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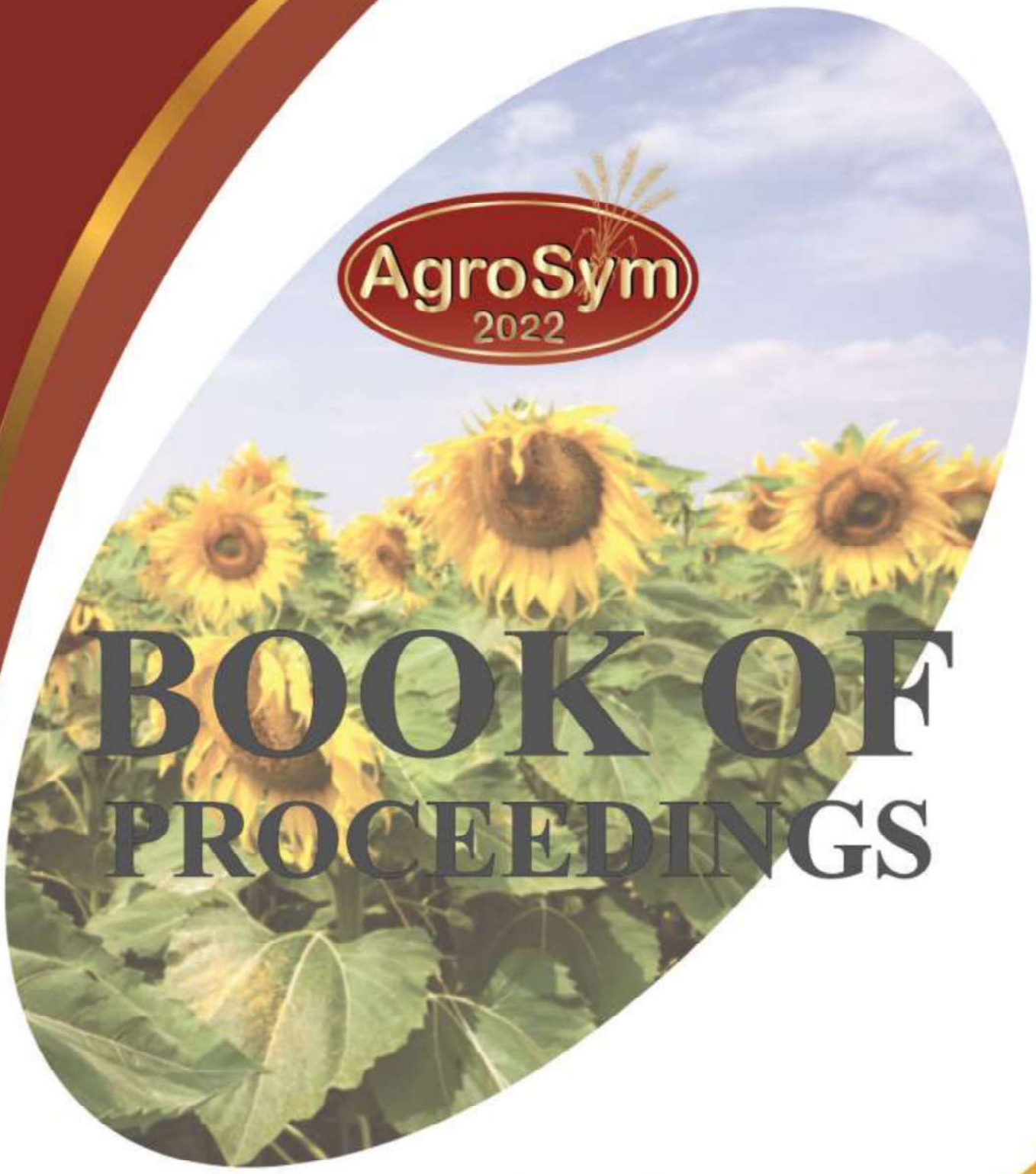

BOOK OF PROCEEDINGS

XIII International Scientific Agriculture Symposium "AGROSYM 2022" October 6-9, 2022

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EFFECTS OF PROTEASE, DURATION OF FATTENING PERIOD AND SEX OF BROILERS ON CARCASS CONFORMATION MEASURES

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Abstract

This study analyses the effect of different protein levels in broiler feeds (supplemented with protease), different lengths of fattening period and sex on body conformation in fast-growing Cobb 500 broilers. Complete feeds for broilers in experimental groups E-I and E-II contained 4 and 6% less crude protein than the control (C) and were supplemented with protease (Ronozyme Pro Act) at a concentration of 200mg/kg feed and 300mg/kg feed respectively. At 49 and 63 days of age, 10 male and 10 female broilers were randomly selected from each experimental group and slaughtered. Body conformation measurement included absolute carcass conformation measures (metatarsus length, keel length, breast depth, breast angle, thigh girth) and relative body conformation measures - conformation indices (body weight/metatarsus length, body weight/keel length, body weight/breast depth, body weight/thigh girth). The results showed that dietary treatment did not affect conformation measures, as well as that the time of slaughter and sex of chickens had a significant effect on the examined carcass quality parameters. Namely, the length of the fattening period affected all conformation indices, as well as some absolute measures of carcass conformation - metatarsus length, keel length and thigh girth, while sex had a significant effect on the values of the all absolute values of carcass conformation (except for breast angle) and indices body weight/keel length and body weight/breast depth.

Keywords: *broilers, body conformation, feeds, lengths of fattening period, sex.*

Introduction

For decades, those involved in the production chain of broiler chickens have been concerned with the potential for growth and body conformation of poultry, since these characteristics are related to the efficiency and profitability of the poultry sector. Genetic enhancements have resulted in the current broiler chicken strains, which are characterized by faster weight gain and better feed conversion (Nascimento *et al.* 2018). The feed efficiency, live and carcass weight and percentages of some carcass parts are significantly affected by age and production system (Castelini *et al.* 2002).

Dietary protein plays a significant role in digestive system development and growth performance. Modern poultry primarily focuses on reducing the feed cost to optimize economic benefits since feed is the main factor determining the total production cost, and crude protein are one of the fundamental cost constituents of poultry feed (Kamran *et al.* 2004). As one of the methods to improve the utilization of proteins and amino acids from the feed is proposed protease supplementation. Protease enzyme have several benefits including positive effects on

growth performance, nutrient utilization, lipid peroxidation and modified plasma lipids profile in broiler chickens (Sorbara, 2009; Saleh *et al.* 2018; Moreira *et al.* 2020; Saleh *et al.* 2020).
Therefore, the objective of the present study was to evaluate some carcass characteristics - body conformation of broiler chickens from different dietary treatments (with or without protease enzymes), different lengths of fattening period (49 and 63 days of age) and sexes.

Material and methods

A total of 300 day-old broiler chicks (Cobb 500) of mixed sex were randomly assigned to 3 nutritionally corn-soybean based experimental diets (C, E-I and E-II) comprising 3 levels of protease supplementation (C - control group, 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 nutrient composition of feeds are presented in Table 1.
Broilers were fed *ad-libitum* starter (day 1-21 of age), grower (day 22-35 of age) and finisher mash diets (day 36-63 of age) and water was available freely and were placed within the identical environmental conditions.

Table 1. Nutrient composition of experimental diets for broilers

Calculated composition	Starter stage (1 to 21 d)			Grower stage (22 to 35 d)			Finisher stage (36 to 63 d)		
Treatments	C	E-1	E-2	C	E-1	E-2	C	E-1	E-2
ME, kcal/kg	3.081	3.100	3.112	3.157	3.174	3.183	3.181	3.198	3.207
Crude proteins, %	22.59	21.72	21.24	18.99	18.22	17.84	17.16	16.45	16.09
Total lysine, %	1.33	1.27	1.24	1.15	1.10	1.08	1.05	1.00	0.98
Methionine+cystine, %	0.92	0.90	0.89	0.91	0.89	0.88	0.86	0.84	0.83

On day 49 and 63, ten male and ten female birds from each dietary treatment were weighed and after were fasted for 6 h and slaughtered to determine eviscerated absolute carcass conformation measures (metatarsus length, keel length, breast depth, breast angle, thigh girth). Based on body weight at slaughter data and absolute conformation measurements, relative conformation measurements were calculated (body weight/metatarsus length, body weight/keel length, body weight/breast depth and body weight/thigh girth).
The data thus obtained on various parameters were subjected to statistical analysis according to using analysis of variance technique (for three factors - diet, fattening period and sex of chickens) and Tukey's test (for individual comparisons, $P<0.05$) (Statsoft Inc. Statistica for Windows, *2006*).

Results and discussion

The measured parameters of the absolute values of carcass conformation (metatarsus length, keel length, breast depth, breast angle and thigh girth) of Cobb 500 broiler chickens at the age of 49 and 63 days, are presented in Table 2.

Table 2. Body conformation (absolute values) of broilers across experimental groups

Treatment				ML mm	KL mm	BD mm	BA degrees	TG mm
Protease	Fattening period, days	Sex						
C	49	♂	$\bar{x}$	83.1^{bc}	123.2^{cd}	114.0^{ab}	153.6^{abc}	165.5^{ab}
			Sd	3.14	3.26	3.20	5.17	6.48
		♀	$\bar{x}$	74.3^{d}	117.2^{ef}	107.7^{cd}	145.7^{c}	148.2^{e}
			Sd	2.50	3.79	2.79	6.81	5.47
	63	♂	$\bar{x}$	91.3^{a}	130.2^{a}	118.8^{a}	161.7^{a}	173.1^{a}
			Sd	2.75	1.55	4.08	5.64	6.84
		♀	$\bar{x}$	80.8^{bc}	126.8^{abc}	108.4^{bcd}	154.1^{abc}	158.4^{bcd}
			Sd	3.76	1.81	3.78	6.81	7.44
E-I	49	♂	$\bar{x}$	82.1^{bc}	121.3^{de}	113.4^{abc}	152.6^{abc}	159.6^{bc}
			Sd	2.18	4.08	3.75	4.14	2.76
		♀	$\bar{x}$	75.1^{d}	116.4^{f}	105.2^{d}	148.9^{bc}	150.4^{de}
			Sd	3.25	3.31	3.12	6.62	4.55
	63	♂	$\bar{x}$	93.6^{a}	130.6^{a}	116.4^{a}	159.2^{a}	171.4^{a}
			Sd	2.37	1.07	6.67	7.15	5.29
		♀	$\bar{x}$	80.4^{c}	126.3^{abc}	110.5^{bcd}	147.9^{bc}	154.8^{cde}
			Sd	2.76	3.59	4.50	7.61	7.27
E-II	49	♂	$\bar{x}$	85.1^{b}	124.3^{bcd}	113.3^{abc}	155.2^{ab}	161.5^{bc}
			Sd	3.93	2.16	4.29	5.63	5.40
		♀	$\bar{x}$	75.6^{d}	117.6^{ef}	105.1^{d}	147.0^{bc}	150.9^{de}
			Sd	2.63	4.09	3.18	5.12	7.49
	63	♂	$\bar{x}$	90.3^{a}	129.7^{a}	116.3^{a}	154.5^{abc}	167.1^{ab}
			Sd	4.19	1.89	3.16	6.79	6.71
		♀	$\bar{x}$	81.0^{bc}	128.3^{ab}	109.4^{bcd}	148.5^{bc}	159.4^{bcd}
			Sd	2.36	2.06	1.78	6.62	7.46

ML-metatarsus length, KL-keel length, BD-breast depth, BA-breast angle, TG-thigh girth
[a-e] Means followed by different superscript letters within columns differ significantly (P<0.05)

The addition of protease enzyme (200 or 300 mg/kg of protease) had no significant influence (P>0.05) on the absolute carcass conformation measures compared to the control group.

The prolongation of duration fattening period for two weeks (both at 7 and 9 weeks of age) significantly increased the metatarsus length, keel length and thigh girth (E-I group in female and E-II group in male chickens) (P<0.05), with a slight increase in breast depth and breast angle (P>0.05). The obtained results are consistent with the results of Dosković *et al.* (2017) who reported that the length of the fattening period affected almost all studied parameters, except breast angle.

Males had higher values for all absolute carcass conformation measures than females (P<0.05), with only breast angle (both 49 and 63 days), keel length (63 day) and thigh girth (49 day, E-1 group and 63 day, E-II group) showing no significance (P>0.05). Similar results on the better conformation of male chicken carcasses compared to females, with no significant difference only

for breast angle, were obtained by Pavlovski *et al.* (2007) and Dosković *et al.* (2018), while Blagojević *et al.* (2009) determined a significant effect of sex on all absolute measures of conformation.

Table 3. Body conformation indices in broilers across experimental groups

Treatment				BW/ML g/mm	BW/KL g/mm	BW/BD g/mm	BW/TG g/mm
Protease	Fattening period, days	Sex					
C	49	♂	$\bar{x}$	41.73^{cde}	28.13^{b}	30.40^{cd}	20.95^{cde}
			Sd	1.89	1.05	1.22	0.83
		♀	$\bar{x}$	39.01^{ef}	24.76^{c}	26.90^{e}	19.56^{def}
			Sd	1.79	1.63	0.99	0.83
	63	♂	$\bar{x}$	48.50^{a}	33.40^{a}	37.28^{a}	25.59^{a}
			Sd	2.61	1.74	1.96	1.45
		♀	$\bar{x}$	44.33^{abc}	28.19^{b}	32.94^{b}	22.54^{bc}
			Sd	4.20	2.30	1.94	1.06
E-I	49	♂	$\bar{x}$	41.36^{c-f}	28.01^{b}	29.97^{d}	21.26^{cd}
			Sd	1.88	1.56	1.71	0.63
		♀	$\bar{x}$	38.40^{ef}	24.74^{c}	27.36^{e}	19.15^{ef}
			Sd	2.45	1.15	1.14	1.00
	63	♂	$\bar{x}$	46.94^{ab}	33.62^{a}	37.73^{a}	25.64^{a}
			Sd	3.54	2.37	1.69	1.93
		♀	$\bar{x}$	44.57^{abc}	28.35^{b}	32.40^{bc}	23.15^{b}
			Sd	3.21	1.70	1.57	1.43
E-II	49	♂	$\bar{x}$	39.94^{def}	27.26^{b}	29.90^{d}	20.98^{cde}
			Sd	3.67	1.64	1.22	1.13
		♀	$\bar{x}$	37.29^{f}	23.97^{c}	26.82^{e}	18.69^{f}
			Sd	1.52	1.02	1.21	0.67
	63	♂	$\bar{x}$	47.21^{ab}	32.78^{a}	36.56^{a}	25.51^{a}
			Sd	3.67	1.47	1.62	2.06
		♀	$\bar{x}$	43.63^{bcd}	27.54^{b}	32.28^{bc}	22.17^{bc}
			Sd	2.52	1.51	1.56	0.99

BW – body weight at slaughter, ML-metatarsus length, KL – keel length, BD – breast depth, TG – thigh girth
a-f Means followed by different superscript letters within columns differ significantly (P<0.05)

Results from this study clearly show non-significant differences in body conformation indices between applied dietary treatments (P>0.05). Similar results on the effect of different concentrations of protease enzymes on carcass quality parameters and conformation measures (both relative and absolute) of chicken carcasses, with a decrease in crude protein content, were published by Dosković *et al.* (2012, 2016), examining the same hybrid - Cobb 500.

With the extension of the duration of fattening (for 14 days), the value of all relative conformation measurements increased (P<0.05). The relative conformation traits were significantly affected by the length of the fattening period in similar growing conditions, according to Dosković *et al.* (2017).

There was a significant effect (P<0.05) between male and females chicks in body weight/keel length and body weight/breast depth, while at the same time there was no difference in indices of body weight/metatarsus length and body weight/thigh girth (P>0.05). Dosković *et al.* (2016)

reported that male chickens had significantly (P<0.01) higher relative conformation measures compared to female chickens, while Blagojević (2011) found that the effect of sex on carcass conformation index value was significant for BW/ML.

Conclusion

Based on the data presented above, it could be concluded that:

- dietary treatments (standard diet without enzyme protease; 4 % less crude protein than the control and enzyme protease (Ronozyme Pro Act) at a concentration of 200mg/kg feed and 6 % less crude protein than the control and with enzyme protease at a concentration of 300mg/kg feed) did not affect carcass conformation measures,
- prolonging the fattening period of Cobb 500 chickens (from 49 to 63 day of age) significantly increased some absolute carcass conformation measures (metatarsus length, keel length and thigh girth), as well as all body conformation indices (P<0.05),
- male chickens had better conformation compared to females, and sex had a non-significant effect on the values of the breast angle and indices of body weight/metatarsus length and body weight/thigh girth (P>0.05).

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