Meat of Guinea fowl. I. Effect of the fattening period on slaughter characteristics of a local Bulgarian population of Guinea fowl (*Numida meleagris*)

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Citation: Nikolova, M., Veleva, P., & Penchev, I. (2021). Meat of Guinea fowl. I. Effect of the fattening period on slaughter characteristics of a local Bulgarian population of Guinea fowl (*Numida meleagris*). *Zhivotnovadni Nauki*, *58*(2), 28-40 (Bg).

Abstract

The effect of the fattening period on the slaughter performance of a local Bulgarian population of free-ranged pearl-gray Guinea fowls was studied. The pre-slaughter weight varied from 1041.00 to 1296.00 g in the group of female fowls and from 1029.50 to 1292.83 g in the group of male fowls, depending on the fattening period duration. The data of grill weight were 605.15–839.81 g for the females and 643.52–826.23 g for the male individuals and of bratfertig: 683.50–915.99 g and 721.82–910.52 g, respectively, depending on gender and duration of the fattening period. Grill meat varied from 459.56 to 643.07 g for a group of male fowls and from 441.15 to 649.55 g for a group of female fowls, while breast meat was 190.84–283.94 g (male) and 186.77–286.7 g (female), depending on the studied factors. The slaughter yields (bratfertig, %) ranged from 65.72% to 70.71% depending on the two factors of influence. The carcass weight (grill, %) of both sexes was 60.36% for the 16-week fattening period, over 61% for the 20-week and 64% for the 24-week fattening period. The proportions of the pectoral muscles in the carcass were higher for the older Guinea fowl, while the percentages of thigh muscles decreased from 31% to 29% with increasing of the age. The relative values of breast and leg muscles increased with the increase of the fattening period duration of the slaughtered birds. Grill's bones had the highest values in the 16-week-old Guinea fowls (29.09%). Besides sex, the slaughter age had a significant effect on almost all the slaughter characteristics except for the weight of the by-products.

Key words: Guinea fowl, slaughter characteristics, meat cuts, meat, bones

Месо от токачки. I. Ефект на периода на угояване върху кланичните характеристики на местна българска популация от токачки (*Numida meleagris*)

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Резюме

Проучен е ефектът на периода на угояване върху кланичните характеристики на местна за България популация, свободно отглеждани перлено-сиви токачки. Предкланичното тегло варира от 1041,00 до 1296,00 g в групата на женските и от 1029,50 до 1292,83 g при мъжките птици в зависимост от продължителността на периода на угояване. Данните за теглото на разфасовката „Грил“ са 605,15–839,81 g за женските и 643,52–826,23 g за мъжките индивиди и за разфасовката „Братфертиг“ съответно 683,50–915,99 g и 721,82–910,52 g. Месото, добито от „грила”, варира от 459,56 до 643,07 g за групата на мъжките птици и от 441,15 до 649,55 g при женските, докато месото от гърди е 190,84–283,94 g (мъжки) и 186,77–286,7 g (женски) в зависимост от проучваните фактори. Рандеманът (Братфертиг, %) варира от 65,72% до 70,71% в зависимост от пола. Теглото на трупа („Грил”, %) и при двата пола е 60,36% за 16-седмичния, над 61% за 20-седмичния и 64% за 24-седмичния период на угояване. Теглото на гръдните мускули в трупа е по-високо при по-възрастните птици, докато процентите на бедрените мускули намаляват от 31% на 29% с увеличаване на възрастта. Относителните стойности на мускулите на гърдите и краката се увеличават с увеличаване на продължителността на периода на угояване на закланите птици. Костите, добити от разфасовката „Грил”, са с най-високи стойности при 16-седмичните токачки (29,09%). Освен пола, възрастта на клане на птиците оказва значителен ефект върху почти всички кланични характеристики, с изключение на теглото на субпродуктите.

Ключови думи: токачки, кланични характеристики, месни разфасовки, месо, кости

Abbreviations:
GLM – General Linear Model; LSD – Least Significant Differences

Introduction

Poultry meat is consumed more than any other type of meat. In the last three decades, there has been a decline in the consumption of all types of meat, except for poultry, its share increasing by 80% (Puvača et al., 2014). Modifying the composition of poultry meat through the feeding diet and the rearing conditions in recent decades and the increased demand for meat from eco-friendly raised rare farm poultry species, among them Guinea fowl, have been widely studied and discussed by many researchers in that area (Aletor et al., 2003; Rymer et al., 2010; Nasr & Kheiri, 2011). Guinea fowl meat is an attractive and appropriate alternative to broiler chicken and has already been tested in practice and implemented not only in France and Italy but also in the United States and Canada (Tufarelli et al., 2007; Laudadio et al., 2012).

The slaughter characteristics of the farm animals and poultry form the major part of their meat production performance. Depending on the fattening period duration (14, 16, and 20 weeks of age), Premavalli (2013) established pre-slaughter live weights of male Guinea fowls of 762.25, 865.21 and 965.63 g, respectively. Significantly higher pre-slaughter live weight, what is more, in 12-week-old individuals, was reported by Zabiyakin et al. (2014) – 1244 g in males and 1250 g in females.

Meat weight to the slaughtered bird weight was 64% in Guinea fowl and 54% in the hen.

The results obtained by Chepkemoi et al. (2017) for the meat to bone ratio of 1.58 in domestic Guinea fowl versus 1.44 in hen, confirmed that fact. Zabiyakin et al. (2014) established approximately the same proportion of meat, 60–63% being a white meat, and 39–40% being leg meat. The same authors also identified 7–8% of by-products. According to Polyanskih et al. (2010), the white to dark meat ratio in those two bird species was 1:1.14 in hen and 1:1.28 in Guinea fowl, and, the ratio of by-products to the carcass weight was 7.5% in Guinea fowl and 6.7% in hen, respectively.

The results in the experiments of Kudryashov et al. (2015) for the cleaned carcass weight were 783.40–885.80 g for females and 807.60–885.80 g for male birds, and the grill weight was 667.88–752.75 for females and from 680.26 to 754.91 g for male Guinea fowls. In their later experiments with White Volga breed, the authors established the average carcass weight (excluding blood and feathers) of 1144.50 g for the male and 1170 g for the female birds. Breast muscle weight was 257.50 g in males and 266.30 g in females or expressed in a percentage, it was 20.7 and 21.3%, respectively. The thigh weight and the percentage to the total carcass weight were 328.40 g in males (26.4%) and 323.80 g in females (25.9%), respectively (Kudryashov et al., 2018).

In trials with Guinea fowl raised for meat production, when testing different fattening periods, under the conditions of different production systems, quite different results were obtained by the authors for the pre-slaughter live weight, the carcass weight, and the slaughter yield. Nobo et al. (2012) reported a live weight of 1.69–1.13 kg, a feed conversion ratio of 3.98–4.10 kg, and a slaughter yield of 72.55–75.82% for Guinea fowls fattened to 13 weeks of age. Other authors established significantly higher values for the slaughter yield (85.6%–87.4%) but after a fattening period of 30 weeks (Adeyemo & Oyejola, 2004). Kokoszyński et al. (2011) reported significantly lower results for Guinea fowl fattened up to 13 and 16 weeks: 70.10–70.9%, finding no statistically significant differences between the two fattening periods. Houndonougbo et al. (2017) established a pre-slaughter live weight at the age of 16 weeks from 876.70 to 965.00 g and a slaughter yield of 77.40, 78.50, 78.20, 85.10 and 79.2%, respectively. In experiments with broiler Guinea fowl raised to different ages (14, 16, and 18 weeks), Pudyszak et al. (2003, 2005) established that the highest slaughter yield was obtained after a 14-week fattening period (73.61%). Significantly lower values of the slaughter yield were reported by Baeza et al. (2001): 68.7% in male and 68.2% in female individuals, intensively fattened up to 96 days of age, and, by Kudryashov et al. (2015): 60.70 to 61.1% in female and 60.2–60.6% in male Guinea fowls raised to the age of 80 days.

Taking into account the limited research investigations on that type of farm birds and, in particular, on their meat production in our country, we set the aim of studying the effect of the fattening period duration and sex of the birds on their slaughter traits as indicators of meat productivity.

Materials and Methods

Materials

The experimental work in the present study was carried out at the poultry farm of the Training and Experimental Site of the Agricultural University of Plovdiv, Bulgaria with three groups of pearl-gray Guinea fowls of a local population, with 30 birds in each group (Total = 90 birds, an equal number of both sexes). The birds were raised free-range, in light-type polymer premises open to free-range yards. Phase feeding of compound feed prepared on the poultry experimental farm of the Agricultural University of Plovdiv, Bulgaria was applied according to the relevant recipe, depending on the bird category and age, following Marinov et al. (2016) (Table 1).

Taking into account the fact that the subject of the study was a late-maturing, slow-growing, not specifically bred for meat production free-range local population of Guinea fowl, two of the longest fattening periods for obtaining meat from young Guinea fowls, known in the available literature, were selected, i.e. 20 and 24 weeks. A shorter fattening period of 16 weeks was also

Table 1. Composition of compound feed for growing Guinea fowls

Compounds, %	Starter			Grower			Finisher		
	Gr. 1	Gr. 2	Gr. 3	Gr. 1	Gr. 2	Gr. 3	GR. 1	Gr. 2	Gr. 3
	0-5	0-5	0-5	6-12	6-16	6-20	13-16	17-20	21-24
Maize	26.00			30.00			33.50		
Wheat	22.20			25.65			35.00		
Soybean meal 44% CP	35.00			33.00			19.16		
Sunflower meal 34% CP	3.00			4.00			5.00		
Fish meal 72% CP	7.00			-			-		
L-lysine HCL	0.12			0.17			0.18		
DL-methionine	0.16			0.18			0.12		
Chalk	1.42			1.15			1.02		
Potassium phosphate	2.15			1.90			2.00		
Salt	0.10			0.10			0.17		
Sodium bicarbonate	0.35			0.35			0.35		
Vitamin –mineral premix	0.50			0.50			0.50		
Sunflower oil	2.00			3.00			3.00		
Total	100.00			100.00			100.00		
Content in comb. fodder: ME, MJ/kg	12.10			12.41			12.70		
Crude protein, %	26.21			21.82			17.71		
Lysine	16.30			12.96			9.46		
Methionine	6.31			5.20			4.10		
Methionine+cystine	0.98			0.87			0.72		
Threonine	1.09			0.95			0.78		
Tryptophan	0.27			0.21			0.20		
Macroelements, %									
Potassum	1.27			1.00			0.95		
Available phosphorus	0.50			0.42			0.42		
Sodium	0.18			0.18			0.18		

tested, which is the longest one used in broiler production of Guinea fowls. At the end of each fattening period (16, 20, and 24 weeks), 6 males and 6 females of average live weight for the given group were studied.

Methods

Slaughtering and primary processing of the Guinea fowls was carried out by the requirements of Ordinance No. 20 of 1.11.2012 on minimizing the suffering of animals during slaughter or killing. The birds were slaughtered after 12 hours of fasting (free access to water). The head was removed in the area between the first and second cervical vertebrae and the legs – at the hock.

Following the removal of the viscera, the edible by-products (liver, heart, gizzard, spleen, and abdominal fat) were separated and individually weighed. The prepared carcasses were packed in foil and placed for cooling and stored at 0–4 °C for 24 hours. The carcass analysis was performed with cooled carcasses.

The following indicators characterizing the slaughter performance of the birds were determined:

• Pre-slaughter live weight (g) – the weight of the birds immediately before slaughter;

• Carcass weight – expressed as bratfertig and grill (g);

• Bratfertig (g and %) – cleaned carcass with the neck and the internal edible by-products;

• Grill, (g and %) – cleaned carcass without the neck and internal edible by-products;

• Slaughter yield (%) – calculated in two ways: grill slaughter yield = (grill weight/pre-slaughter live weight) * 100, and, bratfertig slaughter yield = (bratfertig weight/pre-slaughter live weight) * 100;

• Breast (g and %) – including the sternum with its superficial and deep pectoral muscles;

• Leg (g and %) – including the femur and tibia, with the adjacent muscles;

• Wings (wings), (g and %) – cut through the shoulder joint;

• Back (g and %) – the part of the carcass including the pelvic bones, the lumbal and sacral vertebrae, the thoracic vertebrae with the vertebral part of the ribs and scapula;

• Abdominal fat (g and %) – found only in the Guinea fowls fattened for the longest period (24 weeks of age);

• By-products (g and %) – heart, spleen, liver, and muscular gizzard.

• After boning of the separate cuts, the following traits were also measured:

• Grill meat (g and %); Grill bones (g and %); Breast meat (g and %); Breast bones (g and %); Leg meat (g and %); Leg bones (g and %).

Statistical processing of the data

Data analysis included obtaining the main statistics (mean values – $\bar{x}$, Standard Deviations – SD, and Coefficients of determination – R^2) for the investigated slaughter components and univariate data analysis to establish the influence of sex and fattening period on slaughter characteristics of a local Bulgarian population of Guinea fowl. As a result, a General Linear Model (GLM) was developed, given as

$Y = \bar{x} + G + e$, where

Y are the measurements of the slaughter characteristics,

$\bar{x}$ are the mean values,

G are the factors of influence (sex and fattening period) and

e are the random residual errors.

Significant differences were tested using Least Significant Differences test (LSD) and p-values < 0.05 were considered statistically significant. The IBM SPSS Statistics 17.0 WinWrap Basic, Copyright 1993 - 2007 statistical package was used to process the data.

Results and Discussion

The analysis of the data obtained in the present study showed that the factors fattening period and sex of the birds had a different degree of effect on the slaughter characteristics of the studied Guinea fowls. Table 2 presents the results of the LSD test for the slaughter traits measured at 16, 20, and 24 weeks of age.

Table 2 shows that the absolute values of the pre-slaughter live weights of Guinea fowls at 16 weeks of age were 1029.50 g for the male and 1041.00 g for the female birds. At 20 weeks of age, the male birds were 1206.50 g and the female – 1209.17 g. The results for the same trait at 24 weeks of age were 1292.83 g for the male and 1296.00 g for the female individuals. As a result of the LSD test, the fattening period was found to have a significant effect ($p < 0.05$) on the pre-slaughter live weight.

Similar to the pre-slaughter live weight, the carcass weight was also affected by the age of the birds. The 16-week-old Guinea fowls did not show significant differences by sex ($p < 0.05$) in that trait (679.41 g for males and 638.28 g for females). After a fattening period of 20 weeks, the carcass values were from 776.70 g (males) to 770.04 g (females). Data reported for 24-week-old Guinea fowls ranged from 862.58 g in males to 873.35 g in females. Taking into consideration the above data, it can be concluded that the fattening period significantly affected the carcass weight ($p < 0.05$).

The Grill is the cleaned carcass without the neck and by-products. In 16-week-old Guinea fowls, the grill was almost equal in males (643.52

Table 2. Slaughter characteristics of Guinea fowl depending on sex and the fattening period duration
Test: LSD

Traits	$\bar{x} \pm SD$					
	16 weeks of age		20 weeks of age		24 weeks of age	
	Males	Females	Males	Females	Males	Females
Pre-slaughter live weight, g	1029.50 ± 71.06 ^{ab}	1041.00 ± 25.47 ^{ab}	1206.50 ± 92.46 ^{ac}	1209.17 ± 46.74 ^{ac}	1292.83 ± 75.19 ^{bc}	1296.00 ± 28.36 ^{bc}
Carcass, g	679.41 ± 43.23 ^{ab}	638.28 ± 25.46 ^{ab}	776.70 ± 5.90 ^{ac}	770.04 ± 60.05 ^{ac}	862.58 ± 44.38 ^{bc}	873.35 ± 35.06 ^{bc}
Grill, g	643.52 ± 41.83 ^{ab}	605.15 ± 26.5 ^{ab}	742.40 ± 8.01 ^{ac}	737.86 ± 60.93 ^{ac}	826.23 ± 43.69 ^{bc}	839.81 ± 34.98 ^{bc}
Bratfertig, g	721.82 ± 42.88 ^{ab}	683.50 ± 25.65 ^{ab}	824.62 ± 5.66 ^{ac}	816.52 ± 62.95 ^{ac}	910.52 ± 44.83 ^{bc}	915.99 ± 34.87 ^{bc}
Breast, g	224.76 ± 17.01 ^{ab}	215.86 ± 6.67 ^{ab}	264.57 ± 5.94 ^{ac}	259.97 ± 18.67 ^{ac}	313.66 ± 35.15 ^{bc}	316.73 ± 31.49 ^{bc}
Leg, g	208.90 ± 13.74 ^{ab}	194.94 ± 7.24 ^{ab}	232.58 ± 8.14 ^{ac}	226.32 ± 19.91 ^{ac}	251.97 ± 9.13 ^{bc}	254.61 ± 7.71 ^{bc}
Wings, g	84.75 ± 6.78 ^{ab}	80.88 ± 5.10 ^{ab}	88.99 ± 3.74 ^{ac}	92.27 ± 8.33 ^{ns}	101.72 ± 6.71 ^{bc}	102.68 ± 3.66 ^{bc}
Back, g	120.86 ± 10.6 ^{ab}	117.60 ± 9.46 ^{ab}	137.80 ± 3.59 ^{ac}	136.37 ± 11.50 ^{ac}	166.67 ± 10.14 ^{bc}	168.50 ± 11.03 ^{bc}
By-products, g	42.41 ± 1.17 ^{ns}	45.22 ± 6.01 ^{ns}	47.92 ± 5.67 ^{ns}	46.47 ± 4.28 ^{ns}	47.95 ± 4.35 ^{ns}	42.64 ± 1.56 ^{ns}
Abdominal fat, g	-	-	-	-	0.31 ± 0.77 ^{bc}	0.38 ± 0.62 ^{bc}

Coefficients of determination (R^2): Pre-slaughter live weight R^2 = 0,759; Carcass weight R^2 = 0.822; Grill R^2 = 0.822; Bratfertig R^2 = 0.820; Breast R^2 = 0.758; Leg R^2 = 0.749; Wings R2 = 0.659; Back R^2 = 0.083; Edible by-products R^2 = 0.090; Abdominal fat R^2 = 0.154

[*] *The difference in the mean values of the slaughter analysis (g) of male and female Guinea fowls was statistically significant at a significance level $p < 0.05$, as follows: a – 16 and 20 weeks of age; b – 16 and 24 weeks of age; c – 20 and 24 weeks of age; d – males and females; ns – no significant differences ($p > 0.05$)*

g) and females (605.15 g). For the second fattening period (20 weeks) the grill weight was 742.40 g in males and 737.86 g in females. After the longest fattening period (24 weeks) the mean values in males were 826.23 g versus 839.81 g in females, respectively. Again, statistically significant differences were found in the grill weight depending on the duration of the fattening period ($p < 0.05$).

The results reported for bratfertig in the three age groups showed statistically significant difference ($p < 0.05$) and had the following values: in 16-week-old: 683.50–721.98 g, in 20-week-old: 816.52–824.62 and in 24-week-old Guinea fowls: 910.52–915.99 g, respectively, depending on their sex.

An important trait characterizing the slaughter productivity is the breast and leg weight. The mean values of the breast in 16-week-old birds did not differ significantly ($p < 0.05$) in both sexes (male – 224.76 g and female – 215.86 g). For the second fattening period (20 weeks) the breast weight ranged from 264.57 g (males) to 259.97 g (females). In 24-week-old Guinea fowls, the mean weight ranged from 313.66 g in the males to 316.73 g in females, respectively.

The leg weight of the birds of both sexes in the variant with the shortest fattening period was close: 208.90 g in males and 194.94 g in females, respectively. The mean values of the leg weight in birds slaughtered at the age of 20 weeks showed

no significant difference between the male (232.58 g) and the female Guinea fowls (226.32 g). The absolute leg weight for the longest fattening period was within the range 251.97–254.61 g in male and female birds, respectively.

The weight of the wings ranged from 84.75 g in males to 80.88 g in female Guinea fowls fattened to 16 weeks of age. At 20 weeks of age, the mean values of that trait were within 88.99 and 92.27 g, depending on the bird sex. In 24-week-old fowls, the results ranged from 101.72 g to 102.68 g in male and female Guinea fowl, respectively.

The values obtained for the back showed significant differences ($p < 0.05$) between the experimental fattening periods, without establishing any effect of sex on that trait.

Abdominal fat was found only in 24-week-old birds, with higher values in the female Guinea fowls. The mean data in males were 0.31 g and in females 0.38 g, respectively. The same conclusion about a higher percentage of fat in the carcass of female birds was also made by Fuentes et al. (1998), Leterrier et al. (1999), Baéza et al. (2001) and Musundire et al. (2018). That was due to the accumulation of some reserves in the female birds before the start of egg-laying. The insignificant amount of reserve fat was the result of the free-range raising system.

A tendency of no significant differences ($p < 0.05$) between the two sexes and between the experimental fattening periods were found in the by-products.

Musundire et al. (2018) reported a pre-slaughter live weight of Guinea fowls of 920.80–973.80 g, which was close to the weight of the birds in the variant with the shortest fattening period in the present experiment. The values of the bird carcass weight in the same variant were 631.40–663.60 g, corresponding to the results in the 16 weeks of fattening. However, the carcass weights of the fowl slaughtered at weeks 20 and 24 were higher than those of the authors cited. Bernacki et al. (2012) carried out a slaughter analysis on 14-week-old Guinea fowl of two color variants (white and pearl-gray) and found values, which were similar to those obtained in the present study after a 20-week fattening period but with conventional fattening. The breast weight in the studies by Bernacki et al. (2012) was 249 g for both sexes and it was close to the results in the present study for 16-week-old birds (215.86–232.43 g), obtained in the two experimental years. The leg muscle, ranging from 187 to 211 g, established in white and pearl-gray fowls by the cited authors, corresponding to 194.94–209.91 g in 16-week-old birds in the present study.

The coefficients of determination (R^2) of the studied traits are presented in Table 2 and show that from moderate to high correlation were observed between the factors of influence (fattening period and sex) and the traits pre-slaughter live weight, carcass weight, grill, bratfertig, breast and leg, the coefficient varying $R^2 = 0.659 \div 0.822$, respectively. A very weak correlation was reported between the fattening period and sex factors and the studied traits: by-products, back and abdominal fat ($R^2 = 0.083 \div 0.154$).

The levels of significance observed in Table 2 show that the factor bird sex had no significant effect on any of the slaughter productivity traits at the three fattening periods (16, 20, and 24 weeks). That finding is a great advantage and can greatly reduce the mechanical work and production costs of that type of poultry. The close values of the studied characteristics of meat production allow raising birds of both sexes.

In contrast to sex, the slaughter age factor had a significant effect on almost all the characteristics of slaughter productivity, except for the by-products weight ($p < 0.05$). The same conclusions about the effect of the two factors on the slaughter performance of Guinea fowl were reached by Fejemilehin (2010) and Porwal et al. (2002).

The most important trait characterizing the meat-production qualities of poultry is the proportion of manually-boned meat from breast and leg. Tables 3 present the results of the LSD test of the slaughter traits meat and bone content (g) in Guinea fowl depending on sex and the duration of the fattening period.

The mean values of hand-boned Guinea fowl grill meat, when the birds were fattened for 16 weeks of age, ranged from 441.15 g to 459.56 g depending on sex. The levels of significance showed that the increase in boned grill meat till

Table 3. Meat and bone content of Guinea fowl depending on sex and duration of the fattening period
Test: LSD

Traits	$\bar{x} \pm SD$					
	16 weeks of age		20 weeks of age		24 weeks of age	
	Males	Females	Males	Females	Males	Females
Grill meat, g	459.56 ± 32.46 ^{ab}	441.15 ± 17.87 ^{ab}	542.18 ± 9.79 ^{ac}	533.20 ± 41.58 ^{ac}	643.07 ± 39.86 ^{bc}	649.55 ± 31.09 ^{bc}
Grill bones, g	179.71 ± 17.62 ^{b}	168.13 ± 7.91 ^{b}	181.76 ± 8.41 ^{c}	181.72 ± 15.66 ^{c}	190.94 ± 8.87 ^{bc}	192.97 ± 8.9 ^{bc}
Breast meat, g	190.84 ± 17.71 ^{ab}	186.77 ± 6.29 ^{ab}	231,87 ± 6.75 ^{ac}	226.87 ± 17.06 ^{ac}	283.94 ± 35.14 ^{bc}	286.7 ± 31.81 ^{bc}
Breast bones, g	33.92 ± 3.14 ^{ns}	29.09 ± 1.23 ^{ns}	32.70 ± 2.76 ^{c}	33.10 ± 2.65 ^{c}	29.72 ± 2.57 ^{c}	30.03 ± 2.58 ^{c}
Leg meat, g	169.59 ± 12.09 ^{ab}	158.13 ± 5.43 ^{ab}	192.79 ± 5.89 ^{ac}	186.47 ± 16.59 ^{ac}	212.98 ± 6.68 ^{bc}	215.24 ± 6.30 ^{bc}
Leg bones, g	39.31 ± 2.74 ^{ab}	36.82 ± 2.05 ^{ab}	39.80 ± 2.93 ^{c}	39.85 ± 3.89 ^{c}	38.98 ± 3.12 ^{b}	39.36 ± 2.70 ^{b}

Coefficients of determination (R^2): Grill meat R^2 = 0,876; Grill bones R^2 = 0,302; Breast meat R^2 = 0,769; Breast bones R^2 = 0,199; Leg meat R^2 = 0,809; Leg bones R^2 = 0,056

** The difference in the mean values of male and female Guinea fowls (g) was statistically significant at a significance level $p < 0.05$, as follows: a – 16 and 20 weeks of age; b – 16 and 24 weeks of age; c – 20 and 24 weeks of age; d – males and females; ns – no significant differences ($p > 0.05$)*

the 20th (533.20–542.18 g) and 24th week (649.55–643.07 g) was statistically significant ($p < 0.05$). The absolute values of grill bones varied from 179.71 g in 16-week-old to 190.94 g in 24-week-old males and 186.77 to 192.97 g in females, respectively.

The age of slaughter had a significant effect on breast meat weight. The data established for the shortest fattening period varied from 186.77 g to 190.84 g in male and female Guinea fowls, respectively. 226.87–231.87 g of breast meat was obtained from the birds slaughtered at the age of 20 weeks. At the age of 24 weeks, the yield amounted to 286.7–283.94 g. The breast bone weight varied from 29.09 to 33.10 g in the different groups of both sexes.

No statistically significant differences were found in the weight of boned leg meat from the male (169.59 g) and female (158.13 g) Guinea fowls at the age of 16 weeks. The leg meat weight of 20-week-old birds was 192.79–186.47 g in the males and females, respectively. The bone weight was slightly higher in males (39.31 g) compared to females (36.82 g) in 16-week-old birds. Bone weight values of 20-week-old Guinea fowls were 39.80–39.85 g in male and female birds, respectively. At the age of 24 weeks, the reported data were slightly lower: 38.98–39.36 g in male and female Guinea fowls, respectively.

The coefficients of determination of the studied traits (R^2), included in Table 3, show that there was a high correlation between the factors of influence (fattening period and sex) and the traits grill, breast and leg meat, the coefficient varying R^2 = 0, 769 ÷ 0.876, respectively. For the other traits: grill bones, breast bones, and leg bones, the correlation with the factors of age in weeks and sex was moderate to very weak (R^2 = 0.302 ÷ 0.056).

Figure 1a-h presents the mean values of the slaughter yield (%) measured at 16, 20, and 24 weeks of age of male and female Guinea fowls.

The percentage of the grill from the live weight (Figure 1a), on average for the birds of

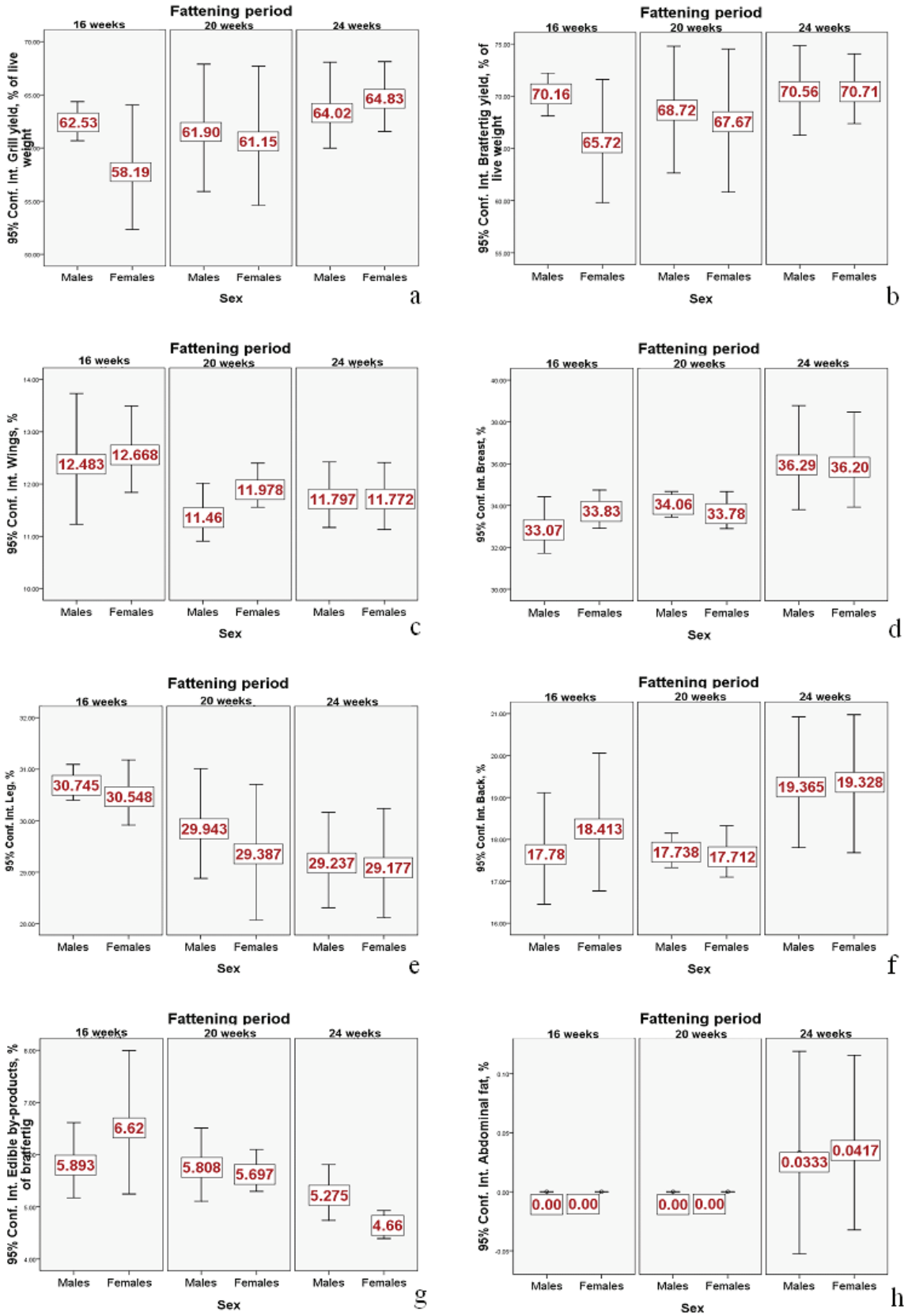

Fig. 1. Mean values of the studied characteristics of slaughter yield (%) measured at 16, 20, and 24 weeks of age in male and female Guinea fowls

both sexes in the variant of the 16-week fattening period, was 60.36%. There was a slight tendency to an increase of the relative values of the grill in the variant of 20-week (over 61%) and 24-week fattening period (64%). Those results were also confirmed by Ayorinde (1989).

Other authors (Baéza et al., 2001; Pudyszak et al., 2005; Kokoszyñski et al., 2011) calculated a lower slaughter yield as birds grew older. The individual differences were because the experimental material originated from a population not specifically bred for meat production. In another study (Kokoszyñski et al., 2011), a lower carcass live weight and a lower slaughter yield in the male compared to the female Guinea fowls at 13 and 16 weeks of age was found. The authors' results were inconsistent with the present study, as no significant differences in that trait were reported depending on the bird sex.

The percentage of bratfertig (Fig. 1b) followed almost the same tendency as the grill. The percentage of bratfertig increased with the increase of the slaughter age of the experimental birds, no significant differences being reported between the two sexes, the difference in the two fattening periods (20 and 24 weeks) being minimal and within 1%.

In the present experiment, wings (Figure 1c) represented between 12.48 and 12.67% of the carcass weight in 16-week-old Guinea fowls. In an earlier study, Saina (2005) found higher values in 12- and 16-weeks-old Guinea fowls (14.50 and 14.6%, respectively). A decrease in the percentage of wings of the carcass weight was established with the increase in the slaughter age. Other authors reached the same conclusion (Kleczek, 2008; Kokoszyñski et al., 2011). In the present experiment the mean values of wings, expressed as a percentage, were almost identical in weeks 20 and 24. They were from 11.46% to 11.98% in male and female individuals, respectively. Results similar to those obtained in the present experiment in 16-week-old Guinea fowls were also reported by Kokoszyñski et al. (2011) in 13-week-old birds (12.70–13.10%). The same authors reported the relative value of the wings to be 12.00% in 16-week-old birds. The results in 20- and 24-week-old Guinea fowls in the present experiment were similar.

The breast share (Figure 1d) was higher in older Guinea fowls in the present study. Similar results were reported by Kokoszyñski et al. (2011), while Pudyszak et al. (2005) and Saina (2005) found a lower percentage of the breast in older birds of the same species. The analysis showed that the percentage of leg decreased from approximately 31% to 29% with the increase of the slaughter age of the birds (Figure 1e). Similar findings were made by Pudyszak et al. (2005), while Kokoszyñski et al. (2011) reported that the leg share in the analyzed carcasses of Guinea fowl increased with age (by 0.10%).

A decrease in the relative share of the edible by-products from 6.62% (16 weeks) to 4.66% (24 weeks) was observed with the increase of the slaughter age (Figure 1g). There were no significant differences in the back and abdominal fat. The relative values of back varied between 17.71 and 19.37% depending on the age and sex of the Guinea fowls (Figure 1f). The percentage of abdominal fat was below 1%, higher in female birds (Figure 1h).

Figure 2a-f presents the mean relative values of meat and bone in the carcass, measured at 16, 20, and 24 weeks of slaughter age of male and female Guinea fowls.

The 'grill' meat obtained after a 16-week fattening period ranged from 71.41% to 72.91% depending on sex (Figure 2a). The percentage of meat yield increased with increasing the slaughter age. At 24 weeks of age, the percentage of grill meat ranged from 77.81% to 77.33% in male and female birds, respectively. Grill bones (Figure 2b) had the highest percentage in 16-week-old Guinea fowls (27.92%) and the lowest in 24-week-old birds (23.01%).

The relative values of breast and leg meat increased with the extension of the fattening period (Figure 2c and Figure 2e). White meat from 84.83% in 16-week-old birds increased to 90.44% in 24-week old individuals. Lower relative values were reported for leg meat: from 81.12% to 84.54%, respectively. The percentage of leg bones decreased from 18.84% in 16-week-old birds to 15.46% in 24-week-old (Figure 2f) and breast bone percentage decreased from 15.17% in 16-week-old birds to 9.56% at the age

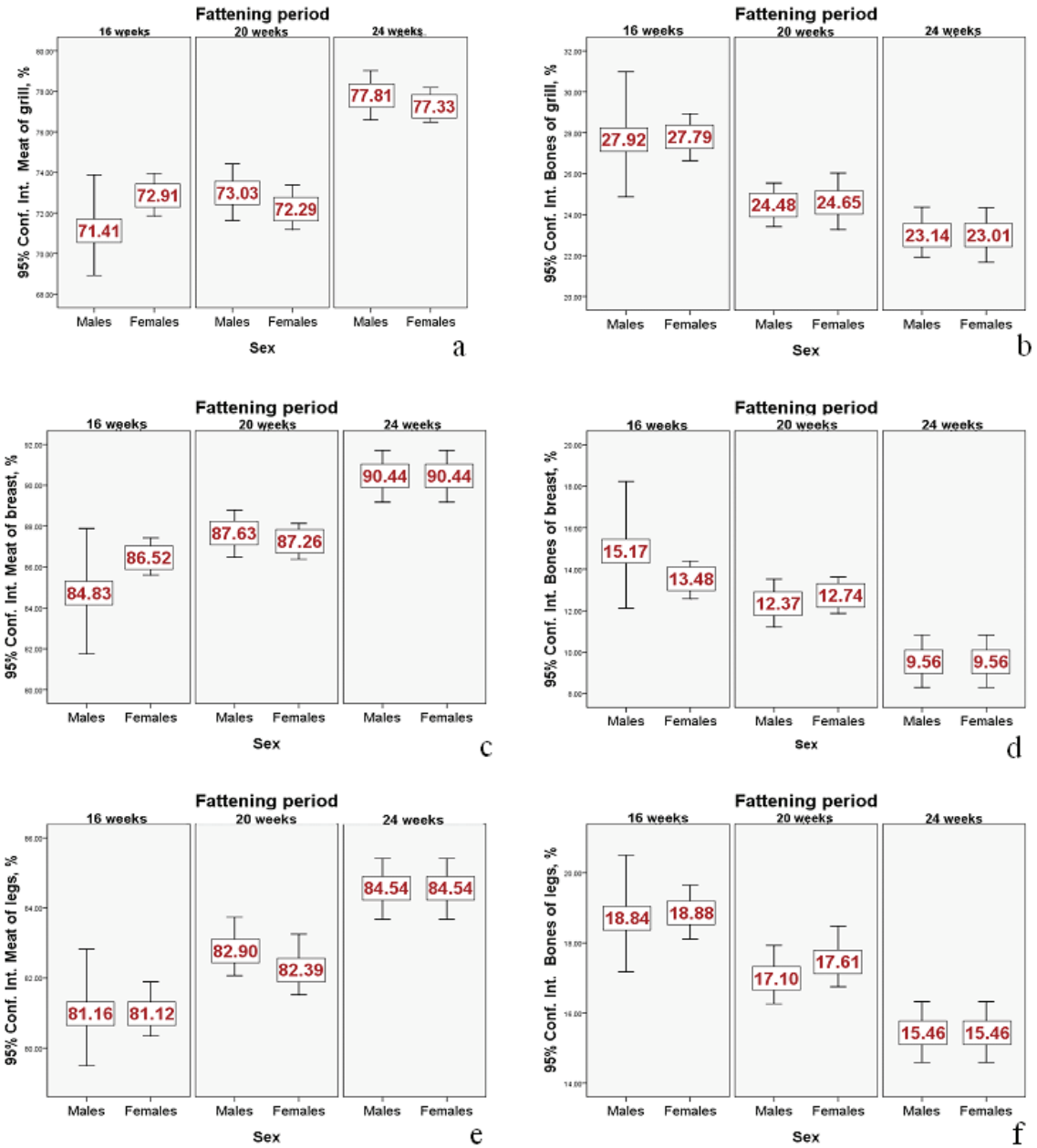

Fig. 2. Relative values of meat and bone in the carcass, measured at 16, 20, and 24 weeks of age in male and female Guinea fowls

of 24 weeks, respectively (Figure 2d). According to Bernacki et al. (2012), the high percentage of breast and leg muscles in the Guinea fowl carcasses make them suitable to be used in broiler breeding.

Since Guinea fowl in Bulgaria are raised mainly by amateur breeders, there are neither regulated preferences for the whole carcass, breast, and leg weights, nor are they discussed. Therefore, the age of slaughter is dictated more by the production efficiency itself than by the market requirements. Despite the relatively high absolute and relative values of the studied slaughter productivity characteristics compared to the results of the authors cited above, it is difficult to determine the optimal slaughter age for that

poultry species without conducting a profound economic analysis of production.

Conclusions

The results of the pre-slaughter live weight were higher than those obtained by most of the authors working with non-bred Guinea fowl populations, such as the local Bulgarian Guinea fowl population included in the present study.

There was a statistically significant decrease in the relative proportion of bones in the carcass with age in both female and male birds, the dependence is most evident in the breast.

The levels of significance showed that sex did not significantly influence any of the studied slaughter productivity characteristics at the three fattening periods (16, 20, and 24 weeks).

Unlike the sex factor, the fattening period length had a significant effect on all the slaughter traits except for the weight of the by-products.

It is necessary to carry out a profound economic analysis of meat production from young Guinea fowl, in particular for two fattening periods (20 and 24 weeks) to determine the optimal slaughter age for that poultry species.

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