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# Giving Golden Apple Snail Meal Up To 10% of the Ration Can Get Optimal Slaughter Weight, Carcass Weight and Abdominal Fat in Broiler Quail

(PEMBERIAN TEPUNG KEONG MAS HINGGA 10% DALAM RANSUM MAMPU MENDAPATKAN BOBOT POTONG, KARKAS DAN LEMAK ABDOMEN YANG OPTIMAL PADA BURUNG PUYUH PEDAGING)

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## ABSTRACT

Quails are a type of poultry that are easy to breed and have advantages such as high egg and meat production, as well as a short and relatively easy in rearing period. The research was aimed to evaluate the effect of different levels of Golden apple snail meal (*Pomacea canaliculata* L.) in the diet on the optimal carcass quality of quail. A total of 100 head of quails were used in this study and were carried out in Sukamenak Village, Darmaraja District, Jatigede, Sumedang Regency of West Java Province. A Completely Randomized Design (CRD) was used to evaluate five treatments (0%, 5%, 10%, 15%, and 20%) Golden apple snail meal on slaughter weight, carcass weight, abdominal fat weight, and edible and inedible weight of meat quails during 42 days of the feeding trial period with four replicates (n=4). The data were statistically analyzed with Analysis of variance (Anova), and if there is a reasonable difference between the treatments, then continue with Duncan's Multiple Range Test (DMRT) using the statistical analysis system (SAS) application program. The results showed that the inclusion of Golden apple snail meal in the diet significantly ($p \leq 0.05$) influenced the slaughter weight, carcass weight, abdominal fat weight, and edible and inedible weight of quails. Based on the findings, it can be concluded that the inclusion of Golden apple snail meal up to 10% in the diet resulted in optimal slaughter weight, carcass weight, abdominal fat weight, and edible and inedible weight of broiler quail.

Keywords: carcass quality; Golden apple snail meal; quail

**ABSTRAK**

Burung puyuh merupakan salah satu jenis unggas yang mudah diternakkan dan memiliki keunggulan produksi telur dan daging yang tinggi, serta masa pemeliharaan yang singkat dan relatif mudah. Penelitian ini bertujuan untuk mengevaluasi pengaruh berbagai level pemberian tepung keong emas (*Pomacea canaliculata* L.) dalam ransum guna mendapatkan kualitas karkas yang optimal pada puyuh. Penelitian ini menggunakan 100 ekor burung puyuh dan dilaksanakan di Desa Sukamenak, Kecamatan Darmaraja, Jatigede, Kabupaten Sumedang, Jawa Barat. Penelitian ini menggunakan Rancangan Acak Lengkap (RAL) untuk mengevaluasi lima perlakuan (0%, 5%, 10%, 15%, dan 20%) tepung keong mas terhadap bobot potong, bobot karkas, bobot lemak abdomen, serta bobot layak makan dan bobot tidak layak makan burung puyuh pedaging selama 42 hari masa percobaan pakan dengan empa kali ulangan (n=4). Data dianalisis secara statistik dengan analisis sidik ragam dan jika ada perbedaan antar perlakuan dilanjutkan dengan uji jarak berganda Duncan menggunakan program aplikasi statistical analysis system (SAS). Hasil penelitian menunjukkan bahwa penambahan tepung keong mas dalam ransum berpengaruh nyata ($P \leq 0.05$) terhadap bobot potong, bobot karkas, bobot lemak abdomen, serta bobot layak makan dan bobot tidak layak makan burung puyuh pedaging. Berdasarkan hasil penelitian dapat disimpulkan bahwa pemberian tepung keong mas sebanyak 10% dalam ransum memberikan pengaruh terhadap bobot potong, bobot karkas, bobot lemak abdomen, serta bobot layak konsumsi dan bobot tidak layak konsumsi burung puyuh yang optimal.

Kata-kata kunci: kualitas karkas; tepung keong emas; burung puyuh

## INTRODUCTION

Poultry production is one of the crucial sectors of agriculture that produce a range of commodities for the global population. Their product, including meat and eggs are being consumed in millions of numbers daily (Rehman *et al*., 2021). Quails are a type of poultry that are easy to breed and have advantages such as high egg and meat production, as well as a short and straightforward rearing period (Directorate General of Livestock and Animal Health, 2012). In the globalization era, the popularity of quail farming increases due to its advantages of high productivity in limited spaces and cost effectiveness, along with the inherent resilience of quails to environmental factors (Taleb *et al*., 2023). Sabow (2020) reported the quail meat could be considered as a beneficial source of protein for humans. In addition to high protein content in quail meat, it also has the advantage of laying eggs in a short period, which is only six weeks.

To enhance the productivity of broiler quail, a good diet formulation is necessary in quail farming. The diet formulation must not only fulfill the nutrient requirements but also should be cost-effective, since the diet requires up to 80% of total production costs (Juandita *et al*., 2024). The rising cost of commercial feed and the requirement for sustainability make it necessary to find alternative feed ingredient (Niepes *et al*., 2023). In the market, one of the expensive feed ingredients is animal-based protein sources, particularly fish meal. To reduce feed costs, alternative feed ingredients is needed especially to replace conventional feed ingredients.

One alternative feed ingredient that can be used as a source of animal protein is golden apple snail meal (*Pomacea canaliculata* L.). Golden apple snails is aquatic animals which abundant in the shallow waters. According to Nusantoro *et al*. (2024), the golden apple snail spreads through waterways and agricultural irrigation systems, then becomes a rice pest for farmers by grazing on the field at the vulnerable stage when the seeds grow as young plants. Golden apple snail has the potential to be a feed ingredient due to its rich in nutrient

content. All parts of their body have the potential to be protein sources and minerals. Rohaeni *et al*. (2021) reported the golden apple snail contained of 16-50% crude protein (CP) and could increase the CP content in the diet then resulted in an increase of crude protein intake. The golden apple snail meal as a source of protein even has potential to be similar to fishmeal (Niepes *et al.*, 2023).

The utilization of golden apple snail meal as an alternative feed ingredient for quail offers an economical and efficient solution for bro-iler quail production. However, this feed ingredient remains uncommon in Indonesia. The evaluation of its potential to increase the quality of the carcass also has not been conducted. A previous study reported that containing up to 20% golden snail in the diet resulted in the best laying performance and economic value of Alabio duck farming (Rohaeni *et al*., 2021). This study was aimed to evaluate the effect of different levels of golden apple snail meal (*Pomacea canaliculata* L.) in the diet on the optimal slaughter weight, carcass weight, and abdominal fat weight of broiler quail. We hypothesized that the diet containing golden apple snail meal will provide a significant result on the carcass quality of broiler quail.

## RESEARCH METHODS

### Location and Study Period

This Study was carried out 42 days of feeding trial period in Sukamenak Village, Darmaraja Subdistrict, Jatigede, Sumedang Regency, West Java.

### Animals

A total of 100 unsexed (male and female) Day Old Quail (DOQ) of the Padjadjaran meat-type quail breed obtained from the Quail Breeding Center of the Faculty of Animal Husbandry, Universitas Padjadjaran, Sumedang Regency, West Java Province were used in this study. Each experimental quail was placed in the colony cage, which was filled with five quails per cage.

Experimental Diet

The schedule of the feeding trial was carried out two times each day, at 07.00 (Jakarta time) and 17.00 (western Indonesian time). Experimental diets in this study were formulated with yellow corn, fine bran, fish meal, bone meal, and premix, while golden apple snail meal was supplemented in the basal diet. The diet in this study consisted of P0 (control diet), P1 (containing 5% golden apple snail meal), P2 (containing 10% golden apple snail meal), P3 (con-taining 15% golden apple snail meal), and P4 (containing 20% golden apple snail meal). The details of the experimental diet and nutrient composition are presented in Table 1 and Table 2. Drinking water was provided *ad libitum*.

### Experimental Design and Statistical Analysis

The slaughter weight, carcass weight, abdominal fat weight, edible weight, and inedible weight of Padjadjaran meat-type quails at 42 days of the feeding trial period were measured using a digital scale after an 8-hour fasting period.

Table 1. Nutrient compositions of golden apple snail meal

| Nutrient Composition | Level |
|---|---|
| Energi Metabolis (Kkal/kg) | 2689 |
| Crude Protein (% DM) | 52.3 |
| Crude Fat (% DM) | 13.3 |
| Crude Fiber (% DM) | 6.07 |
| Calcium (% DM) | 7.75 |
| Phosphorus (% DM) | 0.35 |
| Lysine (% DM) | 4.13 |
| Met (% DM) | 1.05 |
| Cys (% DM) | 0.67 |

Analyzed in the Laboratory of Ruminant Nutrition and Feed Chemistry, Animal Husbandry Faculty, Universitas Padjadjaran (2023).

The experimental design of this study was a Completely Randomized Design (CRD) with five treatments and four replicates (n=4) per treatment. The data were statistically analyzed using Analysis

of variance (Anova), followed by Duncan's multiple range test (DMRT) for post-hoc comparisons using the Statistical Analysis System (SAS) application program. Statistical significance was set at minimum $p \leq 0.05$.

## RESULTS AND DISCUSSION

The effect of golden apple snail meal 0% (P0), 5% (P1), 10% (P2), 15% (P3), and 20% (P4) on slaughter weight, carcass weight, abdominal fat weight, edible weight, and inedible weight is presented in Table 3. The data shows that containing golden apple snail in the diet has a significant difference ($p \leq 0.05$) on slaughter weight, carcass weight, abdominal fat weight, edible weight and inedible weight.

### The Effect of Golden Apple Snail Meal on Slaughter Weight

Table 3 presents a significant effect ($p<0.05$) of dietary Golden apple snail on the slaughter weight of broiler quail. It indicates that the average slaughter weights tended to decrease as the percentage of Golden apple snail meal in the diet increased, with results ranging from 150.10 to 205.13 g/head. According to Seker *et al*. (2009) the slaughter weight of quail could reach up to 181.4 g/head. It indicates that this study had better slaughter than the previous study. The results of Duncan's multiple range test in Table 3 indicate that control diet (P0) and containing 5% (P1), 10% (P2), and 15% (P3) Golden apple snail were significantly increased ($p \leq 0.05$) slaughter weight than containing 20% (P4) Golden apple snail in the diet. Moreover, containing up to 10% Golden apple snail meal in the diet was still beneficial and had no negative effect and could replace fish meal in the diet. However, containing more than 10% Golden apple snail meal could reduce slaughter weight. This may be due to the mucus in the Golden apple snails, which contains antinutritional factors such as thiaminase, which may not have been completely removed and could inhibit the growth performance of livestock (Paler *et al*., 2024). According to Rohaeni *et al*. (2021), thiaminase is a destructive factor for thiamin or vitamin $B_1$ that affects growth and productivity in poultry, including the reduction of egg production.

### The Effect of Golden Apple Snail Meal on Carcass Weight

The effect of Golden apple snail meal on carcass weight is presented in Table 3. The carcass weight in this study ranged from 95.88 to 142.28 g/head. According to Vargas-Sánchez *et al.* (2018), the average carcass weight of quail was 133.0 g/head. Statistical analysis in this study indicates that dietary Golden apple snail meal significantly ($P<0.05$) reduces the carcass weight of broiler quail. The P3 was similar ($p>0.05$) compared to P4 treatments, while these treatments were lower ($p \leq 0.05$) on the carcass weight than the control diet (P0), P1, and P2. This may be attributed to their higher slaughter weights, which result in carcass weight. According to Ulutaş *et al*. (2021), the carcass weight is closely related to slaughter weight.

Containing 10% Golden apple snail meal (P2) seems to be effective to provide crude protein and carcass weight. Generally, Golden apple snail meal is rich in crude protein (Rohaeni *et al*., 2021). This provides the potential to increase the formation of muscle and body weight then resulting in better carcass weight. According to Herlina (2022), different final weights across treatments also lead to significant variations in carcass weight, with smaller slaughter or final weights resulting in lower carcass weights.

### The Effect of Golden Apple Snail Meal on Abdominal Fat Weight

The result of abdominal fat weight observed in this study is shown in Table 3. The abdominal fat weight in this study ranged from 0.30-1.88 g/head. The results are consistent with Kurnia *et al.* (2015), which reported abdominal fat weights ranging from 0.54 to 0.75 g/head. The inclusion of Golden apple snail meal in the diet significantly ($p \leq 0.05$) reduced the abdominal fat weight of broiler quail than the control diet (P0). Similarly, supplementation

Table 2. Experimental diet formulation

| Feed Ingredients | P0 | P1 | P2 | P3 | P4 |
|---|---|---|---|---|---|
| | .....% ..... | | | | |
| Yellow Corn | 50.0 | 51.2 | 52.0 | 53.5 | 54.0 |
| Fine Bran | 16.5 | 16.0 | 15.0 | 14.0 | 13.5 |
| Golden Apple Snail Meal | 0.00 | 5.00 | 10.0 | 15.0 | 20.0 |
| Fish Meal | 32.0 | 26.3 | 21.5 | 16.0 | 11.0 |
| Bone Meal | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Premix | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Nutrient Composition | | | | | |
| Energy Metabolism (Kcal /kg) | 2991.80 | 2976.20 | 2962.90 | 2950.30 | 2903.20 |
| Crude Protein (%) | 22.7 | 22.4 | 22.6 | 22.4 | 22.4 |
| Crude Fat (%) | 6.03 | 6.35 | 6.66 | 6.97 | 7.26 |
| Crude Fiber (%) | 4.39 | 4.43 | 4.44 | 4.44 | 4.49 |
| Calcium (%) | 2.10 | 2.17 | 2.30 | 2.38 | 2.49 |
| Phosphorus (%) | 1.12 | 0.98 | 0.86 | 0.73 | 0.60 |
| Lysine (%) | 2.22 | 2.08 | 1.98 | 1.85 | 1.48 |
| Met (%) | 0.68 | 0.64 | 0.61 | 0.57 | 0.51 |
| Cys (%) | 0.46 | 0.44 | 0.42 | 0.40 | 0.39 |

Table 3. The effect of golden apple snail on slaughter weight, carcass weight, abdominal fat weight, edible weight, and inedible weight

| Parameters | P0 | P1 | P2 | P3 | P4 | *P-value* |
|---|---|---|---|---|---|---|
| | .....g/head..... | | | | | |
| Slaughter Weight | $205.13^{b}$ | $197.75^{b}$ | $189.75^{b}$ | $155.40^{a}$ | $150.10^{a}$ | P<0.05 |
| Carcass Weight | $142.28^{b}$ | $138.48^{b}$ | $128.40^{b}$ | $105.38^{a}$ | $95.88^{a}$ | P<0.05 |
| Abdominal Fat Weight | $1.88^{b}$ | $1.00^{a}$ | $0.90^{a}$ | $0.30^{a}$ | $0.68^{a}$ | P<0.05 |
| Edible Weight | $149.50^{c}$ | $149.30^{c}$ | $131.70^{bc}$ | $116.50^{ab}$ | $103.40^{a}$ | P<0.05 |
| Inedible Weight | $55.7^{b}$ | $48.5^{ab}$ | $58.0^{b}$ | $39.0^{a}$ | $46.7^{ab}$ | P<0.05 |

P0 (control diet); P1 (containing 5% golden apple snail meal); P2 (containing 10% golden apple snail meal); P3 (containing 15% golden apple snail meal); P4 (containing 20% golden apple snail meal).

of *Pomacea* sp., in the diet could reduce the abdominal fat of Alabio ducks (Dharmawati *et al*., 2023).

Abdominal fat is deposited in poultry in the abdominal cavity and can be a source of energy in the body (Volvoka *et al*., 2023). The reduction in abdominal fat can be attributed to a reduction of fatty acid absorption (Saeidi *et al*., 2016). According to Subhan *et al*. (2015), *Pomacea canaliculata* could stimulate cholesterol excretion in the small intestine and oxidize it into bile acids and resulting in the reduction of fatty acids. Moreover, the higher body weight has led to higher abdominal fat weight (Ozkan *et al*., 2024). The small body weight in quails could be due to inadequate protein intake, leading to suboptimal growth and consequently lower abdominal fat weight.

**The Effect of Golden Apple Snail Meal on Edible Weight**

Based on Table 3, the average edible weight of quail ranged from 103.4 to 149.5 g/head. The highest average edible weight is observed in treatment P0 (149.5), followed P1 (149.3), P2 (131.7), P3 (116.5), and the lowest in P4 (103.4). The edible parts of

quail include the carcass and giblets (El-Faham *et al*. 2024). The result indicates that the inclusion of Golden apple snail meal in the diet had a significant effect ($p \leq 0.05$) on reducing the edible weight of quail. This might be due to significant differences ($p \leq 0.05$) in slaughter and carcass weight, which influence the edible weight, since the carcass is a component of edible weight. Tamasgen *et al.* (2021) reported that carcass weight would reflect to edible weight.

Containing Golden apple snail meal at 10% (P2) in the diet seems to be the optimum level to provide good the edible weight. The P2 also provided the potential of crude protein composition (22.6%) compared to other treatments and was still able to maintain edible weight. Ashour *et al*. (2022) recommended up to 24% CP in the diet for growing quail. In the current study, Golden apple snail meal was also rich in crude fat and contributed to increase crude fat composition in line with the increasing levels of Golden apple snail meal supplementation in the diet. However, the increasing of crude fat in this study resulted in a reduction of edible weight. The dietary crude fat up to 5% still would be beneficial to the edible part of quail (Shimaa *et al*. 2017). On contrary, Shahryar *et al*. (2011) reported that the edible weight of broilers was significantly higher in the control diet than supplemented with crude fat.

**The Effect of Golden Apple Snail Meal on Inedible Weight**

The results in Table 3 indicate that P2 had the highest inedible weight (58.0 g/ head), followed by P0 (55.7 g/head), P1 (48.5 g/head), P4 (46.7 g/head), and P3 (39.0 g/head). The inedible components include the head, neck, feet, abdominal fat, and all internal organs except giblets. According to El-Faham *et al*. (2024), the inedible component consisted of blood, feather, ovary, oviduct, spleen, and visceral. In the current study, the inclusion of Golden apple snail meal in the broiler diet had a significant difference ($p \leq 0.05$) in reducing inedible weight. This may be due to a significant difference ($p \leq 0.05$) in carcass and edible weight, which consequently affects the inedible weight. Rezende *et al*. (2022) reported that edible and edible weight was the representative of carcass weight.

The result of Duncan's Test, P3 (containing 15% Golden apple snail meal) was significantly lower ($p \leq 0.05$) compared to P0 (control diet) and P2 (containing 10% Golden apple snail meal), but it did not significantly different ($p > 0.05$) from P1 (containing 5% Golden apple snail meal) and P4 (containing 10% Golden apple snail meal). This also indicates that inedible weight across all treatments did not vary substantially and significantly impact the inedible weight. Therefore, Golden apple snail meal can be the feed ingredient due to its potential of nutrient composition, especially for crude protein. The Golden apple snail meal has the potential to be an alternative protein source for poultry (Nusantoro *et al*., 2024).

## CONCLUSION

The effect of Golden Apple Snail meal (*P. canaliculata* L.) in the diet affects the slaughter weight, carcass weight, abdominal fat weight, as well as the edible and inedible weights of broiler quail. The inclusion of Golden apple snail meal in the diet of broiler quail up to 10% is the optimum level for slaughter weight, carcass weight, abdominal fat weight, edible and inedible weights.

## SUGGESTION

Further studies are required to evaluate the bioactive components of Golden apple snail meal and their effects on the performance, reproductive, and therapeutic effects in quail.

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