RESULTS RELATED TO THE MEAT PRODUCTION OF „ROSS-308" CHICKEN BROILERS, REARED IN FAMILIAL-TYPE FARMS

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Abstract

The compulsory characteristic of certain E.U. measures, related to poultry welfare, imposed to run some researches on the quantitative and qualitative aspects of poultry meat in alternative-familial technological systems. The biological material comprised 3000 ROSS-308 chickens, equally divided in 2 groups: Control group-LC (natural micro-climate, access to paddock, conventional feeders and water devices); Experimental group–LE (artificial micro-climate, closed hall, automated equipments). Studied parameters: slaughtering efficiency, meat/bones ratio, meat chemical composition. Chickens have been slaughtered at 42 days old, the efficiency-dressed weight reaching 70.84% (LC)–74.09% (LE). Boned breast participated in carcass structure with 34.73% (LC)-36.80% (LE); thighs and shanks participated with 28.28% (LC)-30.73% (LE) proportions in carcass; meat/bones ratio was calculated at 3.99:1 (LC)–4.23:1 (LE) values. The chemical investigations for breast fillet revealed proteins content between 23.11% (LC) and 23.79% (LE), while lipids oscillated from 0.75% till 0.98% (LE-LC); for rear limbs samples, was found a proteins content of 18.94%-19.33% (LC-LE), respectively lipids concentration of 8.15%-8.82 % (LE-LC). Although freedom of movement negatively influenced meat yield, its dietetic value was better in these fowl reared within the familial system, due to inner poorer lipids content.

Key words: broiler chickens, familial farms, meat, slaughtering efficacy, chemical composition

INTRODUCTION

Poultry meat is a high value source of nutritional facts for human consumers, both healthy of ill, knowing that this animal origin product is rich in proteins, low in lipids and caloricity [8]. Some influential factors could affect meat yield and its quality. One of them is represented by the technological system applied in broilers husbandry, knowing that certain issues emphasises on rearing technology impact on production and poultry welfare [2, 3]. Many poultry producers moved to alternative – organic systems in chicken broilers husbandry, in order to provide better confidence products or to comply the EU regulations related to fowl welfare [6, 7]. In our studies, two husbandry systems have been investigated, in order to know their influence on broilers meat production (yield, meat/bones ratio, chemical features): the intensive system and an alternative husbandry system adapted to certain familial farm, almost similar as husbandry conditions with the organic or free-range broiler farms [2, 5].

MATERIAL AND METHOD

The researches have been carried out during April 1-May 12, 2009, within the „T.C.E. 3 Brazi S.R.L." company Piatra Neamț, Turtureşti farm. Two experimental groups have been established (LC and LE) each of the including at brooding 1500 "ROSS-308" chicken broiler. All groups were similarly fed with mixed feed (Starter=3010 Kcal/Kg EM, 23% PB; Grower=3175 Kcal/Kg EM, 21% PB; Finisher=3225 Kcal/Kg EM, 19% PB) [4]. Therefore, the experimental groups were represented by certain technological peculiarities, as given by the version of husbandry system (tab. 1).

Table 1 – Experimental factors provided to each investigated group

Technological parameters	Control group – LC	Experimental treatment – LE
Brooding density	16 broilers/m^2	14 broilers/m^2
Environment temperature (°C)	Artificially controlled, in order to comply the management guide	Artificially controlled, in order to comply the management guide
Relative air moisture (%)	According to the management guide	According to the management guide
Ventilation	Natural: admission by windows and doors; exhausting by roof chimneys	Artificial: forced admission and exhausting
Lighting	Natural + artificial lightning	Artificial lightning
Access in paddock	Yes	No
Feeding	In feeders, manual feeding	In Big Dutchman feeders, automated feeding
Water distribution	Vaccumatic water devices (starter) and valve-controlled (other periods)	Nipple type water lines
Heating	Suspended brooders, electrically powered	Air heaters, liquid gas powered

Certain quantitative and qualitative traits have been investigated in order to evaluate the adaptability degree of chickens at the meat production achieved within the studied technological versions: dressed weight – slaughtering efficacy; participation of trenched parts in carcass structure; meat/bones ratio; meat chemical features.

When finishing was completed (chickens aged 42 days), the fowl have been slaughtered. From each group, 25 specimens have been elected to assess body weight, carcass weight. These data served to calculate slaughter efficacy, on fresh and refrigerated carcasses. The same chickens served to trench the parts and to calculate their participation in whole carcass formation. The parts (breast with bone, wings, thighs and shanks, remnants), the results being noticed as absolute (g) or relative values (% from carcass).

Meat/bones ratio has been calculated to better express meat production performances. Chemical analyses have been also run, using 5 chickens from each group.

Laboratory analysis have been carried out at the Veterinary Authority Labs-Neamt county, certain meat chemical traits being studied: water and dry matter content, (oven drying, at +105°C); minerals content (calcinations at +550°C); proteins content (Kjeldhal method); lipids content (Soxhlet method).

Mathematical computation relations complied with scientific literature methods. The data have been statistically processed then ANOVA Single Factor method has been applied in order to test the statistic significance of the differences between means.

RESULTS AND DISCUSSIONS

Table 2 briefly presents the performances related to the final weigh of the chickens, as well as certain data concerning carcasses weight and slaughtering efficacy.

Table 2-Values related to live weight, carcass weight and slaughtering efficacy

Notice	LC (n=25)			LE (n=25)		
	$\overline{X}$	$\pm S_{\bar{x}}$	v%	$\overline{X}$	$\pm S_{\bar{x}}$	v%
Live weight (g)	2269.15^{a}	23.72	5.23	2418.61^{d}	31.86	6.59
Fresh carcass weight (g)	1608.63^{a}	22.16	6.89	1792.02^{d}	25.37	7.08
Slaughtering efficacy (fresh carcasses) (%)	70.84^{a}	0.30	2.09	74.09^{d}	0.35	2.34
Refrigerated carcass weight (g)	1542.44^{a}	23.22	7.53	1731.42^{d}	24.49	7.07
Slaughtering efficacy (refrigerated carcasses) (%)	67.91^{a}	0.44	3.27	71.59^{d}	0.34	2.35

ANOVA test – between groups: ^{ad} highly significant ($\hat{F}$>F. Tab. α 0.001 at 1;48 DF)

Very significant differences occurred between groups, for the body live weight after 42 days of rearing: LE (2418.61±31.86g) vs. (2269.15±23.72g).

Weight of fresh carcasses oscillated between 1608.63±22.16g (LC) and 1792.02±25.37 g (LE), the differences between means having high degree of statistical significance.

These values, correlated to the live weight ones, led to the calculation of slaughtering efficacy that reached 70.84±0.3% (control) to 74.09±0.35% (experimental treatment) (very significant statistical differences). The values were found within the literature specified interval (70-80%, assessed in fresh carcasses).

Same differentiation trend occurred in other studied parameters (refrigerated carcass weight and dressed weight on refrigerated carcasses). Absolute values were lower, as normal carcass dehydration during refrigeration occurred (final dressed weight being comprised between 67.91%-71.59%) (LC vs. LE = highly significant).

Values related to the weight of trenched parts and of their participation in carcass are presented in tab. 3

Weight of breast with bone and skin was quite different between the studied groups, in order to consider the existing differences as very significant statistically, the trait values oscillating from 535.58±8.59 g in LC till 637.72g in LE.

Breast participation in carcass reached average quotas of 34.73±0.25% in control group and 36.80±0.21% in LE group, respectively (high significant differences).

Table 3-Weight and proportion of trenched parts in whole carcass structure

Notice	LC (n=25)			LE (n=25)		
	$\overline{X}$	$\pm s_{\bar{x}}$	V%	$\overline{X}$	$\pm s_{\bar{x}}$	v%
Breast weight (g)	535.58[a]	8.79	8.21	637.72[d]	11.10	8.71
% from carcass	34.73[a]	0.25	3.63	36.80[d]	0.21	2.82
Wings weight (g)	163.58[a]	3.00	9.17	182.88[d]	3.38	9.23
% from carcass	10.61	0.12	5.51	10.55	0.09	4.12
Thighs and shanks weight (g)	435.87[a]	6.40	7.34	531.62[d]	6.52	6.14
% from carcass	28.28[a]	0.21	3.66	30.73[d]	0.17	2.71
Remnants weight (g)	407.41[a]	8.25	10.12	379.19[b]	6.24	8.23
% from carcass	26.38[a]	0.25	4.79	21.91[d]	0.23	5.24

ANOVA test – between groups: [ab] significant ($\hat{F}$>F. Tab. α 0.05 at 1;48 DF); [ad] highly significant ($\hat{F}$>F. Tab. α 0.001 at 1;48 DF)

In other comparisons (LC vs. LE), high significant differences occurred (wings, thighs and shanks weight) and significant ones for remnants weight.

Meat: bones ratio was also calculated, to better express the quantitative meat production, consequently carcasses quality. 5 individuals from each group were used for de-boning and assessments (tab. 4).

Table 4-Meat/bones ratio

Notice	LC (n=5)			LE (n=5)		
	$\overline{X}$	$\pm s_{\bar{x}}$	V%	$\pm s_{\bar{x}}$	$\overline{X}$	V%
Meat in carcass (g)	1259.88[a]	30.93	5.49	1423.42[c]	37.51	5.89
Bones in carcass (g)	316.34	9.92	7.01	338.18	9.76	6.45
Meat/bones ratio	3.99[a]	0.07	4.00	4.21[b]	0.06	3.17

ANOVA test – between groups: [ab] significant ($\hat{F}$>F. Tab. α 0.05 at 1;8 DF); [ac] distinguished significant ($\hat{F}$>F. Tab. α 0.01 at 1;8 DF)

Meat quantity in carcass was 13% higher in the experimental group compared to control (distinguished significant difference). The mean values of meat: bones ration

reached 3.99±0.07 (LC), respectively de 4.21±0.06 (LE), while uniformity was very good in all conditions (v=3,17-4,23%). Significant statistical difference occurred for LC vs. LE association.

Data related to water content, dry matter, minerals, proteins and lipids in the samples issued from breast, thighs and shanks are presented in tables 5 and 6.

Water proportion in breast muscles was higher in control group (74.10±0.36%), compared to the experimental one (73.24±0.14%). The differences between compared means (breast, thighs and shanks did not reveal statistical significance in any considered situation.

However, breast fillet from experimental group chickens was richer in proteins (+2.9%), compared to the control group.

Table 5-Chemical composition of the breast fillet

Notice	LC (n=5)			LE (n=5)		
	$\overline{X}$	$\pm s_{\bar{x}}$	V%	$\pm s_{\bar{x}}$	$\overline{X}$	V%
Water (%)	74.10	0.36	1.08	73.24	0.14	0.36
Dry matter (%)	25.90	0.36	3.09	26.76	0.17	1.47
Proteins (total nitrogen) (%)	23.11	0.33	3.23	23.79	0.25	2.47
Lipids (%)	0.98	0.03	6.97	0.75	0.02	9.08
Minerals (%)	1.02	0.04	7.90	1.03	0.03	5.86

Lipids content of the meat issued from breast was higher in control group chickens (+30%), this fact could be given by an insufficient development of pectoral mass, into which connective tissue were found in high proportion, consequently the fatty deposits, against the muscle pure tissue.

Table 6-Chemical composition of meat from thighs and shanks

Notice	LC (n=5)			LE (n=5)		
	$\overline{X}$	$\pm s_{\bar{x}}$	V%	$\pm s_{\bar{x}}$	$\overline{X}$	V%
Water (%)	70.73	0.31	0.99	71.12	0.42	1.34
Dry matter (%)	29.27	0.31	2.39	28.88	0.42	3.29
Proteins (total nitrogen) (%)	18.94	0.16	1.87	19.33	0.28	3.27
Lipids (%)	8.82^{a}	0.16	4.16	8.15^{b}	0.09	2.55
Minerals (%)	0.95	0.06	14.89	1.02	0.05	10.75

ANOVA test – between groups: ^{ab} significant ($\hat{F}$>F. Tab. α 0.05 at 1;8 DF)

In thighs and shanks, lower water content was found in control group chickens (70.73±0.31%). This fact could due to the higher lipids level (8.82±0.16%) in the samples from LC group chickens, compared with the results recorded by those in LE group (statistically significant difference).

Whole nitrogenous content of the thighs and shanks varied from 18.94±0.16% (LC) till 19.33±0.28% (LE, +2.01%).

The results we achieved complied with other issues in the scientific literature [1, 6].

CONCLUSIONS

Certain conclusions issued from the analyses of meat production performances, achieved by "ROSS-308" broilers, reared within two versions of technological system: familial type-LC and intensive-LE:

After slaughtering, the efficacy (dressed weight) oscillated between 70.84% (LC) – 74.09% (LE), these values complying with the hybrid producer's specifications.

Higher participation quota of trenched parts in carcass was recorded in experimental group for most of the components, except the remnants, whose proportion was higher in control group.

Chemical analyses from breast fillet samples revealed protein contents of 23.11% (LC) – 23.79% (LE), while in those muscles issued from thighs and shanks, it varied from 18.94% till 19,33% (LC - LE).

Highest lipids content in control group chickens (the group which provided rearing conditions similarly to those in familial farms) could also due to certain misbalances in normal feeding rhythm (higher intake during natural lightning moments, establishing of gut deposits, associated to chickens inactivity during dark period), as well as to certain trying of fowl organism to facilitate thermoregulation, through subcutaneous deposits development.

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