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MEAT QUALITY OF BROILERS IN AN EXTENDED FATTENING PERIOD

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Abstract: This study evaluates the effect of protease-supplemented diets containing different crude protein levels, sex and length of the fattening period on the weight and percentage yield of primal cuts in Cobb 500 broilers. Chickens were fed maize-and-soybean-based diets. Fattening periods lasted 49 and 63 days. The results showed that the recommended crude protein reduction by 4% in diets supplemented with 0.2% protease had no effect on the weight and percentage yield of primal cuts ($P>0.05$), while the effect of broiler sex and slaughter age on the studied carcass quality parameters was significant ($P<0.05$).

Keywords: broilers, protease, sex, fattening period

Introduction

In the last several decades, broiler chickens have increasingly been reared in non-standard i.e. non-commercial systems. Modifications of conventional commercial production systems involve using other hybrids (medium growing hybrids, slow growing hybrids, fattening breeds of hens), reducing stocking density (often allowing access to an outdoor grass range) and feeding new formulas (particularly to improve nutrient digestibility, health and immunity, etc.). As explained by broiler farmers and experts, major reasons for these modifications include the improvement of farm animal welfare and poultry meat quality, and reduction of environmental pollution.

Numerous researchers have investigated alternative broiler fattening systems from the viewpoint of: genotype (Škrbić *et al.* 2007, Meluzzi *et al.* 2009, Madeira *et al.* 2011), stocking density (Beg *et al.* 2011), fattening period (Mitrović *et al.* 2010, Bogosavljević-Bošković *et al.* 2011), dietary protein reduction

(Horniakova and Abas, 2009), and enzyme supplementation (Dosković et al. 2017, Vojtěch et al. 2016, Mohammadigheisar and Kim 2018).

This study evaluates the quality of meat from fast growing Cobb 500 male and female broiler chickens receiving protease supplemented diets over an extended fattening period (49 and 63 days). The weights and percentage yields of primal cuts were used as meat quality parameters.

Materials and Methods

The broiler feeding trial lasted 63 days. The Cobb 500 broiler chickens used as the experimental material were allocated to 2 feeding groups: a control group – C (100 broilers, a standard diet containing maize and soybean meal) and an experimental group – E-1 (100 broilers, a diet reduced in crude protein by 4% and supplemented with 0.2% Ronozyme ProAct protease).

On days 49 and 63 of the feeding trial, 10 males and 10 females were randomly selected from each group, slaughtered and processed (*Commission Regulation (EC) No. 543/2008*), and their carcasses were weighed and dissected into primal cuts i.e. breasts, thighs, drumsticks, wings, back and pelvis. The weights of primal cuts were used for the calculation of their percentage yields in the dressed carcass.

Data sets were statistically analysed by a three-way analysis of variance in a 2 x 2 x 2 design (2 diets, 2 fattening periods – FP, 2 sexes), F-test and LSD test ($P < 0.05$) using *Statistica for Windows Release 6.0 (1995)*.

Results and Discussion

Table 1 shows the weights of primal cuts of male and female broilers at 49 and 63 days of age across experimental groups.

The statistical analysis of the data on the weights of primal cuts of broilers shows similar responses of broilers to dietary treatments given their approximately equal weights of primal carcass cuts ($P > 0.05$). Extended fattening led to an increase in body weight and, hence, weight of primal cuts ($P < 0.05$). Moreover, males had greater carcass weights and, hence, greater weights of primal cuts ($P < 0.05$). *Nikolova and Pavlovski (2009)* also determined that broiler sex and slaughter age of the same hybrid (Cobb 500) broilers had a significant effect on breast, drumstick and thigh weights. Somewhat smaller weights of primal cuts in Cobb 500 broilers at 49 days of age were reported by *Abera et al. (2017)*, who also found a significant effect of sex on breast and thigh weights, and an effect of fattening period (49 and 56 days) on the weights of drumsticks, thighs and wings.

Table 1. Weights of primal cuts across treatments, gr

Diet	Fattening period, days	Sex		Breast	Dumsticks	Thighs	Wings	Back	Pelvis
C	49	♂	\bar{x}	856.3 ^{bcd}	361.9 ^b	412.9 ^b	285.4 ^b	304.8 ^{bc}	272.8 ^b
			Sd	43.7	27.9	23.5	15.5	23.2	18.3
		♀	\bar{x}	741.1 ^d	290.9 ^c	341.8 ^d	238.3 ^c	262.3 ^d	219.6 ^c
			Sd	65.7	22.0	27.5	9.8	28.1	14.3
	63	♂	\bar{x}	1085.9 ^a	435.9 ^a	537.5 ^a	337.7 ^a	379.3 ^a	328.1 ^a
			Sd	209.8	35.4	43.9	27.1	23.7	27.7
		♀	\bar{x}	951.5 ^{ab}	332.4 ^b	406.5 ^b	257.1 ^c	306.8 ^{bc}	273.3 ^b
			Sd	141.1	33.3	54.1	11.4	22.3	24.6
E-1	49	♂	\bar{x}	803.8 ^{bcd}	343.7 ^b	397.3 ^{bc}	275.1 ^b	317.9 ^b	268.5 ^b
			Sd	73.11	11.9	29.7	11.9	24.1	22.1
		♀	\bar{x}	778.9 ^{cd}	281.4 ^c	347.3 ^{cd}	229.2 ^c	231.6 ^c	221.4 ^c
			Sd	109.2	15.6	25.2	15.6	31.4	16.9
	63	♂	\bar{x}	1110.7 ^a	426.6 ^a	516.4 ^a	329.1 ^a	378.0 ^a	328.9 ^a
			Sd	163.3	38.2	40.9	25.7	43.2	32.7
		♀	\bar{x}	968.0 ^{ab}	332.6 ^b	406.4 ^b	275.4 ^b	297.9 ^c	279.0 ^b
			Sd	145.7	21.1	36.2	22.7	27.1	23.5
p-value									
Source of variation				ns	ns	ns	ns	ns	ns
Diet				ns	ns	ns	ns	ns	ns
Fattening period				P<0.05	P<0.05	P<0.05	P<0.05	P<0.05	P<0.05
Sex				P<0.05	P<0.05	P<0.05	P<0.05	P<0.05	P<0.05
Diet x fattening period				ns	ns	ns	ns	ns	ns
Diet x sex				ns	ns	ns	ns	ns	ns
Fattening period x sex				ns	P<0.05	P<0.05	P<0.05	ns	ns
Diet x fattening period x sex				ns	ns	ns	ns	ns	ns

a-e Means followed by different superscript letters within columns differ significantly (P<0.05)

Table 2 presents the percentage yields of primal cuts in the dressed carcasses of broilers of different age and sex groups.

Table 2. Percentage yield of primal carcass cuts of broilers on days 49 and 63 of the fattening trial, %

Diet	Fattening period, days	Sex		Breast	Drumsticks	Thighs	Wings	Back	Pelvis
C	49	♂	\bar{x}	33.17 ^{bc}	14.01 ^a	15.96 ^{ab}	11.06 ^a	11.80 ^{ab}	10.57
			Sd	1.31	0.83	0.67	0.53	0.79	0.67
		♀	\bar{x}	34.03 ^{abc}	13.38 ^{ab}	15.70 ^{ab}	10.97 ^a	12.03 ^{ab}	10.11
			Sd	1.80	0.83	0.70	0.55	0.84	0.68
	63	♂	\bar{x}	33.60 ^{abc}	13.60 ^{ab}	16.78 ^a	10.53 ^{ab}	11.88 ^{ab}	10.23
			Sd	4.75	1.16	1.50	0.83	1.38	0.83
		♀	\bar{x}	35.75 ^{ab}	12.55 ^b	15.31 ^{ab}	9.75 ^b	11.62 ^{ab}	10.32
			Sd	2.66	0.79	1.19	0.80	0.85	0.57
E-1	49	♂	\bar{x}	32.09 ^c	13.75 ^a	15.87 ^{ab}	11.00 ^a	12.70 ^a	10.74
			Sd	1.90	0.42	0.66	0.26	0.63	0.88
		♀	\bar{x}	35.77 ^{ab}	13.00 ^{ab}	16.05 ^{ab}	10.58 ^{ab}	10.66 ^b	10.19
			Sd	4.02	1.11	1.55	0.85	1.34	0.52
	63	♂	\bar{x}	34.61 ^{abc}	13.36 ^{ab}	16.18 ^{ab}	10.32 ^{ab}	11.82 ^{ab}	10.33
			Sd	2.75	0.66	0.93	0.60	0.95	1.06
		♀	\bar{x}	36.20 ^a	12.51 ^b	15.27 ^b	10.37 ^{ab}	11.23 ^b	10.51
			Sd	3.21	0.52	0.76	0.84	1.04	0.81
p-value									
Source of variation									
Diet				ns	ns	ns	ns	ns	ns
Fattening period				ns	P<0.05	ns	P<0.05	ns	ns
Sex				P<0.05	P<0.05	P<0.05	ns	P<0.05	ns
Diet x fattening period				ns	ns	ns	ns	ns	ns
Diet x sex				ns	ns	ns	ns	ns	ns
Fattening period x sex				ns	ns	P<0.05	ns	ns	ns
Diet x fattening period x sex				ns	ns	ns	ns	P<0.05	ns

^{a-c} Means followed by different superscript letters within columns differ significantly (P<0.05)

As shown by the results in Table 2, broiler diet had no effect on the percentage yields of primal cuts (breasts, drumsticks, thighs, wings, back, pelvis) (P>0.05). Similarly, crude protein reduction in broiler diet supplemented with protease (0.05% and 0.1% Ronozyme Pro Act) had no effect on some carcass quality traits (breast, liver and heart yields) in a study by *Mohammadigheisar and Kim (2018)*. Significant differences were observed in the percentage yields of some primal cuts between male and female broilers, as well as between different broiler age groups (P<0.05). Females had greater breast yields and lower drumstick yields compared to males (P<0.05), and their wing yields in the dressed carcass at 49 days of the fattening trial were higher than in male broilers of 63 days of age (P<0.05),

whereas the percentage yields of the other primal cuts did not significantly differ between the sexes and slaughter age groups ($P>0.05$). In 49-day-old Cobb 500 broilers, *Fomentini et al. (2016)* determined the percentage yields of 36.9% for breasts, 15% for drumsticks and 15.8% for thighs. The results reported by *Moreira et al. (2003)* were similar to the present data i.e. the authors found no significant difference in the percentage yields of breasts, thighs and drumsticks across slaughter age and sex groups. In Cobb 500 broilers at 49 days of age, *Fernandes et al. (2013)* obtained the percentage yields of 23.2% for breasts, 33.98% for thighs and drumsticks, and 10.95% for wings, and found no dependence of the percentage yields of breasts, thighs, drumsticks and wings on sex and age, while interactions often occur as the result of the effect of hybrid, sex and slaughter age. *Nikolova and Pavlovski (2009)* stressed that sex affects the percentage yield of thighs (lower values were found in females than in males), while having no effect on breast and drumstick yields, and that extended fattening leads to an increase in the percentage yields of the three primal cuts. In contrast, *Bogosavljević-Bošković et al. (2011)* found no effect of slaughter age on the percentage yields of primal cuts in Cobb 500 broilers, but observed significant differences between the sexes in the percentage yields of breasts, thighs and drumsticks (females had higher breast yields, while male broilers had higher thigh and drumstick yields).

Conclusion

The results of the present research indicate that:

- protease supplementation (0.2%) of broiler diets containing crude protein levels reduced by 4% had no effect on the weights and percentage yields of primal cuts (breasts, thighs, drumsticks, wings, back, pelvis),
- significant differences ($P<0.05$) were observed between male and female broilers in primal cut weights (higher values found in males) and breast and drumstick yields (females had greater breast yields and lower drumstick yields, $P<0.05$),
- the 14-day extension of the fattening period (from 49 to 63 days) resulted in increased weights of primal cuts ($P<0.05$), whereas the percentage yields of primal cuts in the dressed carcass showed no significant differences ($P>0.05$) between the two age groups of broilers (only the percentage yield of wings at 49 days of the feeding trial was higher than in broilers aged 63 days, $P<0.05$).

Kvalitet mesa brojlera iz produženog trajanja tova

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Rezime

U radu je ispitivan efekat hrane sa različitim nivoom sirovih proteina, uz dodatak enzima protease, pola pilića i vremena trajanja tova na masu i udeo osnovnih delova trupa brojlera hibrida Cobb 500. Pilići su hranjeni potpunim smešama na bazi kukuruza i sojine sačme. Tov pilića trajao je 49 i 63.dana. Na osnovu dobijenih rezultata zaključeno je da predložena supstitucija smanjenja sadržaja sirovih proteina za 4% u odnosu na standardni obrok, uz dodatak 0,2% enzima protease, nije uticala na masu i udeo osnovnih delova trupa ($P>0,05$), kao i da se ispoljio značajan efekat pola pilića i vremena klanja pilića na ispitivane parametre kvaliteta trupa brojlera ($P<0,05$).

Ključne reči: brojleri, proteaza, pol, trajanje tova.

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