# RESEARCH ON THE QUALITATIVE PARAMETERS OF THE GUINEA FOWL MEAT

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**Abstract**

*Nowadays, the prevention of diseases through a healthy diet for the modern society, is becoming a problem of major interest, both socially, economically and politically.*

*In this context, the objective of the research was to evaluate the quality of the meat obtained from guinea fowls slaughtered at 84 days. A number of features related to fat content, cholesterol concentration, concentration in mineral substances and a number of indicators regarding meat microbiology were investigated.*

*Data on saturated fatty acids showed that the main constituent was C16: 0 palmitic acid in both the leg (27.06 ± 0.02 g / 100 g) and the breast (28.07 ± 0.02 g / 100g). The results obtained from the analysis of monounsaturated fatty acids showed that C18: 1n9 cis oleic acid was dominant with an average of 29.54 ± 0.01 g / 100g for the leg and 29.84 ± 0.01, g / 100g for the chest muscles. The highest values for the mineral substances were recorded for iron, namely 33.31 g / 100 for the pectoral musculature and 71.22 g / 100g for the meat from the leg. Next was zinc with a value of 26.35 g / 100g for the breast and 78.15 g / 100g for the leg.*

*Guinea fowl meat has a number of very valuable biological properties, which is why its exploitation in intensive systems has broad development prospects.*

**Keywords:** Guinea fowl, quality, poultry, microbiology, minerals

## INTRODUCTION

Meat consumption worldwide has had an upward trend over the last 10 years, also correlated with the positive demographic evolution about it. Therefore, an implicit growth and consumption of poultry meat, together with the proven meat of another species.

Poultry meat for human consumption must come from healthy birds, then it is known because part of the specific diseases can be transmitted by human consumption of meat [2].

Whatever the constraints, food control must nevertheless remain the main objective of civilized societies [3].

The degree of contamination of the meat differs greatly in terms of the analyzed lot, carcass, but also the anatomical region.

The assessment of the degree of contamination is a lot of meat that must be able to establish, to obtain results in a larger number of samples.

Researches of qualitative indices of poultry meat, which would contribute to a general overview of the nutritional and dietary properties of this type of product, are becoming less and less frequent [4].

The purpose of the examination differs microbiologically according to the assessment of the general microbiological quality, the detection of the pathogenic germs, the stabilization of the degree of freshness and the care of the causes and after the modification of the changes [1].

## MATERIAL AND METHOD

The analysed biological material was represented by 50 specimens of grey guinea fowl (*Numida Meleagris*), which were grown by applying the species-specific technology.

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*The manuscript was received: 04.10.2019*
*Accepted for publication: 25.03.2020*

The actual determinations were performed on a number of 30 individuals, who were slaughtered at the age of 84 days.

During the researches, the followed indicators were represented by the content in fatty acids, the concentration in cholesterol, the concentration in mineral substances and a series of indicators regarding the microbiology of the meat.

The determination of the content in fatty acids was performed by the gas chromatographic method according to SR CEN ISO / TS 17764-1:2008 and with SR CEN ISO / TS 17764-2:2008. The determination of the concentration in cholesterol is in accordance with: AOAC International 1996 AOAC Official Method 99136 Fat in meat and meat products. Calcium and magnesium concentrations were determined according to the method presented in SR EN ISO 6869:2002, and sodium and potassium according to SR ISO 7485:2001. Phosphorus was determined according to the method presented in Regulation (EC) no. 152/2009.The concentrations of copper, iron, manganese and zinc were determined according to the method presented in Regulation (EC) no. 152/2009.

The method used to determine *Staphylococcus aureus* in food is described in ISO 6888-3: 2003. Positive plaques for the identification of bacteria of the genus *Salmonella spp.* were subjected to biochemical and serological tests (SR EN ISO 6579:2003 / AC:2009). The identification of *Escherichia coli* was performed according to the standard (identification methodology: STAS ISO 4832/1992 and the one for determining the probable number: SR EN ISO 7251-2009).

The acquired data were statistically processed to obtain the main descriptors (mean, standard deviation, coefficient of variation - CV%).

## RESULTS AND DISCUSSIONS

The data obtained on saturated fatty acids origin from the musculature of the legs, revealed that the main constituent is palmitic acid C16:0 with an average of 27.06 ± 0.02 g / 100 g, with of variation 27.01 g / 100 g (minimum) and 27.07 g / 100 g (maximum); the constituent with the lowest weight is represented by C8:0 caprylic acid with an average of 0.02 ± 0.01 g / 100g, with a value that can range from a minimum of 0.01 g / 100g and a maximum of 0.03 g / 100g. The total saturated fatty acids resulting from the legs muscles was 39.17g / 100g.

In the case of monounsaturated fatty acids, dominant was oleic cis acid C18:1n9 with an average of 29.54 ± 0.01 g / 100g, the minimum being 29.55 g / 100g and the maximum 29.56 g / 100g; the acid with the lowest weight was erucic acid C22:1n9 with an average value of 0.06 ± 0.01 g / 100g with a variation limit of between 0.06 g / 100g, minimum value and 0.09 g / 100g-maximum value. The amount of monounsaturated fatty acids was 35.52 g / 100g.

Results on polyunsaturated fatty acids indicated a total value of 25.03 g / 100g, the lowest value was recorded by C18: 3n6 linolenic acid with an average of 0.02 ± 0.01 g / 100g , the minimum value being of 0,01 g / 100g, and the maximum of 0.04 g / 100g, on the opposite pole being C18: 2n6 linoleic acid with 19.94 ± 0.02 g / 100 g with values that ranged between the minimum of 19.90 g / 100g and the maximum value of 19.98 g / 100g. The maximum value of the coefficient of variation did not exceed 13.21%, which is synonymous with intermediate variability (Table 1).

The results regarding saturated fatty acids of the chest musculature, indicates a total of 40.69 g / 100 g, the lowest one is recorded by capric acid C10:0 and lauric acid C12:0, both with a mean value of 0.05 ± 0.01, based on limits value of 0.04 g / 100g (minimum) and 0.07 g / 100g (maximum). The acid with the highest proportion was palmitic acid C16: 0 with an average of 28.07 ± 0.02. Total monounsaturated fatty acids reached a value of 36.13 g / 100g, with a major component represented by oleic cis acid C18:1n9 with a result of 29.84 ± 0.01 g / 100g, with values ranging from 29.83 g / 100g - minimum and 29.86 g / 100g - maximum; the acid with the lowest weight was erucic acid C22:1n9 0.08 ± 0.01 g / 100g with minimum values of 0.07g / 100g and maximum value of 0.10 g / 100g.

Of the total 22.97 g / 100 g of polyunsaturated fatty acids, linoleic Cis C18: 2n6 acid had the highest weight with an average of 16.28 ± 0.05, with a minimum of 16.29 g / 100g and a maximum of 16.31 g / 100 g, the smallest contribution is linolenic acid C18: 3n6 with an average of 0.12 ± 0.01 g / 100g - the minimum value being 0.11 g / 100g and the maximum value of 0.13 g / 100g. And in this case, the highest value of the coefficient of variation was 15.10 g / 100g (medium variability) (Table 1).

Regarding the ratio between fatty acids Ω6 and Ω3, it had a higher value among the legs, namely 11.90 and 9.13 for the amino acids of the breast.

The SFA / UFA ratio was 0.64 for the leg and 0.69 for chest musculature; the PUFA / MUFA ratio had values of 0.70 (legs) and 0.62 (chest) (Table 1).

Table 1 Fatty acid content of the meat

| **Specification** | **Legs** | | | | **Chest** | | | |
|---|---|---|---|---|---|---|---|---|
| **Fatacids** | **Statistical estimators** | | | | | | | |
| | $X+S_x$ (g AG/100g ) | **V%** | **Min.(g AG/100g)** | **Max.** (g AG/100g) | $X+S_x$ (g AG/100g ) | **V%** | **Min.** (g AG/100g ) | **Max.** (g AG/100g ) |
| C8:0 | 0.02±0.01 | 5.00 | 0.01 | 0.03 | 0.06±0.01 | 9.44 | 0.05 | 0.06 |
| C10:0 | 0.05±0.01 | 5.20 | 0.04 | 0.05 | 0.05±0.01 | 3.16 | 0.04 | 0.07 |
| C12:0 | 0.05±0.01 | 4.16 | 0.03 | 0.05 | 0.05±0.01 | 4.96 | 0.04 | 0.07 |
| C14:0 | 1.07±0.05 | 2.34 | 1.05 | 1.07 | 1.04±0.02 | 1.28 | 1.03 | 1.05 |
| C15:0 | 0.57±0.01 | 2.66 | 0.57 | 0.59 | 0.75±0.03 | 6.61 | 0.69 | 0.77 |
| C16:0 | 27.06±0.02 | 0.02 | 27.01 | 27.07 | 28.07±0.02 | 0.14 | 28.02 | 28.09 |
| C17:0 | 0.24±0.01 | 13.21 | 0.22 | 0.23 | 0.09±0.01 | 6.66 | 0.08 | 0.09 |
| C18:0 | 9.77±0.01 | 0.21 | 9.75 | 9.79 | 10.11±0.02 | 0.46 | 10.09 | 10.15 |
| C20:0 | 0.12±0.09 | 12.39 | 0.12 | 0.14 | 0.17±0.02 | 15.10 | 0.14 | 0.19 |
| C24:0 | 0.31±0.01 | 4.98 | 0.29 | 0.31 | 0.32±0.03 | 3.82 | 0.31 | 0.33 |
| **SFA** | **39.26** | **-** | **-** | **-** | **40.69** | **-** | **-** | **-** |
| C14:1 | 0.27±0.01 | 9.79 | 0.28 | 0.29 | 0.24±0.01 | 4.87 | 0.23 | 0.25 |
| C15:1 | 0.08±0.01 | 6.92 | 0.08 | 0.09 | 0.18±0.01 | 5.55 | 0.17 | 0.19 |
| C16:1 | 5.07±0.01 | 0.34 | 5.06 | 5.09 | 5.19±0.02 | 0.67 | 5.16 | 5.23 |
| C17:1 | 0.27±0.01 | 5.72 | 0.25 | 0.28 | 0.22±0.01 | 5.17 | 0.21 | 0.23 |
| C18:1n9 | 29.54±0.01 | 0.07 | 29.55 | 29.56 | 29.84±0.01 | 0.05 | 29.83 | 29.86 |
| C22:1n9 | 0.06±0.01 | 6.04 | 0.06 | 0.09 | 0.08±0.01 | 12.50 | 0.07 | 0.10 |
| C24:1n9 | 0.30±0.01 | 3.89 | 0.29 | 0.31 | 0.38±0.01 | 3.01 | 0.37 | 0.39 |
| **MUFA** | **35.59** | **-** | **-** | **-** | **36.13** | **-** | **-** | **-** |
| C18:2n6 | 19.94±0.02 | 0.20 | 19.90 | 19.98 | 16.28±0.05 | 0.10 | 16.29 | 16.31 |
| C18:3n6 | 0.02±0.01 | 7.90 | 0.01 | 0.04 | 0.12±0.01 | 9.89 | 0.11 | 0.13 |
| C18:3n3 | 0.74±0.01 | 1.35 | 0.73 | 0.74 | 0.55±0.01 | 3.63 | 0.53 | 0.57 |
| C18:2 | 0.27±0.01 | 7.80 | 0.26 | 0.29 | 0.28±0.04 | 3.57 | 0.27 | 0.29 |
| C18:4n3 | 0.43±0.01 | 4.65 | 0.43 | 0.45 | 0.54±0.01 | 2.84 | 0.52 | 0.55 |
| C20:2n6 | 0.29±0.01 | 3.44 | 0.28 | 0.30 | 0.30±0.01 | 8.81 | 0.27 | 0.32 |
| C20:3n6 | 0.25±0.01 | 13.03 | 0.21 | 0.27 | 0.56±0.02 | 3.09 | 0.54 | 0.57 |
| C20:3n3 | 0.20±0.01 | 10.58 | 0.18 | 0.22 | 0.20±0.03 | 10.58 | 0.18 | 0.22 |
| C20:4n6 | 1.79±0.02 | 1.96 | 1.75 | 1.79 | 2.58±0.02 | 1.36 | 2.54 | 2.61 |
| C22:2n6 | 0.22±0.01 | 9.09 | 0.20 | 0.24 | 0.19±0.01 | 7.87 | 0.17 | 0.20 |
| C22:3n6 | 0.20±0.01 | 5.67 | 0.19 | 0.21 | 0.20±0.05 | 4.74 | 0.19 | 0.21 |
| C20:5n3 | 0.30±0.01 | 3.89 | 0.29 | 0.31 | 0.28±0.02 | 3.56 | 0.27 | 0.29 |
| C22:4n6 | 0.10±0.01 | 9.98 | 0.09 | 0.11 | 0.16±0.04 | 9.82 | 0.15 | 0.18 |
| C22:5n3 | 0.11±0.01 | 9.14 | 0.11 | 0.12 | 0.15±0.01 | 10.80 | 0.13 | 0.16 |
| C22:6n3 | 0.12±0.01 | 12.79 | 0.11 | 0.12 | 0.33±0.08 | 4.35 | 0.31 | 0.34 |
| **PUFA** | **24.97** | - | - | - | **22.70** | - | - | - |
| Other fat acids | 0.13±0.01 | 7.69 | 0.12 | 0.14 | 0.34±0.02 | 5.87 | 0.32 | 0.36 |
| Ω3 | **1.91** | | | | **2.23** | | | |
| Ω6 | **22.81** | | | | **20.36** | | | |
| Ω6/ Ω3 | **11.90** | | | | **9.13** | | | |
| SFA/UFA | **0.64** | | | | **0.69** | | | |
| PUFA/MUFA | **0.70** | | | | **0.62** | | | |

*SFA- Saturated fat acids*MUFA- Monounsaturated fat acids
*PUFA- Poliunsaturated fat acids*UFA- Unsaturated fat acids

For the musculature collected from the legs, a cholesterol concentration of 0.19 ± 0.02 g / 100g was recorded, with a minimum of 0.17 g / 100g and a maximum of 0.20 g / 100g.In the case of the chest, the analysis of the cholesterol concentration shows an average of 0.12 ± 0.02, the minimum value being 0.10 g / 100g and the maximum one slightly rising to 0.13 g / 100g.

We mention that in neither case were values of the coefficient of variability greater than 10% found, resulting in good homogeneity of the studied characteristic (Table 2).

Table 2 Cholesterol concentration of musculature from guinea fowls slaughtered at 84 days

| Specification | Statistical estimators | | | |
|---|---|---|---|---|
| | $X+S_x$ (g/100g) | V% | Min. (g/100g) | Max. (g/100g) |
| **Whole Legs** | 0.19±0.02 | 1.45 | 0.17 | 0.20 |
| **Chest** | 0.12±0.02 | 3.99 | 0.10 | 0.13 |

The mineral substances in the analyzed muscles that were evaluated quantitatively were zinc, manganese, iron, copper, potassium, sodium, magnesium, phosphorus and calcium.

The highest values were recorded for iron, namely 33.31 g / 100 for the pectoral musculature and 71.22 g / 100g for the meat from the legs. Next was zinc with a value of 26.35 g / 100g for the breast and 78.15 g / 100g for the legs.

The lowest values were those recorded by the quantities of magnesium (0.13 g / 100g-breast and 0.10 g / 100g-legs) (Figure 1).

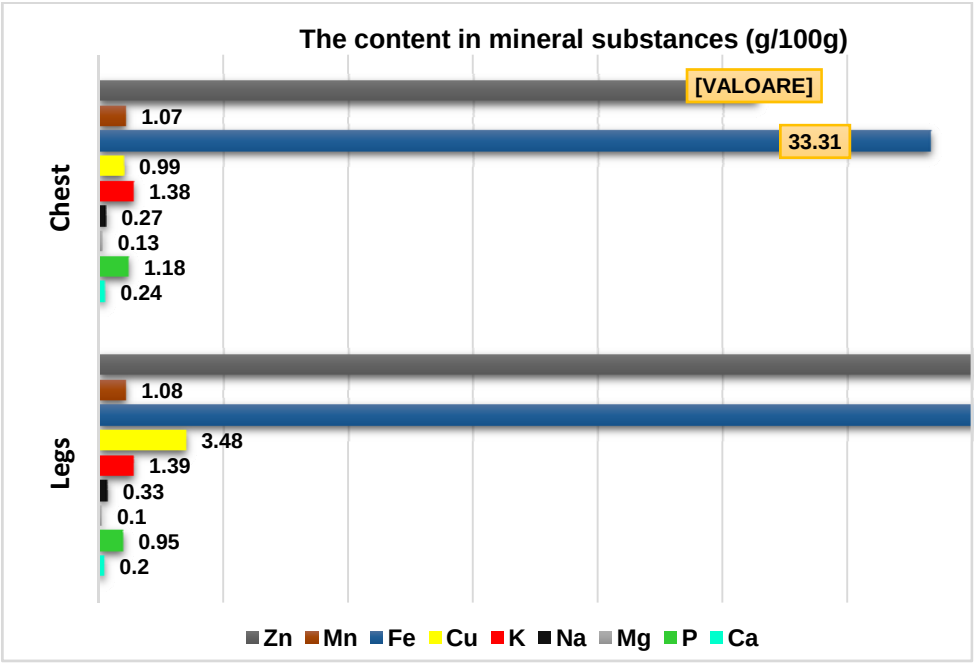


Fig. 1 The content of mineral substances of meat provided by guinea fowl

The laboratory analyzes showed that the biological load of the meat analyzed for both sliced portions was very low, falling within the parameters required by the legislation in force. Bacteria of the genus *Salmonella* and *Escherichia coli* were absent in all samples (Table 3).

Table 3 Detection *Salmonella* on meat provided by guinea fowl slaughtered at 84 days

| Analyzed anatomical part | Results | Referential |
|---|---|---|
| | *Salmonella*/25 grams | |
| Whole leg | absent / 25 grams | SR EN ISO 6579:2003/AC 2009 |
| Chest | absent / 25 grams | |

For the *Staphylococcus aureus* parameter, in the case of legs, the values obtained were between a minimum of 8.45x $10^2$ufc / ml and a maximum of 9.2 x $10^2$ufc / ml, with an average of 8.8 ± 13.5x$10^2$ufc / ml. In the musculature of the chest area the analyzes resulted in an average value of 9.5 ± 6.25x$10^2$ufc / ml, with values ranging from a minimum of 9.35x$10^2$ufc / ml and a maximum of 9.7x$10^2$ufc / ml. The values of the coefficient of variation (1.46-3.43%) indicate a good homogeneity of this attribute. (Table 4).

For *Escherichia coli*, the results obtained in the legs were between the minimum value of 11.15 x $10^3$ufc / ml and the maximum value of 12.95 x $10^3$ufc / ml resulting in an average value of 12.00 ± 30.19 x $10^3$ufc / ml; The chest had an average value of 16.00 ± 52.78 x $10^3$ufc / ml against the variation limits of 15.0 x $10^3$ufc / ml (minimum) and 17.7 x $10^3$ufc / ml (maximum). In this case also the coefficient of variability (V% = 5.63-7.03) indicates a good homogeneity of the studied characteristic.

The results were within the range required by the legislation (Regulation C.E 2073/2017), which mentions a range of 50 ufc / g and 500 ufc / g (Table 4).

Table 4 Degree of contamination of meat from guinea fowl slaughtered at 84 days

| Analyzed anatomical part | Specification | $X \pm s_x$ | V% | Minimum | Maximum |
|---|---|---|---|---|---|
| Whole leg | *Staphylococcus aureus* (ufc/ml) | 880±13.50 | 3.43 | 845 | 920 |
| | *Escherichia coli* (ufc/ml) | 1200±30.19 | 5.63 | 1115 | 1295 |
| Chest | *Staphylococcus aureus* (ufc/ml) | 950±6.25 | 1.46 | 935 | 970 |
| | *Escherichia coli* (ufc/ml) | 1600±52.78 | 7.03 | 1500 | 1770 |

## CONCLUSIONS

The quality of the meat can be influenced by several factors, some acting during the life of the birds (breeding system, food provided, microclimate factors etc.), others during transport to the slaughterhouse (temperature, large number of chickens in the transport cages, distance and the duration of the transport, the non-observance of the post-transport rest, etc.) or during the slaughter of the birds (by the techniques of stunning, bleeding, scratching or refrigerating the carcasses, etc.).

Guinea fowl meat presents a series of biological properties of great value, which is why their exploitation in intensive system has broad development prospects.

As far as research is concerned, guinea fowl meat can be considered as high quality, due it's low cholesterol and high proportion of polyunsaturated fatty acids.

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