Jurnal Agro Veteriner (Agrovet)
https://e-journal.unair.ac.id/agrovet/

Original Article

The usage of cattle rumen contents in commercial quail feed towards the production and haugh unit (HU) of eggs (*Coturnix coturnix japonica*)

Joel Jeevan Raj S/O Yogarajah[1], Tita Damayanti Lestari[2], Mohammad Anam Al-Arif[3*], Widya Paramita Lokapirnasari[3], Sri Hidanah[3], Nove Hidajati[4]

[1]Profession Program of Veterinary Medicine, Faculty of Veterinary Medicine, Universitas Airlangga, Jl. Dr. Ir. H. Soekarno, Kampus C Mulyorejo, Surabaya 60115, East Java, Indonesia
[2]Division of Veterinary Reproduction, Faculty of Veterinary Medicine, Universitas Airlangga, Jl. Dr. Ir. H. Soekarno, Kampus C Mulyorejo, Surabaya 60115, East Java, Indonesia
[3]Division of Animal Husbandry, Faculty of Veterinary Medicine, Universitas Airlangga, Jl. Dr. Ir. H. Soekarno, Kampus C Mulyorejo, Surabaya 60115, East Java, Indonesia
[4]Division of Basic Veterinary Medicine, Faculty of Veterinary Medicine, Universitas Airlangga, Jl. Dr. Ir. H. Soekarno, Kampus C Mulyorejo, Surabaya 60115, East Java, Indonesia

ABSTRACT

The purpose of this study was to determine the effect of rumen content fermentation on quail bird ration. The parameters measured were the production of egg weight and haugh unit. In total 24 quail birds were used with 4 treatments and 6 repetitions. Treatments were consists of T0(formulated feed without fermented rumen content), T1(formulated feed with 5% fermented rumen content), T2(formulated feed with 10% fermented rumen content), T3(formulated feed with 15% fermented rumen content). Samples are observed on the last day to determine the egg quality with the egg weight and haugh unit. The results showed that there are significant differences effected on the egg weight and haugh unit.

Keywords: Egg weight, haugh unit, feed, fermented rumen content, quail bird

ARTICLE INFO

Original Research

Received: October 07, 2024
Accepted: November 29, 2024
Published: December 30, 2024
***Corresponding Author:**
moh-a-a-a@fkh.unair.ac.id
DOI:
https://doi.org/10.20473/agrovet.v8i1.64989

Introduction

Quail (*Coturnix coturnix japonica*) is one type of poultry which is being developed and improved in production. Besides producing meat, quail also produce eggs with quite high productivity. Quail eggs are a potential source of animal protein. Seen from physical composition, Quail eggs consist of egg white (albumen) 47.4%, yellow eggs (yolk) 31.9% and eggshell and eggshell membrane 20.7%. Content quail egg protein is around 13.1%, while the fat content is 11.1%. Quail egg yolk contains 15.7% -16.6% protein, 31.8% -35.5% fat 20.2% -1.0% carbohydrate and 1.1% ash. Quail eggs contain vitamin A 543 µg (per 100g) (Lovela *et al*., 2023).

The type of quail that is often cultivated is the Japanese quail (*Coturnix coturnix japonica*) because this quail starts laying eggs at 42 days old. Quail females can produce 250-300 eggs in a year. Egg weight about 10 g / item or 7-8% of body weight. Quail potential as contributors of animal origin food to meet consumption needs protein (Quaresma *et al*., 2022).

In quail breeding, factors are also a problem for breeders because they are relatively expensive feed costs and their availability is not fixed throughout the year. Feed is one of the main factors which is very important in the growth of quails. The cost of feed in maintenance can be reaching 60-70% even more during the production period (Buccaro *et al*., 2023). Effort done to reduce these costs is to find alternative feed ingredients, where the material is cheaper, sufficiently available, and not competitive with human needs (Makkar, 2018). One alternative solution is to utilization of the contents of the cow's rumen which has always only been livestock waste in slaughterhouse. With the development of livestock and business human

needs for livestock products, the more waste produced increased.

In terms of nutrition, cattle rumen content contains nutrients that can used as an energy source because it contains metabolic energy of 2821.20 kcal / kg. According to Bayissa *et al.* (2022) the chemical composition of rumen contents (% dry materials): ash 11%, crude protein 17.6%, crude fat 2.1%, crude fibre 28%, NFE 41.40%, Ca 0.79%, P 0.67%. Crude fibre is part of a carbohydrate consists of cellulose and hemicellulose which, if degraded are usually obtained glucose which later can be used as an energy source. In the ruminants also have microbes, which consist of protozoa, bacteria and fungi (Cammack *et al*., 2018). One very bacterial group important in the rumen are cellulolytic bacteria. Cellulase enzymes produced cellulolytic bacteria are able to break down cellulose so that ruminants can living with low-quality forage (Weimer, 2022). Biodegradation process materials containing cellulose are largely determined by the ability of microbes cellulolytic to produce cellulose enzymes which have high activity (McDonald *et al*., 2012). Inside the rumen there is a population of bacteria included in the family Bacteriodes, Fusobacterium, Streptococcus, Eubacterium, Ruminococcus, and Lactobacillus (Gilbert *et al*., 2020).

Microbes in rumen contents function to degrade contents the rumen is not yet completely degraded, this can be done inside research drums (Cammack *et al*., 2018). It is expected that the fermentation carried out in the research drums will be able to decrease crude fibre content, increase protein content which can later be used as an ingredient feed in the manufacture of quail feed (Lovela *et al*., 2023).

Haugh units are one of the important criteria for determining egg quality. According to Sinha *et al*. (2017) egg quality also refers to its weight.It also shows that the egg weight can affect the egg haugh unit value because the higher the egg weight, the haugh unit value is also higher. The haugh unit value is the determinant of the egg albumen quality. So it can be concluded that egg weight and haugh unit have a role to determine the egg quality.

Based on the research background, a study should be done on giviing formulated feed with fermented content of cattle rumen to the quail birds with commercial formulated feed. It is expected that this research can potentially be an increase in protein content which enhance the egg quality to increase.

Materials and methods

Research design

The type of research carried out was experimental research by conducting experiments on fermenting the contents of cattle rumen in feed on quail which became the study sample. The pattern of research design used in this study used a completely randomized design (CRD). In this study 24 quail birds were used. There were four treatments (T0, T1, T2, T3) with 6 repetition of each treatment of 4 quail birds.

This research was conducted in Surabaya. The making of feed consisting of fermented cattle rumen for quails will be carried out at the Animal Feed Laboratory, Faculty of Veterinary Medicine, Airlangga University, Surabaya. The examination of the Haugh Unit will be carried out at the lab material at the veterinary public health Laboratory of the Faculty of Veterinary Medicine, Airlangga University, Surabaya. This research was carried put on mid of September–October 2019 for 4 weeks.

Treatment

The experiment was carried out with four treatments and five repetitions respectively. The treatment under observation:

T0 = Control, Formulated feed (0% fermented content of cattle rumen)

T1 = Formulated feed (5% fermented content of cattle rumen)

T2 = Formulated feed (10% fermented content of cattle rumen)

T3 = Formulated feed (15% fermented content of cattle rumen)

Feed formulations are prepared using feed ingredients consisting of: corn, rice bran, fish meal, soybean meal, premix and vitamins with a

crude protein content of 22% for quail layer. The research feeds are composed of isoprotein.

Preparation of Feed

The first step is to wash 5 drums and dry it. Each drums can be filled up to 100 liters. Then the content of cattle rumen is fillrd up inside the drum for fermentation process to make anaerobic conditions and given bacterial food in the form of molasses and urea. It is mixed well and sealed for 5 days. The next step is to dry the fermented cattle rumen after the 5th day. The duration to dry the fermented cattle rumen is approximately 7-8 hours per day. This took place at the animal slaughterhouse of Surabaya with 5 days of drying prrocess. After 4 days, the fermented cattle rumen content is analyzed in Animal Feed Technology Laboratorium. After the analyzing process, the cattle rumen content is seived and the fine contents are measured and mixed with quail ration.

Preparation of experimental animals or adaptation of cages and feed

Experimental animals in the form of quail birds (*Coturnix-coturnix japonica*) as many as 24 birds. Prior to the study, quail birds (*Coturnix-coturnix japonica*) were adapted to the site of conditions and research feed for 7 days, the cages were placed in ventilated and luminous rooms indirectly in accordance based on the experimental environment in Surabaya.

One week before the cage is used, the cage is cleaned, and sprayed evenly with a disinfectant, after each cage below it is covered using newspapers. Equipment for feeding and drinking water to be used must be cleaned (sterilized), while preparing the cage. A 40 watts incandescent lamp is installed in the center of each enclosure. Temperature measurement of the cage approximately around (20-25°C), humidity of the cage (30-80%).

The sample taken

Egg is collected on the very last day to analyse the quality of the egg laid by the quail birds. Haugh Unit of egg is calculated. The better the egg quality, the higher the haugh unit value.

Data analysis

The data obtained were analyzed using variance analysis method (ANOVA). If there is a significant difference, continue with Duncan's Multiple Range Test with a significance level of 5% ($p < 0.05$) to find out which treatment is the best (Kusrinigrum, 2008). The software that has been used to analyse the data is Statistical Program for Social Science (SPSS) 24 for Windows.

Result

Egg Weight

Based on the result obtained from this research conducted, the value of egg weight has increased . It is stated below on table 1, the results of data analysis using One way ANOVA showed that the weight of the eggs between treatments gave a significant ($p<0.05$). Moreover the usage of 5% rumen content can increase the weight of the egg significantly. Besides that on adding more 10% and 15% also increases the weight of egg. According to the Duncan test, it shows a significant difference compared to all other treatments (T0, T1, T2, and T3).

Table 1. Egg weight of eggs laid by quail birds

Treatment	Egg Weight (X ± SD)
T0	$9.567^{a} \pm 0.446$
T1	$10.433^{b} \pm 0.151$
T2	$11.250^{c} \pm 0.197$
T3	$12.233^{d} \pm 0.686$

Note: Different superscripts (a, b, c and d) in the column shows significant differences ($p<0.05$)

Haugh Unit (HU)

Haugh Unit is calculated based on the formula introduced by Raymond Haugh. This also shows that on table 2, the results of data analysis using One way ANOVA showed that the usage of 5% cattle rumen has gave a significant ($p<0.05$) and raise value of Haugh Unit. There is increase from the 5%-15% and changes of value in the egg Haugh Unit .According to the Duncan test, it shows a significant difference compared to all treatments (T0, T1, T2, and T3)

https://doi.org/agrovet.v8i1.64989
How to Cite:
Yogarajah JJR, Lestari TD, Al-Arif MA, Lokapirnasari WP, Hidanah S, Hidajati N. The usage of cattle rumen contents in commercial quail feed towards the production and Haugh Unit (HU) of eggs (Coturnix coturnix japonica)J. Agrovet. 2024, 8(1): 39 - 43.

Table 2. Haugh Unit of eggs laid by quail birds

Treatment	Haugh unit (g, X±SD)
T0	$70.666^{a} \pm 0.339$
T1	$71.410^{b} \pm 0.378$
T2	$72.298^{c} \pm 0.280$
T3	$73.282^{d} \pm 0.340$

Note: Different superscripts (a, b, c and d) in the column shows significant differences ($p<0.05$)

Discussion

Egg Weight

The result of average egg weight in quail eggs can be seen in table 1. The results showed that the quail eggs produced in treatment where the quail birds are given formulated feed with no fermented content of cattle rumen is (9.0567g), treatment where the quail birds are given formulated feed with 5% fermented content of cattle rumen is (10.433g), treatment where the quail birds are given formulated feed with 10% fermented content of cattle rumen is (11.250g), and treatment where the quail birds are given formulated feed with 15% fermented content of cattle rumen is (12.233g). It is proven that the usage of fermented rumen gives good effect towards the egg. Moreover it is because naturally the rumen contains bacteria, protozoa, and yeast like organism that has good proteins in it. The increasement of protein is because of the breeding of the microbacteria until it can be absorb by the quail for the egg weight (Kulshreshtha *et al*., 2022).

Haugh Unit (HU)

The result of average haugh unit in quail eggs can be seen in table 2. The results showed that quail eggs produced the haugh unit in treatment where the quail birds are given formulated feed with no fermented content of cattle rumen is (70.666), treatment where the quail birds are given formulated feed with 5% fermented content of cattle rumen is (71.410), treatment where the quail birds are given formulated feed with 10% fermented content of cattle rumen is (72.298), and treatment where the quail birds are given formulated feed with 15% fermented content of cattle rumen is (73.282).

Haugh Unit are closely related to the viscosity of the egg, as the viscosity increases, the Haugh Unit value of the egg also increases. According to Obianwuna *et al*. (2022), the Haugh Unit value increases correspondingly by increasing the egg viscosity. Silaban *et al*. (2019) also states that the value of HU is a value that describes the thickness of the egg albumen, because the smaller the value of HU, the thinner the albumen of the egg so that the quality of the egg albumen is lower.

Conclusion

Based on the results of the study on the utilization of cow rumen contents in commercial quail feed on egg production and Haugh units (HU), it can be concluded that providing 5% - 15% rumen contents to quail can increase egg weight and Haugh Unit value.

References

Bayissa T, Dugumaa B, Desalegn K. Chemical composition of major livestock feed resources in the medium and low agroecological zones in the mixed farming system of Haru District, Ethiopia. Heliyon. 2022; 8(2): e09012.

Buccaro M, Toscano A, Balzarotti M, Re I, Bosco D, Bettiga M. Techno-Economic Assessment of APS-Based Poultry Feed Production with a Circular Biorefinery Process. Sustainability. 2023; 15(3): 2195.

Cammack KM, Austin KJ, Lamberson WR, Conant GC, Cunningham HC. RUMINANT NUTRITION SYMPOSIUM: Tiny but mighty: the role of the rumen microbes in livestock production. J Anim Sci. 2018; 96(2): 752–770.

Gilbert RA, Townsend EM, Crew KS, Hitch TCA, Friedersdorff JCA, Creevey CJ, Pope PB, Ouwerkerk D, Jameson E. Rumen Virus Populations: Technological Advances Enhancing Current Understanding. Front Microbiol. 2020; 11(1): 450.

Kulshreshtha G, D'Alba L, Dunn IC, Rehault-Godbert S, Rodriguez-Navarro AB, Hincke MT. Properties, Genetics and Innate Immune Function of the Cuticle in Egg-Laying

Species. Front Immunol. 2022; 13(1): 838525.
Lovela AR, Lokapirnasari WP, Al-Arif MA, Soeharsono S, Hidanah S, Warsito SH, Prasinta R, Hapsari T, Andriani A. The Quality of Japanese Quail Eggs After Administration of *Bifidobacterium* sp. and Guazuma ulmifolia Leaf Extract. J Med Vet. 2023; 6(1): 132–136.
Makkar HPS. Review: Feed demand landscape and implications of food-not feed strategy for food security and climate change. Animal. 2018; 12(8): 1744–1754.
McDonald JE, Rooks DJ, McCarthy AJ. Methods for the isolation of cellulose-degrading microorganisms. Methods Enzymol. 2012; 510(1): 349–374.
Obianwuna UE, Oleforuh-Okoleh VU, Wang J, Zhang HJ, Qi GH, Qiu K, Wu SG. Potential Implications of Natural Antioxidants of Plant Origin on Oxidative Stability of Chicken Albumen during Storage: A Review. Antioxidants (Basel). 2022; 11(4): 630.
Quaresma MAG, Antunes IC, Ferreira BG, Parada A, Elias A, Barros M, Santos C, Partidário A, Mourato M, Roseiro LC. The composition of the lipid, protein and mineral fractions of quail breast meat obtained from wild and farmed specimens of Common quail (*Coturnix coturnix*) and farmed Japanese quail (*Coturnix japonica domestica*). Poult Sci. 2022; 101(1): 101505.
Silaban EM, Tafsin M, Hanafi ND. Free Choice Feeding on the Quality of Quail Eggs (*Coturnix coturnix-japonica*). Indian J Agric Res. 2019; 2(2): 110–125.
Sinha B, Mandal KG, Kumari R. Effect of Egg Weight on Egg Quality Traits of Laying Hens. Int J Pure App Biosci. 2017; 5(3): 293–300.
Weimer PJ. Degradation of Cellulose and Hemicellulose by Ruminal Microorganisms. Microorganisms. 2022; 10(12): 2345.