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CHEMICAL AND FATTY ACID COMPOSITION IN MEAT OF YOUNG CHICKENS DIFFERENT HYBRID LINES

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Abstract

This paper presents the results of the study on the chemical contents, the fatty acid composition and the quality loss thermic manufacturing of the calf meat from the hybrid lines Isa Brown and Dekalb. For this purpose, 7 samples of broiler chicken were taken from the hybrid lines Isa Brown and Dekalb. After the slaughter and primary manufacture, the inner fillet and drumsticks are separated. The inner fillet from the hybrid Dekalb contains less water and more proteins compared to the meat from the inner fillet from the hybrid Isa Brown. The meat from the drumsticks from the hybrid line Isa Brown contains more saturated and less unsaturated fatty acids compared to the meat from the hybrid Dekalb. At the meat taken from the inner fillet the contents of the saturated fatty acids is lower than the contents from the unsaturated which is higher at the hybrid line Isa Brown.

Key words: *Isa Brown, Dekalb, thermic manufacturing, pH*

INTRODUCTION

The chicken meat is considered to be a diet food for people from various target groups. Young chicken at the hard hybrid lines have higher muscle mass which corresponds to a higher body mass. The muscles are built of muscle fibers. The muscle fiber is the basic unit of the skeletal muscle and covers 75-90% of the overall muscle mass (Perich and Sar, 1986). The poultry muscle is built of two types of muscle fibers, bright and dark. Dark muscle fibers are richer with sarcoplasm and active oxidases while the light ones contain more glycogenase compared to dark ones. Therefore, in the dark muscles, the oxidase of some substances in the post-mortem corpus is enhanced (Djerić et al., 2009). The white meat contains more protein while the darker more fat (Rašeta and Dakić, 1984). The chicken meat compared to other types of meat in its composition contains a higher percentage of proteins and the lowest percentage of fat and can be used as a diet food (Vasilev and Kitanovski, 2005). According to Baltic et al. (2003), poultry meat on average

contains 70.6-78.2% water 21% protein, 1.85-9.85% fat, about 1% mineral matter and its energy value is 700 kJ per 100 grams. According to Ristic et al. (2008) quoted by Todorovski (2015), the white meat from broilers contains 74.9% water, 0.6% fat, 23.6% protein and 1.2% ash, and white chicken meat contains 72.9% water, 1.35% fat, 25% protein 1.1% ash.

The fatty acids in poultry meat are important from a nutritional point of view. The content of fatty acids in poultry meat has been examined by many authors. According to (Cortinas et al., 2004) the drumstick meat contains the most commonly polyunsaturated fatty acids, then unsaturated and saturated. (Klarik et al., 2005) state that in the breast meat the most common are the polyunsaturated fatty acids and then the unsaturated and saturated. According to their tests in the meat of the inner fillet, the most present are the saturated fatty acids and then the unsaturated and polyunsaturated fatty acids.

The loss of mass during the thermic

treatment of the meat, as well as in the other types of meat and in poultry meat, depends on: the manner of the thermic treatment, the time of thermic treatment, the temperature, the surface of the piece of meat. At normally, thermally treated meat, losses range from 5 to 20%. According to Klarik et al. (2012), calving of

breast meat in chickens is 22.65%.

The objective of our research is to examine the chemical compound, the fatty acid compound and the quality loss of thermic manufacture at the drumstick and inner fillet meat at young chicken at the age of 16 weeks from the hybrid lines Isa Brown and Dekalb.

MATERIAL AND METHODS

The sample materials for the research are 7 broiler chickens from the hybrid line Isa Brown and 7 broiler chicken from the hybrid line Dekalb. Both hybrids are supplied as one-day chicks and breed at the poultry farm on the floor. The chicks are grown on sawdust, fed controlled according to the recommendations of manufacturers of hybrid lines with hanging feeders whose height is regulated by the growth of the chickens. During the breeding, the chickens receive all the vaccines on the recommendation of the veterinary institute. Both hybrids are at the age of 16 weeks. Young chicks were taken from a farm in Kriva Palanka in cardboard boxes with ventilation openings, a special truck for poultry transport and a document that was examined

by a veterinary doctor - inspector (health certificate). The slaughtering and primary processing of the chicken broilers was done according to all sanitary veterinary regulations. Before slaughter, the chicken broilers were subjected to an 8 hour fasting. After slaughtering and primary treatment, the hull of the basic parts was taken out (wings, drumsticks, hooves, breasts and back). Subsequently, each of the basic parts was specially processed so that the skin, bone and the meat were specially taken with a knife, and then measured on a digital scale with an accuracy of 0.01 g. Then the meat was separated from the bones of the inner fillet and the drumstick of all the chickens from the two hybrids.

Chemical composition

The chemical composition was examined (water content, protein, fat mineral matter). The water with the method of drying 105 °C; the fats according to the method of Gerber, proteins

were examined by using the Kjeldahl method, and the mineral material by the method of incineration.

Fatty acid composition

The fat acid composition of the meat was determined by a gas chromatography. The method of work on the sample is AOAC 996.06 GC-FID-7890 A with appliance of the tool Gas chromatograph with Flame Ionized Detector. The fat from the analyzed samples of meat are extracted by hydrolysis methods (acid hydrolysis). The pirogal acid is added so as to avoid liberation of the fatty acids. The methylation of fatty acids was performed according to AOAC GC - FID - 7890. The obtained methyl esters of fatty acid (FAMES) were analyzed by using the appliance of Gas chromatograph with Flame Ionized Detector and a capillary column (SP 2560 100 mx0.25

mm to 0.25 µm). Operating conditions were: injector temperature 225 °C detector 285 °C. Initial temperature of 100 °C-keep 4 minutes increased by 3 °C every minute to a final temperature of 240, hold 15 minutes. The gas holder gas was helium with a flow rate of 0.75 ml / min. Certain FAMES from the analyzed meat were identified separately on the basis of comparison with the respective retention time (which is characteristic of their molecular mass as identification parameter) with retention time standards FAMES (which include cis and trans isomers of fatty acids) standard mix. The analyzed content of each fatty acid is expressed in percentage (%).

Difference in the mass

In determining the heat of the heat treatment of the meat from the digging in the two hybrids, separation of the meat from the bones of the drumsticks was carried out in the two hybrid hens and the measurement of the meat on an electronic scale. The determination of the quality loss of the thermic treatment of the meat from the drumsticks of the two hybrid

lines was made after their thermic treatment at the temperature from 180°C for about 60 minutes (with its electrically heated body (electric cooker). The difference in the mass before and after the thermic treatment gives the quality loss of the thermic treatment of the meat of the drumsticks of the two hybrids.

Statistical analysis

The obtained results of the performed measurements were processed according to

the usual statistical variations according to the method of ANOVA - EXEL 1997- 2003.

RESULTS AND DISCUSSION

Chemical composition

The chemical composition of the drumstick and inner fillet meat of the hybrid lines Dekalb and Isa Brown is presented in Tables 1 and 2.

Table 1. Chemical composition of inner fillet at hybrids Dekalb and Isa Brown.

Chemical parameters	Dekalb Mean±SD	Isa Brown Mean±SD
Water %	74.332±1.059	75.592±0.773
Fat %	0.8±0.365	0.302±0.090
Ash %	1.182±0.023	1.136±0.046
Protein %	23.066±0.6	21.982±0.744
pH	5.832±0.031	5.814±0.059

Table 2. Chemical composition of the meat of drumsticks at the hybrids Dekalb and Isa Brown.

Chemical parameters	Dekalb Mean±SD	Isa Brown Mean±SD
Water %	73.47±0.577*	76.324±1.185*
Fat %	4.5±1.190*	1.6±0.532*
Ash %	1.132±0.060	1.154±0.47
Protein %	20.11±0.573	20.384±0.730
pH	6.16±0.045	6.066±0.37

*Statistically significant differences

The examined chemical composition of inner fillet meat in the hybrids Dekalb and Isa Brown shows that the average water content of the Dekalb hybrid is 74.33, ±1.059 while in Isa Brown it is 75.592±0.773, of which it can be concluded that the meat of inner fillet in the hybrid Isa Brown contains a larger percentage of water than that of the Dekalb. The average fat content of the Isa Brown hybrid is 0.8±0.365 and it is less than the fat content of meat in Isa Brown meat which is 0.302±0.090. The content of ash in the meat of the inner fillet in

the Dekalb hybrid is larger than that of the Isa Brown hybrid and it is 1.182±0.023, while in Isa Brown is 1.136±0.046. The proteins are also more represented in the meat of the inner fillet in the Dekalb hybrid, 23.066±0.6, 21.982±0.744 in Isa Brown, pH in Dekalb is 5.832, while in Isa Brown 5.814.

The average water content of the meat of drumstick in the Dekalb hybrid is 73.47±0.577, while the Isa Brown hybrid is 76.324±1.185, which means that it contains a higher percentage of water from the meat in Dekalb. The salt of fat in

the drumstick meat is more prevalent in Dekalb with 4.5 ± 1.190 opposed to that in Isa Brown 1.6 ± 0.532 . The larger ash content is found in the meat of drumstick in the Isa Brown hybrid with 1.154 ± 0.47 , and Dekalb 1.132 ± 0.060 . And also the protein content is more present in the meat in this hybrid, 20.384 ± 0.730 and Isa Brown that is 20.11 ± 0.5873 in Dekalb. pH in the Hybrid Dekalb is 6.16, while at the hybrid Isa Brown is 6.066. From Table 1 in relation to the chemical composition of the inner fillet at hybrids Dekalb and Isa Brown there are no statistically significant differences. Table 2 shows that in meat from drumsticks in the hybrids of Dekalb and Isa Brown there are statistically significant differences in water and fat parameters ($p < 0.05$). Dekalb water 73.47 ± 0.577 ; Isa Brown water 76.324 ± 1.185 ; Dekalb fat 4.5 ± 1.190 ; Isa Brown fat 1.6 ± 0.532 .

Ristić et al. (2008) determined that the contents of water at the meat of breasts and

drumsticks at the chicken is 75 %, fat at the inner fillet 0.6% at the drumsticks 3.9%, proteins at the meat of the inner fillet 23.6% at the meat of drumsticks 19.6% mineral material and the meat of inner fillet 1.2 at the drumsticks 1.1%.

Glamoclija (2013) determined that the average content of water in the meat of the chicken is 74.6 %, fat 11.1%, proteins 12.1%, and mineral material in the meat 1 %. Todorovski (2015) researched the chemical compound of chicken meat from the hybrid lines Isa Brown and Dekalb which are excluded from production due to the ending of the production cycle of age of 84 weeks. He realized that the meat of the chicken from the hybrid line Isa Brown contains water 76.342%, proteins 20.384%, fat 2.968%, and mineral material 1.154%. The meat from the hybrid line Dekalb contains water 75.592%, proteins 21.928%, fat 2.302% and mineral material 1.163%.

Fatty acid composition

The fatty acid compound from the meat of drumsticks and inner fillet of the hybrid lines Isa

Brown and Dekalb are presented in Table 3 and Table 4.

Table 3. Determining fatty acids at drumstick meat at hybrids Isa Brown and Dekalb (%).

Fatty acids	Isa Brown %	Dekalb %
C14:0	0.461	0.332
C16:0	16.977	16.896
C16:1	4.002	4.034
C18:0	4.545	5.422
C18:1n9	42.126	39.965
C18:2n6c	31.196	32.823
C18:3n6	0.692	0.528
Saturated fatty acids	21.983	22.50
Unsaturated fatty acids	78.016	77.350
Polyunsaturated fatty acids	31.888	33.351

From Table 3 it can be concluded that the saturated fatty acids are more present at

the hybrid Dekalb, while the unsaturated and polyunsaturated at Isa Brown.

Table 4. Determining the fatty acid compound of the meat of inner fillet at the hybrid Isa Brown and Dekalb (%).

Fatty acids	Isa Brown %	Dekalb %
C14:0	0.079	0.316
C16:0	18.956	21.038
C16:1	3.533	0.995
C18:0	6.093	7.466
C18:1n9	41.835	37.868
C18:2n6c	29.503	32.316
C18:3n6	ND*	ND*
Saturated fatty acids	25.128	28.80
Unsaturated fatty acids	74.871	71.179
Polyunsaturated fatty acids	20.503	32.316

ND* - Not determined

It can be seen from Table 4 that the Dekalb hybrid contains more saturated and polyunsaturated fatty acids, while the hybrid Isa Brown contains more unsaturated fatty acids. According to the studies of Cortinas et al. (2004), the saturated fatty acids in the meat of the drumstick are represented by 53.81%, unsaturated 89.34% and polyunsaturated 92.03%. while in the breast meat, saturated fatty acids are represented by 6.82%, unsaturated with 10.43% and polyunsaturated are represented by 13.29%. Klarik et al. (2005) found that fatty acids in inner fillet meat of the chicken are represented by 39.97%, saturated fatty acids 33.40%, unsaturated and 5.79%, polyunsaturated fatty acids. While in the

drumstick meat, 39.27%, unsaturated 38.29% and polyunsaturated fatty acids are present with 20.79%. According to the research of (Kralić et al., 2002) the inner fillet meat contains saturated fatty acids 32.44%, monounsaturated fatty acids 37.59% and polyunsaturated fatty acids 21.26%. Barbir et al. (2014) indicate that in the bright and dark meat from the chickens the following fatty acids are present: SFA 40.4%, MUFA 35.3%, PUFA omega - 6 17.4%. The differences in the results of our examinations related to the chemical composition and fatty acid composition are probably the result of the fact that we examined young chicken at age of 14-16 weeks while the other authors examined broilers and laying hens.

Difference in the mass

The quality loss thermic manufacture of the meat of drumsticks at the hybrid lines Isa

Brown and Dekalb are presented in Table 5.

Table 5. Determination of mean quality loss of meat from the legs hybrids Dekalb and Isa Brown

Drum sticks	Dekalb	Isa Brown	
Weight before heat treatment	0.0632	0.0708	NS
Weight after heat treatment	0.0408	0.0474	NS
% on loss of mass of the meat in heat treatment	35.724	33.364	NS

NS- No statistically significant differences

As it can be seen from the table 5 it can be concluded that the larger heat of heat treatment of meat from the digested has in the Dekalb hybrid 35.724% (0.0224 g), as opposed to the feces of the Isa Brown hybrid, which is 33.364%

(0.0234 g). From Table 5 it can be seen that there are no statistically significant differences in the loss of the mass of heat treatment of the meat of drumsticks from Isa Brown and Dekalb.

CONCLUSION

From the above presented it can be concluded that the meat of inner fillet from the hybrid Dekalb contains less water and more proteins compared to the inner fillet meat from the hybrid Isa Brown. The drumstick meat from the hybrid Dekalb contains less water and more fat compared to the drumstick meat from the hybrid Isa Brown. The drumstick meat from the

hybrid line Isa Brown contains more saturated and less unsaturated fatty acids compared to the meat of hoof from the hybrid Dekalb. At the meat of the inner fillet, the content of the saturated fatty acids is lower than the unsaturated fatty acids one which is higher at the hybrid line Isa Brown compared to the hybrid line Dekalb.

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ХЕМИСКИ И МАСНОКИСЕЛИНСКИ СОСТАВ КАЈ МЕСО ОД МЛАДИ КОКОШКИ РАЗЛИЧНИ ХИБРИДНИ ЛИНИИ

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Резиме

Во трудот се дадени резултатите од испитувањето на хемискиот состав, маснокиселинскиот состав и кало на термичка обработка на месо од копани и кобилица добиено од хибридните линии *иса браун* и *декалб*. За целта се земено по 7 броја млади кокошки од хибридните линии *иса браун* и *декалб*. Од нив по колењето и примарната обработка се одвоени кобилиците и копаните. Месото од кобилица од хибридниот *декалб* содржи помалку вода, а повеќе белковини во споредба со месото од кобилица од хибридниот *иса браун*. Месото од копани од хибридниот *декалб* содржи помалку вода, а повеќе масти во споредба со месото од копани од хибридниот *иса браун*. Месото од копани од хибридниот *иса браун* содржи повеќе заситени, а помалку незаситени масни киселини во споредба со месото од копани од хибридниот *декалб*. Кај месото од кобилица содржината на заситените масни киселини е помала, а на незаситените масни киселини е поголема кај хибридниот *иса браун*, во споредба со хибридниот *декалб*.

Клучни зборови: *иса браун*, *декалб*, термичка обработка, pH