**Carica papaya** seed meal in diet can reduce egg quail cholesterol without reduce egg quality

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**Abstract.** The purpose of this study was to determine the effect of papaya seed meal on the quality of quail eggs and to determine the best dose of quail egg quality. Using an experimental method with a completely randomized design (CRD), with 4 treatments and 6 replications, each replication consisted of 7 quails. The treatments were P0 (control feed), P1 (0.3% papaya seed meal in feed), P2 (0.6% papaya seed meal in feed) and P3 (1.2% papaya seed meal in feed). The parameters observed were egg white index, egg yolk index, egg yolk color, shell thickness, and egg cholesterol. The data was analysed by Analysis of Variance (ANOVA). The results showed that the addition of papaya seed meal in the feed had not a significant effect (p<0.05) on egg white index, on egg yolk index and shell thickness, but decreased egg yolk color. However addition papaya seed meal had significant effect (p<0.05) reduces egg yolk cholesterol. In conclusion, addition of papaya seed meal (**Carica papaya** L.) up to 1.2% reduce egg yolk cholesterol without effected the quality of quail eggs.

1. **Introduction**

Human body need good nutrition for their growth and health. One of the popular foods that contain good nutrition is eggs. Eggs that are frequently consumed is quail eggs which are consumed as a protein source. Quail eggs production increase every year, the growth 0.46% from 2018 to 2019 [1]. The average consumption of quail eggs per capita per year in Indonesia increased from 7.8 to 9.2 from 2016 to 2017 [2]. Quail eggs have a complete nutrient, however quail eggs contain high cholesterol and that make a reason some people don’t want to consume quail eggs. [3] Cholesterol content in quail eggs around 12.26 mg/g. [4] report that cholesterol level in quail egg around 844 mg/100g and thats number quit higher than cholesterol in chicken egg 372 mg/100 g. Food with high cholesterol level not favored by people who suffer with diseas cause by cholesterol such as cardiovascular disease, high blood pressure and obesity [5]. Some research have been done to reduce cholesterol content on quail eggs, such as with diet treatment. Feed rich in vitamins, minerals, or phenolic compound such as tanin, saponin, and another compound can effect to egg cholesterol levels. One of the potential ingredients can be used on decreasing egg cholesterol levels without affected egg quality is papaya seeds.

Papaya is one of the fruit in Indonesia with high production. [6] papaya production in Indonesia about 1.016.388 tons at 2020. Some part of papaya fruit such as seeds and leaves are not widely used for human food. The amount of papaya seeds is about 16% from the whole papaya fruit and is considered as a waste [7]. [8] [9] Papaya seeds meal are rich with nutrients, such as 21.8% crude
protein, 6.7% ash, 26.2% crude fiber, crude fat 28.3%, metabolism energy 3570 kcal/kg, 681.4 mg/100 g Ca, 2115.7 mg/100 g P and 423.5 mg/100 g Mg. Several experiments regarding papaya seeds meal for feed have been done.

Adding papaya seeds meal to quail feed 0.25%, 0.5% and 1% was unaffected egg weight and feed conversion [9]. Another research report that 0.5% papaya seed meal on broiler breeder diet showed that weigh of eggs and DOC weigh are heavier than control diet (p<0.05) [10]. However, data about affect of papaya seeds meal on quail still limited. This research is presents to evaluation of papaya seeds meal on quail diets on egg interior quality and egg cholesterol content.

2. Materials and Methods

2.1. Preparation of papaya seed meal
Papaya seed were collected from local papayas farmer around Jember district. Papaya seeds then were washed and sun dried for 4-5 days. The dried papaya seed were ground to powder.

2.2. Animal and diet treatments
The experiment used 168 of 75-days-old quail were reared for eight weeks. This experiment was conducted in a completely randomized design (CRD) with four treatments and six replications with seven quails in each. The diet treatments were P0: 0% papaya seed meal (control), P1: diet contain 0.25% papaya seed meal, P2: diet contain 0.5% papaya seed meal and P3: diet contain 1% papaya seed meal. The ingredients were used on diets are corn, rice bran, fish meal, soybean meal, oil, CaCO₃, premix and commercial feed. The diets were prepare in crumble. Diet and drinking water given ad libitum. Feed formulation and nutrient content are shown in Table 1.

| Ingredients (%) | P0   | P1   | P2   | P3   |
|-----------------|------|------|------|------|
| Corn            | 39.92| 40.41| 40.08| 40.57|
| Rice bran       | 5.59 | 5.41 | 5.37 | 5.35 |
| Soybean meal    | 19.33| 19.57| 19.41| 19.65|
| Fish meal       | 6.45 | 6.53 | 6.63 | 5.90 |
| Oil             | 3.63 | 3.67 | 3.64 | 3.69 |
| Papaya seed meal| 0    | 0.25 | 0.5  | 1    |
| CaCO₃           | 5.32 | 5.39 | 5.34 | 5.41 |
| Commercial feed | 19.35| 18.37| 19.03| 18.03|
| Premix          | 0.40 | 0.40 | 0.40 | 0.40 |

| Nutrients content | Treatments | P0     | P1     | P2     | P3     |
|--------------------|------------|--------|--------|--------|--------|
| Gross energy (kcal/kg) | 2964.84  | 2966.46| 2966.69| 2966.81|
| Crude protein (%)* | 22.83     | 22.63 | 22.73  | 22.43  |
| Crude fat (%)      | 6.16      | 6.20  | 6.19   | 6.24   |
| Crude fiber (%)    | 3.67      | 3.67  | 3.77   | 3.87   |
| Ca (%)             | 3.07      | 3.07  | 3.05   | 3.03   |
| P (%)              | 0.64      | 0.63  | 0.63   | 0.60   |

*The analysis result from Laboratorium Teknologi Pakan, Politeknik Negeri Jember. P0: diet without papaya seed meal (control), P1: diet containing 0.25% papaya seed meal, P2: diet containing 0.5% papaya seed meal, and P3: diet containing 1% papaya seed meal.

2.3. Interior egg quality data collection
Variable of interior egg quality data in this research were egg white index, yolk index, yolk color, shell thickness and cholesterol content. egg white index, yolk index, yolk color, shell thickness was
measured once a week during treatment. Cholesterol content was measured once time in the end of treatment. Data were to analysis of variance (ANOVA), if any indicated a signifianct effect, the analysis was continued with a post-hoc test by Duncan’s multiple range test using SPSS software.

3. Results and Discussion

The averages data of egg white index, yolk index, yolk color and shell thickness of quail egg during treatment are shown in Table 2. Adding papaya seed meal in the diets (0.25; 0.5 and 1%) not significantly affected on egg white index, yolk index, and shell thickness (p>0.05) compared to the control. There was no difference in egg white index, yolk index and shell thickness means that no negative effect of papaya seed meal on the interior egg quality. Another factor was possibly because nutrients contents such as energy, protein and mineral in the diet treatments had the same value between control diet and diet treatments [9]. However, papaya seed meal was significantly affected yolk color (p<0.05). Yolk color was decreased by adding papaya seed meal. Score of yolk color on control diet treatment was higher than yolk color on diet with papaya seed meal (p<0.05). [11] some factors that influenced yolk color are xanthophylls pigment, zeaxanthin, lutein and synthetic pigments.

**Table 2.** The averages data of egg white index, yolk index, yolk color and shell thickness of quail egg during treatment

| Treatments | P0        | P1        | P2        | P3        |
|------------|-----------|-----------|-----------|-----------|
| Egg white index | 0.13a     | 0.14ab    | 0.14ab    | 0.14ab    |
| Yolk index | 0.47      | 0.46      | 0.46      | 0.47      |
| Yolk color | 4.79c     | 3.87b     | 3.48a     | 3.29a     |
| Shell thickness | 0.03      | 0.03      | 0.03      | 0.03      |

P0: diet without papaya seed meal (control), P1: diet containing 025% papaya seed meal, P2: diet containing 0.5% papaya seed meal, and P3: diet containing 1% papaya seed meal. Means in the same row with superscripts differ significantly (P<0.05).

**Table 3.** Cholesterol content of yolk quail egg after treatment

| Treatments | Cholesterol content (mg/100g) |
|------------|-------------------------------|
| P0         | 670.619c                      |
| P1         | 574.884b                      |
| P2         | 424.694a                      |
| P3         | 406.516a                      |

P0: diet without papaya seed meal (control), P1: diet containing 0.25% papaya seed meal, P2: diet containing 0.5% papaya seed meal, and P3: diet containing 1% papaya seed meal. Means in the same row with superscripts differ significantly (P<0.05). Analyzed at Laboratorium Biokimia Nutrisi, Departemen Nutrisi dan Makanan Ternak, Fakultas Peternakan, Universitas Gajah Mada.

Cholesterol content of yolk quail egg after treatment are shown in Table 3. The result showed that adding papaya seed meal up to 1% on diet had significant effect on reducing egg yolk cholesterol levels (p<0.05). The same result was reported that total cholesterol and SGPT levels decreased in white rats suffering from hypercholesterolemia. The decrease in total cholesterol was around 13.39% and SGPT levels 31.4% (p<0.05) [12]. In addition high nutrient content, papaya seeds meal contain some antinutrient and antioxidant properties. Antinutrient compositions on papaya seed meals were phenols 28.32 mg/100g, hydrogen cyanide 1.87 µg/g, alkaloids 1.07% and oxalates 11.08 mg/100g [13]. The antinutrient may cause decreasing cholesterol level. Fat metabolism is inhibited due to inhibition of lipase enzyme secretion may cause by the addition 1.42 g papaya seeds meal on diet [14]. Obstructed fat metabolism is thought directly inhibit cholesterol synthesized. [15] Yolk precursors are synthesized in the liver and transported by plasma to ovary. Yolk cholesterol content is primarily dependent on the cholesterol content (triglyceride-lipoprotein). Inhibition of cholesterol synthesis can
reduce the rate of lipoprotein synthesis and secretion which possibility cause reductions in egg yolk cholesterol levels.

4. Conclusion
The results showed that adding papaya seed meal on quail diet has not significant effect on egg white index, on egg yolk index and shell thickness, but decreased egg yolk color. However addition of papaya seed meal (*Carica papaya* L.) up to 1.2% reduce egg yolk quail cholesterol without effected the quality of quail eggs.

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