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Effect of the Level Freshwater Snail Flesh (*Pomacea paludosa*) Soaked in Biochar in Feed on the Performance and Digestives Tract of Male Alabio Ducks (*Anas Plathyrhyncos* Borneo)

Research Article

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ABSTRACT

This research was conducted to study the effect of the level freshwater snail flesh soaked in biochar in feed on performance and digestive tract of male Alabio ducks. The ducklings used in this study were 200 day old ducks with an average initial body weight of 44.89 ± 2.71 g/head, which were put in to experimental cages with ten day old duck each. This study used a completely randomized design consisting of five treatments, four replications, and 10 ducklings in each plot. The treatment consist of: T0) basal feed + 0% freshwater snail flesh soaked with biochar; T1) basal feed + 2.5% freshwater snail flesh soaked with biochar; T2) basal feed + 5.0% freshwater snail flesh soaked with biochar; T3) basal feed + 7.5% freshwater snail flesh soaked with biochar and T4) basal feed + 10% freshwater snail flesh. The results have shown that there were significantly affected on feed intake, body weight gain, carcass weight, and percentage carcass yield by level treatment on male Alabio duck (P<0.01). Male Alabio duck fed diets containing freshwater snail flesh in feed showed that the male Alabio digestive tract profile had normal size. There was concluded that level of use of freshwater snail flesh soaked in biochar up to 5.0 % was able to improved feed intake, body weight gain, feed conversion, carcass weight, percentage carcass yield and the digestive track of male Alabio ducks.

KEY WORDS biochar, digestive tract, freshwater snail flesh, growth performance, male Alabio duck.

INTRODUCTION

Duck is one of the poultry commodities that plays an important role as a producer of eggs and meat to support the availability of animal protein. Duck rearing leads to an intensive pattern, namely from grazing to being kept in a cage. The consequence of intensive maintenance is that the feed is fully provided by the farmer, so production costs increase. Feed costs for duck farms are 70-80% of production costs (Dharmawati *et al.* 2018). One way to reduce production costs incurred by feed costs can be done by using local feed ingredients, one of which is Freshwater snail flesh which is available in duck habitats. Freshwater snail flesh (Pomacea spp.) is a fast-breeding mollusk that lives in swamps, rivers, and irrigation waters. The distribution of snails is quite widespread in various countries, namely Indonesia, Cambodia, Thailand, the Philippines, Singapore, Pakistan, Vietnam, and Papua New Guinea (Burks *et al.* 2017; Khin and Khin, 2017; Ng *et al.* 2017; Yahaya *et al.* 2017). The losses caused by snails are quite extensive, namely, they invasive attack rice plants and other aquatic plants with feathery leaves (Martin *et al.* 2019). So it becomes a threat to aquatic ecology because of reduced biodiversity (Sala *et al.* 2000; Loreau *et al.* 2001). The golden apple snail is defined as a plant-disturbing organism (OTP) in paddy fields. This is due to the fact that Pomacea spp. prefer submerged or floating aquatic plants, so it becomes a threat to rice plants in wetlands (Kasidiyasa *et al.* 2018; Martin *et al.* 2019). This organism has the potential to damage rice plants because rice fields is the preferred habitat for breeding and growth of freshwater snails (Kaiming *et al.* 2013).

Snails are herbivorous animals that are very greedy and eat all aquatic plants. The rapid spread of Pomacea spp. causes damage to aquatic plants resulting in an increase in the density of phytoplankton in the water so that the water becomes cloudy (Carlsson, 2017), disrupting the function of the water as a provider of food for organisms that live in the waters, including swamp buffalo and fish. In addition, it was reported that Pomacea spp. is a disease vector namely *Angiostrongylus cantonensis* (causes *Eosinophilic meningitis*) and *Angiostongylus costaricensis* (causes gastrointestinal syndrome) in humans (Murphy and Johnson, 2013), and as a vector of schistosomiasis transmitted by schistosomiasis worms which can infect the urinary tract and intestines (Cantanhede *et al.* 2014; Bishoy *et al.* 2021). Based on this, it is necessary to manage snails in water to eliminate losses incurred by snails, one of which is used as feed ingredients. Freshwater snail flesh has the potential to be a source of animal protein for poultry feed, especially for Alabio ducks (*Anas plathyrhyncos*), because their protein is equivalent to fish meal with a nutrient composition of 60.77% crude protein, 3.20% crude fat, 1.74% crude fiber, phosphorus 2.06%, calcium 4.92%, methionine 1.22%, lysine 1.91% and metabolizable energy 2410, kcal/kg (Dharmawati *et al.* 2023). Kaiming *et al.* (2013) states that the use of golden snails up to 10% increases body weight gain and duck egg production. Nafiu and Pegala (2010) states that snails can use as much as 10% in Tegal feed, while according to Rodiallah *et al.* (2018), the golden snail can be used as much as 4% in broiler feed. Although snails are very potential as a source of protein before being given to livestock, they must go through processing first because they contain anti-nutritional substances in the form of thiaminase (Resla *et al.* 2019), heavy metals in the form of Pb, Cd, and Hg (Dharmawati *et al.* 2022) and worms of the *type Plagiorchi* spp., *Bullastra lessoni* (Diane *et al.* 2022). One method which can to reduce heavy metal in freshwater snail flesh meat is by soaking it in rice husk charcoal. The results of the research Dharmawati *et al.* (2022), use of biochar by 10% with 24 hours soaking time, was able to remove the heavy metals Pb and Cadmium from freshwater snail flesh meat with an absorption effectiveness of 99.99% and reduced mercury (Hg) with an absorption effectiveness of 97.76%. In addition, it was reported that charcoal was able to reduce total *Coliform* from 1.4 × 10 6 to 5.1 × 10 5 and *E. coli* from 1.7 × 10 6 to 8.2 × 10 5 CPU/g in broiler feed (Hien *et al.* 2018). It was also reported that charcoal can control zoonotic pathogens in poultry and can be used as an alternative to antibiotics in feed. There are still not many research reports regarding the use of biochar in the flesh of freshwater snails. So far, biochar is mostly used in agriculture for fertilizer and improving soil quality and in water for water purification and heavy metal filters. So this research provides an important meaning so that freshwater snail flesh which has been considered a pest on agricultural land and destroys ecosystems can be used optimally as a source of animal protein in poultry feed. However, the use of freshwater snail flesh in feed must also pay attention to feed safety so it is important that before use it is soaked with biochar so that it can be utilized optimally in feed with the aim of increasing the performance and digestive tract of male Alabio ducks.

MATERIALS AND METHODS

Ethical approval and experimental location

This research activity was carried out according to the experimental protocol and was approved by the Institutional Animal Care and Use Committee, Kalimantan Islamic University Muhammad Arsyad Al Banjary, No. 106/Uniska/A.15/XII/2022. The trial was executed at the Poutlry Experimental Unit of the Teaching and ResearchFarm Faculty of Agricultural Kalimantan Islamic University.

Birds arrangement and management

A total of 200 male Alabio day old o ducks (DOD) with an average initial body weight of 44.89 ± 2.71 g/head were separated randomly into five groups. Each treatment consisted of four replications, or four experimental units, where each experimental unit consisted of ten ducks reared in colonies. The experimental unit used is grams/bird. The placement of male Alabio duck into each experimental unit was carried out randomly, and weight was measured with the aim of knowing the initial weight day old duck.

The experimental design used was a completely randomized design consisting of five treatments and four replications, following treatments: T0) basal feed + 0% freshwater snail flesh soaked with biochar; T1) basal feed + 2.5% freshwater snail flesh soaked with biochar; T2) basal feed + 5.0% freshwater snail flesh soaked with biochar; T3) basal feed + 7.5% freshwater snail flesh soaked with biochar; and T4) basal feed + 10% freshwater snail flesh. In this study, the snail meat used had been soaked in 10% (w/w) biochar for 24 hours, then mixed into the basal diet according to the treatment. Feed is given every morning and evening according to the needs of the ducks while drinking water *ad libitum*. The experimental feed was formulated as iso protein and energy (21%: 2900 kcal/kg). The nutrient composition of the feed ingredients used in this research is presented in Table 1.

Rice husk charcoal and freshwater snail flesh preparation

The rice husks were washed thoroughly to remove adhering dirt, then dried in the sun until the rice husk weight was constant, then put in the oven at 100 ˚C for 1 hour. Furthermore, the rice husk charcoal is physically activated by heating it in the furnace for 2 hours at 400 ˚C to activate the carbon contained in the rice husk charcoal. The resulting activated carbon is then crushed to reduce the size by screening 80 mesh.

Freshwater snail flesh that has been mashed is mixed with activated carbon from rice husk charcoal at 10% (w/w) for 24 hours. The next step is to clean the freshwater snail flesh using water flow to separate the meat with activated carbon from the rice husk charcoal, drained, and dried. The dried freshwater snail flesh is mixed into the Alabio duck feed. The content of nutrients and heavy metals in freshwater snail is shown in Tables 2 and 3.

Data collection

Growth performance, carcass, and abdominal fat

Weight gain and feed consumption ratio of each duck were recorded weekly. In the following, the feed conversion ratio (FCR) was calculated. Feed intake is calculated by method Sjofjan *et al*. (2021a), where the total feed supply (g) to the male duck was equal to the total feed remaining (g) of the male Alabio duck and divided by 8 weeks (trial period). Body weight gain is obtained according to the method of Sjofjan *et al*. (2021a); body weight of male ducks (g) at the end of the experimental period excluding the initial Alabio male duck and was 8 weeks. Feed conversion ratio the calculation uses the Sjofjan *et al*. (2021b); Feed intake (g/head/day) divided by body weight gain (g/head/day). Slaughter weight the Slaughter weight of male Alabio ducks was calculated by weighing live weight before slaughter (g) after Alabio male ducks were fasted for approximtely 12 hours (Sjofjan *et al*. 2021b). The sample slaughtering procedure was carried out as follows: (1) Eight-week-old ducks were fasted for 12 hours and still given drinking water *ad libitum*, and their weight was measured. (2) Slaughter of livestock is done by cutting the jugular vein and carotid artery, which are located between the skull and the first neck vertebra (United States Department of Agriculture, 1977). (3). The blood is collected using a beaker glass and weighed. After confirming that the ducks are dead, the feathers are then removed by immersing them in warm water with a temperature of 65 ˚C-70 ˚C for 1 minute to make it easier to remove the feathers. After the ducks are clean, they are weighed without feathers or blood. Carcass weight was obtained by separating the head and legs and removing the internal organs; the separation of the internal organs was carried out surgically from the chest to the cloaca, and each was weighed according to the observed variables. The slaughter method is very concerned about animal welfare. Carcass percentage is obtained by using method Gopingera *et al*. (2014) with a slight modification. Skinned male Alabio ducks were weighed (g), then divided by the live weight of male Alabio ducks (g) and multiplied by 100%. On day 60, in each repetition, two ducks were randomly selected and then slaughtered. Dressing rates were calculated from individual measurements of live weight and carcass weight. Abdominal fat yield is collected from the outer area of the stomach, from the gizzard to the cloaca. The abdominal fat weight was then divided by the individual carcass weight to obtain the abdominal fat yield percentage. Digestive tract percentage obtained by following the methode Sjofjan *et al*. (2019) with a slight modification. Digestive tract percentage is the ratio of the digestive tract of male Alabio ducks divided by the live weight of male Alabio ducks (g) and multiplied by 100%.

pH chyme gizzard and intestine

pH measurements were carried out using an electric pH meter in each part of the intestine, namely the duodenum, jejunum, and ileum. The chyme of the small intestine covers the duodenum (from the beginning of the intestine attached to the gizzard to the end of the duodenal loop), the jejunum from the end of the *duodenal loop* to the Meckel's diventriculum and ileum, namely from the Meckel's diventriculum to the confluence with the caecum or *ileo-caecal junction*, taken from 40 samples (each experimental unit taken 2 samples), then measured by inserting an electric pH meter where the needle was inserted, so that the pH of the chyme was read.

Data analysis

All the data from this research were then processed statistically with variability analysis. Descriptive statistical analysis was applied to the data collected using SPSS software version 20.0 to display the mean and standard error of the results (SPSS, 2011). An ANOVA method was used to compare growth media and gastrointestinal performance of male Alabio ducks and significance was set at $P < 0.01$ was used to compare means. Data is expressed as mean ± standard deviation. Finally, the probability values were included in the Duncan Multiple Range test (DMRT).

Table 1 Composition and nutrients levels of the experimental (on an as-fed basis)

Ingredients, %	Experiment diets composition				
	0.0%	2.50%	5.0%	7.50%	10.0%
Rice bran meal	10.0	10.0	10.5	10.0	10.0
Corn starch	46.5	48.5	48.0	50.0	50.0
Soybean meal	15.0	13.0	13.0	11.0	11.0
Palm kernel meal	15.0	15.0	15.0	15.0	15.0
Local fish meal	10.0	7.5	5.0	2.5	0.0
Freshwater snail flesh soaked biochar	0.0	2.5	5.0	7.5	10.0
Palm oil	2.5	2.5	2.5	3.0	3.0
$CaCO_3$	0.5	0.5	0.5	0.5	0.5
Vitamin and mineral premix	0.5	0.5	0.5	0.5	0.5
Calculated composition					
Crude protein (%)	21.38	21.11	21.68	21.35	21.90
Crude fat (%)	9.25	8.99	8.98	9.13	9.07
Crude fiber (%)	5.41	5.41	5.48	5.42	5.45
Metabolizable energy (kcal/kg)	2919.5	2938.7	2920.1	2967.4	2950.6
Calcium (%)	0.92	0.84	0.88	0.80	0.72
Available phosporus (%)	0.44	0.7	0.51	0.42	0.46
Lysine (%)	0.83	0.76	0.70	0.62	0.56
Methionine (%)	0.39	0.39	0.38	0.36	0.35
Proximat composition					
Crude protein (%)	21.78	21.00	22.10	21.45	22.00
Crude fat (%)	8.89	9.03	8.78	8.15	9.32
Crude fiber (%)	5.33	5.37	5.78	5.38	5.65
Metabolizable energy (kcal/kg)	2803.3	2806.1	2816.2	2805.8	2812.8
Calcium (%)	0.90	0.83	0.90	0.80	0.77
Available phosporus (%)	0.45	0.67	0.55	0.40	0.36
Energy protein ratio	128.71	133.63	127.43	130.81	127.85

Each kg contains: vitamin A: 12000 IU; vitamin: 2000 IU; vitamin E: 8000 IU; vitamin K: 2 mg; vitamin B1: 2 mg; vitamin B2: 5 mg; vitamin B_6: 500 mg; vitamin B_{12}: 12 µg, vitamin C: 25 mg; Calcium-D panthothenate: 6 mg; Niacin: 40 mg; Cholin chloride: 10 mg; Manganese: 120 mg; Iron: 20 mg; Iodine: 200 mg; Zinc: 100 mg; Copper: 200 mg; Cobalt: 4 mg and Zinc bacitracin: 21 mg.

Table 2 Nutrient content of freshwater snail flesh (FWSF) soaked with biochar (on DM-basis)

Item	Crude protein (%)	Crude fat (%)	Crude fiber (%)	Ca (%)	P (%)	Metabolizabe energy (kcal/kg)	Methionine (%)	Lysine (%)
FWSF soaked with biochar	67.35	3.2	1.74	4.92	2.06	2445.93	1.222	1.912

Table 3 Types of heavy metals in freshwater snail flesh (FWSF) and FWSF with soaked biochar 10%

Heavy metals	FWSF without soaked biochar (ppm)	FWSF with soaked 10% for 24 hours (ppm)
Lead (Pb)	20.44±0.55	< 0.001±0.00015
Mercuri (Hg)	15.89±0.23	0.51±0.02
Ferrum (Fe)	981.29±15.19	120.58±2.76
Cadmium (Cd)	10.65±0.26	< 0.001±0.00018

RESULTS AND DISCUSSION

The effect of using freshwater snail flesh soaked in biochar is presented in Table 3. The results of the study showed that the used level of freshwater snail flesh soaked with biochar in the feed has a very significant effect on feed intake, body weight gain, feed conversion (P<0.01).

The average feed consumption of Alabio ducks was statistically significantly different in all treatments (P<0.01). The use of freshwater snail flesh soaked in biochar up to 7.50% in feed able to improve feed consumption for male Alabio ducks, from 4237.87 ± 8.46 g/head to 4493.13 ± 4.65.g/head, then decreased when using 10% snails to 4028.42 ± 8.43.

Table 4 Growth performance of growing male Alabio ducks fed on different level freshwater snail flesh (*Pomacea paludosa*) soaked with biochar in feed for 8 weeks

Parameters	Treatments[1]				
	T0	T1	T2	T3	T4
Feed intake (g/head)	4237.87±8.46[b]	4277.08±11.74[b]	4345.49±3.56[c]	4493.13±4.65[d]	4028.42±8.43[a]
Body weight gain (g/head)	1233.49±3.80[b]	1286.96±3.75[c]	1348.12±3.25[d]	1342.95±2.83[d]	1216.67±8.87[a]
Feed conversion ratio	3.44±0.006[c]	3.21±0.013[a]	3.22±0.007[a]	3.35±0.007[d]	3.31±0.02[b]
Income over feed cost (IDR)	8936.96	13801.87	13601.84	12909.57	10991.84

[1] T0: basal feed + 0% freshwater snail flesh soaked with biochar; T1: basal feed + 2.5% freshwater snail flesh soaked with biochar; T2: basal feed + 5.0% freshwater snail flesh soaked with biochar; T3: basal feed + 7.5% freshwater snail flesh soaked with biochar and T4: basal feed + 10% freshwater snail flesh.
The means within the same row with at least one common letter, do not have significant difference (P>0.05).

The results of this study differ from reports of Subhan *et al.* (2015) which stated that the use of freshwater snails by up to 6% could increase feed consumption, namely 4975.48-5506.03 g in Alabio ducks, 5163.59-5482.34 g in Mojosari ducks and 5259.74- 5422.40 g/head in the King duck. Suci *et al.* (2019) reported that using Pomacea spp. snails as much as 10% mixed with Coconut dregs produced the highest feed consumption, namely 4936.38 ± 84.91 g. Meanwhile, Rodiallah *et al.* (2018) reported that the use of snails (Pomacea spp.) as much as 4% in standard commercial feed was able to increase the consumption of starter-phase broiler chicken feed. The difference in the results of this study with some of the results of previous studies is thought to be related to the different species of snails used, their habitat, and the processing of the snails before they are mixed into poultry feed. Data from this research indicate that average feed intake is lower than the results of previous studies (4493.13±4.65), meaning that the feed in this study is more efficient. The processing factor of freshwater snail flesh before being mixed into the feed plays a significant role, so the use of freshwater snail flesh in feed is a maximum of 7.5%. Most of the previous studies used the method of boiling at 100 ˚C for 15-20 minutes and making it in the form of flour. Processing of snails by boiling allows the protein contained in the snail meat to be denatured, but not enough to loosen the connective tissue and dissolve the protein in the snail meat. This is what causes feed consumption in this study to be higher because the nutritional needs, especially protein, and energy of the ducks, have not been met. In this study, swamp snails were soaked in rice husk charcoal (biochar or charcoal) to eliminate heavy metals found in snail meat. As is well known, rice husk charcoal (charcoal) is not only an absorbent but also can bind antinutrients found in feed (Kutlu *et al.* 2001). Furthermore, use as much as 10% of freshwater snail flesh reduces feed consumption. This is considered to be closely related to feed palatability, where freshwater snail meat has a very distinctive, fishy, and pungent aroma. In addition, the higher use of freshwater snail flesh in the feed causes the color of the feed to become darker and slightly blackish.

In this study, it was suspected that the fishy smell of freshwater snail flesh had no significant effect on consumption because palatability in poultry was not determined by smell or taste. According to Irianing *et al.* (2015), what determines the palatability of feed is the light or dark color of the feed. The use of freshwater snail flesh in feed as a substitute for fish meal tends to increase body weight gain of male Alabio ducks and higher than feed using 100% fish meal. The use of freshwater snail flesh soaked in biochar up to 5.0%-7.5% resulted in higher body weight gain (1342.95±2.83 to 1348.12±3.25 g/head) and subsequently decreased significantly significant at 10% usage as has been presented in Figure 1. Data from this research are in line with the research of Subhan *et al.* (2015) who used golden snails to feed female Alabio ducks, where the use of freshwater snail flesh increased up to 5% body weight gain, and then decreased final body weight when using 7.5% to 10%. Feed conversion. The use of freshwater snail flesh in Alabio duck feed was able to reduce the feed conversion value from 3.44 ± 0.006 (T0) to 3.21 ± 0.013 and 3.22 ± 0.007 respectively (level of use of freshwater snail flesh 2.5% - 5.0% The conversion value in the study was 0% better than compare of research by Suci *et al.* (2019) who supplemented boiled golden snail flour into the feed for Mojosari-Peking hybrid ducks, resulting in feed conversion of 2.68 ± 0.58. High feed conversion was the result of the study. This is because Alabio ducks are laying type ducks, so they are not effective in producing meat. The feed conversion results of the study were lower compared to the results of Subhan *et al.* (2010) study, which used golden snail flour at a level of 2% - 6% in male Alabio ducks, resulting in a conversion of 3.6; in Mojosari ducks 3.87 and in Raja ducks 3.84. Protein digestibility factors and corrected N metabolic energy also have an important role in reducing feed conversion rates. The use of freshwater snail flesh in feed can increase protein digestibility from 75.31% (T0) to 78.71% (T2) and increase the value of metabolic energy and corrected N metabolizable energy respectively 2816.17 and 2817.21 kcal/kg. Birds in the growth period require energy of 1.5-3.0 kcal/g for body weight growth depending on the amount of fat in the body and its relationship to protein in daily body weight gain. Ducks tend to increase feed consumption of the energy content is reduced. If the energy content of feed for growing ducks falls below a critical level, growth will decrease and the amount of fat stored in carcasses decreases. When energy levels are lower than those required for basic life functions, the animal will lose weight by using its body protein tissues for energy. The metabolic energy in this study was still in the range suggested by NRC (1994) that the metabolic energy requirements of growing ducks were 2800-2900 kcal/kg.

Furthermore, the use of freshwater snail flesh in feed as a substitute for the fish meal. Slaughter weight, carcass weight, carcass percentage, and percentage of abdominal fat is presented in Table 4.

The use of freshwater snail flesh in Alabio duck feed at the usage level of 5.0% - 7.5 freshwater snail flesh slaughter weight of each 1369.21 ± 3.61 and 1361.31 ± 6.39 g/head respectively. Slaughter weight of male Alabio ducks, the results of this study were in line with the results of the study by Matitaputty *et al.* (2011) that the standard slaughter weight for male Alabio ducks aged 8 weeks on average 1328.83 ± 26.67 g /head. Furthermore, the results of research by Rirgiyensi *et al.* (2014) which supplemented probiotics into drake feed as much as 0.75 ml to 1.5 mL produced slaughter weights in the range of 1.2-1.3 kg.

The use of 5.0% freshwater snail flesh in Alabio duck feed resulted in higher carcass weight (867.60±4.80 g/head). The highest percentage was obtained in the use of freshwater snail flesh in feed, up to 2.5-5.0%, namely 63.36 ± 0.22% – 63.39 ± 0.92%. The carcass percentage is higher than that of Subhan *et al.* (2010) who used swamp snails with steamed sago on male Alabio ducks, Mojosari ducks, and Raja ducks, respectively 59.73 ± 2.27%; 58.59 ± 1.09% and 60.16 ± 2.92%. This indicates that the snail meat in the feed can improve the growth of male Alabio ducks. According to Soeparno (2005), carcass and percentage are influenced by growth rate and feed quality. The growth rate is characterized by weight gain which will affect the resulting slaughter weight. Based on the data of this study, even though the carcass weight was not optimal, it was suitable enough to be used in male Alabio ducks. The high carcass weight and percentage at the freshwater snail flesh level treatment of 2.5-5.0% is considered to be closely related to the presence of fish meal in the feed. The proteins and amino acids in freshwater snail flesh and fish meal complement each other, resulting in a higher slaughter weight of male Alabio ducks than if the two protein sources of animal protein were used singly in Alabio duck feed. The results of this study are in line with research by Resla *et al.* (2019), who used golden snail (5%) and fish meal (5%) to feed Bali ducks, resulting in a slaughter weight of 1389 g/head. According to Pratiwi *et al.* (2017), feeding with increasingly diverse protein sources can complement each other's acid balance to produce optimal slaughter weight. Protein and high protein digestibility play a role in carcass formation, following the opinion of Sjofjan *et al.* (2019), that protein is used for basic life, growth, and production. Amino acid imbalance in freshwater snail flesh supplemented with a fish meal in the feed. In addition, the results of the proximate test of freshwater snail flesh contained quite high Ca. Hossain *et al.* (2013) stated that the use of animal protein sources in feed would result in higher body weight. Animal protein in feed is not only for tissue formation but also for bone growth, which is used to support meat muscles because in essence poultry muscle is a collection of its protein. Riskuna *et al.* (2014) lysine is closely related to the process of bone cell growth and synergistically together with Ca absorb protein.

The use of freshwater snail flesh in ducks tends to reduce the percentage of abdominal fat in male Alabio ducks, namely 0.67 ± 0.02 % (T0) to 0.57 ± 0.009 % (T3 and T4). These results are different from the study of Gulita *et al.* (2019) which stated that the use of golden snails as a substitute for a fish meal did not affect the abdominal fat of male Bali ducks. The percentage of fat in this study was lower than the results of a study by Gulita *et al.* (2019) which stated that duck abdominal fat was 0.78%. Abdominal fat is affected by diet and age. The results of research by Subhan *et al.* (2015), the higher the use of snails in duck feed, the lower the cholesterol level in the meat. The use of swamp snails up to 10% in the feed resulted in the lowest cholesterol levels, namely 58.36 ± 2.80 mg/100 g compared to the control diet of 67.02 ± 2.81 mg/100 g. Hasegawa *et al.* (1994) stated that the high accumulation of abdominal fat is due to the high concentration of triglycerides originating from the high synthesis of fatty acids in the liver. Subhan *et al.* (2010) reported that freshwater snail flesh contains quite high unsaturated fatty acids, namely 20.37% oleic acid, 20.26% linoleic acid, and 12.83% linolenic acid. Unsaturated acid sour on Pomacea canaliculata meat can stimulate cholesterol excretion the small intestine and oxidize it into bile acids. Furthermore, the effect using freshwater snail flesh soaked in biochar in feed on digestive tract profile of male Alabio ducks is presented in Table 5. Gizzard weight the use of freshwater snails from 2.5-7.5% in the feed resulted in gizzard weights that were not significantly different from the control feed, namely 3.41 ± 0.02 – 3.49 ± 0.02 g/100 g, then gizzard weights increased on the use of 10% freshwater snails (100% processed freshwater snails in feed), namely 3.54 ± 0.03 g/100 g. The size or percentage of gizzards in this study exceeded the normal size of poultry gizzards in general, namely 1.6-2.3% of body weight (Sturkie, 2000).

Table 5 Slaughter and carcass weight, % carcass yield, % abdominal fat of male Alabio duck male Alabio ducks fed on different level freshwater snail soaked with biochar in feed

Parameters	Treatments[1]				
	T0	T1	T2	T3	T4
Slaughter weight (g/head)	1257.33±5.99[b]	1309.85±5.27[c]	1369.21±3.61[d]	1361.31±6.39[d]	1228.68±1.13[a]
Carcass weight (g/head)	775.60±6.39[b]	837.60±3.09[c]	867.60±4.80[d]	842.49±5.36[c]	708.81±1.49[a]
% carcass yield	61.68±0.21[b]	63.39±0.92[c]	63.36±0.22[c]	61.89±0.39[b]	57.69±0.09[a]
Abdominal fat (%)	2.71±0.27[d]	2.57±0.13[c]	2.41±0.08[b]	2.26±0.10[a]	2.27±0.12[d]

[1] T0: basal feed + 0% freshwater snail flesh soaked with biochar; T1: basal feed + 2.5% freshwater snail flesh soaked with biochar; T2: basal feed + 5.0% freshwater snail flesh soaked with biochar; T3: basal feed + 7.5% freshwater snail flesh soaked with biochar and T4: basal feed + 10% freshwater snail flesh.
The means within the same row with at least one common letter, do not have significant difference (P>0.05).

Table 6 Digestive track profile of male Alabio duck male Alabio ducks fed on different level of freshwater snail flesh soaked with biochar in feed

Parameters	Treatments[1]				
	T0	T1	T2	T3	T4
Gizzard (g/100 g)	3.49±0.02[b]	3.41±0.02[a]	3.49±0.03[b]	3.39±0.01[a]	3.54±0.03[b]
Liver (g/100 g)	1.78±0.03[a]	1.89±0.01[b]	1.85±0.01[b]	1.85±0.01[b]	2.00±0.01[d]
Pancreas (g/100 g)	0.27±0.02[c]	0.27±0.002[b]	0.25±0.004[ab]	0.24±0.002[a]	0.28±0.004[c]
Limfa (g/100 g)	0.34±0.01[b]	0.32±0.001[ab]	0.32±0.014[ab]	0.32±0.01[a]	0.36±0.004[c]
Small intestine weigt (g/100 g)	2.77±0.01[a]	2.68±0.01[a]	3.03±0.04[b]	3.33±0.10[c]	3.84±0.05[d]
Small intestine length (cm)	155.25±0.15[a]	167.25±0.8[c]	166.65±0.41[b]	166.29±0.15[b]	155.06±0.32[a]
pH Gizzard	3.49±0.02[b]	3.41±0.02[a]	3.49±0.03[b]	3.39±0.01[a]	3.54±0.03[b]
pH small intestine	6.21±0.51	6.10±0.11	6.15±0.15	6.00±0.21	6.02±0.71

[1] T0: basal feed + 0% freshwater snail flesh soaked with biochar; T1: basal feed + 2.5% freshwater snail flesh soaked with biochar; T2: basal feed + 5.0% freshwater snail flesh soaked with biochar; T3: basal feed + 7.5% freshwater snail flesh soaked with biochar and T4: basal feed + 10% freshwater snail flesh.
The means within the same row with at least one common letter, do not have significant difference (P>0.05).

However, the gizzard size of Alabio ducks on the results of this study were lower than those of Budiansyah (2004) who used rumen fluid in Kerinci ducks with gizzard weights of 5.67 ± 0.35 – 6.12 ± 0.66% of slaughter weight, The results of this study are in line with research by Oktaviantoro *et al.* (2019), substituted a fish meal with boiled golden apple snail meal (*Pomacea canalicula*) using 2.5% - 10 to produce a gizzard weight of 3.63-4.04% in male Bali ducks.

The size of the gizzard (ventriculus) is affected by the performance of the gizzard itself. The severe activity of the gizzard in digesting feed mechanically, the size of the gizzard increases. The results of observations of freshwater snail flesh have a tougher texture because, in essence, the freshwater snail's flesh is the leg of the snail which is used actively for activities in the water, both for swimming and walking when the snail is attached to the land. In addition to the tough feed texture factor, the way of eating ducks is also thought to affect the size of the gizzard, where the method of feeding ducks is different from chickens, namely by pecking, while ducks eat by poking so that the feed given is usually swallowed whole. On the other hand, duck crops are not fully developed and are different from chickens, where the number of mucous glands in duck crops is less than the mucous glands in chickens (Zainudin *et al.* 2015) and duck crops have an oval shape with thinner walls because they absorb more water, while chickens thick round cache (Sturkie, 2000). This condition allows the feed consumed by the ducks to become the full responsibility of the gizzard in the process of reducing the size of the feed.

Gizzard muscles begin to move when feed enters the body and a mechanical digestion process occurs. According to Rose (1997), the function of the gizzard is almost the same as the teeth in mammals. When the feed that enters the gizzard has a smooth texture, the digestion process takes place, but if the feed is coarse, the grinding process takes longer.

This is what causes the size and gizzard percentage of male Alabio ducks in the study to be higher because, physiologically, the activity of gizzards is higher in grinding feed using freshwater snail flesh which does not undergo enzymatic processing and is safe for male Alabio ducks. Weight and liver percentage are affected by body size, species, and sex. Liver weight is also affected by pathogenic bacteria which usually cause liver swelling (Sturkie, 2000).

Liver weight the liver weight of male Alabio ducks from 1.78 ± 0.03 - 1.85 ± 0.008 g/100 g. The use of freshwater snail flesh in Alabio duck feed resulted in higher weight and liver percentage compared with control feed. The percentage of liver weight in this study is still in normal (1.70-2.80%) (Putnam, 1991).

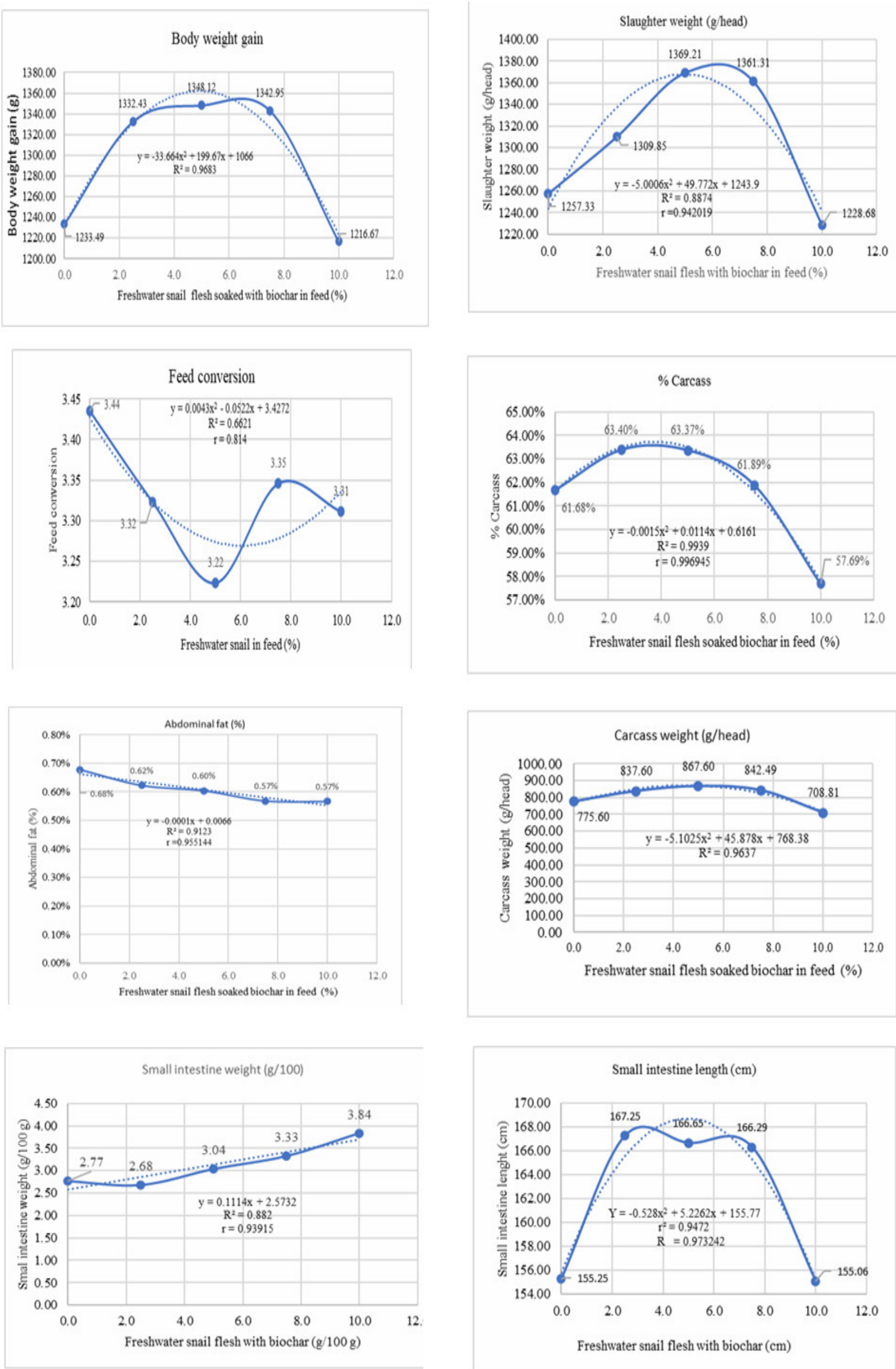

Figure 1 Effect of the level freshwater snail flesh (*Pomacea paludosa*) soaked in biochar in feed on the performans and digestives tract of male Alabio ducks (*Anas plathyrhyncos* Borneo)

The percentage of the pancreas in the study was lower than the results of Oktaviantoro *et al.* (2019), who substituted fish meal with boiled golden apple snail flour in male Bali duck feed from 2.5-10.0% yielding 3.83-3.90%. The low pancreas in the results of this study was due to the fact that the feed used was free of harmful substances because, in the processing process, it had been soaked with biochar. The pancreas gland is used to break down proteins, fats, and anti-nutritional substances in the digestive tract (Sturkie, 2000). The weight and percentage of the liver in this study were lower than the results of Kusmayadi *et al.* (2019), ranging from 1.88 ± 0.53 - 3.67 ± 1.86%. This indicates that the feed used is safe for male Alabio ducks. Weight and liver percentage are affected by body size, species, and sex. Liver weight is also affected by pathogenic bacteria which usually cause liver swelling (Sturkie, 2000). The average weight and percentage of the pancreas of male Alabio ducks ranged from 0.2 ± 0.002 - 0.28 ± 0.004 g/100 g. The average weight and percentage of the pancreas in the study were lower than that of Iriyanti *et al.* (2016), reported that the use of 0.2% prebiotic added with Frukto oligosaccharides and Manna oligosaccharides to Tegal feed resulted in a pancreas weight of 0.40 ± 0.04 and 0.38 ± 0.02%, respectively. The average weight and length of the small intestine of male Alabio ducks ranged from 2.77 ± 0.01 - 3.84 ± 0.05 g/100 g and 155.25 ± 0.15 - 166.65 ± 0.41 cm. The research results show that the higher the using in feed of freshwater snail flesh in Alabio ducks, the weight and length of the small intestine increased. The results showed that the weight and length of the small intestine were above normal, namely 2.24-3.05% of body weight (Kusmayadi *et al.* 2019).

CONCLUSION

The level of use of freshwater snail flesh soaked in biochar up to 5.0% was able to improve feed intake, body weight gain, feed conversion, carcass weight, percentage carcass yield and the digestive track of male Alabio ducks.

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