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Fat and Cholesterol Contents of Local Duck (*Anas platyrhynchos platyrhynchos*) Meat Fed Mash, Paste and Crumble Feeds

Ismoyowati and Juni Sumarmono
Faculty of Animal Science, Jenderal Soedirman University, Soeparno Street No 60 Purwokerto, Central Java, 53122 Indonesia

Corresponding Author: Ismoyowati, Faculty of Animal Science, Jenderal Soedirman University, Soeparno Street No 60 Purwokerto, Central Java, 53122 Indonesia

ABSTRACT

Feed is one of factors that determines quality attributes of duck meat. The objective of this experiment was to investigate the effects of different forms of feed (mash, paste and crumble) on fat and cholesterol contents of blood and meat of male local ducks reared for 9 weeks. The experiment used 54 day old male local ducks of Indonesia and complete feed (BR II). Treatment applied was the form of the feed which were mash, paste and crumbe. Each treatment has 6 replicates and each experimental unit consisted of 3 ducks. Variables observed were fat and cholesterol contents of meat and cholesterol content of blood. Feeding ducks with different forms of feed significantly affected fat and cholesterol contents of the meat. However, it has no significant effects of blood cholesterol. Locals ducks fed paste feed produce meat with higher cholesterol and fat contents than those fed mash or crumble feeds.

Key words: Local duck, feed form, mash, crumble, paste

INTRODUCTION

Most of ducks in Indonesia were reared to produce eggs (Ismoyowati, 2008). Utilization of duck meat was limited, hence male ducks were not optimally reared (Ismoyowati and Widiyastuti, 2003). The price of male ducklings was generally lower than their female counterparts, although male ducklings show higher growth rate than females (1407 vs. 1277 g) (Ismoyowati *et al*., 2001).

Feeding is one of important factors that determine the success of rearing ducks, by which it contributes to the welfare of the animals (Garner *et al*., 2002; Sanotra *et al*., 2002). When feeding ducks, the form of feeds must be taken into consideration because it influences the amount of feed consumed. This is due to the specific shape of the bill (Dan Roesdiyanto, 2001). Different feed forms (mash, paste and crumble) influence feed palatability and consumption and at the end growth rate (Vilarino *et al*., 1996). Mash feed is feed in the form of small particles, mostly fed during starter period. Crumble feed is complete feed composed of ingredients that were milled, mixed and formed into cumbles. Paste feed is feed produced by mixing complete feed with water of particular proportions (North and Bell, 1990). Most of previous investigations were dealed with different forms of feeds for broiler chicken and rarely with ducks. The objective of this study was to investigate the effects of different forms of feed (mash, paste and crumble) on fat and cholesterol contents of blood and meat of male local ducks reared for 9 weeks.

MATERIALS AND METHODS

A total of 54 day old male ducks were obtained from duck farmers group Purwadiwangsa, Tegal, Central Java. Duck feed used was complete feed BR-II with composition: moisture 12%, Metabolisable Energy (ME) 2900 kcal kg^{-1}, crude protein 19%, fat 5%, crude fiber 4.5%, ash 6.5%, calcium 1.1% and phosphorus 0.95%. The amount of feed given was calculated according to Scott and Dean (1992). Ducklings were reared in 18 cages, each cage measured 1×0.5 m for 3 ducklings.

A completely randomised design was used in this study. The treatment was feed forms which were mash, paste and crumble. Each treatment was replicated 3 times and each experimental units comprised of 3 ducklings. Variables measured were meat fat and cholesterol contents and blood cholesterol content. Feed consumption and feed conversion during 9 weeks of rearing were also measured. Data analysis was done using analysis of variances, with Honestly Significant Difference (HSD) as the post-hoc test (Steel and Torrie, 1991).

The study was started by preparation and sanitation of the cages, then continued with brooder preparation. All ducklings were weighed and tagged. Duclings were randomly assigned into cages based on treatments and replications. Ducks were reared for 9 weeks and feed were available *ad libitum*. Mash feed was produced by milling BR-II feed, paste feed was produced by mixing BR-II feed with water (1:1) and crumble feed was BR-II as is Drinking water was available in each cage *ad libitum*. Blood samples were obtained from vena axielaris one day before slaughtering. Slaughtering was conducted when the ducks reached 9 weeks of age.

Blood cholesterol was determined using enzymatic method (CHOD-PAP method), meat cholesterol was determined using Liebermen-Burchard method and meat fat content was determined using Soxhlet apparatus (AOAC, 1990).

RESULTS AND DISCUSSION

Feed consumption and feed conversion: Table 1 shows feed consumption and feed conversion of local ducks fed complete feeds in the form of mash, paste and crumble. On average, each duck consumed 2838.33±304.21 g of feed during 9 weeks of rearing with feed conversion of 2.40±0.14. In this study, feed consumption was lower but feed conversion was higher than those previously reported by Ismoyowati *et al.* (2001) that a male local duck consumed 3854 g of feeds (CP 19-22%) during 8 weeks of rearing. The effect of feed forms was highly significant ($p<0.01$) on feed consumption but not significant of feed conversion ($p>0.05$). Ducks preferred feed in the form of paste, hence paste feed has the highest consumption. Amornthewaphat *et al.* (2005) reported that in broiler, feed consumption of chicken fed crumble feeds was higher than those fed mash feed. Ducks consumed more paste feed than mash or crumble feeds due to the shape of the bill and their natural frequent drinking behaviour while eating (Samosir, 1990).

Table 1: Average consumption (g), feed conversion and body weight of 9 weeks local male ducks fed different form of feeds

Feed form	Feed consumption (g/9 week)	Feed conversion	Body weight at 9 weeks
Mash	2501.00±140.37^{a}	2.44±0.09^{a}	1023.33±23.73^{a}
Paste	3194.17±50.95^{c}	2.48±0.11^{a}	1289.56±64.88^{b}
Crumble	2819.83±58.66^{b}	2.29±0.16^{a}	1232.97±63.61^{b}
Average	2838.33±304.21	2.40±0.14	1181.95±130.37

Means within the same column bearing the different superscript differ significantly ($p<0.01$)

Table 2: Average blood cholesterol and fat and cholesterol content of duck meat fed different form of feeds

Treatment	Blood cholesterol (mL dL^{-1})	Meat fat (%)	Meat cholesterol (mg/100 g)
Mash	173.17±13.69[a]	4.93±0.41[a]	171.58±8.74[a]
Paste	186.33±10.46[a]	7.51±0.93[c]	197.04±8.36[c]
Crumble	184.17±19.74[a]	6.03±0.96[b]	190.16±8.16[bc]
Average	181.22±7.06	6.16±1.29	186.26±13.17

Means within the same column bearing the different superscript differ significantly ($p<0.01$)

Feed conversion of ducks fed complete feed in different forms was similar. Feed conversion was obtained by dividing feed consumption (g) by growth rate (g) and so growth or body weight of ducks has high influence on feed conversion. Results showed that ducks fed mash feed have lowest growth and body weight so that they have similar feed conversion (Table 1). The range of growth rate of local ducks was 19.01-25.27 g d^{-1}. The growth rate in this study was lower than that reported by (Ismoyowati *et al*., 2001) which was 27.85 g d^{-1} for ducks fed pellet feeds. Feed in the form of mash is not efficient for feeding ducks because it bring about difficulties in swallowing and lead to more frequent drinking during eating. These would result in higher amount of unconsumed feeds this problem can be resolved by giving crumble or paste feeds (Srigandono, 1991).

Cholesterol content in the blood and meat and meat fat content: On average, cholesterol content in the blood of ducks fed different forms of feed was 181.22±7.06 mL dL^{-1}. Blood cholesterol was not affected by feed forms (Table 2). Murray *et al*. (2000) reported that factors affecting blood cholesterol were genetic and environment. Feed is one environmental factor that has high contribution on fat and cholesterol metabolism. Precursors of cholesterol are obtained from feeds and its biosynthesis is happen in body organs such as intestines and liver. Feed consumption contributes to the synthesis of cholesterol, where high feed consumption would result in high cholesterol content in the blood. However, the result of this study showed no significant differences on blood cholesterol.

Feed in the form of paste led to high feed consumption, hence ducks deposited more fat in the body and contributed to more cholesterol synthesis and deposition in the tissues. McDonald *et al*. (2002) stated that cholesterol regulation in blood was due to the regulation from the intestine and liver. When precursors for cholesterol synthesis is limited in the intestine, absorption of cholesterol by limph is also declining which results in lower absorption and synthesis of cholesterol in the liver.

Male ducks fed mash, paste and crumble feeds produced meat with different fat and cholesterol contents. Ducks fed feeds in the form of paste deposited more fat (7.51±0.93) than those fed feeds in the form of crumble and mash (Table 2). Fat content of duck meat in this study was lower than that of meat type Cherry Valley ducks from China as reported by Wang *et al*. (2003) Deposition of meat fat is directly affected by feed consumption; feed in the form of paste led to high feed consumption because of faster digestion rate, hence higher nutrient absorption and more energy was deposited as fat. The results of this study are in line with Greenwood *et al*. (2005) and Brickett *et al*. (2007) who reported that form and nutrient contents of feeds have high impact on body weight, feed conversion, carcass yield and meat fat content in poultry. Feeding poultry with pellet feed bring about higher feed consumption, growth rate, carcass weight and meat fat contents than feeding poultry with mash feed. Higher energy in feeds causes higher deposition of fat in the abdomen and carcass of poultry (Jackson *et al*., 1982; Summers *et al*., 1992; Leeson *et al*., 1996; Ghaffari *et al*., 2007).

Male ducks fed feeds in the form of paste produced meat with highest cholesterol content. High feed consumption caused high energy intake in ducks. Carbohydrates and fatty acids would be converted into triglycerides that deposited in liver and other tissues including muscles. Excess amount of triglycerides is deposited in the form of body fat which causes more deposition of cholesterol in muscles (Murray *et al*., 2000). Cholesterol is important as structural component of membranes and as precursors for synthesis of steroid hormones, vitamin D and bile acids. Cholesterol can be obtained directly from feeds or synthesized in cells through asetil-coenzyme A pathway. Formation of cholesterol through acetyl-coenzyme A depends on cholesterol in the consumed feeds that is known as de-novo biosynthesis of cholesterol. When cholesterol intake from feed is low, de-novo biosynthesis produces cholesterol to supply various biological processes in the body that requires cholesterol (Ponte *et al*., 2004). Brickett *et al*. (2007) stated that feed forms have high influence on feed consumption and meat fat content in broiler. Pellet feeds produced carcasses and meat with higher fat contents that mash feeds.

CONCLUSION

Male local ducks fed with paste feeds produces meat with higher fat and cholesterol contents than those fed with mash and crumble feeds. Feed conversion was similar among paste, mash and crumble feeds.

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