EFFECT OF AGE AND SEX ON SLAUGHTER VALUE OF GUINEA FOWL (*NUMIDA MELEAGRIS*)

WPŁYW WIEKU I PŁCI NA WARTOŚĆ RZEŹNĄ PERLIC (NUMIDA MELEAGRIS)

Dariusz KOKOSZYŃSKI[1], Zenon BERNACKI, Henryka KORYTKOWSKA, Anna WILKANOWSKA, Karolina PIOTROWSKA

[1]University of Technology and Life Sciences, Faculty of Animal Breeding and Biology, Department of Poultry Breeding, Mazowiecka 28, 85-084 Bydgoszcz, Poland, Phone (+) 48 52 374 97 71, Fax: (+) 48 52 322 81 58, e-mail: kokoszynski@utp.edu.pl

ABSTRACT

The effects of age and sex of guinea fowl on their dressing percentage, carcass composition, pH value, water holding capacity, colour and sensory properties of meat was determined. At 16 weeks of age, males and females had significantly higher body weights and carcass weights compared to birds at 13 weeks of age. The carcasses of older birds contained more breast muscles, leg muscles and skin with subcutaneous fat, and less wings, with a significant difference for males. At both evaluation times, males compared to females had lower body weight, carcass weight, dressing percentage, content of breast muscles and abdominal fat, and a higher proportion of leg muscles. Older birds had significantly lower redness (a*) values for breast muscles in males and for leg muscles in females.

KEYWORDS: guinea fowl, slaughter value, colour of meat, sensory property

STRESZCZENIE

Określono wpływ wieku i płci perlic na ich wydajność rzeźną i skład tuszki oraz wartość pH, wodochłonność, barwę i właściwości sensoryczne mięsa. Samce i samice w wieku 16 tygodni miały istotnie większą masę ciała i masę tuszki niż ptaki w wieku 13 tygodni. Tuszki starszych ptaków zawierały więcej mięśni piersiowych i nóg oraz skóry z tłuszczem podskórnym, a mniej skrzydeł, u samców istotnie. Samce, w porównaniu z samicami miały mniejszą masę ciała, masę tuszki, wydajność rzeźną, zawartość mięśni piersiowych i tłuszczu sadełkowego, a większy udział mięśni nóg. U starszych ptaków stwierdzono statystycznie istotnie mniejsze wartości a* mięśni piersiowych u samców, a w przypadku mięśni nóg u samic.

SŁOWA KLUCZOWE: perlica, wartość rzeźna, barwa mięsa, właściwości sensoryczne

DETAILED ABSTRACT

Ocenie podano 60 perlic perłowoszarych. Ptaki utrzymywano na głębokiej ściółce w budynku zamkniętym o regulowanych parametrach środowiska, bez dostępu do wybiegu. W pierwszych czterech tygodniach stosowano promienniki podczerwieni. Odpowiednią wymianę i ruch powietrza umożliwiła wentylacja mechaniczna. W pomieszczeniu z perlicami stosowano światło żarowe. Ptaki utrzymywano w dwóch kojcach, każdy o powierzchni 12 m^2, po 30 sztuk w jednym kojcu. Perlice karmiono *ad libitum* przemysłowymi mieszankami dla indyków. Do 3. tygodnia życia włącznie ptakom podawano mieszankę paszową zawierającą 24,5% białka ogólnego i 12,15 MJ (2900 kcal) energii metabolicznej, od 4. do 8. tygodnia mieszankę zawierającą 22,6% białka i 12,35 (2950 kcal) EM, a od 9. tygodnia do końca badań mieszankę z udziałem 20,7% białka i 12,55 MJ (3000 kcal) EM. W 13. i 16. tygodniu wychowu wybrano po 10 perlic do uboju. Po uboju oznaczono pH_{15} mięśni, wykonano rozbiór tuszki, pobrano próby mięśni piersiowych i nóg do oznaczeń właściwości fizykochemicznych i sensorycznych. Ptaki 16-tygodniowe miały istotnie większą masę ciała i masę tuszki. Obliczona wydajność rzeźna była większa u ptaków młodszych (w wieku 13 tygodni) oraz u samic w porównaniu z samcami. Wraz z wiekiem stwierdzono zwiększenie zawartości (%) mięśni piersiowych, mięśni nóg i skóry z tłuszczem podskórnym, a zmniejszenie udziału skrzydeł w tuszce. Samce, w porównaniu z samicami charakteryzowała mniejsza masa ciała, masa tuszki, wydajność rzeźna, zawartość mięśni piersiowych i tłuszczu sadełkowego, a większa mięśni nóg. Płeć i wiek perlic nie miały istotnego wpływu na pH_{15} mięśni piersiowych i nóg. W obu terminach oceny stwierdzono większe wartości pH_{15} mięśni nóg niż mięśni piersiowych podobnie jak wodochłonności. Mniejszą wodochłonność mięśni piersiowych stwierdzono u ptaków starszych oraz u samic niż u samców. W trakcie oceny parametrów barwy (L*, a*, b*), wykonanej na świeżej powierzchni mięśni piersiowych i nóg stwierdzono, że mięśnie piersiowe 16-tygodniowych perlic miały większe wartości jasności barwy (L*) u samców, a w 13 tygodniu u samic. Ponadto starsze ptaki miały istotnie mniejsze wartości a*- wysycenia barwy czerwonej mięśni piersiowych u samców i mięśni nóg u samic. Wartości parametru b* - wysycenia barwy żółtej były w 16 tygodniu większe u samców niż u samic. Analiza właściwości sensorycznych gotowanych mięśni piersiowych perlic wykazała brak istotnego wpływu wieku i płci na ich natężenie i pożądalność zapachu i smakowitości oraz kruchość i soczystość.

INTRODUCTION

The domesticated guinea fowl is descended from wild guinea fowl (*Numidia meleagris*) that still inhabits the steppe regions of South Africa and Madagascar. Compared to other poultry species, domestication took place relatively recently (about 3000 years ago) in Mediterranean countries, where ancient Greeks and Romans appreciated the taste of guinea fowl meat [31].

Because of their high adaptability to different environmental conditions, guinea fowl are now farmed all over the world. France is the largest producer and consumer of

guinea fowl meat in Europe, with Italy ranking second. In 2004, guinea fowl meat production in France reached 42,000, with annual per capita consumption of 0.6 kg [3]. In France, young slaughter guinea fowl are produced in four different ways: standard (~2/3 of production), label rouge (~30%), certified and organic. Standard guinea fowl are usually slaughtered at 77 days, label rouge at 94 days, and certified at 82 days [16].

In accordance with European marketing standards for poultry meat, guinea fowl can be slaughtered at 82 days of age in the litter system and at a minimum age of 94 days in the free-range system [28].

Research to date has shown that body weight, dressing percentage, carcass composition and meat quality are mainly influenced by genotype [5, 12, 22] and age [6, 24, 27, 28, 34]. In addition, the above traits are affected by diet composition [2, 11, 15, 25, 26], housing system [4, 23, 24], husbandry system [8, 29], environmental conditions [13, 22] and sex [7, 22, 25, 26].

The aim of the study was to determine the effect of age and sex of guinea fowl on their dressing percentage, carcass composition, pH_{15} value, water holding capacity, colour and sensory properties of meat.

MATERIAL AND METHODS

Sixty day-old pearl grey guinea fowl were investigated. Throughout the 16-week experiment, birds were kept on deep litter in confinement housing without outdoor access. Guinea fowl were fed a commercial mixture containing 24.5% crude protein and 12.15 MJ (2900 kcal) ME during the first 3 weeks of age, a mixture containing 22.6% protein and 12.35 MJ (2950 kcal) ME from 4 to 8 weeks of age, and a mixture containing 20.7% protein and 12.55 (3000 kcal) ME from 9 weeks to the end of the study.

At 13 and 16 weeks of age, birds were weighed on an electronic balance and each time 5 males and 5 females (identified from secondary sex characters) with close to average body weight were selected for dissection. After slaughter, plucking and evisceration, sex identification was confirmed through inspection of reproductive organs. Thereafter, carcasses were dissected according to a method described by Ziołecki and Doruchowski [35]. Each carcass was dissected into neck, neck skin, wings with skin, skin with subcutaneous fat from the remaining part of the carcass, breast muscles, thigh and lower thigh (leg) muscles, and abdominal fat. The remainder of the carcass contained the skeleton with some skeletal muscles. In addition, pH_{15} value of breast muscles (surface muscle) and leg muscles (thigh) was measured 15 min postmortem. Measurements were made with a spearhead pH electrode connected to a CP-401 pH meter (Elmetron). Dissection was followed by the sampling of breast and leg muscles to determine water holding capacity, and the measurement of colour parameters and sensory properties. Water holding capacity of breast and leg muscles was determined in accordance with a modified version of the

method described by Grau and Hamm [18]. To this end, meat samples weighing between 280 and 320 mg (0.280-0.320 g) were placed on a filter paper (5 × 5 cm) between two glass plates (30 × 30), which were weighed down with a 2 kg weight for 5 min. After 5 min, the meat sample was weighed again to calculate water holding capacity from the ratio between sample weight after and before squeezing (mg), multiplied by 100%. Meat colour was determined on the fresh surface of breast and leg muscles according to the L* (colour lightness), a* (redness) and b* (yellowness) system, using a Minolta CR 310 chroma meter.

Only breast muscles were subjected to sensory analysis of meat. Meat samples obtained from 13- and 16-week-old guinea fowl were cooked in 0.6% table salt solution, at a water to meat ratio of 2:1 until the internal temperature reached 80°C. After cooking, the meat was cooled to 60°C [20] and subjected to sensory analysis by a standing committee of 5 evaluators according to a 5-point hedonic scale provided by Baryłko-Pikielna [9]. Intensity and desirability of aroma and taste, and juiciness and tenderness of meat were determined during the evaluation.

The numerical data were analysed statistically by calculating arithmetic means and coefficients of variation for each analysed trait. Significant differences between the means (within sex and between males and females of the same age) were analysed using Student's t-test [30].

RESULTS

The mean body weight of male and female guinea fowl selected for dissection was significantly higher at 16 weeks of age compared to birds that were 3 weeks younger. Body weight increased by 118 g in males and by 120 g in females (Table 1). On both evaluation dates, females were heavier than males. Older birds had significantly heavier carcasses. The carcasses of females were heavier than those of males. Dressing percentage was high and exceeded 70%. Higher dressing percentage was found in 13-week-old guinea fowl compared to older birds and in females than in males.

The carcasses of 16-week-old males contained 0.3% less, and those of females 0.2% more neck compared to 13-week-old birds. In addition, proportion of neck at 13 weeks of age was significantly higher in males than in females. In guinea fowl of both sexes, proportion of wings in eviscerated carcass with neck decreased between 13 and 16 weeks of age. Significant differences in this parameters were found in males.

Carcasses from older birds contained more breast and leg muscles, but also more skin with subcutaneous fat and the remainder of the carcass. Compared to males, females had more breast muscles, abdominal fat and the remainder of the carcass (Table 1).

Table 1. Body weight and carcass composition in guinea fowl
Tabela 1. Masa ciała i skład tuszki perlic

Trait	Age in weeks – sex – characteristics Wiek w tygodniach – płeć – charakterystyki							
	13				16			
	male samiec		female samica		male samiec		female samica	
Cecha	x	v	x	v	x	v	x	v
Body weight (g)	1232a	2.4	1257a	1.7	1350b	3.0	1377b	1.6
Carcass weight (g)	866a	3.8	890a	2.2	947b	2.0	973b	1.8
Dressing percent-age (%)	70.2	1.5	70.9	1.1	70.1	1.3	70.7	2.5
Neck (%)	5.1	4.7	4.6*	2.5	4.8	7.8	4.8	7.3
Wings (%)	13.1a	3.0	12.7	5.2	12.0b	1.4	12.0	4.9
Breast muscles (%)	23.0	5.6	23.1	7.0	23.2	6.0	23.9	8.2
Leg muscles (%)	21.9	6.8	20.6	4.0	22.0	3.0	20.7	7.0
Abdominal fat (%)	0.4	35.0	1.8a	21.8	0.6	50.	0.9b	26.5
Skin with fat (%)	8.7	9.2	8.7	8.9	9.2	8.7	9.3	10.7
Remainders (%)	27.8	7.9	28.5	7.5	28.2	4.2	28.4	5.8

a, b – Trait mean values in rows within sex followed by different letters differ significantly (P£0.05)
a, b – Wartości średnie cech w rzędach w obrębie płci oznaczone różnymi literami różnią się istotnie (P£0,05)
*- Significant difference between males and females of the same age
*- Istotne różnice między samcami i samicami w tym samym wieku

Table 2. pH15 value and water holding capacity of breast and leg muscles guinea fowl

Trait		Age in weeks – sex – trait values Wiek w tygodniach – płeć - wartości cech							
		13				16			
		male samiec		female samica		male samiec		female samica	
Cecha		x	v	x	v	x	v	x	v
pH15	BM	6.1	5.1	5.9	6.6	6.1	3.0	6.1	4.7
	LM	6.5	2.6	6.3	4.9	6.4	4.1	6.5	3.2
WHC (%)	BM	64.2	7.6	62.5	5.0	63.7	6.5	61.3	4.2
	LM	69.6	6.2	68.5	4.7	64.4	2.9	67.2	5.7

BM - breast muscles, LM - leg muscles

The age and sex of guinea fowl had no significant effect on pH_{15} of breast and leg muscles. In older birds, the pH_{15} of breast muscles was higher in females and the same in males, and that of leg muscles was higher in females and lower in males. On both evaluation dates, the pH_{15} of leg muscles was higher than the pH_{15} of breast muscles, which had an effect on greater water holding capacity of leg meat. In addition, water holding capacity of breast muscles decreased with advancing age. WHC of breast muscles was lower in females than in males (Table 2).

The breast muscles of 16-week-old guinea fowl had higher values of colour lightness (L*) in males and lower values in females compared to birds aged 13 weeks. The leg muscles of older birds had lower L* values. In addition, lower L* values were found for leg muscles than for breast muscles. With advancing age, redness (a*) was found to decrease in breast muscles of males and females and in leg muscles of females. Redness of male breast muscles and female leg muscles was significantly lower. In older birds, b* values for breast and leg muscles were higher in males than in females (Table 3).

Table 3. Colour of breast and leg muscles in guinea fowl
Tabela 3. Barwa mięśni piersiowych i nóg perlic

Trait Cecha		Age in weeks – sex – trait values Wiek w tygodniach - płeć - wartości cech							
		13				16			
		male samiec		female samica		male samiec		female samica	
		x	v	x	v	x	v	x	v
L*- lightness	BM	47.9	8.3	50.7	15.7	48.9	5.1	46.0	3.1
	LM	42.8	3.9	43.9	3.8	42.6	6.7	42.7	2.9
a*- redness	BM	18.5a	8.7	17.4	3.6	16.5b	4.8	17.0	4.0
	LM	17.8	4.2	18.6a	2.5	17.8	4.8	17.1b	3.4
b*- yellowness	BM	5.0	62.6	6.5	53.1	5.8	42.1	4.7	27.0
	LM	2.0	55.0	2.2	18.3	2.8	35.0	1.9	26.6

BM – breast muscles, LM – leg muscles
BM- mięśnie piersiowe, LM – mięśnie nóg

a, b – Trait mean values in rows within sex followed by different letters differ significantly (P£0.05)
a, b – Wartości średnie cech w rzędach w obrębie płci oznaczone różnymi literami różnią się istotnie (P£0,05)

The breast muscles of 16-week-old males were given lower scores for aroma intensity and desirability, tenderness and juiciness, and higher scores for taste intensity and desirability compared to younger birds. The breast muscles of older females had lower scores for aroma intensity, aroma desirability and taste desirability (Table 4).

Table 4. Sensory properties of breast muscles in guinea fowl
Tabela 4. Właściwości sensoryczne mięśni piersiowych perlic

Trait Cecha	Age in weeks – sex- trait values Wiek w tygodniach – płeć- wartości cech							
	13				16			
	male samiec		female samica		male samiec		female samica	
	x	v	x	v	x	v	x	v
Aroma intensity	4.0	14.7	4.0	9.8	3.6	14.2	3.6	12.2
Aroma desirability	4.0	10.5	4.0	11.9	3.7	12.7	3.5	13.4
Juiciness	3.7	18.9	3.6	16.9	3.5	13.1	3.6	8.8
Tenderness	3.7	23.0	3.7	17.8	3.5	16.6	3.7	14.6
Taste intensity	3.5	16.5	3.7	18.6	3.7	12.7	3.7	8.9
Taste desirability	3.6	21.6	3.7	18.6	3.7	11.9	3.6	11.1

D ISCUSSION

As in studies by Fejemilehin [14] and Porwal et al. [27], we found that the body weight of guinea fowl increased with age. Guinea fowl kept in different husbandry or bedding systems [23, 29] were characterized by lower body weight from 12 to 16 weeks of age compared to birds studied in our experiment. Meanwhile, Mazanowski et al. [25] found that the body weights of 12-week-old males (1199-1289 g) and females (1207-1307 g) were similar to those of guinea fowl aged 13 weeks. In addition, the analysed females had higher body weights than males as in studies by Baéza et al. [7] and Leterrier et al. [22].

Like in a study by Baéza et al. [7], we found dressing percentage to decrease slightly with age. Pudyszak et al. [28] also calculated lower dressing percentage in 18-week-old guinea fowl compared to birds that were 2 weeks younger (74.22 vs. 74.49%). Meanwhile, Ayorinde [6] found dressing percentage in guinea fowl to increase from

67.97 to 74.01% between 16 and 24 weeks of age. In our study, females had higher dressing percentage than males. An earlier study demonstrated that in poultry, higher dressing percentage in females is associated, among others, with lower percentage of slaughter waste and giblets in the body [17].

In the present experiment, the proportion of neck decreased with age in males and increased in females, whereas the proportion of wings decreased (significantly in males). In an earlier study [19], the proportion of neck and wings in guinea fowl carcasses decreased significantly over subsequent weeks of life. The proportion of neck in the birds studied was higher than in 12-week-old guinea fowl (4.05-4.58% of the carcass) evaluated by Mazanowski et al. [25], and wing content was lower than that reported by Saina [29] for guinea fowl aged 12 and 16 weeks (14.5 and 14.6%, respectively). The proportion of breast muscles in carcasses was higher in older guinea fowl aged 16 weeks, which is consistent with the results obtained for game pheasants [1]. Meanwhile, Pudyszak et al. [28] found breast muscle content of guinea fowl carcasses to decrease from 17.81% at 14 weeks of age to 16.48% in 18-week-old birds. Saina [29] obtained lower content of breast muscles in 12-week-old guinea fowl reared under intensive conditions (21.43%) and in 16-week-old guinea fowl (19.6%) raised under semi-intensive conditions, compared to our findings.

As for breast muscles, the proportion of leg muscles in the carcasses of analysed guinea fowl increased slightly with age (by 0.1%), which is contrary to the results of another experiment [28], which found carcass leg muscle content to decrease from 17.92% at 14 weeks of age to 14.93% at 18 weeks of age.

In the analysed birds, the content of skin with subcutaneous fat was lower than in 12-week-old guinea fowl (9.91-10.33%) investigated by Mazanowski et al. [25]. The proportion of abdominal fat was similar or lower compared to that reported by Frątczak et al. [15] for guinea fowl (0.4-0.9%) aged 12 weeks, and markedly lower than in meat guinea fowl (1.93-3.30%) studied by Leterrier et al. [22]. As in our experiment, other studies [7, 8, 22] found abdominal fat content to be higher in females than in males.

The quality of guinea fowl meat was evaluated based on physicochemical (pH_{15}, water holding capacity, colour) and sensory parameters (aroma, tenderness, juiciness, palatability). The pH_{15} values obtained for breast muscles (5.9-6.1) showed no quality aberrations such as PSE (pale, soft, exudative) and DFD (dark, firm, dry) meat. An earlier study [8] found higher pH values of breast muscles in standard (6.45) and label (6.20) guinea fowl raised without and with outdoor access (6.16 and 6.20, respectively) than in the present study. Similar or higher pH values of breast muscles were obtained by Pudyszak et al. [28] two hours postmortem (6.1-6.4). Higher WHC values for leg than breast muscles, obtained in this study, are

associated with greater protein hydration, which increased the water holding capacity of leg muscles.

The mean values obtained for colour lightness (L*) are lower than those reported by Chiericato et al. [11] for 78-day-old ISA guinea fowl males (maize – 44.4, sorghum – 44.7). Similar L* values (43.12-46.66) were obtained for game pheasants by Kuźniacka et al. [20] and markedly lower (33.69-35.42) in quail [32]. Meanwhile, Bianchi and Fletcher [10] found lower L* values (darker colour) in chickens with thicker breast muscles and higher rate of growth. In addition, the analysed guinea fowl had higher redness (a*) and yellowness (b*) values of breast muscles compared to 78-day-old ISA guinea fowl males (a* - 10.1 and 10.7; b* - 3.99 and 4.39) evaluated by Chiericato et al. [11].

The scores for sensory properties of guinea fowl meat (3.5-4.0) are similar to those (66.9-80.2) reported by Tlhonga [33], assuming that 1 point on a 5-point scale used in our study corresponds to 20 units on a 100-point scale used by Tlhonga.

CONCLUSION

In conclusion, older guinea fowl had significantly higher mean body weight and carcass weight. With advancing age, the content of breast muscles, leg muscles and skin with subcutaneous fat increased and the proportion of wings decreased (significantly in males). Compared to females, males were characterized by lower body weight, carcass weight, and content of breast muscles and abdominal fat, and higher proportion of leg muscles. Redness decreased significantly for breast muscles in older males and for leg muscles in females.

REFERENCES

[1] Adamski A.,J. Kuźniacka J., The effect of age and sex on slaughter traits of pheasants (Phasianus colchicus L.). Anim. Sci. Pap. Rep. (2006) 24 suppl 2, 11-18.

[2] Adeyemo A.I., Oyejola O., Performance of guinea fowl Numidia Meleagris fed varying levels of poultry droppings. Inter. J. Poult. Sci.(2004) 3, 357-360.

[3] Audran X., Gain Report FR 5080 - France. Poultry and Products. A brief overview of the French Poultry Sector 2005. USDA Foreign Agricultural Service (2005), 1-3.

[4] Ayorinde K.L., Ayeni J.S.O., The reproduction performance of indigenous and exotic varieties of guinea fowl (Numidia meleagris) during different seasons in Nigeria. J. Anim. Prod. Res. (1986) 6, 127-140.

[5] Ayorinde.K.L., Oluyemi J.A., Ayeni J.S.O., Growth performance of four indigenous helmeted guinea fowl varieties (Numidia meleagris galeata pallas) in Nigeria. Bull. Anim. Health Prod. in Africa (1988) 36, 356-360.

[6] Ayorinde K.L., Carcass yield and chemical composition of four Indigenous guinea fowl varieties at different areas. Bull. Anim. Health Prod. in Africa (1989) 37, 361-366.

[7] Baéza E., Juin H., Rebours G., Constantin P., Marche G., Leterrier C., Effect of genotype, sex and rearing temperature on carcase and meat quality of guinea fowl. Br Poultry Sci (2001) 42, 470-476.

[8] Baéza E., Lessire M., Berri C., Juin H., Compared carcass and meat characteristics of label and standard fowl. Proceedings of the XV European Symp-osium on the Quality of Poultry Meat, September 9-12, Kusadusi - Turkey, 2001, 73-78.

[9] Baryłko-Pikielna W., Zarys oceny sensorycznej żywności. PWN Warszawa, 1975.

[10] Bianchi M., Fletcher D. L., Effects of broiler breast meat thicknes and background on color measurements. Poult. Sci. (2002) 81, 1766-1769.

[11] Chiericato G.M., Rizzi C., Zakaria H., Effect of tannin sorghum diet on productive response and meat quality of guinea fowl. Proceedings of the XV European Symposium on the Quality of Poultry Meat. September 9-12, Kusadasi – Turkey (2001), 193-198.

[12] Culioli J., Touraille C., Bordes P., Girard J.P., Caractéristiqu-es des carcasses et de la viande de poulet “label rouge” fermier. Arch. Geflügelk. (1990) 53, 237-245.

[13] De Houx J.P., Buldgen A., Dachet A., Et Dieng P., Influence de la saison et de la concentration énergétique de l’aliment sur les performances de croissance de pintadeaux en région tropicale. Revue d’elevage et de médecine vétérinaire des pays tropicaux (1997) 50, 303-308.

[14] Fajemilehin S.O.K., Morphostructural characteristics of three varieties of greybreasted helmeted guinea fowl in Nigeria. Int. J. Morphol. (2010) 28: 557-562.

[15] Frątczak M., Rutkowski A., Józefiak D., Comparison of several diet formulas used in rearing guinea fowl. Rocz Nauk Zoot (2002) supl 16, 205-210 (In Polish).

[16] French Guinea Fowl, Industry news, Sopexa – UK 1, 1-2.

[17] Górski J., Effect of age, origin and sex of the Pekin ducks on their slaugh-ter value. Rocz. Nauk. Zoot. (1992) 19, 77-85. (In Polish)

[18] Grau R., Hamm R. (1952): Eine einfache Methode zur Bestimmung der Wasserbindung im Fleisch. Fleischwirtschaft, 4, 295-297.

[19] Kleczek K., Wawro K., Wilkiewicz – Wawro E., Makowski W., Murawska D., Age-related changes in the content of particular cuts in the carcasses of guinea fowl. Proceedings of the XX Inter-national Poultry Sympo-sium PB WPSA September 15-17 Bydgoszcz/Wenecja, (2008) 109-110

[20] Krełowska-Kułas M., The study of quality food products. Ed. PWE Warszawa, 1993 (In Polish).

[21] Kuźniacka J., Adamski M., Bernacki Z., Effect of age and sex of pheasants (phasianus colchicus L) on selected physical properties and chemical composition of meat. Ann. Anim. Sci. (2007) 7: 45-53.

[22] Leterrier C., Baéza E., Rebours G., Constantin P., Marche G., Jamenot P., Label production of guinea fowl and carcass quality. Proceedings of the XIV European Symposium on the Quality of Poultry Meat, September 19-23 Bologne-Italy, (1999), 265-270.

[23] Mareko M. H. D., Nsoso S.J., Thibelang K., Preliminary carcass and meat characteristics of guinea fowl (Numidia meleagris) raised on concrete and earth floors in Bostwana. J. Food Tech. (2006) 4, 313-317.

[24] Mareko M. H. D., Nsoso S.J., Lebetwa N., Nutritive value of meat of guinea fowl raised on concrete and bare soil floors from 16-26 weeks of age. Res. J. Anim. Sci. (2008) 2, 5-11.

[25] Mazanowski A., Mazanowska K., Faruga A., Evaluation of complete feeds for broiler guinea-hens. Zesz. Nauk. ART Olsztyn, Zootechnika 24, (1982) 85-94 (In Polish).

[26] Mazanowski A., Mazanowska K., Faruga A., Evaluation of the efficiency of several rations of mixed feed for rearing and reproducing guinea-hens. Zesz. Nauk. ART Olsztyn Zootechnika 24, (1982) 95-105 (In Polish).

[27] Porwal V., Singh B., Kumar D., Sharma R.K., Pandey H., Genetic studies on growth and conformation traits of guinea fowl. Indian J. Poult. Sci. (2002) 37, 179-180.

[28] Pudyszak K., Pomianowski J., Majewska T., (2005): Slaughter value and meat quality of guinea fowl slaughtered at a different age. Food Sci. Technol. Quality (2005) 42, 27-34 (In Polish).

[29] Saina H., Guinea fowl (Numidia meleagris) production under smallholder farmer management in Guruve district, Zimbabwe. MSc thesis, 1-108, 2005.

[30] StatSoft. Inc., Statistica (data analysis software system), version 6., 2001.

[31] Świreczewska E., Wężyk S., Horbańczuk J., Poultry farming. Edit. Hoża Warszawa, 1999, pp. 88 (In Polish).

[32] Tarasewicz Z., Gardzielewska J., Szczerbińska D., Ligocki M., Jakubowska M., Majewska D., The effect of feeding with low-protein feed mixes on the growth and slaughter value of young male Pharaoh quails. Arch. Tierz. (2007) 50, 520-530.

[33] Tlhong T.M., Meat quality of raw and processed guinea fowl – Numidia meleagris. MSc thesis Stellenbosch University, 1-138, 2008.

[34] Touraille C, Ricard F.H., Kopp J., Valin C., Leclercq B., Qualité du poulet: evoluation en function de l'ages des caractéristiques physic-chemique et organoleptiques de la viande. Arch. Geflügelk. (1981) 45, 97-104.

[35] Ziołecki J., Doruchowski W., Estimation methods of poultry slaughter value. COBRD Poznań, (1989), 1-22 (In Polish).