THE INFLUENCE OF GENOTYPE, NUTRITION AND SEX ON CHEMICAL COMPOSITION OF MUSCLES IN BROILER CHICKENS

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Abstract

In this paper was studied the influence of sex and nutrition on the meat chemical composition of breast, thighs and drumsticks, at different broiler genotypes. The biological material was represented by broilers: „Cobb-500" (Lc), „Hybro PN+"(L1 with variants V1, V2, V3) and „Hubbard F15" (L2 with variants V1, V2, V3), reared 42 days in identical microclimate conditions.The recipes of compound feed used had different levels of energy and protein: standard at Lc, L1V1 and L2V1; with 10% higher at L1V2 and L2V2; with 10% lower at L1V3 and L2V3. After slaughter, from each batch and variant were taken 10 carcasses (five per sex) and was determined the chemical composition of meat (water, dry matter, protein, lipids and ash), using STAS methods. For analysis of variance was used Mann Whitney test. The lipids content in meat showed the biggest variation between muscles analyzed, with minimum values in the breast and maximum values in thighs. In all cases, it was found that, males had a lower quantity of lipids and a higher quantity of proteins, compared to females.The results showed that the sex had significant influence on the lipids content from thighs and breast. The statistical differences between the three variants in the L1 and L2 batches, support the claim that the content of protein and lipids in the examined muscles was influenced by protein-energy levels of the feeding. The genotype has influenced content of proteins and lipids from breast, with statistical differences ($p \leq 0.05$) between Lc and L2.

Key words: broiler chicken, chemical composition of muscle, genotype, nutrition, sex

INTRODUCTION

In practice, broiler chickens reared for meat production are usually slaughtered at 42 days old. In Romania and in most countries of the world, poultry meat is produced in industrial system, with a period of growth between 35 to 42 days, depending on market demand for carcasses weight.

In time, were changed growth performance of broiler chickens through selection by improved growth rate, body mass, feed conversion, slaughter yield, carcass composition and meat quality [2].

The chemical composition of meat is greatly influenced by the rations used in feeding the broiler chickens [4, 9, 11, 19, 20]. The meat obtained from broilers specialized in this area is known for its sensory, technological, physical, chemical, nutritional and dietary qualities [3, 4, 10, 23, 26]. The poultry meat is requested by consumers, because has special flavor characteristics, high nutritional value and high degree of digestibility [4, 8].

The broiler chicken hybrids had require diets with higher levels of energy and protein [11], to maximize genetic potential and to achieve high efficiency of growth [11, 27]. In different researches were reported result on the effects of the diet, genotype and sex on broiler meat quality [1, 4, 6, 10, 19, 26]. However, it is not known whether a reduction in energy and protein levels will affect meat quality at broiler chickens reared in Romania, depending on genotype and sex.

Researchs in this respect are necessary, in order to understand the response of genotype

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and sex of chickens to diets with different levels of protein and energy and investigate effect of the raw materials used in the feed recipes on carcass traits and the chemical composition of poultry meat.

The objective of our study was to determine the influence of genotype, sex and nutrition (the different energy and protein levels) on chemical composition of muscles in broiler chickens, which were sacrificed at age 42 days.

MATERIAL AND METHOD

In this work, the study was made on three genotypes of chicks (males and females), „Cobb-500", Lc batch (5 pens); „Hybro PN^{+}", L1 batch: (15 pens) and „Hubbard F15", L2 batch (15 pens), reared in the identical condition of microclimate. Broiler chickens from L1 and L2 batches were distribute in three experimental variants per batch (V1, V2, V3), each with five pens. In the growth period (1 to 42 d) for microclimate factors of the house (air temperature and air relative humidity), the values have been according to recomendations from Management Manual „Cobb-500" hybrid [27]. The growth system was on the permanent litter and a density of 12 chicks/m^2 and the growing technological system was in accordance with the new European Union regulation on animal welfare compulsory from 2012 in all EU members. The three growth periods conducted, were: starter, from 1 to 14 d; grower, from 15 to 35 d and finishing, from 36 to 42 d [11, 27].

Depending on the age of chickens during the growth period (1 to 42 d) at each chickens batch were given three recipes of compound feed: starter (1 to 14 d), grower (15 to 35 d) and finishing (36 to 42 d), ad libitum. The recipes of compound feed used had different levels of energy and protein: standard at Lc, L1V1 and L2V1; with 10% higher at L1V2 and L2V2; with 10% lower at L1V3 and L2V3 (Table 1).

Table 1 Features of feed compound recipes for chickens

Growth period	Lots / Recipe features	Lc L1V1 L2V1	L1V2 L2V2	L1V3 L2V3
Starter 1-14 d	CP (g/kg feed)	238.00	261.80	214.00
	ME (kcal/kg feed)	3036	3281	2839
Grower 15-35 d	CP (g/kg feed)	218.60	240.30	197.20
	ME (kcal/kg feed)	3142	3439	2861
Finisher 36-42 d	CP (g/kg feed)	201.80	222.70	182.10
	ME (kcal/kg feed)	3196	3483	2877

CP (g/kg feed)-crude protein; ME (kcal/kg feed)-metabolizable energy

At the end of the growing period (42 d), chickens have been slaughtered and from each batch or experimental variant were used 10 carcasses (2 carcasses per each pen), in equal number per each sex (5♀+5♂). After portioning of carcasses have been carried laboratory analysis for meat chemical composition (water, dry matter, protein, lipids and minerals) for three regions (breast, thighs and drumsticks).

Methods of analysis used to determine the chemical composition of the meat were: drying method for water and dry matter content (at +103°C); calcinations for total minerals content (at +550°C); Soxhlet method by modern appliances-Soxtest Raypa PG-16 E01 for total lipids; Kjeldahl method adapted on appliances FOSS TECATOR for protein substances.

Raw data obtained from measurements were processing using methods of biostatistics with Microsoft Excel spreadsheet application. To test the statistical significance of differences between mean values of the characters studied has been applied analysis of variance using Mann Whitney test from the program MINITAB 14 [5].

RESULTS AND DISCUSSIONS

The values related to the chemical composition of meat from the major parts of the carcasses: breast, thigh and drumstick, are presented in Tables 2, 3 and 4.

Water proportion in breast muscles (Table 2) was from 73.10% to 74.18%, in male chickens and from 73.22% to 75.00%, in female chickens, and with very good uniformity for it trait (V<1.20%). The differences observed were not statistical influenced to genotype or sex (P>0.05), but if nutrition were reported at some statistical differences (P≤0.05).

Proteins content, with values from 21.18%, in female chickens L2V3 up to 24.51%, in male chickens L1V2, was statistically influenced by genotype and nutrition. For the Cobb genotype were observed slightly superior values versus Hybro genotype and statistical differences vs. Hubbard genotype (P≤0.05). In all cases, recipes with greater energy and protein levels had positively influence on protein content of breasts, and situation was reverse for diets with lower energy and protein levels. The differences between mean values from the three experimental variants L1 and L2 were significant statistically (P≤0.05).

Table 2 Chemical composition of meat from pectoral muscles

Specification		Lc	L1V1	L1V2	L1V3	L2V1	L2V2	L2V3
Male chickens	Water $\bar{X} \pm s_{\bar{x}}$ (%)	73.44 ±0.30	73.60 ±0.30	^{B}73.10 ±0.31	^{A}74.18 ±0.32	^{A}73.83 ±0.35	^{B}73.21 ±0.34	$^{a\ A}$74.16 ±0.39
	V%	0.93	0.90	0.94	0.97	1.07	1.02	1.19
	Dry matter $\bar{X} \pm s_{\bar{x}}$ (%)	26.56 ±0.28	26.40 ±0.18	^{A}26.90 ±0.22	^{B}25.82 ±0.10	^{AB}26.17 ±0.12	^{A}26.79 ±0.16	$^{a\ B}$25.84 ±0.06
	V%	2.38	1.56	1.83	0.90	1.05	1.30	0.55
	Proteins $\bar{X} \pm s_{\bar{x}}$ (%)	^{a}23.93 ±0.22	^{AB}23.65 ±0.20	^{A}24.51 ±0.22	^{bB}22.68 ±0.12	^{bAB}23.22 ±0.16	^{A}24.17 ±0.13	$^{a\ bB}$22.45 ±0.18
	V%	2.06	1.85	2.03	1.17	1.50	1.18	1.76
	Lipids $\bar{X} \pm s_{\bar{x}}$ (%)	$^{b\ a}$1.13 ±0.04	$^{b\ bAB}$1.31 ±0.03	$^{b\ bB}$0.91 ±0.04	$^{b\ bA}$1.77 ±0.07	$^{b\ bAB}$1.54 ±0.08	$^{b\ B}$1.11 ±0.03	$^{b\ bA}$2.02 ±0.10
	V%	7.48	5.34	9.68	8.53	12.14	5.87	11.09
	Ash $\bar{X} \pm s_{\bar{x}}$ (%)	1.12 ±0.01	1.13 ±0.01	1.16 ±0.03	1.13 ±0.03	1.12 ±0.04	1.13 ±0.05	1.12 ±0.02
	V%	2.36	2.96	6.70	5.74	7.17	8.95	3.31
Female chickens	Water $\bar{X} \pm s_{\bar{x}}$ (%)	^{a}73.62 ±0.34	73.34 ±0.36	73.22 ±0.31	74.34 ±0.34	^{B}73.54 ±0.38	^{B}73.27 ±0.39	$^{b\ bA}$75.00 ±0.40
	V%	1.02	1.09	0.94	1.02	1.16	1.20	1.19
	Dry matter $\bar{X} \pm s_{\bar{x}}$ (%)	^{a}26.38 ±0.11	26.66 ±0.18	26.78 ±0.19	25.66 ±0.46	^{A}26.46 ±0.11	^{A}26.73 ±0.10	$^{b\ bB}$25.00 ±0.12
	V%	0.89	1.51	1.60	4.02	0.91	0.87	1.04
	Proteins $\bar{X} \pm s_{\bar{x}}$ (%)	^{a}23.55 ±0.16	^{A}23.56 ±0.22	^{A}24.16 ±0.24	^{bB}22.15 ±0.30	^{bAB}23.05 ±0.16	^{A}23.91 ±0.13	$^{b\ bB}$21.18 ±0.20
	V%	1.55	2.06	2.23	3.01	1.58	1.20	2.08
	Lipids $\bar{X} \pm s_{\bar{x}}$ (%)	$^{a\ a}$1.44 ±0.05	$^{a\ bAB}$1.69 ±0.06	$^{a\ bB}$1.13 ±0.07	$^{a\ bA}$2.20 ±0.14	$^{a\ bAB}$2.02 ±0.10	$^{a\ B}$1.43 ±0.06	$^{a\ bA}$2.53 ±0.13
	V%	8.42	8.03	14.08	13.86	10.72	10.12	11.16
	Ash $\bar{X} \pm s_{\bar{x}}$ (%)	1.18 ±0.02	1.18 ±0.02	1.20 ±0.05	1.16 ±0.04	1.17 ±0.06	1.19 ±0.06	1.16 ±0.06
	V%	4.47	3.46	9.51	8.15	11.05	10.69	10.76

Note: Mann Whitney-test: $^{ab, AB}$ significant differences P≤0.05;

$\bar{X}$ -Mean; $\pm s_{\bar{x}}$ Standard error; V%-Coefficient of variation

Total lipids content, had inferior limits in male chickens (from 0.91%, at L1V2 to 2.02%, at L2V3) and superior values at female chickens (from 1.13%, at L1V2 to 2.53%, at L2V3), with statistic differences for all situation (genotype, sex and nutrition).

For this indicator the best performance was obtained at the Cobb genotype, followed in order by the genotypes: Hybro and Hubbard (P≤0.05).

Nutrition for the three experimental variants L1 and L2 has determined significant differences (P≤0.05). Thus, data from Table 2 show, increasing lipid content of breast muscles, in parallel with the reduction of the levels of energy and protein from diets.

For chemical components from breast muscles, our results can be compared with the researches of other authors who reported values of over 22.50% for total proteins and less than 3% for lipid content [14, 15, 16, 17, 18, 24].

In meat from thighs (Table 3), water content was from 70.64% up to 72.53% and total proteins from 17.47% up to 19.24%, with small differences between male and female chickens (P>0.05).

Lipids content of the thigh ranges from 7.75% to 10.38% in female chickens and from 6.98% to 8.97% in male chickens, with good variability for this trait (V=4.25-9.41%) and statistically significant differences (P≤0.05) between chickens of different sex.

Table 3 Chemical composition of meat from thighs muscles

Specification		Lc	L1V1	L1V2	L1V3	L2V1	L2V2	L2V3
Male chickens	Water $\bar{X} \pm s_{\bar{x}}$ (%)	71.90 ±0.51	71.92 ±0.47	72.32 ±0.29	72.23 ±0.78	72.53 ±0.66	72.54 ±0.53	72.14 ±1.09
	V%	1.59	1.45	0.91	2.43	2.04	1.62	3.37
	Dry matter $\bar{X} \pm s_{\bar{x}}$ (%)	28.10 ±0.51	28.08 ±0.47	27.68 ±0.29	27.77 ±0.78	27.47 ±0.66	27.46 ±0.53	27.86 ±1.09
	V%	4.06	3.71	2.38	6.31	5.38	4.28	8.73
	Proteins $\bar{X} \pm s_{\bar{x}}$ (%)	18.74 ±0.51	18.68 ±0.53	19.24 ±0.43	17.60 ±0.63	18.06 ±0.56	18.92 ±0.73	17.47 ±0.72
	V%	6.07	6.30	4.94	8.01	6.88	8.57	9.24
	Lipids $\bar{X} \pm s_{\bar{x}}$ (%)	$^{b\ a}$7.64 ±0.20	$^{b\ AB}$7.81 ±0.17	$^{b\ bB}$6.98 ±0.17	$^{b\ bA}$8.63 ±0.36	$^{b\ AB}$8.03 ±0.18	$^{b\ B}$7.21 ±0.14	$^{b\ bA}$8.97 ±0.29
	V%	5.75	4.81	5.47	9.41	4.98	4.30	7.25
	Ash $\bar{X} \pm s_{\bar{x}}$ (%)	0.98 ±0.03	0.95 ±0.04	0.98 ±0.03	0.94 ±0.01	0.96 ±0.02	0.97 ±0.03	0.92 ±0.03
	V%	7.63	9.69	5.90	3.51	5.22	7.65	6.70
Female chickens	Water $\bar{X} \pm s_{\bar{x}}$ (%)	71.22 ±0.56	71.05 ±0.81	71.62 ±0.56	71.09 ±0.89	72.08 ±0.80	72.11 ±0.83	70.64 ±1.19
	V%	1.76	2.56	1.75	2.81	2.48	2.58	3.76
	Dry matter $\bar{X} \pm s_{\bar{x}}$ (%)	28.78 ±0.56	28.95 ±0.81	28.38 ±0.56	28.91 ±0.89	27.92 ±0.80	27.89 ±0.83	29.36 ±1.19
	V%	4.37	6.29	4.41	6.91	6.40	6.66	9.04
	Proteins $\bar{X} \pm s_{\bar{x}}$ (%)	18.54 ±0.50	18.50 ±0.59	19.09 ±0.65	17.52 ±0.59	18.04 ±0.62	18.90 ±0.77	17.64 ±0.86
	V%	5.97	7.13	7.59	7.32	7.70	9.16	10.91
	Lipids $\bar{X} \pm s_{\bar{x}}$ (%)	$^{a\ a}$8.78 ±0.31	$^{a\ AB}$8.98 ±0.35	$^{a\ bBC}$7.94 ±0.21	$^{a\ bA}$10.03 ±0.34	$^{a\ AB}$8.63 ±0.21	$^{a\ bBC}$7.75 ±0.15	$^{a\ bA}$10.38 ±0.35
	V%	8.16	8.82	5.91	7.55	5.33	4.25	7.51
	Ash $\bar{X} \pm s_{\bar{x}}$ (%)	0.95 ±0.02	0.93 ±0.02	0.95 ±0.03	0.92 ±0.02	0.94 ±0.02	0.96 ±0.03	0.91 ±0.02
	V%	5.04	3.92	6.73	5.71	3.82	7.34	6.07

Notes: Mann Whitney-test: $^{ab,\ AB}$significant differences P≤0.05; $^{ac,\ AC}$distinguished significant differences P≤0.01; $\bar{X}$ -Mean; $\pm s_{\bar{x}}$ - Standard error; V%-Coefficient of variation

Lipid proportion in thigh muscles was lower at V2 variants (6.98% to 7.21% at males and 7.75% to 7.94% at females, respectively), and higher at V3 variants (8.63% to 8.97% at males and 10.03% to 10.38% at females, respectively).

Significant statistical differences were revealed, in all case between the V1, V2 and V3 of the two experimental batches (L1 and L2).

The values obtained for chemical composition of thighs are consistent with other results obtained in scientific works that studied effect of the genotype, nutrition and sex on poultry meat quality [4, 6, 8, 10, 13, 14, 15, 16, 17, 18, 24].

Data related to water content, dry matter, minerals, proteins and lipids in the samples taken at drumsticks are presented in Table 4. For water content from drumstick were obtained the highest values in male chickens (71.79% to 72.61%) and the lowest values at female chickens (71.29% to 72.02%), and situation was reversed for dry matter content. In all case were not statistical differences (P>0.05).

Table 4 Chemical composition of meat from drumsticks muscles

Specification		Lc	L1V1	L1V2	L1V3	L2V1	L2V2	L2V3
Male chickens	Water $\bar{X} \pm s_{\bar{X}}$ (%)	72,38 ±0,62	72,46 ±0,68	72,09 ±0,81	72,61 ±0,89	71,79 ±0,56	72,00 ±0,72	72,24 ±0,69
	V%	1,91	2,08	2,51	2,76	1,75	2,24	2,13
	Dry matter $\bar{X} \pm s_{\bar{X}}$ (%)	27,62 ±0,62	27,54 ±0,68	27,91 ±0,81	27,39 ±0,89	28,21 ±0,56	28,00 ±0,72	27,76 ±0,69
	V%	5,01	5,48	6,48	7,31	4,44	5,77	5,54
	Proteins $\bar{X} \pm s_{\bar{X}}$ (%)	20,54 ±0,51	20,55 ±0,59	^{A} 21,71 ±0,62	^{B} 19,19 ±0,67	20,24 ±0,50	^{A} 21,21 ±0,60	^{B} 18,85 ±0,60
	V%	5,60	6,37	7,08	7,81	5,51	6,28	7,06
	Lipids $\bar{X} \pm s_{\bar{X}}$ (%)	^{a} 5,69 ±0,26	^{AB} 5,33 ±0,19	^{bB} 4,68 ±0,31	^{bA} 6,66 ±0,30	$^{b\ AB}$ 6,57 ±0,16	^{B} 5,39 ±0,41	^{bA} 7,43 ±0,31
	V%	10,06	8,07	14,63	9,99	5,60	17,07	9,25
	Ash $\bar{X} \pm s_{\bar{X}}$ (%)	0,98 ±0,03	1,01 ±0,03	1,03 ±0,03	0,95 ±0,02	1,02 ±0,04	1,04 ±0,02	0,98 ±0,02
	V%	7,30	5,89	5,51	4,23	8,29	3,56	5,21
Female chickens	Water $\bar{X} \pm s_{\bar{X}}$ (%)	71,85 ±0,62	72,02 ±0,66	71,94 ±0,89	71,69 ±0,65	71,35 ±0,53	71,29 ±0,79	71,70 ±0,69
	V%	1,92	2,05	2,77	2,01	1,65	2,48	2,17
	Dry matter $\bar{X} \pm s_{\bar{X}}$ (%)	28,15 ±0,62	27,98 ±0,66	28,06 ±0,89	28,31 ±0,65	28,65 ±0,53	28,71 ±0,79	28,30 ±0,69
	V%	4,90	5,28	7,10	5,10	4,10	6,17	5,49
	Proteins $\bar{X} \pm s_{\bar{X}}$ (%)	^{a} 20,57 ±0,63	^{A} 20,13 ±0,63	^{A} 21,23 ±0,44	^{bB} 19,14 ±0,40	19,79 ±0,63	^{A} 21,19 ±0,63	^{bB} 18,63 ±0,45
	V%	6,82	7,91	4,66	4,65	7,11	6,60	5,39
	Lipids $\bar{X} \pm s_{\bar{X}}$ (%)	^{a} 6,01 ±0,23	^{B} 5,84 ±0,34	^{B} 5,29 ±0,27	^{bA} 7,54 ±0,36	$^{a\ bB}$ 7,59 ±0,24	^{B} 6,14 ±0,38	^{bA} 8,22 ±0,34
	V%	8,54	13,04	11,41	10,55	6,96	13,67	9,37
	Ash $\bar{X} \pm s_{\bar{X}}$ (%)	1,02 ±0,06	1,02 ±0,05	1,04 ±0,05	0,98 ±0,06	1,05 ±0,05	1,09 ±0,05	1,02 ±0,04
	V%	12,38	11,86	11,06	13,03	10,13	11,12	7,82

Notes: Mann Whitney-test: $^{ab, AB}$ significant differences P≤0.05;

$\bar{X}$ -Mean; $\pm s_{\bar{X}}$ - Standard error; V%-Coefficient of variation

In drumstick muscles, the V2 variants had the highest protein content, with differences of +0.66 to +1.40% vs. Lc batch (P>0.05); +0.62% to +1.16% vs. V1 variants (P>0.05) and +2.09%

to +2.56% vs. V3 variants (P≤0.05) that had the lowest values for total proteins.

When making reference to the lipids content for samples taken from thighs area, the data presented the Table 4 shows the lowest proportions at male chickens, V2 variants and Hybro genotype, and the greater values at female chickens, V3 variants and Hubbard genotype. Analysis of variance revealed statistical differences (P≤0.05) between the three variants L1 and L2.

In meat from thighs and drumsticks, were found values lower for water and protein content, while for lipids were higher, as compared with breast muscles.

As regards the anatomic region, the protein proportion in the breast had higher values with 3.54% up to 5.27%, compared with the thighs and with 2.55% up to 3.60% versus drumsticks, and if we mean lipids content the situation was reversed.

Some studies have revealed statistical differences for chemical composition of breast, thigh and drumstick muscles. Suchy et al. (2002) had showed that at hybrids „Ross 308", „Cobb" and „Hybro", the protein content of breast muscle was higher on the average with 3.6 to 4.2 percentages, compared with thighs muscles, similar data was reported by Žlender et al. (1995) cited by [4], Bogosavljević-Boškcović et al. (1999), Simeonová (1999) cited by [4], Marcu et al. (2009, 2011a, 2011b, 2011c, 2012a, 2012b) Diaz et al. (2010) cited by [4]. While, in some studies by comparing of breast, thigh and drumsticks muscles were found higher differences for lipid content than for total protein content [13, 14, 15, 16, 17, 18].

Nutrition as external factor has major influence on the chemical composition of broiler meat. Diets with low protein and energy had determined reduced meat protein content, while the lipids content of the muscles had increased [4].

The feeding effect with different protein and energy levels on the chemical composition of broiler meat was reported in the literature by several authors. Thim et al. (1997) using feed recipes, with 16% and 24% proteins had reported different protein content in broiler meat (15.2% and 16.97%, respectively). Marcu et al. (2009) at „Cobb-500" hybrid had used recipes of compound feed that had CP higher by 2% and obtained the increase protein content in breast, thighs and drumsticks by 0.48, 0.74 and 0.64%, respectively.

Marcu et al. (2011a, 2011b, 2011c, 2012a, 2012b) reported some statistical differences for protein and lipid content in samples taken from breast, thighs and drumsticks in broilers „Ross-308", „Lohmann Meat" „Arbor Acres" „Hubbard F15" and „Hybro PN^{+}", if it was used feed recipes that had different levels of energy and protein.

Genotype is another factor significantly affecting protein and lipid content from broiler meat. The genotype effect on broiler meat composition was observed by Farran et al. (2000), that had reported differences in carcass composition at five hybrids with fast-growing. This results were confirmed the results obtained by the other authors [1, 12, 21, 22].

CONCLUSIONS

In breast fillet the water proportion and proteins was higher, as compared with thighs and drumstick muscles, which had the higher lipids content and lower total protein.

The lipids content in meat showed the biggest variation between muscles analyzed, with minimum values in the breast and maximum values in thighs.

The results obtained show that in parallel with increased protein and energy in diet ware increased protein content of broiler meat, and situation was reverse for meat lipids.

In all cases, it was found that, males had a lower quantity of lipids and a higher quantity of proteins, compared to females.

The genotype has influenced content of proteins and lipids from breast, with statistical differences (P≤0.05) between Lc and L2.

Overall speaking, the results obtained have confirmed the substantial influence of feed with different protein and energy levels in terms of meat quality, as well as the effect of sex and genotype on the traits. Moreover, in future is required research more thorough for facilitate and further issue presented.

REFERENCES

[1] Abdullah Y.A., Al-Beitawi N.A., Rjoup M.M.S., Qudsieh R.I., Abu Ishmais M.A., 2010: Growth performance, carcass and meat quality characteristics of different commercial crosses of broiler strains of chicken, Poultry Science Journal, vol.47, nr.1, p.13-21.

[2] Berii C., Wacrenier N., Millet N., LeBihan-Duval, E., 2001: Effect of selection for improved

body composition on muscle and meat characteristics of broilers from experimental and commercial lines, Poultry Science Journal, vol.79, nr.6, p.833-838.
[3] Bogosavljevic-Boskovic S., Gajic I., Gajic Z., 1999: The Influence of Rearing Systems on Basic Tissue Share and Muscle Chemical Structure in Broilers. 45th International Congress of Meat Science and Technology, 01-06. August, Yokohama, Japan, Proceedings: p. 510-511.
[4] Bogosavljević-Bošković S., Pavlovski Z., Petrović M.D., Dosković V., Rakonjac S., 2010: Broiler meat quality: Proteins and lipids of muscle tissue-review, African Journal of Biotechnology, vol.9, nr.54, p.9177-9182.
[5] Brudiu I., 2010: Biostatistică în abordarea practică. Editura Eurobit, Timişoara.
[6] Demby J.H., Cunningham F.E., 1980: Factors affecting composition of chicken meat-literature review. World's Poultry Science Journal vol.36, nr.1, p.25-37.
[7] Farran M.E., Iuialil R.E., Uwayjan M.G., Ashkarian V.M., 2000: Performanance and carcass quality of commercial broilers strains, The Journal of Applied Poulry Research, vol.9, 252-257.
[8] Fletcher D.L., 2002: Poultry meat quality, World's Poultry Science Journal, vol.58, nr.2, p.131-145.
[9] Furlan R.L., Faria Filho D.E., Rosa P.S., Macari M., 2004: Does low-protein diet improve broiler performance under heat stress conditions, Brazilian Journal of Poultry Science, vol.6, nr.2, p.71-79.
[10] LeBihan-Duval E., Debut M., Berri C.M., Sellier N., Sante-Lhoutellier V., Jego Y., Beaumont C., 2008: Chicken meat quality: genetic variability and relationship with growth and muscle characteristics, BMC Genetics, vol.9, nr.53, p.1-6.
[11] Leeson, S., Summers, J.D., 2005: Commercial poultry nutrition, Nottingham Univ. Press., England, p.230-295.
[12] Lorengsan S.M., Deeb N., Fedler C.A., Lamont S.J., 2003: Breast meat quality and composition in unique chicken populations. Poultry Science Journal, vol.82, nr.12, p.1990-1994.
[13] Marcu A., Vacaru-Opris I., Marcu A., 2009: The influence of feed protein and energy level on meat chemical composition from different anatomical regions at „Cobb 500" hybrid, Lucrări stiinţifice Zootehnie şi Biotehnologii, vol.42, nr.1, p.147-150.
[14] Marcu A, Vacaru-Opriş I., Marcu A., Nichita I., Nicula M., Dronca D., Kelciov B., 2011a: Influence of energy and protein level of the feed on carcass caharacteristics and meat quality at hybrids „Ross 308" and „Arbor Acres", Scientific Papers Veterinary Medicine-Timişoara, vol. XLIV, nr. 2, p 220-230.
[15] Marcu A., Vacaru-Opriş I., Marcu A., Nicula M., Dronca D., Dumitrescu G., Kelciov B., 2011b: The influence of feed energy and protein level on meat composition at „Arbor Acres" hybrid, Scientific Papers, Animal Science, USAMV Iaşi, vol.55, nr.16, p.458-463.
[16] Marcu A., Vacaru-Opriş I., Marcu A., Nicula M., Dumitrescu G., Nichita I., Dronca D., Kelciov B., 2011b: The influence of feed protein and energy level on the meat chemical composition at „Lohmann Meat" hybrid, Scientific Papers Animal Science and Biotehnology, vol.44, nr.2, p.439-443.
[17] Marcu A., Vacaru-Opriş I., Marcu A., Dronca D., Kelciov B., 2012a: The influence of protein and energy level on meat chemical composition at „Hybro PN+" broiler chickens, Scientific Papers, Animal Science, USAMV Iaşi, vol. 57 (17), p.260-265.
[18] Marcu A., Vacaru-Opriş I., Marcu A., Nicula M., Dronca D., Kelciov B., 2012b: The influence of feed energy and protein level on meat quality at „Hubbard F15" broiler chickens, Scientific Papers Animal Science and Biotehnology, vol.45, nr.2, p.432-439.
[19] Meluzzi A., Sirri F., Castellini C., Roncarati A, Melotti P., Franchini A., 2009: Influence of genotype and feeding on chemical composition of organic chicken meat. Italian Journal of Animal Science, vol.8, nr.2, p.766-768.
[20] Rezaei M., Moghaddam H.N., Pour Reya J., Kerman Shahi H., 2004: The effect of dietary protein and lysine levels on broiler performance, carcass characteristics and N excretion, International Journal of Poultry Science, vol.3, nr.2, p.148-152.
[21] Ristić M., 2005: Influence of breed and weigh loss on the carcass value of broilers, XVIIth European Sympo. Of the Quality of Poultry Meat, Docenwerth, The Netherlands, 23-26 may.
[22] Rizzi C. and Chiericato G.M., 2010: Chemical composition of meat and egg yolk of hybrid and Italian breed hens reared using an organic production system, Poultry Science Journal, vol. 89, nr. 6, p. 1239-1251.
[23] Sogunle O.M., Egbeyale L.T., Alajo O.A., Adeleye O.O., Fafiolu A.O., Onkwor O.B., Adegbite J.A. Fanimo A.O., 2008: Comparison of meat composition and sensory values of two different strains of broiler chickens, Archivos de Zootecnia, vol. 59, nr. 226, p. 312-315.
[24] Suchy P., Jelínek P., Straková E., Hucl J., 2002: Chemical composition of muscles of hybrid-broiler chickens during prolonged feeding, Czech Journal of Animal Science, vol.47, nr.12, p.511-518.
[25] Thim K.C., Melvin L.H., Craig N.C., 1997: Effect of environomental temperature, dietary protein and energy levels on broiler performance, The Journal of Applied Poultry Research, vol.6, p.1-17.
[26] Tůmová E., Teimouri A., 2010: Fat deposition in the broiler chicken: a review, Scientia Agriculturae Bohemica, vol. 41, nr. 2, p. 122-128.
[27] *** 2010: Broiler Management Guide „Cobb 500", p.2-61.