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EFFECT OF PROTEASE ADDED IN FOOD AND SEX ON CHICKEN MEAT CLASESS

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Abstract: The effects of feeding low dietary crude protein with supplemental protease and sex on the weight and percent yields of individual meat classes in broiler chickens of hybrid Cobb 500 were investigated. A total of 300 day-old broiler chicks were fed with one of the following three experimental diets: control group (C), the experimental group I (E-I) contained 4% less crude protein than the control (C) and were supplemented with protease (Ronozyme Pro Act) at a concentration of 200mg/kg feed and the experimental group II (E-II) contained 6% less crude protein and were supplemented with protease (Ronozyme Pro Act) at a concentration of 300mg/kg feed.

Supplementation of protease to diets had no significant effects on weights of individual meat classes ($P>0.05$), as well as the percentage of meat classes, and the only differences were manifested between E-I and E-II ($P<0.05$, female broilers from the E-I group were had a higher percentage of class I meat and a lower percentage of class III meat compared to females from the E-II group). The effect of sex was manifested in the weights of all meat classes and the percentage of class I meat and class III meat ($P<0.05$).

Keywords: fattening chickens, meat classes, protease, sex

Introduction

Protein is the second major nutrient (after energy) and the most expensive in the broiler diet. The protein sources in modern poultry diets are mostly derived from soybean products (Dosković et al., 2020).

Lately, the use of proteases as feed enzymes has gained interest. Proteases are added to feed to increase dietary protein hydrolysis and thus enabling improved nitrogen utilization. When animals utilize nitrogen better, there is a

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possibility to decrease the diet protein content and in turn also reduce the content of nitrogen in manure (Oxenboll et al., 2011). The use of protease as a feed additive offers significant environmental benefits: it decreases the pollution of water and air with nitrous compounds leading to eutrophication and acidification, decreases the health risks associated with NH_3 emissions in broiler houses and can contribute significantly to reducing nitrogen emissions from livestock production.

Dietary supplementation of protease to low crude protein and/or metabolisable energy diets showed negligible effects on growth performance, carcase characteristics and physiological responses in broiler chickens under heat stress conditions. The inclusion of microbial protease in broiler diets could be considered by the poultry industry as an effective nutritional tool for reducing metabolisable energy or crude protein, to decrease abdominal fat deposition, improve feed efficiency and increase the profit margin (Law et al., 2019).

Many researchers have investigated the effects of protease and reduction of crude protein levels on carcass characteristics and meat quality of broilers (Mahmood et al., 2017; Park and Kim 2018; Law et al., 2019; Dosković et al., 2020; Dosković et al., 2022;…).

The hypothesis was that protease supplementation would increase the digestibility of crude protein and amino acids in diets that reduced crude protein (groups E-I and E-II) and would lead to the same carcase quality as the standard diet (group C).

Materials and methods

A total of 300 one-day-old Cobb 500 broiler chickens males and females were randomly divided into 3 experimental units of 100 chickens each: C - control group, standard diet, without protease enzyme; E-I group - 200 mg Ronozyme ProAct/kg feed and 4% less crude protein than the control group and E-II group - 300mg/kg feed and 6% less crude protein than the control respectively.

The fattening period was divided into 3 phases: starter (1 to 21 d) and grower (22 to 35 d) and finisher (36 to 49 d). Feed (mash form) and water were provided *ad libitum* throughout the experimental period.

At the end of the experiment, at 49 day of age, 20 chickens per treatment (10 males and 10 females) were randomly selected for carcass quality measurement.

The selected chickens after slaughter, were dissected into primal cuts (according to the Commission Regulation (EC) No. 543/2008) and divided into meat classes (class I meat: breast, drumsticks and thighs; class II meat: wings and class III meat - back and pelvis), and then the weights of individual meat classes were measured. Based on the weights of the meat class and ready-to-grill carcass weights, the proportions of the meat class in the dressed carcass were determined.

The results were analyzed by Stat Soft Inc Statistica For Windows (Version 7.0., 2006) program using the two-factor analysis of variation (diet treatments and sex). Data were followed by the Tukey test ($P<0.05$).

Results and discussion

Data on the weight of meat classes, by feeding treatments and sexes, are presented in Table 1.

Table 1. Weight of different classes of chicken meat on the 49th day of fattening, gr

Treatment			Class I (breast, thighs, drumsticks)	Class II (wings)	Class III (back, pelvis)
Groups	Sex				
C	Male	$\bar{X}$	1630.47[a]	285.43[a]	577.61[a]
		Sd	72.86	15.49	32.00
	Female	$\bar{X}$	1373.74[b]	238.33[b]	481.88[b]
		Sd	93.36	9.57	35.71
E-I	Male	$\bar{X}$	1544.84[a]	275.06[a]	586.46[a]
		Sd	99.46	11.96	32.37
	Female	$\bar{X}$	1407.61[b]	229.24[b]	453.03[b]
		Sd	91.71	15.58	40.60
E-II	Male	$\bar{X}$	1561.07[a]	277.90[a]	583.68[a]
		Sd	104.18	20.37	64.29
	Female	$\bar{X}$	1306.81[b]	229.77[b]	480.67[b]
		Sd	35.94	14.81	32.50

$\bar{X}$-Average, Sd - Standard deviation

Different superscripts (a, b) indicate a statistical significant differences between groups ($P<0.05$)

Analysis of the data in Table 1. showed that no significant differences were observed in the weight of all class meat between dietary treatments ($P>0.05$). Similar results, that the mass of certain parts of the carcass and meat classes has no effect on reducing the content of raw proteins, with the addition of protease enzymes are indicated by Jawad (2017), Dosković et al. (2020), Matshogo et al.

(2021),… Male chickens had a larger mass before slaughter compared to female chickens, as well as a larger ready-to-grill carcass weights, which was reflected in the mass of all meat classes (class I meat: breast, drumsticks and thighs; class II meat: wings, and class III meat back and pelvis) (P<0.05). Brewer et al. (2012), Dosković et al. (2020) and Kamporn et al. (2022) state that the sexes of the chickens have a significant influence on the weight of the primal carcass cuts, which make up the meat classes.

Table 2. The percentage of different classes of chicken meat in the dressed carcass on the 49th day of fattening, %

Treatment			Class I (breast, thighs, drumsticks)	Class II (wings)	Class III (back, pelvis)
Groups	Sex				
C	Male	$\bar{X}$	63.14^{ab}	11.06	22.38^{ab}
		Sd	1.45	0.53	1.04
	Female	$\bar{X}$	63.11^{ab}	10.97	22.14^{ab}
		Sd	1.25	0.55	0.98
E-I	Male	$\bar{X}$	61.72^{b}	11.00	23.45^{a}
		Sd	1.50	0.26	0.86
	Female	$\bar{X}$	64.81^{a}	10.58	20.86^{b}
		Sd	2.07	0.85	1.49
E-II	Male	$\bar{X}$	62.19^{b}	11.08	23.21^{a}
		Sd	1.61	0.73	1.38
	Female	$\bar{X}$	62.35^{b}	10.95	22.91^{a}
		Sd	1.95	0.51	1.16

$\bar{X}$ - Average, Sd - Standard deviation
Different superscripts (a, b) indicate a statistically significant difference between groups (P <0.05)

Based on the analysis of the data from table 2, it can be concluded that the only change in the concentration of the protease enzyme (200 mg Ronozyme ProAct/kg feed and 4% less crude protein than the control group or 300mg/kg feed and 6% less crude protein than the control) had a significant effect (P<0.05) on the percentage of class I meat and class III meat, while there were no differences between the standard feeding treatment (C group) and the E-I group, i.e. E-II group. Female broilers from the E-I group had a higher percentage of class I meat and a lower percentage of class III meat compared to females from the E-II group. In similar research, Dosković et al. (2020) report a significant effect of protease (P<0.05) in the Master Gris hybrid on the percentage yield of wings - class II meat, while Mahendran et al. (2022) determined that protease supplementation to broiler fed with a corn-soybean

meal based normal and low crude protein diets did not have any effect on carcass characteristics.

The effect of sex was manifested in the percentage of class I meat and class III meat only in the E-I group ($P<0.05$), while there was no effect of sex on the percentage of class II meat ($P>0.05$). Namely, female chickens in the E-I group had a higher percentage of class I meat, and a lower percentage of class III meat compared to male broilers. Similar results about the percentage of class II meat are reported by Young et al. (2001) and Kamporn et al. (2022), while Bogosavljevic-Bošković et al. (2011) and Dosković et al. (2020) determined that the percent yield of class I and III meat was not affected by sex ($P>0.05$).

Conclusion

Based on the analysis of data on weight and percentage of individual class meat, it can be concluded that the proposed substitution of the standard diet for fattening broilers with a diet that contained 4% less crude protein than the control (C) and was supplemented with protease (Ronozyme Pro Act) at a concentration of 200mg/kg feed did not affect the examined carcass quality parameters ($P>0.05$), consequently, differences appeared only in the percent yield of class I and III meat between E-I (200mg Ronozyme Pro Act/kg feed) and E-II (300mg Ronozyme Pro Act/kg feed) feeding treatments ($P<0.05$).

The sex of the chicken affected the mass of all classes of meat and the percentage of class I meat and class III meat ($P<0.05$), while there were no differences only in the percentage of class II meat ($P>0.05$).

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