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Effects of dietary supplementation of *Aspergillus orizae* originated prebiotic (Fermacto) on carcass characteristics of broiler

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Abstract

This study investigated the effects of different levels and consumption period of prebiotic on some carcass characteristics of broiler. A total 270 one day old male chicks Ross 308 strain based on a 2 (0.2 and 0.4% dietary Fermacto) × 4 (starter, grower, finisher, and total periods) factorial arrangement using a completely randomized design and also a control treatment with included 9 treatments have been studied by 3 replicates per each treatment. Treatments including 1) Control (basal diet, with no added Fermacto); 2) Control + Fermacto (0.2%, in starter period); 3) Control + Fermacto (0.2%, in grower period); 4) Control + Fermacto (0.2%, in finisher period); 5) Control + Fermacto (0.2%, in total period); 6) Control + Fermacto (0.4%, in starter period); 7) Control + Fermacto (0.4%, in grower period); 8) Control + Fermacto (0.4%, in finisher period) and 9) Control + Fermacto (0.4%, in total period). There was no difference in liver, heart, pancreas, and small intestine length ($P>0.05$). Fermacto as much as 0.2% and 0.4% in finisher period had the highest small intestinal percentage ($P<0.05$).

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Introduction

Prebiotics as a helpful additive into broiler diet is used recently and there are many reports about its positive effects on broiler traits (Patterson and Burkholder, 2003; Lan *et al.*, 2005;

Midilli *et al.*, 2008; Kim *et al.*, 2011; Dibaji *et al.*, 2014). Fermacto is a nover prebiotics and there are few reports about its effects (Torres-Rodriguez *et al.*, 2005; Piray *et al.*, 2007; Ghiyasi *et al.*, 2007). However, there are little information about Fermacto effects on body organs of broiler. Therefore, the objective of this study was to determine the effect of period and amount of Fermacto on some gastrointestinal organ characteristics of commercial broilers.

Materials and methods

A total 270 one-day old Ross 308 chicks were divided in 27 groups of 10 animals. Each group included a replication (10 animals by replication) and feed for 42 days with iso-caloric and iso-nitrogenous including different Fermacto (PetAg, USA) (0.02 and 0.4%) and duration of Fermacto usage (starter, grower, finisher, and total period). There is also a control treatment without Fermacto:

Treatment 1: Control (basal diet, with no added Fermacto)
Treatment 2: Control + Fermacto (0.2%, in starter period)
Treatment 3: Control + Fermacto (0.2%, in grower period)
Treatment 4: Control + Fermacto (0.2%, in finisher period)
Treatment 5: Control + Fermacto (0.2%, in total period)
Treatment 6: Control + Fermacto (0.4%, in starter period)
Treatment 7: Control + Fermacto (0.4%, in grower period)
Treatment 8: Control + Fermacto (0.4%, in finisher period)
Treatment 9: Control + Fermacto (0.4%, in total period).

At day-old experimental birds were weighed individually and randomly assigned to 27 floors pens where brooding was carried out for all experimental birds during the first three weeks of age. Room temperature was maintained at 30-33°C for the first week and reduced gradually by 2.8°C/5°F every week until 22°C and at this point on no artificial heating was provided to the birds. Room temperature was monitored by three thermometers which were placed in the middle and two ends of the broiler house where the birds were reared. The birds received a 23 hrs light and one hour of dark (23L: 1D) regiment throughout the study period. During the first week, fed and water were provided in feeder trays and conical drinkers, respectively. During the rearing period, chute feeders and drinkers were used. Feed and water we-were provided *ad libitum*.

The birds were vaccinated against bronchitis disease (1st and 7th day of age), Newcastle disease (1st and 7th day of age), influenza disease (1st day of age) and Gumboro disease (21st day of age).

At 42 days, one representative chick per replicate was selected and scarified. Feet were separated from the carcass in the tibio-tarsal joint. Liver, gizzard, hearth, pancreas, and small intestine were removed and was weighed and recoded.

The data were analyzed using the general linear models procedure of SPSS software (SPSS, 1997), which is robust enough to allow for the moderately imbalanced data from these experiments. The model included level and usage duration of Fermacto as main effects. The interaction between main effects was included in the model. Mean separation was accomplished using Duncan. All significance level was set at $P<0.05$. The model used was $Yij = \mu + A_i + Bj + ABij + e_{ijk}$ where μ = the common mean, A_i = the effects of the Fermacto level, Bj = the effect of the Fermacto duration, $ABij$ the effect of the ith A with the jth B, and e_{ijk} = the random error. Before performing the statistical analysis of data, all data

were tested by normality test.

Results and discussion

Obtained results are summarized in Table 1. From obtained results, it is showed that usage period of Fermacto had not significant effect on relative weight of liver (P>0.05), although usage period of Fermacto as starter period had the highest liver relative weight numerically (2.40%). Fermacto amount also had not significant on liver relative weight (P>0.05), however 0.4.% Fermacto resulted to the highest liver relative weight numerically (2.39%). Meanwhile statistical differences between nine studied treatments for relative weight of liver were not significant (P>0.05). Amount of relative weight of liver in nine studied treatments were between 2.27-2.44%. Among studied treatments, the highest level of liver relative weight belonged to treatment 8 (usage period as finisher period, and Fermacto level as amount as 0.4%), and treatment 1 (control) remained at lower level than other treatments. Other treatments were between these treatments.

Table 1. Mean (±SEM) of body parts at 42nd days of age in Ross 308 broilers affected the four different amounts of Fermacto and two different periods of its usage*.

Trait / Treatment		Relative weight of liver (%)	Relative weight of gizzard (%)	Relative weight of hearth (%)	Relative weight of pancreas (%)	Relative weight of small intestine (%)	length of small intestine (cm)
Fermacto level (%)	0.2	2.34^{a}	1.41^{a}	0.515^{a}	0.262^{a}	2.60^{a}	198.31^{a}
	0.4	2.39^{a}	1.40^{a}	0.489^{a}	0.255^{a}	2.57^{a}	199.01^{a}
SEM (Standard Error of Mean)		0.038	0.07	0.009	0.007	0.08	6.36
Fermacto duration	Starter	2.40^{a}	1.44^{a}	0.505^{a}	0.265^{a}	2.48^{a}	200.13^{a}
	Grower	2.36^{a}	1.39^{a}	0.475^{a}	0.235^{a}	2.63^{ab}	198.37^{a}
	Finisher	2.36^{a}	1.47^{a}	0.518^{a}	0.275^{a}	2.81^{a}	198.87^{a}
	Total period	2.35^{a}	1.42^{a}	0.511^{a}	0.260^{a}	2.43^{b}	197.40^{a}
SEM (Standard Error of Mean)		0.034	0.063	0.01	0.008	0.07	5.08
Control: Amount (0)- Period (0)		2.27^{a}	1.46^{a}	0.512^{a}	0.23^{a}	2.83^{a}	202.00^{a}
Amount (0.2%)- Period (starter)		2.39^{a}	1.39^{a}	0.533^{a}	0.28^{a}	2.48^{a}	199.27^{a}
Amount (0.2%)- Period (grower)		2.35^{a}	1.42^{a}	0.486^{a}	0.24^{a}	2.62^{ab}	198.00^{a}
Amount (0.2%)- Period (finisher)		2.28^{a}	1.46^{a}	0.546^{a}	0.27^{a}	2.87^{da}	198.65^{a}
Amount (0.2%)- Period (total)		2.37^{a}	1.40^{a}	0.497^{a}	0.26^{a}	2.44^{b}	197.35^{a}
Amount (0.4%)- Period (starter)		2.42^{a}	1.35^{a}	0.478^{a}	0.25^{a}	2.48^{b}	201.00^{a}
Amount (0.4%)- Period (grower)		2.37^{a}	1.36^{a}	0.465^{a}	0.23^{a}	2.65^{ab}	198.75^{a}
Amount (0.4%)- Period (finisher)		2.44^{a}	1.48^{a}	0.490^{a}	0.28^{a}	2.75^{a}	199.10^{a}
Amount (0.4%)- Period (total)		2.33^{a}	1.44^{a}	0.525^{a}	0.26^{a}	2.42^{b}	197.45^{a}
SEM (Standard Error of Mean)		0.036	0.064	0.01	0.01	0.08	7.25

Means (± standard error) within each column of dietary treatments with no common superscript differ significantly at P<0.05.

It is showed that usage period of Fermacto had not significant effect on relative weight of gizzard (P>0.05), although usage period of Fermacto as finisher had the highest gizzard relative weight numerically (1.47%). Fermacto amount had not significant on gizzard relative weight (P>0.05), however 0.2% Fermacto resulted to the highest gizzard relative weight numerically (1.41%). Meanwhile statistical differences between nine studied treatments for relative weight of gizzard were not significant (P>0.05). Amount of relative weight of gizzard in nine studied treatments were between 1.35-1.48%. Among studied treatments, the highest level of gizzard relative weight belonged to treatment 8 (usage period as finisher, and Fermacto level as amount as 0.4%), and treatment 5 (usage period as starter, and Fermacto level as amount as 0.4%) remained at lower level than other treatments. Other

treatments were between these treatments.

Usage period of Fermacto had not significant effect on relative weight of hearth (P>0.05), although usage period of Fermacto at finisher had the highest hearth relative weight numerically (0.518%). Fermacto amount had not significant on hearth relative weight (P>0.05), however 0.2% Fermacto resulted to the highest hearth relative weight numerically (0.515%). Meanwhile statistical differences between nine studied treatments for relative weight of hearth were significant (P≤0.05). Amount of relative weight of hearth in nine studied treatments were between 0.465-0.546%. Among studied treatments, the highest level of hearth relative weight belonged to treatment 4 (usage period at finisher days, and Fermacto level as amount as 0.2%), and treatment 7 (usage period at grower, and Fermacto level as amount as 0.4%) remained at lower level than other treatments. Other treatments were between these treatments.

From obtained results, it is showed that usage period of Fermacto had not significant effect on relative weight of pancreas (P>0.05), although usage period of Fermacto at finisher had the highest pancreas relative weight numerically (0.275%). Fermacto amount also had not significant on pancreas relative weight (P>0.05), however 0.2% Fermacto resulted to the highest pancreas relative weight numerically (0.262%). Meanwhile statistical differences between nine studied treatments for relative weight of pancreas were not significant (P>0.05). Amount of relative weight of pancreas in nine studied treatments were between 0.23-0.28%. Among studied treatments, the highest level of pancreas relative weight belonged to treatments 2 and 8 (usage period at starter and finisher, and Fermacto level as amount as 0.2 and 0.4% respectively), and treatment 1 (control) remained at lower level than other treatments. Other treatments were between these treatments.

It is showed that usage period of Fermacto had significant effect on relative weight of small intestine (P≤0.05), so usage period of Fermacto at finisher had the highest small intestine relative weight numerically (2.81%). Fermacto amount had not significant on small intestine relative weight (P>0.05), although 0.2% Fermacto resulted to the highest small intestine relative weight numerically (2.60%). Meanwhile statistical differences between nine studied treatments for relative weight of small intestine were significant (P≤0.05). Amount of relative weight of small intestine in nine studied treatments were between 2.42-2.87%. Among studied treatments, the highest level of small intestine relative weight belonged to treatment 4 (usage period at finisher, and Fermacto level as amount as 0.2%), and treatment 9 (usage period whole period, and Fermacto level as amount as 500 g.ton) remained at lower level than other treatments. Other treatments were between these treatments.

Usage period of Fermacto had not significant effect on length of small intestine (P>0.05), although usage period of Fermacto at starter had the highest small intestine length numerically (200.13 cm). Fermacto amount also had not significant on small intestine length (P>0.05), however 0.4% Fermacto resulted to the highest small intestine length numerically (199.01 cm). Meanwhile statistical differences between nine studied treatments for length of small intestine were not significant (P>0.05). Amount of length of small intestine in nine studied treatments were between 197.35-202.00 cm. Among studied treatments, the highest level of small intestine length belonged to treatment 1 (control), and treatment 5 (usage period as long at whole period and Fermacto level as amount as 0.2%) remained at lower level than other treatments. Other treatments were between these treatments.

There are reports on positive effects of prebiotics and synbiotics on broiler (Dibaji *et al.*, 2014). However, there are few reports on positive effects of Fermacto prebiotics on broiler (Torres-Rodriguez *et al.*, 2005; Ghiyas *et al.*, 2007; Piray *et al.*, 2007; Navidshad *et al.*, 2010), and there is not report about effects of Fermacto on broiler organs. Therefore, findings of

this study are novel and demonstrated positive effects of dietary Fermacto on organ characteristics of broiler.

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