Internal Quality of Eggs from Japanese Quail (Coturnix - Coturnix Japonica L.) Feeded by Fermented Sauge Waste

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Abstract. Japanese quail (Coturnix-coturnix japonica L.) is one type of quail that can be developed to support animal protein sources' needs in fulfilling community nutrition. The quality and quantity of feed influences production and quality. Bean sprouts waste contains 63.35% water content, 7.35% ash content, 1.17% fat content, 13-14% crude protein, 49.44% crude fiber and 64.65% total digestible nutrient. The study aimed to obtain the best level of bean sprout waste in feed on the internal quality of quail eggs. This research has four treatments and uses a completely randomized design. The treatments were control (R0) treatment without fermented bean sprouts (LTF), P1 giving 5% LTF, P2 giving 10% LTF, and P3 giving 15% LTF. The egg weight, egg yolk diameter, yolk height, albumen height, yolk index, and Haugh units were measured. The data obtained analyzed for variance and if between treatments showed a significant effect, continued with Duncan's smallest total distance test. The results showed that the provision of fermented bean sprouts in the ration had a very significant effect ($P<0.01$) on albumen height and quail egg unit Haugh value. The study results show that the addition of fermented bean sprouts waste flour affects albumen height and unit Haugh value but does not affect egg weight, white diameter, yolk diameter, yolk height, and quail egg index.

Keywords: quail eggs; quality; waste bean sprouts

1 Introduction

Eggs are poultry products that are easily digested and have high nutritional value (Amin, 2017). The nutritional value of quail eggs is the same as other poultry eggs so that it can add variety in the supply of protein sources, containing 13.3% crude protein, 1993 kcal/kg energy, 0.63% crude fiber, 11.99% ether extract (Ambarwati et al. ., 2017). Knowledge of the internal quality of eggs includes the Haugh unit and egg yolk index (Yuwanta, 2010). According to Taylor and Field (2004), the quality standards according to the USDA for classifying eggs are as follows: quality factors in eggs include albumen height, egg yolk condition, air cavity size, and abnormalities. The waste used in this research is bean sprout waste. There is quite a lot of

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bean sprout waste available, but its use for quail ration ingredients is still limited. Green bean sprouts waste has a high crude protein content of about 13.60%.

According to Amin (2017), research on quail fed with papaya leaf flour affects egg weight and egg yolk colour but does not affect yolk index, albumen index and Haugh unit values. Meanwhile, Fadila et al. (2018) examined quail fed commercial feed with garlic flour and cumin flour, stating that the addition of 1-2% garlic flour can improve the quality of quail eggs, especially in the quality of egg yolk colour. Arnollus et al. (2020), researching the appearance of female quail fed a feed containing fermented bean sprouts waste flour, stated that the addition of 0, 5, 10, and 15% bean sprout waste flour ration did not affect the appearance of female quail.

Therefore, it is necessary to study the internal quality of quail eggs fed fermented waste feed. This study aimed to determine the quality of quail eggs and obtain the best quality of quail eggs from the treatment of bean sprouts waste flour. The benefit of this study was to get data on the quality of the inside of quail eggs given fermented bean sprouts waste flour. It is hoped that the results of this study can be used as a source of information for further research and can provide information to quail farmers regarding the use of bean sprouts waste as female quail feed.

2 Research Methods

The materials used in this study were 48 female quail (Coturnix-coturnix japonica L.) aged 4 – 9 weeks, fermented bean sprouts waste with levels of 0.5,10, 15%, commercial quail feed, and 80 quail eggs.

2.1 Research Location and Time

The research location is in Jalan Badak Agung X No.11, Br. Badak Sari, Sumerta Kelod, East Denpasar District, and the agricultural analysis laboratory, Faculty of Agriculture, Warmadewa University, Denpasar. Research starting in March 2021 and ending in September 2021.

2.2 Research Methodology

This study had four treatments and four replications. The study used a completely randomized design. Quail eggs used to measure egg quality were eggs from laying eggs at week 7 to week 8. Egg samples were taken randomly from each experimental unit. The treatments applied are:

P0 = eggs from quail fed control feed or without the addition of fermented bean sprouts (LTF)

P1 = eggs from quail fed with 5% LTF

P2 = eggs from quail fed with 10% LTF

P3 = eggs from quail fed a feed containing 15% LTF.

2.3 Observed Variables

Egg Weight

Egg weight was obtained by collecting and weighing eggs from quail at 8-9 weeks of age. The eggs were collected and then weighed using a digital scale with a sensitivity of 0.01 g.

Egg Yolk Diameter

The procedure for measuring the diameter of the yolk is as carried out by (Andi, 2013) by placing the broken egg on flat glass and then measuring the diameter of the yolk using a calliper.

High Egg Yolk

Measurement of the height of the yolk is by placing the broken egg on the flat glass. Then the size is measured using a toothpick, the egg yolk that is imprinted on the toothpick is measured with a calliper (Andi, 2013).

2.4 Albumen Height

The albumen measurement procedure (Andi, 2013) was carried out by placing the broken egg on flat glass. Then the height was measured using a toothpick, then measured using a calliper.

2.5 Egg Yolk Index (IKT)

The calculation of IKT is the ratio of the height of the yolk to the diameter of the yolk. BSNI (2008) explains the calculation to determine the Egg Yolk Index (IKT) using the following formula:

IKT = (High egg yolk)/(Egg Yolk Diameter)

2.6 Haugh Units (HU)

HU calculation is a measurement of albumen height and egg weight. Eggs weighed using a digital scale are broken down, the egg fragments are placed on flat glass. Then the albumen height was measured using a calliper. Panda (1996) states the formula for the haugh unit made by Raymond Haugh, namely:

HU = 100 logs (H +7.57 – 1.7 W 0.37)

Description: HU = Haugh Unit

H = Albumen Height (mm)

W = Egg Weight (g)

2.7 Data analysis

The data obtained were analyzed by ANOVA using the SPSS 24 application. The treatment that gave a significant effect was continued with the Duncan test at 5% level ($P < 0.05$) (Steel and Torrie, 1991).

3 Results and Discussion

The results showed a significant effect ($P<0.05$) on egg albumen height and a very significant ($P<0.01$) effect on the Haugh Unit value. However, it had no significant effect ($P>0.05$) on egg weight, yolk height, yolk diameter, and egg yolk index, as shown in Table 3.1 below.

Table 1. Average Internal Quality Value of Eggs from Quail Feeding Fermented Sprout Waste Flour

Research variable	**Treatment**				
	R0	R1	R2	R3	SEM
Egg Weight (g/egg)	9.81a	10,11a	10.57a	11.03a	0/18
Egg Yolk Height (cm)	0.90a	0.94a	0.92a	0.90a	0.03
Egg Yolk Diameter (cm)	2.74a	2.69a	2.68a	2.66a	0.09
Albumen Height (cm)	0.23b	0.24ab	0.26a	0.26a	0.03

Index Egg yolk	0.33a	0.34a	0.34a	0.34a	0.07
Haugh Unit (HU)	77.02c	77,48bc	79.26ab	80.02a	0.32

Information:
1). R0: control ration
R1: ration with 5% fermented bean sprout waste flour
R2: ration with 10% fermented bean sprouts waste flour
R3: Ration with 15% fermented bean sprout waste flour
2). Values with the same letter in the same row indicate a non-significant difference (P>0.05) and values with different letters in the same row indicate a significant (P<0.05) and very significant difference (P<0, 01).
3.) SEM (Standard Error of Treatment Mean).

3.1 Egg Weight

The average weight of quail eggs in the study was 9.81 – 11.03 g/egg (Table 3.1). The results of the variance test showed no significant difference (P > 0.05) for all treatments of fermented bean sprouts waste flour. The lowest egg weight was indicated by the control treatment (R0), then at R1, R2, and the highest at R3. This meant that rations containing fermented bean sprouts waste flour to female quail did not affect egg weight.

The egg weight range from the study was higher than the egg weight from the research by Satria et al. (2021), who used cassava flour silage in quail rations and obtained the egg weight range from 8.08 to 8.96 g/egg. In Claudia's (2014) study, which added turmeric, temulawak, and white ginger flour to the quail ration, the egg weights were 10.0 – 10.67 g/egg. According to Parizadian (2011), quail eggs weigh about 10 g -12 g (about 8% of the bodyweight of the parent). Many factors affect egg weight, such as genetics, sexual maturity, age, several nutrients, type and amount of feed, cages, and drugs (Syahada, 2016).

3.2 High Egg Yolk

The results of the analysis of high variance in egg yolks (Table 3.1) showed no significant difference (P > 0.05) at all levels of administration of fermented bean sprouts waste flour. The yolk height at R0 and R3 was 0.90 cm, R2 was 0.94 cm, and R2 was 0.92 cm. Yolk height is influenced by several factors, such as protein and amino acids in the feed (Triastiarti et al., 2017). The components that make up the vitamin membrane that holds egg yolks are proteins and amino acids. Bean sprouts waste flour used as a treatment contains high protein and amino acids, increasing crude protein in the ratio. The protein content of the ratio that meets the needs significantly influences egg yolk height (Argo et al., 2013).

3.3 Egg Yolk Diameter

In Table 3.1, the analysis results of the various diameters of egg yolks were not significantly different (P > 0.05) at all treatment levels of fermented bean sprouts waste flour. In this study, the average yellow diameter was 2.66 cm at R3, 2.68 cm at R2, 2.69 cm at R1, and 2.74 cm at R0. Still, these values were not significantly different (P>0.05). This means that giving fermented bean sprouts waste flour to quail can maintain the diameter of the yolk. The wider diameter of the yolk indicates that the yolk is getting thinner, or there is a decrease in internal quality (Argo et al., 2013).

3.4 Albumen Height

Table 3.1 shows that the treatment level of bean sprout flour had a significant effect ($P<0.05$) on the albumen height of quail eggs. Duncan test results showed that the treatment R0 was significantly lower than R2 (10%) and R3 (15%), but the albumen height at R0 was not substantially different from R1 (5%) given fermented bean sprouts waste flour). The higher the level of fermented bean sprouts wastes flour, the higher the albumen level. This is because bean sprout flour is a good source of protein for livestock, the adequacy of protein intake in feed is one factor that affects the quality of egg whites (the higher and thicker) (Amin et al., 2015).

3.5 Egg Yolk Index (IKT)

The treatment of fermented bean sprouts waste flour level showed no significant difference ($P>0.05$) to the quail egg yolk index value. The quail egg yolk index value ranged from 0.33 to 0.34, namely 0.33 at R0 and 0.34 at R1, R2 and R3. (Table 5.1). This shows that the egg yolk index is relatively the same for all treatments. The addition of fermented bean sprouts waste flour in quail rations did not affect egg yolk height and yolk diameter so that the yolk index value was not significantly different. The yolk index shows the quality of the yolk, which is the ratio between the height of the yolk and its diameter (Suparyanti et al., 2013). According to the Indonesian National Standard (SNI 3926:2008), the index value of fresh egg yolks ranges from 0.33–0.52.

This study's egg yolk index value was lower than the results of Satria et al. (2021), who used cassava leaf flour silage in quail rations to get an egg yolk index value range of 0.34–0.39. Kurnia (2012), using papaya flour in quail rations, got an egg yolk index value range of 0.39 – 0.44. The decrease in the yolk index can occur due to the entry of water and egg white into the yolk, due to the difference in osmotic pressure between the egg white and the yolk, so that the yolk becomes watery (Kusumastuti et al., 2012).

Haugh Unit (HU)

The study results (Table 3.1) show that the treatment of fermented bean sprout dregs flour had a significant effect ($P<0.01$) on the Haugh value. The Haugh unit value in the control (R0) of 77.02, very significantly lower ($P<0.01$) than the haugh unit value of R2 of 79.26 and R3 of 80.02 and R1 differing significantly lower than R3. The highest haugh unit value was obtained in treatment R3 (15% bean sprout waste flour). Meanwhile, the Haugh unit values between R0 and R1, R1 and R2, and R2 and R3 were not significantly different ($P>0.05$), as shown in Table 3.1. This is due to the difference in albumen height obtained. The albumen height from the study was 0.26 cm at R2 and R3, which was significantly different from R0 at 0.24 cm. A high Haugh unit value indicates a thicker albumen viscosity.

According to Kusumastuti et al., (2012), the higher the Haugh unit value, the higher the ovomucin which means the better the egg quality. This follows the opinion of Amin et al. (2015), which states that albumen height, feed nutrition, protein intake, and egg weight can affect the Haugh unit value. Mulyadi et al., 2017 also stated that the higher the albumen value, the higher the Haugh unit value produced (positively correlated). Haugh unit is a parameter of egg freshness quality calculated based on egg white height and egg weight.

According to the United State Department of Agriculture (USDA), egg quality is based on the haugh unit (HU) value, AA quality if the haugh unit value is more than 79, A rate if the haugh unit (HU) value is between 79-55, B quality if the haugh unit value is 55 -31 and C quality if the haugh unit value is less than 31 (Suparyanti et al., 2013). The Haugh values of the research units on R2 and R3 were 79.26 and 80.02, including AA quality, R1 and R0 including A quality (77.48 and 77.02). The higher the level of giving fermented bean sprouts flour, the higher the Haugh value of the egg unit. It can be said that the better the quality of the eggs.

The haugh value of this research unit is higher than the haugh value of the research unit reported by Syahada (2016), which adds shrimp waste in commercial quail rations, which is 61.33. However, the haugh value of this research unit is lower than the results of Amin et al. (2015), who reported the haugh value of quail eggs with the addition of turmeric extract in drinking water of 88.95 – 89.27.

4 Conclusion

Giving 10% to 15% fermented bean sprouts waste flour in female quail rations can increase albumen height and egg unit Haughs, but has not increased egg weight, yolk height, yolk diameter, and egg yolk index. The best internal quality of quail eggs was produced by giving 15% fermented bean sprouts waste flour in the female quail ration. It significantly increased the albumen height and haugh unit of eggs.

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