

AGROSYM

BOOK OF PROCEEDINGS



*XV International Scientific Agriculture Symposium
"Agrosym 2024"
Jahorina, October 10-13, 2024*

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THE EFFECT OF GENOTYPE AND PROTEASE ENZYME ON THE WEIGHT AND PERCENTAGE OF MEAT CLASSES IN CHICKENS

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Abstract

The aim of the present study was to evaluate the effects of adding protease enzymes (Ronozyme ProAct, 0, 200 mg/kg and 300 mg/kg diet) while reducing the crude protein content (control group - standard diet, group E-I - 4 % less crude protein compared to the control group and group E-II, which received 6 % low-protein feed compared to the control group) in fast and medium-growing meat chickens on the weight and percentage of certain classes of meat. In the experiment, fast-growing Cobb 500 and medium-growing Master Gris chickens were used. The genotype had a significant effect on the weight and percentage of the different chicken meat classes ($P < 0.05$). The fast-growing Cobb 500 genotype had a higher weight of all meat classes and a higher percentage of meat class I and a lower percentage of meat class II and meat class III compared to the broilers of the Master Gris genotype ($P < 0.05$). Significance was found under the influence of the protease enzyme in the hybrid Cobb 500 for meat class III (between C group and E-I group on the one hand and E-II group on the other hand, $P < 0.05$) and in the hybrid Master Gris for meat class III (between C group and E-I group, $P < 0.05$), while there was no effect on the mass of all three classes of meat ($P > 0.05$). Enzyme protease can be used as an additive in a broiler diet for production at a concentration of 200 mg/kg Ronozyme ProAct and with 4% less crude protein compared to the standard diet.

Keywords: broilers, hybrids, enzyme protease, classes of meat.

Introduction

One of the biggest challenges in poultry production is the high cost of feed, which can account for up to 70% of total costs. One strategy to overcome this problem is the use of alternative feeds that provide good animal performance at a reasonable cost without harming the environment (da Silva *et al.* 2021). Research studies have shown that exogenous enzymes added to diets improve the digestibility of nutrients and their absorption in the intestines of birds (Borda-Molina *et al.* 2019; Hafeez *et al.* 2020), thereby reducing environmental pollution (Hafeez *et al.* 2021) and production costs (Ding *et al.* 2016). The application of proteases in broiler diets is complex and therefore the properties and dosage of the protease as well as the protein content in the feed should be fully considered when protease is provided in animal feed (Zheng *et al.* 2023). The facts show that the efficacy of exogenous proteases is highly dependent on the amount of protease added. Currently, there is a lack of knowledge on the dose-dependent relationship between commercial proteases and animal growth, organ weight, gut health and nutrient digestibility (Song *et al.* 2023). Therefore, the aim of the present study was to investigate the effect of a commercial protease supplement to corn-soybean meal diet on the weight and percentage of certain meat classes of two commercial broiler chickens with different growth rates.

Materials and methods

Six treatments consisting of a 2 × 3 factorial design of 2 genotypes (fast-growing hybrid Cobb 500 and the medium-growing hybrid Master Gris) and 3 experimental diets (control group - standard diet without protease; group E-I, which received 4 % less crude protein with the addition of 200 mg/kg Ronozyme ProAct in relation to the control group, and Group E-II, which received 6 % low-protein diet with the addition of 300 mg/kg Ronozyme ProAct in relation to the control group). Each treatment comprised 100 chicks. Until 21 day of age, chicks received a starter diet, from 22 to 35 d a grower diet and from 35 to 49 day a finisher diet. Diets for the control groups was formulated to meet the requirements of Cobb 500 (Cobb 500, 2012). The feed was provided in mash form. Feed and water were offered to the chicks ad libitum during the experimental period. At the end of the experiment on day 49, 20 birds (10 males and 10 females) were randomly selected from each experimental unit, weighed, slaughtered and processed to determine the weight and percentage of meat classes (meat class I: breast, drumsticks and thighs; meat class II - wings and meat class III - back and pelvis). The percentages of certain meat classes are calculated in relation to the weight of the ready-to-grill carcass. The data were analysed using analysis of variance (Anova). Significant main effects or interactions were separated using the LSD test. Statistical significance was defined as a P-value of less than 0.05.

Results and discussion

Slaughter yield is an important indicator of the characteristics of meat production in livestock and poultry. The results for the weight of certain meat classes are shown in Table 1.

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

Treatment			Class I	Class II	Class III
Hybrids	Groups		(breast, thighs, drumsticks)	(wings)	(back, pelvis)
Cobb 500	C	\bar{X}	1502.1 ^a	261.9 ^a	529.7 ^a
		Sd	154.9	27.2	59.2
	E-I	\bar{X}	1476.2 ^a	252.1 ^a	519.7 ^a
		Sd	116.7	27.1	77.2
	E-II	\bar{X}	1433.9 ^a	253.8 ^a	532.2 ^a
		Sd	150.9	30.2	72.5
Master Gris	C	\bar{X}	1105.8 ^b	221.7 ^b	434.1 ^b
		Sd	90.5	19.5	37.7
	E-I	\bar{X}	1067.8 ^b	219.2 ^b	410.0 ^b
		Sd	100.8	20.4	32.2
	E-II	\bar{X}	1077.8 ^b	219.2 ^b	422.1 ^b
		Sd	101.3	23.4	41.9
p-value					
Source of variation					
Sex			0.001	0.001	0.001
Protease			0.204	0.491	0.378
Protease x sex			0.605	0.799	0.806

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

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

Table 1. shows that the investigated carcass traits were predominantly influenced by the genotype ($P < 0.05$). Namely, fast-growing Cobb 500 chickens aged 49 had a higher weight in all meat classes than the medium-growing Master Gris chickens of the same age. However, that crude proteins levels and protease concentrations as well as the interaction of genotype and feeding regime had no effects on the weight of meat classes of broilers in both hybrids ($P > 0.05$). Blagojević *et al.* (2009) determined a higher mass of the carcass parts and thus the meat class in the same fast-growing hybrid compared to the same medium-growing genotype. Dosković *et al.* (2024) also came to similar conclusions about the weight of certain meat classes, that there are differences between hybrids and that there is no influence of the applied nutritional treatments studying the same genotypes at 63 days of age.

Table 2. shows the effects of genotype and diet (with three different protease levels at three different crude protein contents) on the percentage of the different meat classes in the dressed carcass of chicks slaughtered at 49 days of age.

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

Treatment			Class I (breast, thighs, drumsticks)	Class II (wings)	Class III (back, pelvis)
Hybrids	Groups				
Cobb 500	C	\bar{X}	63.1 ^a	11.0 ^c	22.2 ^b
		Sd	1.3	0.5	0.9
	E-I	\bar{X}	63.3 ^a	10.8 ^c	22.1 ^b
		Sd	2.4	0.6	1.8
	E-II	\bar{X}	62.3 ^a	11.0 ^c	23.1 ^a
		Sd	1.7	0.6	1.2
Master Gris	C	\bar{X}	60.2 ^b	12.1 ^b	23.6 ^a
		Sd	1.1	0.4	0.7
	E-I	\bar{X}	60.5 ^b	12.4 ^a	23.2 ^a
		Sd	0.9	0.4	0.7
	E-II	\bar{X}	60.1 ^b	12.2 ^{ab}	23.5 ^a
		Sd	0.9	0.5	0.8
p-value					
Source of variation					
Sex			0.001	0.001	0.001
Protease			0.122	0.819	0.049
Protease x sex			0.484	0.051	0.178

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

Different superscripts (a-c) indicate a significant difference between groups ($P < 0.05$)

The genotype has a significant effect on the percentage of the different chicken meat classes ($P < 0.05$). Thus, the proportion of meat class I was higher in the Cobb 500 genotype, while the proportion of meat class II and the proportion of meat class III was lower compared to the Master Gris hybrids ($P < 0.05$).

In our study, significance under the influence of the protease enzyme was found in the Cobb 500 hybrid for meat class III (between C group and E-I group on the one hand and E-II group on the other hand, $P < 0.05$) and in the Master Gris hybrid for meat class III (between C group and E-I group, $P < 0.05$). Differences between strains with different growth intensity in the proportion of individual carcass parts and meat classes (group of carcass parts) were also cited by Aksoy *et al.* (2010), Jaspal *et al.* (2020), Dosković *et al.* (2021) and Tůmová *et al.* (2021).

The different effects of protease application may be due to the type, amount, composition of feed, breed, age and health status of the broilers (Li *et al.* 2023). The results are in some agreement with those of Mahendran *et al.* (2022), Duque-Ramirez *et al.* (2023) and Dosković *et al.* (2024), who reported that supplementation of protease enzyme with different crude protein-reduced diets had no effect on the proportion of meat classes and carcass traits in broilers.

The interaction between genotype and diet was not significant for any meat class, implying that the genotype responses to the diet treatments are the same.

Conclusion

The present study shows that the genotype has a much greater influence on the weight and percentage of certain meat classes of broiler chickens ($P < 0.05$) in relation to the applied feeding regime. Namely, the fast-growing Cobb 500 genotype showed a higher weight of all meat classes and a higher percentage of class I meat and a lower percentage of class II and class III meat compared to the broiler chickens of the Master Gris hybride.

Based on the results obtained, it can be concluded that the enzyme protease can be used as an additive in a broiler diet for production at a concentration of 200 mg/kg Ronozyme ProAct and with 4% less crude protein compared to the standard diet, accordingly very small differences in the examined characteristics of the processed chicken carcasses - weights and percentages of certain classes of meat.

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