

## Freshwater snail flesh (*Pomacea paludosa*) incubated with bromelain enzyme levels in feed on the carcass quality of Alabio male ducks (*Anas platyrhynchos* Borneo)

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### Abstract

This study aimed to determine Freshwater snail flesh (*Pomacea paludosa*) incubated with bromelain enzyme levels in feed on the carcass quality of alabio male ducks. The treatment as ; P0 basal diet + 100% fish meal, P1 basal diet + 75% fish meal + 25% freshwater snail flesh incubated bromelain enzyme, P2 basal diet + 50% fish meal + 50% freshwater snail flesh incubated bromelain enzyme, P3 : basal diet + 25 % fish meal + 75% freshwater snail flesh incubated bromelain enzyme, P4 : basal diet + 100% freshwater snail flesh . In each treatment, two male Alabio ducks were taken randomly and then slaughtered. The crude protein, crude fat, moisture, pH, and texture, by taking as many samples as 20 g of sample then mashed for 2 minutes and added 40 ml aquadest. pH measurement is done with pH meter, which was previously calibrated with buffer solution of pH 7.0 and 4.0. Meat tenderness is measured by using the shear warner bratzler tool Instron, , protein,fat and moisture using proximate analysis

The result showed that level freshwater snail flesh incubated with bromelain enzyme in feed up to 7.5-10% on Alabio male duck diets improved crude protein meat (21.51±0.19 to 23.90±0.40) but decreased meat moisture ( 69.46±0.79 to 62.79±0.27) and decreased crude fat meat (9.55±0.44 to 4.18±0.53). Meanwhile, the tenderness of the meat increased from 3.55% on the control feed to 26.77% on the feed using 7.5-10%.

**Keywords:** Freshwater snail; Bromelain enzyme; Carcass quality; Alabio male ducks

### 1. Introduction

The Alabio duck (*Anas platyrhynchos* Borneo) is a local fowl found in South Kalimantan that has a high egg production capacity and is dual-purpose that is, apart from being an egg producer, it is also a meat producer. Male Alabio ducks have great potential as meat producers, where the average carcass produced ranges from 59.65-67.79% and is quite efficient in using feed with a conversion value of 2.18 to 2.56 [1]. Increased consumption of local duck meat is expected to be an alternative source to reduce dependence on imported meat. Community consumption of local duck meat is still low when compared to consumption of chicken meat; this is because duck meat has a distinctive aroma (fishy) and has a higher fat content than chicken meat. One of the factors that affects the quality of meat is the type of feed used in poultry. In duck farms, usually the feed ingredients used are derived from local ingredients found in duck habitat. One of the local feed ingredients that can be used is freshwater snail. Although the availability of freshwater snails is abundant, their use is not optimal in Alabio duck feed. The use of freshwater snails is not optimal due to low digestibility and an imbalance in nutrient content. One of the reasons for the low digestibility of freshwater snail protein is because the freshwater snail contains heavy metals, which hinder the absorption of nutrients in poultry [2] and tannins, which hinder protein absorption [3].

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## 2. Material and methods

The research was conducted at the Field Laboratory and Applied Laboratory of the Faculty of Animal Husbandry, Kalimantan Islamic University, Muhammad Arsyad Al Banjari Banjarmasin. The tools used in the experimental cage studies were equipped with feed and water bowls, measuring cups, analytical scales, and laboratory equipment to test the quality of male Alabio duck carcasses. The materials used were 80 male Alabio ducks aged 8 weeks, freshwater snail meat that had been incubated with bromelain enzymes, and feed ingredients (Table 1). The design used in this study was a completely randomized design (CRD) consisting of 5 treatments and 4 replications.

The treatment diet was formulated as follows : P0 basal diet + 100% fish meal (10% in diet), P1 : basal diet + 75% fish meal (7.5% in diet)+ 25% freshwater snail flesh incubated bromelain enzyme (2.5% in diet), P2 : basal diet + 50% fish meal (5% in diet)+ 50% freshwater snail flesh incubated bromelain enzyme (5% in diet), P3 : basal diet + 25 % fish meal (2.5% in diet)+ 75% freshwater snail flesh incubated bromelain enzyme (7.5% in diet), P4 : basal diet + 0 % fish meal (0% in diet)+ 100% freshwater snail flesh incubated bromelain enzyme (10% in diet). The freshwater snail flesh used in this study was freshwater snail flesh which was incubated with bromelain enzyme 3% for 3 hours. Freshwater snails flesh incubated are given in the form of paste was mixed with other feed ingredients. Feeding starts from the starter phase using freshwater snail flesh that has been incubated with the bromelain enzyme. The diets were given every morning and evening according to the requirement of each maintenance, and drinking water was also given ad- libitum. The composition and chemical composition of the diet can be seen in Table 1. Experimental diets were formulated as iso energy (2900 kcal/kg) and iso protein (21%).

**Table 1** Experimental diet composition

Feedstuffs (%)	Experiment diets composition				
	P0	P1	P2	P3	P4
Rice bran	10	11.5	11.5	11.5	12.5
Yellow corn	46.5	45	46	47	48
Soybean meal	15	15	14	13	13
Palm kernel	15	15	15	15	13
Fish meal	10	7.5	5	2.5	0
Freshwater snail flesh incubated with bromelain enzym	0	2.5	5	7.5	10
Coconut oil	2.5	2.5	2.5	2.5	2
Mineral	0.5	0.5	0.5	0.5	0.5
Top Mix	0.5	0.5	0.5	0.5	1
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
Ingredients					
Crude protein (%)	21.38	21.62	21.37	21.13	21.13
Crude fat (%)	9.25	9.37	9.25	9.13	8.65
Crude fiber (%)	5.41	5.61	5.65	5.69	5.55
Metabolizable energy (kcal/kg)	2919.49	2923.87	2951.74	2979.61	2968.83
Calcium (%)	0.92	0.96	0.89	0.81	0.73
Available phosphorus (%)	0.44	0.33	0.36	0.39	0.42
Lysin(%)	0.83	0.81	0.78	0.75	0.74
Methionin (%)	0.39	0.40	0.41	0.42	0.43

The variable observed in this study was the pH of the meat, measured by taking a sample of 20 g, grinding it for 2 minutes, and adding 40 ml of distilled water. Prior to measuring the pH, it was calibrated with a buffer solution of pH 7.0 and 4.0. Measurements were made three times per sample. Moisture and crude protein contents were determined following the AOAC official methods 39.1.02 and 39.1.19, respectively, while fat content using Soxhlet's method with the help of Buchi 810 device following the Polish Norms PN-ISO 1444. Measurements meat tenderness is measured by using the shear warner bratzler tool Instron Testing Machine

### 2.1. Statistical Analysis

All data obtained in the current study were processed statistically by analysis of variability. Descriptive statistical analysis was applied to the data collected using SPSS version 25.0 software to show the mean and standard error of the finding results. One way ANOVA was used to compare the means of moisture, pH, crude protein, crude fat and meat tenderness and the significance threshold was established at  $p < 0.05$  using the  $F$  was used to compare the means. The data has been expressed as mean values  $\pm$  standard deviation. All analysis were carried out in six replications and significant of difference was defined as the 5% level ( $P < 0.05$ ). All computation were calculated in SPSS versi 25 software. At the end, probabalities values were subjected in Duncan Multiple Range Test (DMRT).

### 3. Results and discussion

Analysis of the of moisture, pH, crude protein, crude fat and meat tenderness is shown in Table 2. Furthermore substitution freshwater snail flesh incubated with bromelain enzym affect on moisture , pH, crude protein, crude fat and meat tenderness male Alabio duck meat ( $P > 0.05$ )

**Table 2** The average pH, moisture, crude protein, crude fat and meat tenderness of male Alabio Duck with treatments diets contains freshwater snail flesh incubated with bromelain enzyme

Variabel	Treatments				
	P0	P1	P1	P3	P4
pH	5.91 $\pm$ 0.11 <sup>a</sup>	6.15 $\pm$ 0.07 <sup>b</sup>	6.53 $\pm$ 0.04 <sup>b</sup>	6.68 $\pm$ 0.04 <sup>b</sup>	6.68 $\pm$ 0.16 <sup>b</sup>
Moisture (%)	69.46 $\pm$ 0.79 <sup>c</sup>	68.85 $\pm$ 0.43 <sup>c</sup>	63.74 $\pm$ 0.16 <sup>b</sup>	62.79 $\pm$ 0.27 <sup>a</sup>	62.32 $\pm$ 1.14 <sup>c</sup>
Crude protein (%)	21.51 $\pm$ 0.19 <sup>a</sup>	21.33 $\pm$ 0.82 <sup>a</sup>	22.55 $\pm$ 0.79 <sup>b</sup>	23.17 $\pm$ 0.11 <sup>c</sup>	23.74 $\pm$ 0.94 <sup>c</sup>
Crude fat (%)	9.55 $\pm$ 0.44 <sup>b</sup>	7.98 $\pm$ 0.22 <sup>a</sup>	5.49 $\pm$ 0.37 <sup>a</sup>	4.62 $\pm$ 0.24 <sup>a</sup>	4.18 $\pm$ 0,53 <sup>a</sup>
Meat Tenderness (gram/fost)	1542.50 $\pm$ 2.11 <sup>d</sup>	1488.88 $\pm$ 2.09 <sup>c</sup>	1303.40 $\pm$ 1.11 <sup>b</sup>	1113.63 $\pm$ 1.21 <sup>a</sup>	1100.75 $\pm$ 2.01 <sup>a</sup>

<sup>a, b, c, d, e</sup> Means with different superscripts in the row differ significantly ( $p \leq 0.05$ ). P0, P1, P2, P3 and P4 = freshwater snail flesh with incubated bromelain enzym usage level; 0%, 2.5% ; 5.0% ; 7.5% and 10.0%

**pH.** The results of the analysis of variance showed that the use of snail flesh incubated with bromelain enzyme made no significant difference to the pH value of Alabio duck meat, but the pH value of Alabio duck meat tended to increase compared to the control diet. The highest pH value was obtained from the use of freshwater snail flesh incubated with 7.5-10% bromelain enzyme in feed. Based on this, it indicates that the use of freshwater snail flesh incubated with the bromelain enzyme has a good effect on the pH of the meat. The using pineapple water in laying hen feed tended to increase the pH value of chicken meat and was optimal at pH 6.5. Changes in the pH of the meat will affect the quality of the meat, such as its ability to hold water, texture, color, and aroma [4]. The bromelain enzyme functions to break down proteins in swelling and produce more fluid. According to [5], the pH of normal poultry meat ranges from 5.4 -5.6 and it is also stated that the higher the pH of meat, the more tender the meat is due to the contraction of muscle fibers.

**Moisture .** The results of the analysis of variance showed that the moisture content of male Alabio ducks that consumed freshwater snail flesh incubated with the bromelain enzyme was significantly different ( $P < 0.05$ ). The higher the use of incubated freshwater snail flesh in the feed, the lower the water content, from 69.46  $\pm$  0.79% (control feed) to 62.32  $\pm$  1.14% (10% in feed). The moisture content of 8-week-old drake meat was 77.30% [6], and the moisture content of Alabio duck meat fed mixed with *Pomacea canaliculata* snails from tidal freshwaters was 2.5% - 10% in the feed produces a water content of duck meat of 69.22  $\pm$  0.06 - 71.22  $\pm$  0.08% [7] and the used 10-30% *Pomacea canaliculata* snail meat in *muscovy duck* feed, resulting in a meat moisture content of 61.70-77.00% [8]. The results of this study are in line with the studies that the higher the use of snails in duck feed, the lower the water content of the duck meat that

consumed the feed. The results of this study indicate that the use of freshwater snail flesh incubated with the bromelain enzyme was able to reduce the moisture content of male Alabio ducks. The low water content in the meat will be very beneficial because it will reduce the damage to the meat.

**Crude proteins.** The average male Alabio duck meat crude protein content was about  $21.33 \pm 0.82 - 23.74 \pm 0.94\%$ . The crude protein content was significantly higher ( $P < 0.05$ ) as the proportion of *Pomacea paludosa* in feed increased. The results showed that the use of freshwater snail meat incubated with bromelain enzyme in feed, as much as 7.5% - resulted in the highest protein content and decreased when 10% was used in feed (Table 2). Meat protein content is an indicator of success in utilizing protein in body tissues. The higher the protein content of the meat, the higher the protein mass of the meat because protein deposition is utilized optimally in the body's tissues. According [9] that protein deposition is an important factor for the success of meat production which is determined by protein consumption and amino acid balance. The role of the bromelain enzyme in this study was able to increase protein consumption because of its ability to break down substrates into simpler ones so that they are easily digested and synthesized by male Alabio ducks.

**Crude fat.** The average crude fat of male Alabio duck meat that was given *Pomacea paludosa* incubated bromelain enzyme in feed showed a significant effect of the treatments ( $P < 0.05$ ). Freshwater snail flesh incubated with bromelain enzyme in the feed was able to reduce the crude fat content of male Alabio duck meat and was lower than the control feed (Table 2). The use of freshwater snail flesh, which was incubated in feed for as much as 2.5% -10% was able to reduce the crude fat content of male Alabio ducks from  $7.98 \pm 0.22\%$  to  $4.18 \pm 0.53\%$ . The crude fat content in this study was not much different from the results of [7], which are in the range of 4-9% and research results, but higher than the who used *Pomacea canaliculata* to feed muscovy ducks, resulting in a meat fat content of 3.33-3.69% [8]. According fat content in poultry is influenced by feed and livestock genetics [10]. In waterfowl, most of the fat spreads beneath the surface of the skin; this is because ducks have rather thick skin compared to chickens. It was also explained by that the fat content of the thighs of local ducks was in the range of 3.84 – 8.47% [1], while hybrid ducks and wild ducks had lower fat, ranging from 2.95-4.18 g/100 g [10].

The content of crude protein and crude fat in duck meat is closely related to changes in pH due to the use of freshwater snail flesh incubated with bromelain enzymes in Alabio male duck feed, if the low pH causes the meat to turn red, conversely, if the pH is high, the duck meat will become slightly pasty [11]. This is related to the isoelectric pH of the meat protein. The duck meat contains mostly red fibers and a small portion of white fibers. On the chest of the duck, there are 84% red fibers and 16% white fibers [12], explained that meat, which mostly consists of red fibers, has a lower protein content and a higher fat content. The use of freshwater snail meat incubated with bromelain enzyme causes the color of the duck meat to be slightly pasty [5].

**Meat tenderness.** The results of the analysis of variance showed that the use of freshwater snail flesh incubated with the bromelain enzyme had a very significant effect ( $P < 0.01$ ) on the tenderness of male Alabio ducks. The tenderness of male Alabio duck meat increased with the increasing use of freshwater snail meat incubated with bromelain enzymes (Table 2). This is because the proteolytic enzymes contained in pineapple are able to break down the weave that binds meat, breaking down and catalyzing meat proteins into simpler ones. The use of freshwater snail meat incubated with bromelain enzyme in feed was able to increase the pH of male Alabio duck meat from  $6.15 \pm 0.07$  to  $6.68 \pm 0.16$  which is higher than the pH of the control (Table 2). Changes in meat pH greatly affect water holding capacity. Water binding power will increase if the pH is higher because it is related to the isoelectric protein of the meat. The presence of the bromelain enzyme is able to break down collagen connective tissue, especially in duck meat, bromelain works more actively on animal proteins, especially collagen. The content of collagen in muscle tissue affects the tenderness of the meat [13,14].

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#### 4. Conclusion

Freshwater snail flesh incubated with bromelai enzym in feed up to 7.5-10 % in feed Alabio male duck diets improved on pH, moisture, crude protein, crude fat and tenderness on male Alabio ducks meat.

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#### Compliance with ethical standards

##### *Disclosure of Conflict of interest*

No potential conflict of interest relevant to this article was reported.

## References

- [1] Dharmawati.S.,Firahmi, N , Widaningsih, N , Yanur, N. 2016.Penggunaan Silase Keong Rawa Dalam PakanYang Disimpan Selama 2, 4, dan 6 Minggu Terhadap Keragaan Itik Alabio Fase Layer. Prosiding Seminar Nasional Lahan Basah Tahun 2016 ISBN: 978-602-6483-33-1 Jilid 1: 231-238.
- [2] Dharmawati, S. MH. Natsir., M.H, Sjofjan, O., Hartutik, H. 2022. Effectiveness of rice husk charcoal as bioadsorben in absorbing heavy metal lead (pb) on freshwater snail flesh (*Pomacea* sp.). Proceedings of the 6th International Seminar of Animal Nutrition and Feed Science (ISANFS 2021). *Advances in Biological Sciences Research, volume 21*. <https://doi.org/10.2991/absr.k.220401.016>.
- [3] Saputri, D.D and Pertiwi, M.P. 2021. Indentification of Secondary Metabolites and Proximate Analysis of Golden Apple Snails (*Pomacea canaliculata*, L) Meat Extract. *J. Ilmu Dasar* 22(2) : 101-110.
- [4] Fenita, Y., Mega, O., dan Daniati, E. 2009. Pengaruh pemberian air nanas (*Ananas comusus*) terhadap kualitas daging ayam petelur afkir. *Jurnal Sains Peternakan Indonesia*. 4(1) : 43-50.
- [5] Soeparno. Ilmu dan Teknologi Daging. Gajah Mada University Press, Yogyakarta. 1995
- [6] Witak, B. 2008. Tissue composition of carcass, meat quality and fatty acid content of ducks of a commercial breeding line at different age. *Arch. Tierz., Dummerstorf*. 51 (2008) 3, 266-275
- [7] Subhan.,A, Tri Yuwanta, Zuprizal and Supadrno, 2015. Use Of (*Pomacea Canaliculata*) In Feed Towards to Improve Quality o Alabio Duck (*Anas Platyrhinchos* Borneo) Meat . *Journal of the Indonesian Tropical Animal Agriculture (J.Indonesian Trop. Anim.Agric)* 40 (4) : 238-244. pISSN 2087-8273 e ISSN 2460-7278.
- [8] Budiari, N.L.D., Pujiawati, Y., Kertawirawan, I.P.A ., Adijaya I.N. (2021). Effect of *Pomacea canaliculata* snail feed on carcass physical composition, meat chemical composition, and hematological profile of muscovy duck. 1<sup>st</sup> ICADAI 2021. E3S Web of Conferences 306, 05006, 1-9 <https://doi.org/10.1051/e3sconf/202130605006>
- [9] Suthama, N., Wahyuni, H.I. dan Mangitsah,L., 2010. Laju pertumbuhan berdasarkan degradasi protein tubuh pada ayam kedua dipelihara ex situ. Prosiding Seminar nasional tentang unggas lokal ke-IV. Semarang 7 Oktober, 2010. Fakultas Peternakan Universitas Diponegoro, Semarang Hal : 138-146.
- [10] Baeza, E. 2006. Effects of genotype, age, and nutrition on intramuscular lipids and meat quality. Symposium COA/INRA Scientific Cooperation in Agriculture, Taiwan. November 7 – 10, 2006. Taiwan, R.O.C. pp. 79 – 82.
- [11] Knuts, U. And H. Pingel. 2013. The effect of initial pH value in duck breast and thigh muscle on other meat characteristics. *Proc. World’s Poultry Congress XIX*. The Netherland. pp. 221 – 224.
- [12] Smith, D.P., D.L. Fletcher, R.J. Burh And R.S. Beyer. 1993. Pekin duckling and broiler chicken pectoralis muscle structure and composition. *Poult. Sci.* 72: 202 – 208.
- [13] Taqwadasbriliani, E. B., Hutabarat, J.& Arini, E. 2013. Pengaruh kombinasi enzim papain dan enzim bromeliin terhadap pemanfaatan pakan dan pertumbuhan ikan kerapu macan (*Epinephelus fuscogutattus*). *Journal of Aquaculture Management and Technology* 2(3): 76-85.
- [14] Chris R. Calkins, Ph.D. and Gary Sullivan. Adding Enzymes to Improve Beef to Tenderness. National Cattleman’s Beed Association. University of Nebraska. [www.beefresearch.org](http://www.beefresearch.org). 2016