RESEARCH REGARDING CHEMICAL COMPOSITION OF BIRD'S LIVER GATHERED FROM ROSS 308 HYBRID

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Abstract

Due to the fact that determination of chemical components from edible organs gathered from birds slaughtered at different ages didn't represent a priority of research regarding quality and human consumers' safety, in the current paper we aimed to realise a study about influence of slaughtering age on quality of liver gathered from a hen hybrid specialised in meat production.

Studied material was bird's liver gathered from Ross 308 hybrid. In this way were established 3 experimental batches, differentiating by the age at which slaughtering was realised (F_1= at 35 days; F_2= at 40 days; F_3= at 42 days). Quality determinations were realised on fresh product and aimed the content in water, dry matter, proteins, fats, ash, non-nitrogenous extractive substances and energetic value.

Regarding protein content in analysed liver, batch F_1 recorded a mean value higher with 0.03% face to batch F_2 and with 0.15% face to batch F_3. Regarding fat content, the highest mean value was obtained by batch F_3, followed by batch F_2 and batch F_1; from statistical analysis of fat content was highlighted significant differences between batch F_1 vs. batch F_3 ($P<0.05$) and batch F_2 vs. batch F_3 ($P<0.05$). Calculus of energetic value presented the highest value at batch F_3, higher with 1.95 kcal/100g face to batch F_2 and with 1.31 kcal/100g face to batch F_1; differences between those 3 batches being without statistical significance ($P>0.05$).

The obtained results showed that slaughtering age for Ross 308 hybrid didn't have a significance influence on chemical composition of liver, with exception of fat content which became higher with bird's aging.

Key words: birds, slaughtering, liver, chemical composition

INTRODUCTION

In the last years was recorded an increase of consumption for birds' meat and edible organs. Humans prefer products from poultry meat detrimental to the ones from pork and beef meat, especially due to their pleasant flavour [8].

Birds' edible organs are consumed on a large scale in the majority of world countries [6]. Factors which influence their consumption are represented by culture, religion and preferences.

Function of country culture and tradition, edible organs could be considered as residual materials being discarded immediately after gathering, but could also be percept as delicatessen or valuable products being sold at high prices [3], [10].

Birds' edible organs (heart, liver and gizzard) present a high importance in human nutrition, being consumed on a large scale, due to their low costs, low content in fat and due to the advantage of a short period of time for their preparation [2].

Meat quality, implicit the one of birds' edible organs is the sum of all sensorial, nutritive, hygiene-toxicological and technological factors. Nutritional value of meat and edible organs is given by proteins and their components, fats and their components, vitamins and minerals at which are added the increased digestibility and their biological value [4], [7].

The current paper aimed to realise a study regarding the influence of slaughtering age

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on chemical quality indicators of liver gathered from a hen hybrid specialized in meat production.

Determination of chemical components for edible organs gathered from birds slaughtered at different ages wasn't a priority for the research regarding food quality and safety for human consumer. During time, researchers aimed on effect of age and sex on birds' slaughtering efficiency.

MATERIALS AND METHODS

The research was carried out based on an experimental plan, organized in 3 experiences, differentiating by 3 of the most frequent ages at which slaughtering of poultry hybrid is realised.

We have opted for Ross 308 commercial poultry hybrid, so were constituted 3 experimental batches noted as follows: F_1 = liver from Ross 308 hybrid slaughtered at the age of 35 days; F_2 = liver from Ross 308 hybrid slaughtered at the age of 40 days and F_3 = liver from Ross 308 hybrid slaughtered at the age of 42 days.

Feeding conditions were the same and complied with the Ross 308 hybrid technological guide.

For each batch of studied liver were formed 5 samples, each with a weight of 0.5 kg, which were minced and homogenized and from those ones were gathered a mean sample, on which determinations were made.

Quality determinations were made on fresh product and targeted content in water, dry matter, proteins, fats, ash, non-nitrogenous extractive substances and energetic value.

Determination of dry matter content (DM) was realised in according with AOAC [11], by drying in stove, for 24 hours at 105ºC and water content resulted by difference in according with the formula: Water (%) = 100% - DM (%).

Content in proteins was evaluated based on the value of total nitrogen, determined through Kjeldahl method [15].

Lipids from liver were determined in according with standard SR ISO 1443:2008, by Soxhlet method [16].

Determination of ash content was realised by calcinations of samples at 550°C, into an oven, after a previous carbonization [14].

Non-nitrogenous extractive substances were calculated as difference with the following formula:

NES (%) = 100 – (Water% + Ash% + Proteins% + Lipids%) [12].

Energetic value of poultry liver was calculated using the relation:

Energetic value (kcal/100g) = (4.27 kcal * Proteins%) + (9.02 kcal * Lipids%) + (3.87 kcal * NES%) [13].

The obtained data were subjected to some statistical calculations, using ANOVA algorithm included in MsExcel.

RESULTS AND DISCUSSION

At the end of determinations realised on poultry liver we observed a light decreasing of water content at chickens slaughtered at older ages. So the liver samples belonging to batch F_1 recorded the higher mean value, respectively, 77.18±0.10%, while batch F_2 had a water content of 77.07±0.17% and F_3 of 77.03±0.19%. Values calculated for variation coefficient were between 0.30-0.56% facts which show a very homogenous character. Statistically speaking, the observed differences between those 3 batches were without any statistical signification ($P>0.05$) (tab. 1).

Naturally, dry matter content from the analysed liver recorded an increasing evolution, in parallel with the decreasing of water content from them. In this way, the calculated means were 22.82±0.10% for batch F_1, 22.93±0.17% for batch F_2 and respectively 22.97±0.19% for batch F_3. Between those 3 batches weren't observed differences with statistical signification ($P>0.05$); the studied character presenting a very good homogeneity, a proof being the values of variation coefficient situated between 1.03% and 1.87% (tab. 1).

Regarding protein content of the analysed liver, statistically speaking was observed insignificant differences between those 3 batches ($P>0.05$). Protein level in poultry liver was 17.12±0.14% at batch F_1, 17.09±0.05% at batch F_2 and respectively 16.97±0.11% at batch F_3, which show that protein level suffered a light decreasing with birds' aging. Variation coefficient had values of 0.61-1.78%, fact which confirm a very good homogeneity inside batches (tab. 1).

Table 1 Chemical composition of liver gathered from Ross 308 hybrid slaughtered at 35, 40 and 42 days

Quality parameters	Analysed batches (n=5)						ANOVA		
	F_1 (slaughtered at 35 days)		F_2 (slaughtered at 40 days)		F_3 (slaughtered at 42 days)				
	$\overline{X} \pm s_{\overline{x}}$	V%	$\overline{X} \pm s_{\overline{x}}$	V%	$\overline{X} \pm s_{\overline{x}}$	V%	Compared batches	P value	Signification
Water (%)	77.18±0.10	0.30	77.07±0.17	0.49	77.03±0.19	0.56	F_1 vs. F_2	0.593909	ns
							F_2 vs. F_3	0.897235	ns
							F_1 vs. F_3	0.528539	ns
Dry matter (%)	22.82±0.10	1.03	22.93±0.17	1.64	22.97±0.19	1.87	F_1 vs. F_2	0.593909	ns
							F_2 vs. F_3	0.897235	ns
							F_1 vs. F_3	0.528539	ns
Proteins (%)	17.12±0.14	1.78	17.09±0.05	0.68	16.97±0.11	1.51	F_1 vs. F_2	0.800743	ns
							F_2 vs. F_3	0.260755	ns
							F_1 vs. F_3	0.411883	ns
Fats (%)	3.81±0.06	3.74	3.87±0.07	3.75	4.09±0.06	3.40	F_1 vs. F_2	0.488927	ns
							F_2 vs. F_3	0.046194	*
							F_1 vs. F_3	0.014147	*
Ash (%)	1.30±0.02	2.59	1.32±0.03	4.79	1.29±0.02	3.68	F_1 vs. F_2	0.408820	ns
							F_2 vs. F_3	0.365468	ns
							F_1 vs. F_3	0.823286	ns
NES (%)	0.60±0.02	6.23	0.65±0.03	8.97	0.62±0.01	5.13	F_1 vs. F_2	0.118867	ns
							F_2 vs. F_3	0.373889	ns
							F_1 vs. F_3	0.269376	ns

Note: ANOVA within rows, between groups for different superscripts, one by one comparison: ns = not significant (P>0.05); significant = * (P<0.05); distinguished significant = ** (P<0.01); highly significant = *** (P<0.001).

Regarding fat content, the highest mean value was 4.09±0.06% for batch F_3, being followed by batch F_2 with a value of 3.87±0.07% and respectively, by batch F_1 with a level of only 3.81±0.06%. Could be remarked the fact that lipid level of poultry liver suffered a light decreasing with the increasing of slaughtering age. The studied character kept very homogenous inside each batch, its values being between 3.40-3.75%. From statistical analysis of fat content were observed significant differences between batches F_1 vs. F_3 ($P<0.05$) and F_2 vs. F_3 ($P<0.05$) (tab. 1).

The effectuated analysis for ash content, leaded to values situated between 1.29±0.02% (F_3) and 1.32±0.03% (F_2). The studied character was very homogenous inside those 3 batches (V%=2.59-4.79%). Analysing the signification of differences between batches' means weren't observed differences with statistical signification ($P>0.05$) (tab. 1).

Liver content in non-nitrogenous extractive substances (NES) varied between a minimum of 0.60±0.02% (F_1) and a maximum of 0.65±0.03% (F_2). The studied character was very homogenous, in none of the situations weren't founded values higher than 10% for variation coefficient. Statistically speaking, in the case of those 3 analysed batches weren't observed differences with statistic signification ($P>0.05$) (tab. 1).

The calculated energetic value show the dietetic properties of poultry liver, these ones oscillated between 109.76-111.71 kcal/100g (fig. 1).

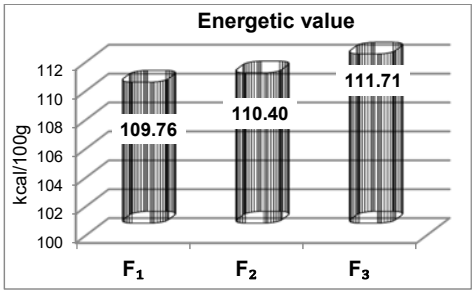

Fig. 1 Energetic value of liver gathered from Ross 308 hybrid, slaughtered at 35, 40 and 42 days

Batch F_1 indicated a lower energetic value due to the decreased recorded lipids' level. The studied character presented, also in this case, values specific to a very good variation (V%=0.53-0.58). Energetic value of the analysed liver show, statistically speaking insignificant differences between those 3 analysed batches (P>0.05).

Even if the obtained results regarding chemical composition of poultry liver are strictly relevant for the studied hybrid type, those values are close to the values obtained by other authors on other types of hybrids at different slaughtering ages (tab. 2).

Table 2 Comparison of chemical content with other published values

Liver	Current study	Literature		
	35-42 days	Jokanović et al. (2014) [5]	Seong et al. (2015) [6]	Abdullah et al. (2016) [1]
Water	77.18- 77.03	75.9	76.68	75.46
Proteins	17.12-16.97	15.70	17.70	17.07
Fats	3.81-4.09	4.10	2.89	1.70
Ash	1.30-1.29	1.3	-	1.21

Some differences could be explained by genetic variations or by nutrition of the birds.

CONCLUSIONS

Having in view the obtained results we can withdraw the following conclusions:

- dry matter content recorded an increasing evolution directly proportional to decreasing of water content with around 0.02% per day;
- at poultry slaughtered at 42 days, protein level in liver was lower with 0.15% face to those slaughtered at 35 days, conversely fat content of liver was higher with 0.28%;
- ash content of analysed liver decreased with 0.01% at poultry slaughtered at 42 days, face to the ones slaughtered at 35 days, while content of non-nitrogenous extractive substances increased with 0.02% inside the same analysed batches;
- energetic value of liver increased with 0.9% for poultry slaughtered at 42 days face to the ones slaughtered at 35 days.

The final conclusion is the one that slaughtering age of Ross 308 hybrid didn't significantly influence the livers' chemical composition, with the exception of fat content which became higher with bird aging.

So, we strongly recommend the consumption of poultry liver due to its nutritive properties and high energetic value.

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