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EFFECT OF STOCKING DENSITY AND GENDER OF CHICKENS IN THE SHARE OF CERTAIN PARTS OF BODY AND KALO CUT OF FATTENING CHICKEN

Amir Zenunović[1], Midhat Glavić[2]
[1]Agricultural Institute, Tuzla, Bosnia and Herzegovina
[2]FARMA II Founded by USAID/Sweden

ABSTRACT

The primary objective of this study was to investigate the influence of population density on clan parameters in fattening chickens of Cobb 500 hybrids. Based on theoretical and experimental studies, the influence of population density, i.e. floor surface per chicken, share of individual parts of the hull and fattening chickens.

The study was carried out on 225 day-old chicks Cobb 500, which were placed in 3-square-foot boxed cubicles with five different population density. The control group (K_0) was populated in a density of 15 chickens / m² which is a technological standard, and the experimental groups K_1 , K_2 , K_3 and K_4 were populated with density of 13 chickens / m², 14 chickens / m², 16 chickens / m² and 17 chickens / m² of floor pads.

When choosing chickens, it was considered that the chickens of the experimental groups were approximately the same mass. Selected chicken specimens of the same sex ratio 50:50 (ten male and ten female) are marked with rings, with the number of records attached to their legs. The rings are made of modified plastic resistant to water and high temperature, avoiding the possibility of damage to the numbers and the determination of the number of sample chickens.

Nutrition and environmental conditions were the same for all chickens. For the purpose of questioning the production parameters after a completed 42-day fattening period, 10 male and 10 female chicks of each sample group were selected by the random sample method. Individual weighing of chickens determined the body mass at the end of each week, the weekly increase in body mass per group, and the final body mass. In addition, in all sample groups, mortality of chickens, consumption and food conversion was monitored. The data were analyzed by statistical program SPSS 15.0 (SPSS Inc., Chicago, IL, USA).

To determine the prepared pieces of chickens, each group of 10 carcasses was taken, weighed and confined, and by weighing the determined mass of the following parts of each chicken: neck, wings, back, breasts, drumstick, thigh, pelvis and kalo cut up.

Keywords: fattening chickens, population density and prefabricated hull parts.

INTRODUCTION

The aim of Fattening is to produce high quality chicken meat that will be acceptable to consumers. The acceptability of chicken meat depends on the quality and amount of muscle mass in it. Chicken bodies are estimated mainly by the yield of edible parts (yield) and the quality of edible parts of the chickens. There are a number of common ways to render the scenes. The basic

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rule of cleansed carcasses ("classic processing"), followed by the "carrots" prepared for roasting and the "grilled" carcass score. Today chicken roots are increasingly confeziona and sold in parts, and in some cases also by specific tissues (meat, fat, skin and bones).

The high percentage of poultry meat in general, especially chicken, is based on the nutritional properties of this meat in human nutrition. The fact that chicken meat is high protein content, and that fat content is very low in chicken meat in dietetic products. This explains the growing rise in consumption of chicken meat in all populations. The success of chicken meat production is based on the selection of best commercial hybrids, the implementation of appropriate technological solutions for accommodation and nutrition, and the application of non-specific and specific health care measures. In order to improve production results and to preserve good health and welfare of chickens, various modifications in the technological processes of chicken production are used.

Residual density has recently been the subject of many studies in chicken fattening. Many authors who carried out these studies, in their experiments, made great differences in the density of chickens per m². Imports were made with a density variation of 5, 10, 15 and 20 units per m², and there were statistically significant differences between this range of density on production and slaughter parameters. For this reason, all efforts of researchers in this area are aimed at finding adequate population density i.e. optimum number of fattening chickens per m², so that the welfare of chicks as well as the economy of production are not endangered.

Yu.G. Simsek et al. (2009) also investigated the impact of different population density (22.5, 18.75, 15, 11.25 and 7.5 chickens / m²) on various parameters such as: conformation of the hull, i.e. the share of individual parts of the body, pomegranate, thigh, etc.) In the entire chicken hull, then the effect on fatty acid composition and the level of serum cholesterol. The authors have shown in their research that the reduction in population density reduces the fat and protein ratio, and significantly affects the fat content of chicken meat as well as the fatty acid content and the serum cholesterol level in fattening chicks.

H. B. Tong et al. (2012) assessed the impact of population density on growth performance, hull yield and immune status of fattening chickens. Chicken population density in this experiment was 25, 35, and 45 chickens / m² from the 1st to the 28th day and 12.5, 17.5 and 22.5 chickens / m² from the 29th to the 42nd day, low, medium and high population density, respectively. The body weight of chickens after 28 and 42 days of age was statistically significantly reduced by increasing the density of chicken populations.

A.Softić et al. (2010) also investigated the effect of population density on conformation of broiler chickens. A total of 120 chickens were included in the experiment, divided into three groups of 40 individuals. At the end of the first week, a random sample was taken and labeled for 20 chickens. The chickens of the first experimental group (P1) represented a group with a lower

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population density (12 chickens / m²), the chickens of the other experimental group (P2) represented a group of chickens with a higher population density (18 chickens / m²), while the population of the control group) chickens were in line with the technological recommendations (15 chickens / m²). During the experiment with marked chickens, the size of the breast, the width of the beak, the length of the keel (chest sternum), the depth of the breast and the chest angle were monitored weekly.

The same authors, A.Softić et al. (2004) investigated the influence of low population density on the development of certain parts of broiler chickens. In the study, the authors used a total of 120 chicks of Coob 500 provenance divided into two groups of 60 chicks. At the end of the first week of each group, a random sample was taken and labeled for 40 chickens. The chickens of the experimental group (P) represented a low population density population (12 chickens / m²) while the population of the control group (K) of the chickens was in accordance with the technological recommendations (15 chickens / m²). During the experiment with marked chickens, the chest length, the sternum length (crista sterni) and the size of the Chicken drumstick were monitored weekly.

In addition, in all chickens, a weekly body mass was measured, as well as the consumption of food. Production results (average live weight, growth and conversion) were calculated and displayed on the total number of examined chickens at the end of the rat. Statistical analysis of the results at the end of the vagina revealed statistically significant differences in the size of the breasts and the width of the bosom, in favor of the experimental group, while in the other parameters the difference was not established. More favorable conformation with regard to the length of the sternum crest, and taking into account the longer sternum chest where there was more muscle space, had chickens of control groups. A smaller index of g / mm diameter had the chickens of control groups. The chickens of the experimental groups achieved 5.38% higher average body mass, a better total increase of 1.88%, but a slightly higher food conversion by 2.79% compared to chicken control groups.

Significant research by the author I.Estevez (2007), which included the examination of the impact of population density on the poultry industry, primarily on the management of cost benefit analyzes and economic gains in production, as well as on cloning parameters and welfare of chickens in turkey. The author of the study shows that by increasing the density of population there are negative consequences for the well-being and health of chickens in the worm, which directly affects the growth, mortality and other production and slaughter parameters and thus the economic justification of production. This research has shown that the health and welfare of chickens will be compromised if the density of population is less than 0.0625 to 0.07 m² per one chicken.

Z.Škrbić et al. (2008) investigated the possibility of improving certain clown parameters of broiler chickens using a lower population density of 12 chickens per square meter of floor pad

compared to a control group of chickens populated with a density of 16 chickens per square meter. In the study, the authors found that body weight before slaughter was higher in broiler counts in the sample population, with a population density of 12 chickens per square meter compared to the control population of 16 chickens per square meter. As a result of larger body mass before slaughter, broths of the experimental group were found to have a significantly higher mass of treated carcasses. Differences in relative yields of treated carcasses between the examined groups were not significant. The shares of valuable hull parts in broilers of both sexes were somewhat higher in the control group than in the control group. On the carcasses the male chicks by using less density maximum is increased proportion of breast, while the carcasses the chickens female most increased share thigh.

The highest number of studies conducted so far is related to the influence of population density on production and slaughter parameters of fattening chicks (Z. Škrbić and Saras 2011, 2009, 2008, A. Sekeroglu, 2011, Pavlovski et al 2009, S. Bogosavljević- Bošković et al 2005, J. Moriera et al 2006, D. Nembilwi, 2002, HHM Hassaninen, 2011, W. Molee et al, 2011, MS Barcho et al 2006, P. Sørensen et al.

MATERIALS AND METHODS

The survey was conducted on 225 day-old Cobb 500 chickens, which were placed in 3-square-foot boxed squares with five different population density. The control group (K_0) was populated in a density of 15 chickens / m² which is a technological standard, and the experimental groups K_1 , K_2 , K_3 and K_4 were populated with density of 13 chickens / m², 14 chickens / m², 16 chickens / m² and 17 chickens / m² of floor pads. Nutrition and environmental conditions were the same for all chickens.

When choosing chickens, it was considered that the chickens of the experimental groups were approximately the same mass. Selected chicken specimens of the same sex ratio 50:50 (ten male and ten female) were scattered with rings, with the number of records attached to their legs. The rings are made of modified plastic resistant to water and high temperature, avoiding the possibility of damage to the numbers and the determination of the number of sample chickens. Before slaughter, chickens were rehearsed for the purpose of determining the fish in the carriage, after which they were chained to a chain conveyor, thus commencing the slaughter process.

In order to obtain "grill" meat, chickens are cut off from the nipples and legs, and we have weighed every chicken in order to determine its mass. For the determination of prefabricated parts of chickens, trunks of hulls on their components were performed according to the procedure in Rašeta J. and Dakić M. (1994).

To determine the prepared pieces of chickens, each group of 10 carcasses was taken, weighed and confined, and by weighing the determined mass of the following parts of each chicken: neck, wings, back, breasts, drumstick, thigh, pelvis and kalo cut up.

The performance of the experiment is accompanied by the registration of all data on the elements that ensure optimal conditions for chicken breeding. All data is recorded in the book of views.

Immediately in the selection of single-day chickens in the incubator station, samples of the blood of individual chickens (random sample method) were taken, after which the maternal immunity of chickens was determined and a specific vaccine program was performed after which the chicken was vaccinated after 10, 15, and 26 days of age. After each vaccination, vitaminization was performed for a period of three days (vitamin AD_3 E) according to the instructions.

Before slaughter, the competent veterinary inspector found that the chickens were healthy and, on the basis of this, issued a certificate on the health condition of the imported chickens.

Transportation of chickens from farm to slaughterhouse was carried out in plastic crates with an impermeable bottom, so that the excrement would not fall on the chickens that are in the lower ranks. Plastic crates are arranged in a means of transport to allow maximum air access. After the transport and unloading, the crates and the transport medium were disinfected in the unclean part of the slaughterhouse. The unloading of the poultry was done manually.

It is important to note that at 12 o'clock before the slaughter, chicken feeding was interrupted. The task of the post is to empty voles, stomachs and intestines in order to reduce the possibility of contamination of the carcasses during processing. Longer hunger than the above also negatively affects, because in that case chickens start consuming bedding and faeces.

During the experimental period, no mortality of chickens was recorded in any of the experimental groups, and a summary of the deaths and scabies of chickens were given in Table 1. Data on body masses of sporadic chickens, i.e. Chickens with a lower body weight of 1200 g are given in Table 2.

Table 1. *Inspection of dead and shriveled chickens in experimental groups for the total period of fattening*

Experimental group	Deaths	Rejekt	Total
K0	0	2	2
K1	0	3	3
K2	0	1	1
K3	0	1	1
K4	0	0	0
Total	**0**	**7**	**7**

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Table 2. *Overview of body weight of culling chickens in experimental groups, body weight less than 1200 g at the end of the fattening.*

Experimental group	Number of chickens	Body mass (g)	Total
K0	2	930 i 1150	2080
K1	3	1150; 1160 i 1160	3470
K2	1	1040	1040
K3	1	890	890
K4	0	0	0
Total	**7**	**7480**	**7480**

In the experimental phase standard concentrated mixtures for intensive fattening chicks were prepared with three combinations. Each combination of concentrative mixtures consisted of starter, grover and finisher which had exactly the same raw composition and nutritional properties in all components for all five experimental groups.

When programming the nutritive composition of concentrate mixtures, starter, grover and finisher, frames of the raw material composition are in accordance with previously selected raw materials, and the nutritive composition of the concentrated mixtures is shown in **Table 3.**

Components	Units measures	Starter	Grover	Finisher
Dry matter	%	88,12	87,95	87,89
Metabolic energy	unit/kg	12,70	12,91	13,01
Digestible protein	%	22,06	20,15	19,70
Usable proteins	%	19,83	17,94	17,70
Crude fat	%	4,30	4,67	5,29
Crude fiber	%	3,44	3,40	2,82
Potassium (K)	%	0,84	0,74	0,82
Natrium (Na)	%	0,14	0,14	0,15
Chlor (Cl)	%	0,17	0,17	0,21
Calcijum (Ca)	%	1,13	1,12	1,03
Phosphor (P)	%	0,60	0,61	0,56
Usable phosphorus	%	0,43	0,44	0,36
Lysine	%	1,34	1,20	1,14
Methionine	%	0,58	0,54	0,48
Methionine + Cystine	%	0,95	0,85	0,82
Arginine	%	1,53	1,35	1,39
Threonine	%	0,90	0,83	0,81
Tryptophan	%	0,29	0,27	0,26
Linoleic acid	%	1,63	1,80	2,27

Vitamin „A“	IJ/g	10,00	10,00	5,00
Vitamin „D_3 “	IJ/g	3,30	3,30	0,75
Vitamin „E“	ppm/kg	30,00	30,00	7,50
Choline chloride	ppm/kg	400,00	400,00	210,00
Virginimicyn	ppm/kg	20,00	20,00	20,00
Maduranicyn	ppm/kg	5,00	5,00	-

RESULTS AND DISCUSSION

Tables 4-6 show the results of the statistical analysis of the average values for the relative proportion of the hull depending on the density of the population. Table 4 shows the results for male chickens - hips, table 5 for chickens - popcorn and in table 6 for all chicks total, regardless of gender.

Table 4. *Relative proportion of individual parts of the body of male-chickens*

Relative share of body parts in "grill" weight	**POPULATION DENESITY OF CHICKENS**				
	Control (15 individuals /m²)	**13 individuals / m²**	**14 individuals / m²**	**16 individuals / m²**	**17 individuals /m²**
	μ ± σ	**μ ± σ**	**μ ± σ**	**μ ± σ**	**μ ± σ**
Neck	5,06 ± 0,69	5,18 ± 0,46	5,09 ± 0,44	5,19 ± 0,82	5,57 ± 0,98
Wings	10,74 ± 0,53	10,80 ± 0,33	10,00 ± 0,81	10,44 ± 0,39	10,58 ± 0,66
Drumstick	13,11 ± 0,71	13,04 ± 0,80	12,93 ± 0,57	12,92 ± 0,55	13,34 ± 1,18
Thigh	15,52 ± 1,24	15,50 ± 0,62	16,66 ± 1,03	16,00 ± 0,88	16,80 ± 2,33
Breasts	34,08 ± 1,88	34,76 ± 1,85	35,76 ± 1,11	34,70 ± 1,74	33,71 ± 2,32
Back	11,02 ± 1,45	11,18 ± 0,51	8,22 ± 2,13	10,44 ± 2,14	9,66 ± 2,85
Pelvis	10,25 ± 1,75	9,45 ± 0,84	11,21 ± 1,38	10,14 ± 1,23	10,19 ± 2,33
Total	99,79 ± 0,44	99,91 ± 0,12	99,86 ± 0,13	99,84 ± 0,40	99,85 ± 0,20
Kalo	0,22 ± 0,44	0,09 ± 0,12	0,14 ± 0,13	0,17 ± 0,40	0,14 ± 0,20

* μ (gained value) ± σ (standard deviation);

According to the results of the research conducted (Table 6.26), the largest male chicken was recorded in the experimental group K_4 (17 units / m²), while the largest part of the breasts was recorded in the K_2 (14 individuals / m²), which is graphically shown in graph 1.

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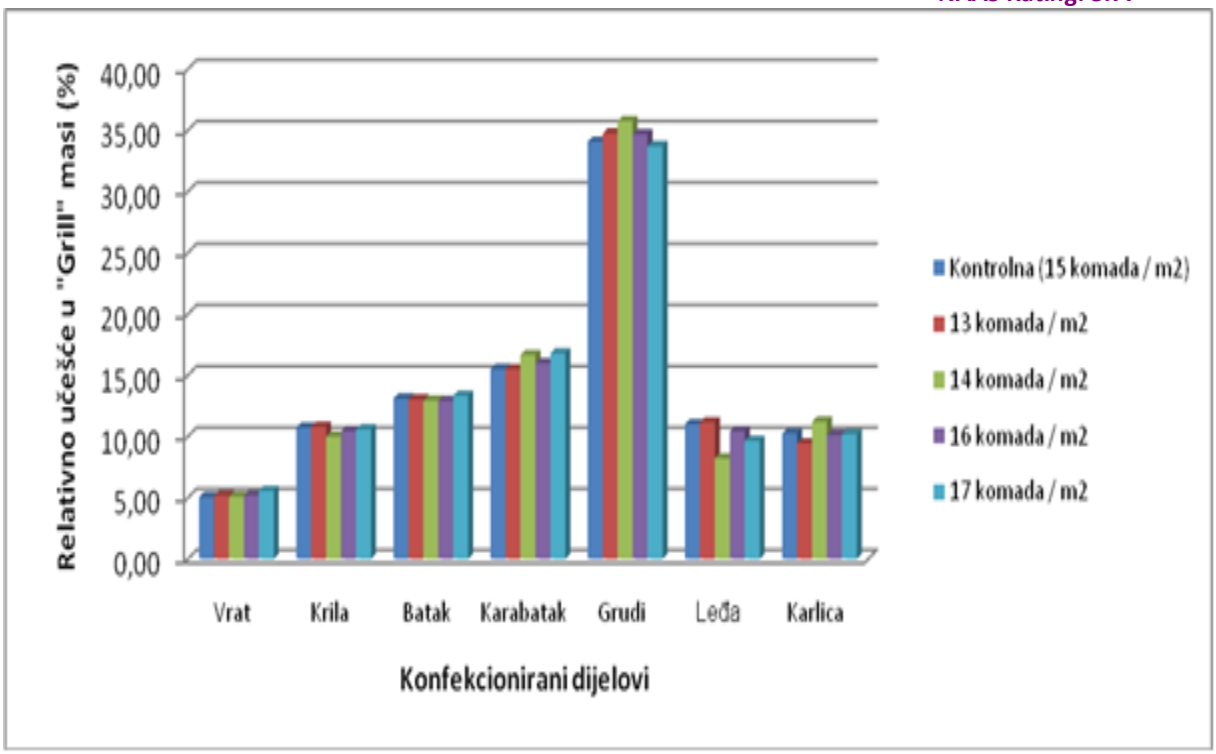

Chart 1. *Average share of individual parts of male chickens for experimental groups*

Table 5. *Relative proportion of individual parts of the chickens of female sex - pullet*

Relative share of body parts in "grill" weight	POPULATION DENESITY OF CHICKENS				
	Control (15 individuals / m^2)	13 individuals / m^2	14 individuals / m^2	16 individuals / m^2	17 individuals / m^2
	μ ± σ	μ ± σ	μ ± σ	μ ± σ	μ ± σ
Neck	5,02 ± 0,47	4,90 ± 0,46	5,26 ± 0,77	5,08 ± 0,50	5,12 ± 0,54
Wings	10,53 ± 0,74	10,32 ± 0,55	10,28 ± 0,34	10,39 ± 0,39	10,84 ± 0,51
Drumstick	12,54 ± 0,41	12,21 ± 0,34	11,99 ± 0,62	12,47 ± 0,64	13,10 ± 0,59
Thigh	15,60 ± 0,75	15,05 ± 0,40	15,86 ± 0,61	15,21 ± 0,74	17,69 ± 2,46
Breasts	35,41 ± 1,59	35,47 ± 1,73	35,64 ± 1,23	35,45 ± 2,02	33,86 ± 1,47
Back	11,38 ± 0,80	11,33 ± 0,86	9,52 ± 2,61	11,36 ± 1,00	9,67 ± 1,68
Pelvis	9,39 ± 0,96	10,65 ± 0,96	11,35 ± 1,58	10,00 ± 0,94	9,62 ± 3,25
Total	99,88 ± 0,23	99,92 ± 0,10	99,92 ± 0,12	99,96 ± 0,06	99,89 ± 0,14
Kalo	0,13 ± 0,23	0,08 ± 0,10	0,09 ± 0,12	0,04 ± 0,06	0,11 ± 0,14

* μ (gained value) ± σ (standard deviation);

According to the obtained values of the share of individual parts of the female chickens (Table 5) it can be seen that the greatest relative proportion body was re-recorded in chickens from the experimental group K_4 (17 chickens / m²), while the highest proportion of chest was recorded in chickens the experimental group K_2 (14 chickens / m²), graph 2.

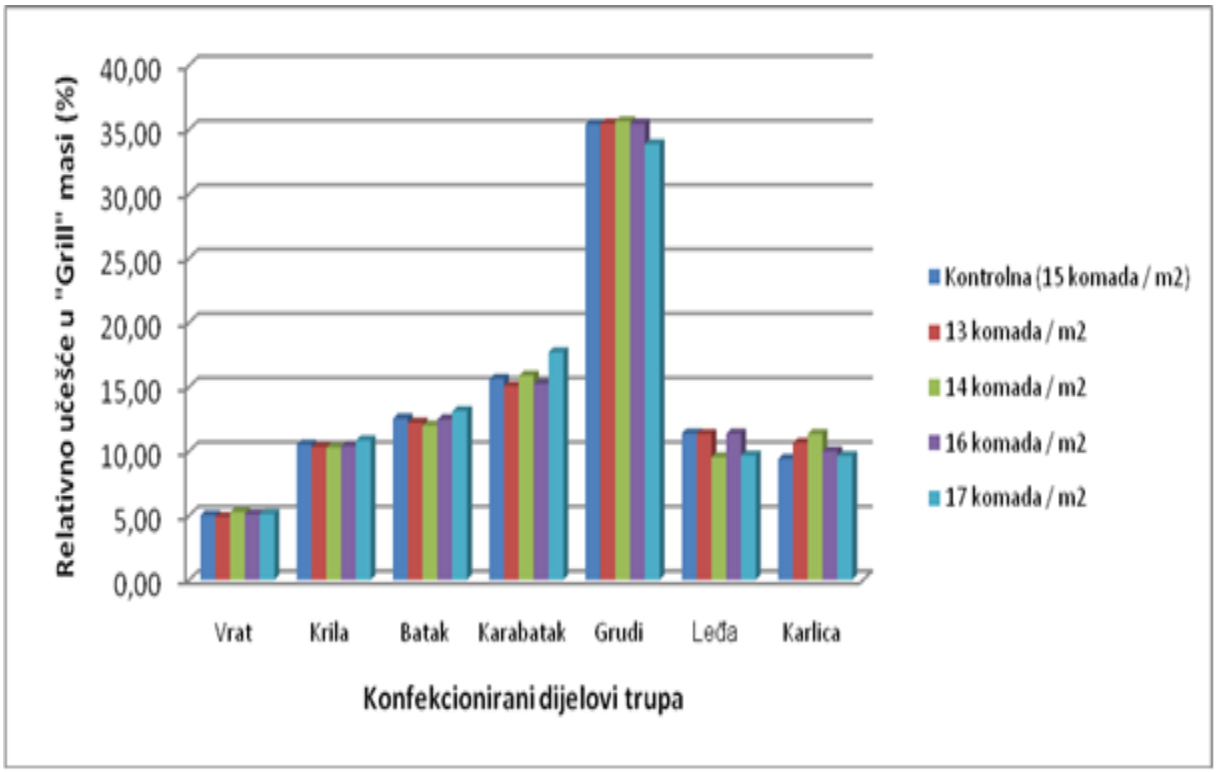

Chart 2. *Average share of individual parts of the female chicken for the sample groups*

Table 6. *Relative share of individual parts of chickens of both sexes-total*

Relative share of body parts in "grill" weight	POPULATION DENESITY OF CHICKENS					p- value
	Kontrolna (15 individuals m²)	13 individuals / m²	14 individuals / m²	16 individuals / m²	17 individuals / m²	
	μ ± σ	μ ± σ	μ ± σ	μ ± σ	μ ± σ	
Neck	5,04 ± 0,57	5,04 ± 0,47	5,18 ± 0,62	5,13 ± 0,66	5,34 ± 0,80	0,5467
Wings	10,63 ± 0,64	10,56 ± 0,51	10,14 ± 0,62	10,42 ± 0,38	10,71 ± 0,59	**0,0141**
Drumstick	12,82 ± 0,64	12,62 ± 0,74	12,46 ± 0,75	12,70 ± 0,63	13,22 ± 0,92	**0,0219**
Thigh	15,56 ± 1,00	15,28 ± 0,56	16,26 ± 0,92	15,60 ± 0,89	17,25 ± 2,38	**0,0000**
Breasts	34,75 ± 1,83	35,11 ± 1,78	35,70 ± 1,14	35,08 ± 1,87	33,79 ± 1,89	**0,0136**

Back	11,20 ± 1,15	11,25 ± 0,69	8,87 ± 2,41	10,90 ± 1,69	9,66 ± 2,27	**0,0000**
Pelvis	9,82 ± 1,44	10,05 ± 1,07	11,28 ± 1,45	10,07 ± 1,06	9,90 ± 2,77	**0,0448**
Total	99,83 ± 0,34	99,92 ± 0,11	99,89 ± 0,12	99,90 ± 0,29	99,87 ± 0,17	0,8050
Kalo	0,17 ± 0,34	0,09 ± 0,11	0,11 ± 0,12	0,10 ± 0,29	0,12 ± 0,17	0,8093

* μ (gained value) ± σ (standard deviation);

Observing, male chicks - female and female chicks – pullet populations (Table 6) show that there is a statistically significant difference (p <0.05) in all relative parts of chicken, except for the "neck" where there is no statistically significant difference (p> 0.05), graph 3.

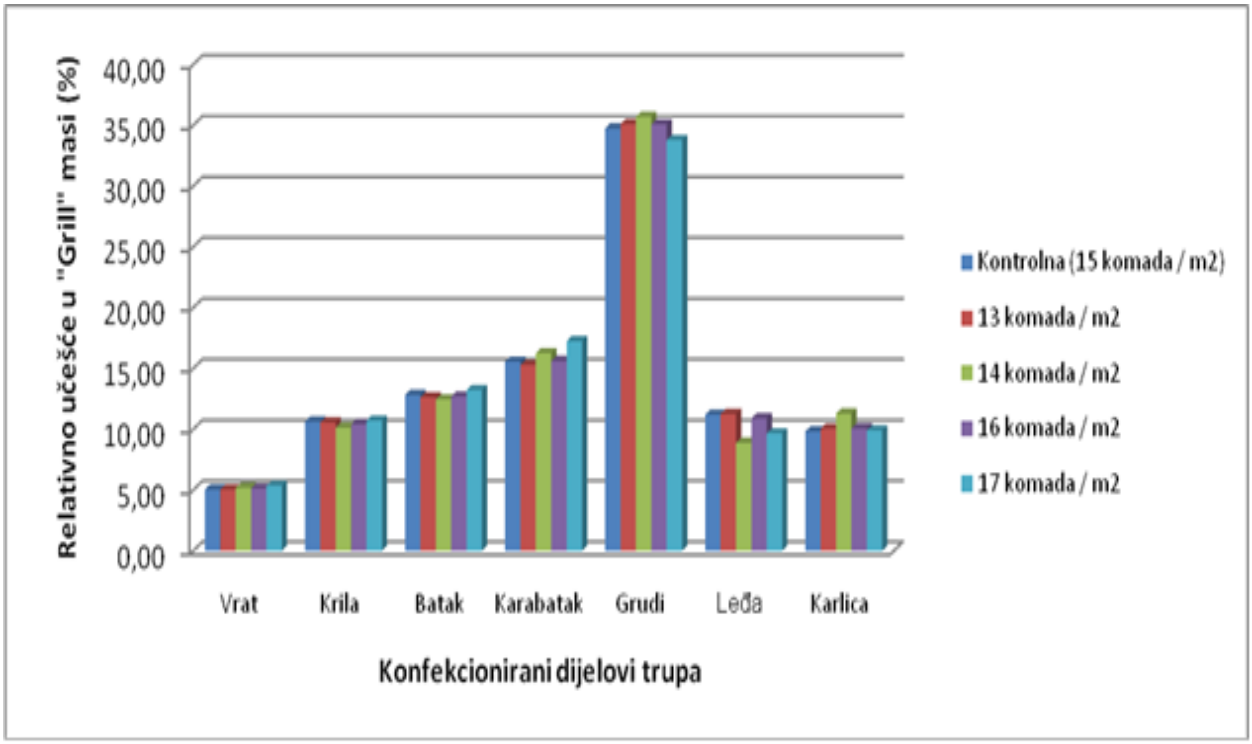

Chart 3. *Average shares of individual parts of the chickens of female and male sex groups of the experimental group*

CONCLUSIONS

- Observing, male chicks - female and female chicks – pullet there is a statistically significant difference (p <0.05) in all relative parts of chickens, except for the "neck" body where there is no statistically significant difference (p> 0.05).

- Observing, chickens of male sex - female and female chicks - pulletit is seen that there is no statistically significant difference (p <0.05) in fish sands.

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