 and SR ISO 937:2007. Also, the statistical analysis was performed using the IBM® SPSS® Statistics 20 (comparison between species and commercial parts). The results were mostly similar to the ones found in the scientific literature. The difference between the fat content of goose meat and turkey meat was statistically significant ($p < 0.0001$) (for both commercial parts). Also, the water content was lower for goose meat compared to the other commercial parts of the species selected for the study. The ash content was not different between the parts and species included in the study, and the same could be observed for the collagen. As for the chicken meat commercial parts, it can be confirmed what the scientific literature was mentioning in different other studies: the protein content (nitrogen percentage) of the breast meat part is higher compared to the thigh part, for the same species. The main conclusion of this study could be that these preliminary results are valuable and may be followed through with a thorough analysis of the amino acids and fatty acids profiles, for further comparisons.

Key words: poultry meat, nutrients, animal products

INTRODUCTION

Poultry meat represents nowadays one of the most popular food items in the world, with a variety of ways in which might be consumed. But this is not the only reason. Besides its versatility, it is also a suitable source of valuable proteins, as well as vitamins and minerals. Also, its fat content makes it a safe food item to be consumed by different categories of people, including those affected by high blood cholesterol and diabetes. It may also be considered suitable for children, as a part of a normal development diet.

Taking these facts into consideration, it may be interesting to further study and analyse poultry meat content in different nutrients, based on the selected portion as well as the species of origin. This study aims

to offer a small insight as well as a starting point for a nutritive quality analysis of several commercial poultry meat portions, with an emphasis on the protein and fat content.

MATERIALS AND METHODS

The nutrient groups selected for this study were: protein content [% of nitrogen], total fat content [%], water content [%], ash [%] and collagen.

The samples were collected from the local marketplaces and were sent to the laboratory for analysis in portions with similar weight of 500 g. Each category included 30 samples of the same portion and the same species of origin, such as: chicken breast, chicken thigh, duck breast, duck thigh, goose breast, goose thigh, turkey breast and turkey thigh. The selected muscle sections were: *Pectoralis major*, *Pectoralis minor*, *Gastrocnemius pars interna* and *Gastrocnemius pars externa*.

*Corresponding author:
costachemihai91@yahoo.com

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Further on, the laboratory analysis was performed based on the following reference methods:

SR ISO 1442:2010 – Meat and meat products. Water content determination (Reference method);

SR ISO 3496:1997/A1:1999 – Meat and meat products. Hydroxyproline content determination;

SR ISO 936:2009 – Meat and meat products. Total ash content determination;

SR ISO 1444:2008 – Meat and meat products. Free fat content determination;

SR ISO 937:2007 – Meat and meat products. Nitrogen content determination (Reference method).

The data was statistically interpreted using the IBM SPSS® Statistics 20 software.

RESULTS AND DISCUSSIONS

The free fat results showed that the highest percentage was observed for the goose breast and thigh portions (30.92% and 28.67%, respectively). The lowest mean value in this series was the one for the turkey breast (0.285%) and the one for the turkey thigh (3.26%) (table 1). The statistical analysis showed that there is a significant difference ($p < 0.0001$) concerning the breast portions included for analysis, between species such as goose and turkey (fig. 1). The results showed here are similar to those found by Bogosavljevic-Boskovic *et al.* (2010).

Table 1 Free fat content for commercial parts of poultry meat [%]

Species and commercial part	Minimum	Maximum	Mean (\pm standard dev.)
Chicken breast	1.36	1.54	1.4537 \pm 0.05543
Goose breast	30.4	31.48	30.9290 \pm 0.35966
Turkey breast	0.21	0.35	0.285000 \pm 0.0443147
Duck breast	5.21	5.43	5.3313 \pm 0.06595
Chicken thigh	6.34	6.76	6.5443 \pm 0.13143
Goose thigh	37.44	39.7	38.673333 \pm 0.6941347
Turkey thigh	3.19	3.33	3.2637 \pm 0.04106
Duck thigh	27.85	28.34	28.0750 \pm 0.15876

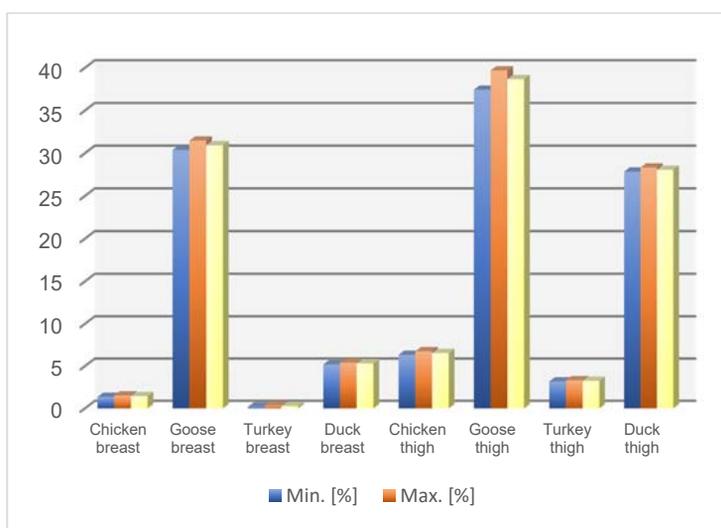


Fig. 1 Free fat content for commercial parts of poultry meat [%]

This team has obtained a free fat percentage of 1.96-2.78 % for chicken breast and 6.29-8.92 % for the chicken thigh. The results are higher than the ones obtained by

Ali *et al.* (2007): 1.05 % of free fat for chicken breast and 1.84 % for duck breast. Huda *et al.* (2011) also showed a fat percentage of 1.81-2.32 for duck breast (Peking and Muscovy) and 3.24-3.63 % for duck thigh (same breeds). For turkey, Paleari *et al.*, 1998 showed values of 1.6 % for turkey meat mix, while Barbut and Mittal (1993) obtained similar results: 1.1 % for breast portion and 3.9 % for thigh. The goose portions have also been analysed by other teams. Geldenhuys *et al.* (2013) mention a 4.43 % for goose breast and 4.64 % for goose thigh (Egyptian breed). Another study

of Okruszek *et al.* (2013) showed similar results: 2.39-3.06 % for breast and 2.84-3.91% for thigh.

The protein content observed in this study showed mean values for breast portions starting at 18.92 % (goose) and ending at a highest of 22.55 % (chicken). Considering the thigh portions, the lowest mean value was 15.74 % (duck) and the highest was 21.71 % (turkey) (table 2). The differences between commercial portions and species could not be considered statistically significant ($p > 0.05$) (fig. 2).

Table 2 Protein content (nitrogen) in the analysed commercial parts of poultry meat [%]

Species and commercial part	Minimum	Maximum	Mean (\pm standard dev.)
Chicken breast	21.95	23.36	22.554 \pm 0.4215
Goose breast	18.56	19.22	18.926 \pm 0.2075904
Turkey breast	21.57	22.19	21.8193 \pm 0.17475
Duck breast	22.26	22.77	22.5307 \pm 0.17838
Chicken thigh	20.1	20.25	20.180333 \pm 0.0416457
Goose thigh	17.41	17.68	17.558667 \pm 0.0869694
Turkey thigh	21.06	22.18	21.712 \pm 0.33981
Duck thigh	15.53	15.97	15.746 \pm 0.13114

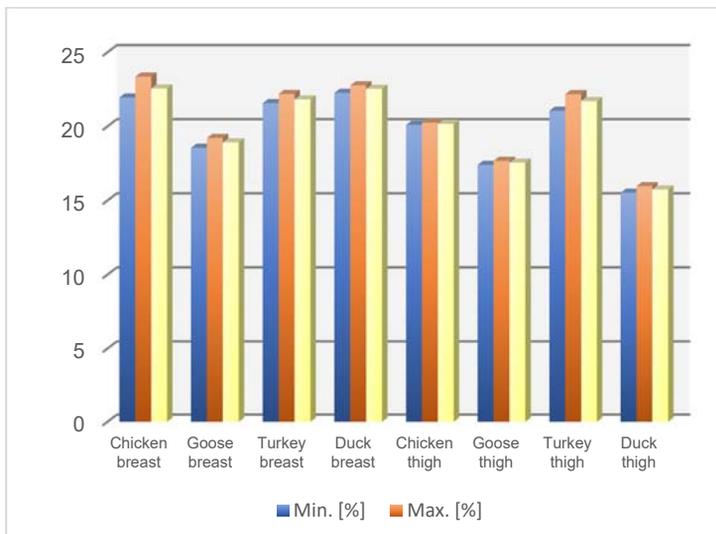


Fig. 2 Protein content (nitrogen) in the analysed commercial parts of poultry meat [%]

These results are similar to those of Ali *et al.* (2007). They have found that the chicken breast portions had a 22.04 % protein content, while the duck breast ones were also close to this value: 20.06 %. The turkey portions analysed by Paleari *et al.* (1998) showed a protein content of 22.2 %.

Barbut and Mittal (1993) also obtained 18.1 % protein content of turkey breast and 18.1 % for turkey thigh.

Bogosavljevic-Boskovic *et al.* (2010) obtained protein content values of 22.44-22.96 % for chicken breast and 18.26-19.5 % for chicken thigh. Considering the latter, the

values are close to the ones mentioned before. Also, Geldenhuys *et al.*(2013) mentioned a protein content of 20.81 % for goose breast and 19.44 % for goose thigh. Similar to these, Okruszek *et al.* (2013) presented these results: 21.82 %-21.96 % for goose breast and 21.17 %-21.36 % for goose thigh. In this study, water percentage had results with values around 70 % (applicable to all except for goose breast and thigh and duck thigh (table 3). For goose portions, other studies obtained similar results. Geldenhuys *et al.* (2013) presented a mean of 72.56 % for breast and 72.08 % for thigh. Okruszek *et al.* (2013) obtained values of 74.03-75.42 % for goose breast and 72.79-

74.52 % for goose thigh. Duck portions were also studied by other teams. Ali *et al.* (2007) had a final water percentage value of 76.41 % for the duck breast, while Huda *et al.* (2011) obtained the following values: 77.08-79.44 % for the breast part and 76-78-78.26 % for the thigh one. Considering the turkey meat, Barbut and Mittal (1993) obtained values of 77.5 % water content for turkey breast and 77.5 % for the thigh, while Paleary *et al.* (1998) had an overall value of the water content of 75.1 % (turkey meat mix).

These results could not be considered statistically significant ($p > 0.05$), as the differences are too low between portions and between species (fig. 3).

Table 3 Water content in the analysed commercial parts of poultry meat [%]

Species and commercial part	Minimum	Maximum	Mean (\pm standard dev.)
Chicken breast	75.03	75.25	75.133667 \pm 0.0647267
Goose breast	52.23	52.77	52.5117 \pm 0.16095
Turkey breast	75.55	75.98	75.771 \pm 0.1314206
Duck breast	70.56	70.94	70.778667 \pm 0.118343
Chicken thigh	74.23	74.98	74.646333 \pm 0.2188762
Goose thigh	43.26	43.86	43.498 \pm 0.17647
Turkey thigh	70.27	75.29	70.886333 \pm 0.8440807
Duck thigh	55.34	55.76	55.5557 \pm 0.11761

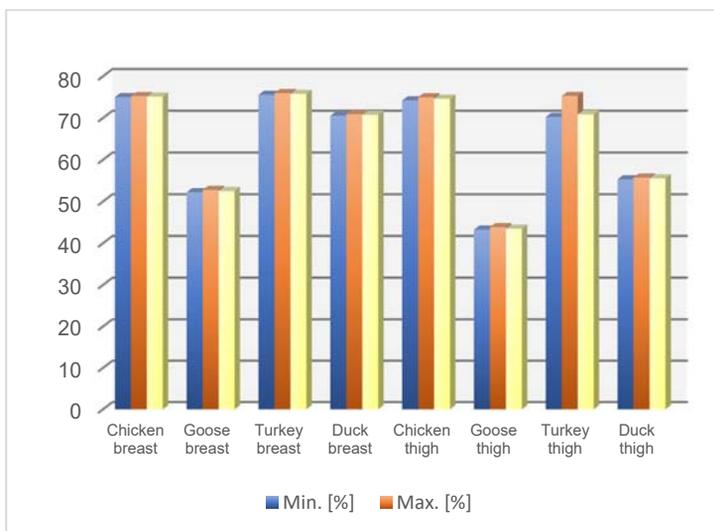


Fig. 3 Water content in the analysed commercial parts of poultry meat [%]

The ash content of the analysed samples showed a minimum of 0.56 % (goose thigh) and a maximum of 1.43 % (duck breast). The highest mean value was the one observed for

the duck breast (1.26 %) (table 4). The differences between the species and the analysed portions cannot be considered statistically significant ($p > 0.05$) (fig. 4).

This study's results are similar to the ones found in the literature. Bogosavljevic-Boskovic *et al.* (2010) had values of 1.01-1.1% total ash for chicken breast and 1.025-1.127 % for chicken thigh. Similarly, Ali *et al.* (2007) showed an ash content of 1.07 % for chicken breast and a 0.92 % for duck breast. This latter value is close to the one obtained by Huda *et al.* (2011): 0.86-1.09 % for duck breast and 0.84-1.08 % for duck

thigh. Different to these can be considered the ones obtained by Barbut and Mittal (1993), which showed a 2.03 % ash content for turkey breast and 2.07 % for turkey thigh. The goose meat ash content is 1.23 % for the breast portion and 1.07 % for the thigh (Geldenhuys *et al.*, 2013). Also, Okruszek *et al.* (2013) observed values of 1.14-1.16 % for the goose breast and 1.12-1.15 % for the goose thigh.

Table 4 Ash content [%] in the analysed commercial parts of poultry meat

Species and commercial part	Minimum	Maximum	Mean (\pm standard dev.)
Chicken breast	1	1.15	1.005 \pm 0.0273861
Goose breast	0.76	0.94	0.841 \pm 0.0553
Turkey breast	1.06	1.26	1.164 \pm 0.0576314
Duck breast	1.14	1.43	1.266 \pm 0.092274
Chicken thigh	0.85	1.15	1.004667 \pm 0.0848013
Goose thigh	0.56	0.78	0.676 \pm 0.0689628
Turkey thigh	0.99	1.25	1.137 \pm 0.0758469
Duck thigh	0.57	0.79	0.668 \pm 0.0642409

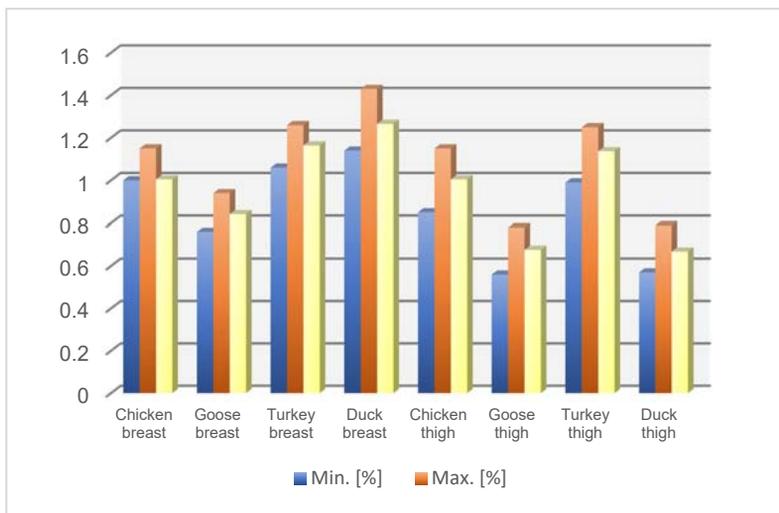


Fig. 4 Ash content [%] in the analysed commercial parts of poultry meat

The collagen content of the analysed samples has varied between 0.162 % and 0.562 % (table 5). The literature shows studies such as the one of Paleari *et al.* (1998), in which the collagen content of turkey meat was set to 0.16 %.

According to a different source, the collagen content of white meat is 0.2-0.4 % (Petracci and Cavani, 2012). In our study, the variation is not high, the lowest quantity could be considered the one in goose breast and the highest in the chicken thigh (fig. 5).

Table 5 Collagen content [%] in the analysed commercial parts of poultry meat

Species and commercial part	Minimum	Maximum	Mean (+ standard dev.)
Chicken breast	0.21	0.58	0.406667±0.1181271
Goose breast	0.11	0.21	0.162±0.0272156
Turkey breast	0.12	0.38	0.274333±0.0845142
Duck breast	0.22	0.33	0.274667±0.0356935
Chicken thigh	0.41	0.69	0.562667±0.0809399
Goose thigh	0.21	0.31	0.267±0.0293786
Turkey thigh	0.25	0.48	0.3627±0.06346
Duck thigh	0.25	0.32	0.28±0.0194759

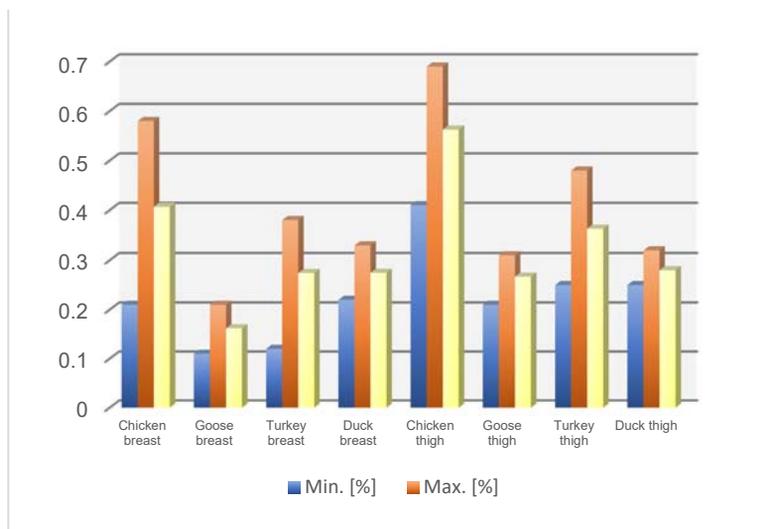


Fig. 5 Collagen content [%] in the analysed commercial parts of poultry meat

CONCLUSIONS

This study can represent one of the starting points in our research to a better understanding of different nutrients in the commercial portions available on our markets. Of course, the data can be interpreted thoroughly by further including an amino acids profile, as well as a fatty acids profile as well, especially looking at the polyunsaturated ones, with a very high impact on human diet and implicitly, the human health.

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