The Effect of The Addition Herbal Dregs Fermentation as A Feed Additive on The Internal Quality Eggs of Quail (*Coturnix coturnix japonica*)

Prihatiningsih[1] *and Osfar* Sjofjan[2*]

[1] Bachelor student, Faculty of Animal Science, Universitas Brawijaya, Malang 65145, Indonesia
[2] Lecturer of the Faculty of Animal Science, Universitas Brawijaya, Malang 65145, Indonesia

Abstract. The aim of this study was to determine the effect of adding herbal dregs as a feed additive to basal feed on the internal quality of quail eggs. This study used 200 quails of the Blaster strain aged 30 days, by placing 10 quail populations in each flock cage. The method used in this study was an experiment design using 5 treatments and 4 replicates. The treatment consisted of T0 = control treatment, T1 = 0.25% herbal dregs, T2 = 0.50% herbal dregs, T3 = 0.75% herbal dregs, and T4 = 0.1% herbal dregs. The observed variables are haugh unit, egg yolk volume, egg albumen volume, and egg yolk colour. The data obtained were statistically analyzed using the Analysis of Variance (ANOVA) with a Complete Randomized Design (CRD), followed by the Duncan Multiple Distance Test (DMRT) if there were significant differences. The results showed that the addition of herbal dregs to basal feed had no significant effect ($P>0.05$) on egg albumen volume, yolk volume, and haugh unit. On the other hand, it had a significant effect ($P<0.05$) on egg yolk colour. The conclusion of this study is that the addition of fermented herbal dregs can improve the internal quality of quail eggs, especially the colour of the yolk with the best herbal dregs fermentation treatment at 0.1%.

1 Introduction

The livestock industry has great potential to be developed considering the high demand for food sources of protein provided from livestock, especially meat and eggs. Egg production and poultry meat have increased every year, the quail population has increased by 5.20%, causing an increase in egg production in 2021 by 24,269.13 tons and in 2022 by 25,766.88 tons [1]. This increase was due to the high public attraction to quail eggs so that it experienced an increase in production by 5.8%.

Quail provides two benefits for meat and egg production so that it becomes a supportive alternative in the availability of animal protein at affordable prices and easy to find. The advantages of breeding quails have a fast production that quails reach sexual adulthood around 40 days with egg production between 250-300 eggs / tail / year at that time faster than

* Corresponding author: osfar@ub.ac.id

© The Authors, published by EDP Sciences. This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/).

laying hens and laying ducks in producing eggs at the first age. The determining factor for the success of quail productivity is found in feed with a contribution of 60-70% of production costs [2].

Quail farmers in Indonesia use commercial feed to improve quail egg performance and productivity. Increasing quail egg productivity needs to strive for additional herbal feed that can be mixed by utilizing ingredients available around the environment. Types of additional feed that can be a solution in raising quails with abundant availability, easy to find, relatively cheap prices, and good nutritional content for livestock. Additional quail feed that can be used is to use spices such as herbal dregs. Herbal dregs are waste from the process of making herbs that have not been fully utilized properly and disposed of as waste. Herbal dregs have good nutritional content when consumed by livestock.

The ingredients of herbal dregs consist of several types of medicinal plants that are specially mixed and adjusted to the level of use of poultry. That compounds contained in ginger such as flavonoids, phenols and terpenoids can stimulate the digestive tract, improve blood circulation, bile production, and antibacterial [3].

Based on the above background, the potential possessed by herbal dregs needs further research on the effect of adding fermented herbal dregs as a feed additive on the internal quality of quail eggs (*Coturnix coturnix japonica*).

2 Material and Method

This research was conducted from July 1 to August 29, 2023 at Mr. Khafidz Murtaji's quail farm located in Krajan, Bocek Village, Karang Ploso District, Malang, East Java. Proximate analysis and gross energy of basal feed on September 4-7, 2023 Laboratorium of Animal Nutrition and Feeding Ingredients, Faculty of Animal Husbandry, Universitas Brawijaya,

2.1 Materials

This research used 200 quails (Coturnix coturnix japonica) blaster strain from the age of 30 days and grouped into 20 treatments with each treatment consisting of 10 quails, body weight uniformity 142.80±10.45 and coefficient of variance 7.32%.

2.2 Method

The method used in this study was an experiment using a Complete Randomized Design (CRD) with 5 treatments and 4 repeats, the treatment of herbal dregs given as follows, T0 (basal feed without treatment), T1 (basal Feed + 0.25% fermentation herbal dregs), T2 (basal Feed + 0.50% fermentation herbal dregs), T3 (basal feed + 0.75% fermentation herbal dregs), and T4 (basal Feed + 1% fermentation herbal dregs. The variables observed and measured haugh units, egg yolk volume (mL), egg albumen volume (mL), and yolk colour.

2.3 Data Analysis

The research variables were assessed through a variety analysis using the Complete Randomized Design (CRD) methodology. Data were organized and tabulated using the Excel software program. Statistical significance was determined, with results considered statistically significant ($P<0.05$) or highly significant ($P<0.01$) by following this models [4] :

$$Y_{ijk} = \mu + T_1 + \varepsilon_{ijk} \quad (1)$$

Where:

Y_{ijk} = Observation value in the i treatment and replication j

μ = Generalmean value
T_1 = Effect of treatment i
ε_{ijk} = Random influences (experimental error) in treatment i and j replication

3 Results and Discussion

The treated feed was obtained from making fermented herbal dregs with 0.6% *Saccharomyces cerevisiae* microbes with a population density of 1.9×108/g. Giving herbal dregs to basal feed by mixing according to treatment. The nutritional content of fermented herbal dregs can be seen in table 1.

Table 1. Nutritional Content of Fermented Feed Treatment of Herbal Dregs

Food Substances	Composition
BK (%)	84.50
PK (%)	7.58
LK (%)	1.02
SK (%)	38.71
Abu (%)	5.97
Gross Energy (Kkal/kg)	5183.99
pH	6.58
Density (g/l)	202.67

Source: Proximate analysis, pH, density and gross energy in the UB Faculty of Animal Husbandry's Nutrition and Animal Feed Ingredients Laboratory [5].

Data on the effect of adding herbal dregs on observation variables including haugh units, egg albumen volume (mL), egg yolk volume (mL), and egg yolk colour can be seen in the results of the ANNOVA single factor test table 2.

Table 2. Research Data on the Effect of Treatment on Internal Egg Quality of Quail Eggs

Treatment	Variables			
	Haugh Unit	Egg Albumen Volume (mL)	Egg Yolk Volume (mL)	Egg yolk colour
T0	74,90 ± 1,59	8,16 ± 0,20	6,02 ± 0,09	1,79 ± 0,22[a]
T1	76,27 ±1,39	8,10 ± 0,34	6,10 ± 0,31	2,29 ± 0,05[b]
T2	75,88 ± 0,83	8,23 ± 0,06	6,02 ± 0,11	2,56 ± 0,17[b]
T3	75,85 ± 1,92	8,11 ± 0,41	6,00 ± 0,11	2,83 ± 0,07[b]
T4	77,46 ± 1,4	8,57 ± 0,18	5,91 ± 0,31	3,19± 0,26[c]

Note: Superscript letters[a-c] on the same line show a very noticeable difference (P<0.01)

The data from the research on the effect of herbal dregs treatment on the internal quality of eggs variable haugh unit, egg white volume (mL), egg yolk volume (mL) gave no real effect while the egg yolk colour variable had a very real effect.

3.1 The Effect of Herbal Dregs on The Haugh Unit of Quail Eggs

The effect of adding herbal dregs to haugh units in table 2, based on the results of the study, quails given fermentation treatment of herbal dregs produced a haugh unit value of 75.88-

77.46 classified as the best quality with a score of AA (HU>72). Haugh unit egg quail units 77.61 to 78.53 [6]. Haugh units above 72 are categorized as grade AA, 60-72 grade A, 31-60 grade B, and less than 31 grade C [7].

In this research, haugh unit value had no significant effect, there was a possibility because eggs taken from cages experienced a storage period of 24 hours, and egg weight had no real effect. Haugh value of units that have no real effect is caused by depletion of albumen, strains, temperature changes, increased humidity which causes loss of carbon dioxide (CO2) and duration of storage [8]. That egg weight and egg albumen viscosity that are not significantly different will produce haugh unit values that are not significantly different, because the size of the haugh unit value depends on egg weight and albumen height [9].

3.2 The Effect of Herbal Dregs on The Egg Albumen Volume of Quail Eggs

The effect of adding herbal dregs on egg white volume in table 2, based on the results of the study showed that (P>0.05) the treatment has no significant effect on the volume of egg whites. The increase in egg white volume occurs due to the microbial fermentation of Saccharomyces cerevisiae. The use of Saccharomyces cerevisiae as a source of probiotics in feed aims to increase the number of lactic acid bacteria (BAL) which will affect a number of digestive processes and fat absorption in the digestive tract [10]. The reaction of adding herbal dregs takes a long time to be able to reduce colonies of pathogenic bacteria in the digestive tract. The use of phytobiotics is proven to have a positive influence but is less optimal because it cannot have a fast effect in the digestive tract [11].

Another factor is that eggs used for research are stored for 24 hours which causes a decrease in egg white volume and an increase in albumen pH. That egg white volume can decrease due to loss of water and carbon dioxide during egg storage which causes albumin depletion and increased albumin pH [12]. pH of albumen increases due to the release of CO2 through the pores of the shell which causes the egg to become an alkaline condition so that the egg white in the thick part undergoes dilution which will eventually seep into the yolk [13].

3.3 The Effect of Herbal Dregs on The Egg Yolk Volume of Quail Eggs

The effect of adding herbal dregs on egg yolk volume in table 2, based on the results of the study showed that (P>0.05) which means the treatment has no real difference on egg yolk volume. The addition of fermented herbal dregs has not been able to change the volume of eggs which is influenced by the amount of fat and protein contained in the feed. The yolk consists of three parts of the vitelline membrane, germinal disc, and egg yolk as a source of food and fat for embryonic growth [14].

Egg volume is strongly influenced by egg weight, if egg weight produces a real difference, it will produce a real difference in egg volume [15]. Based on the results of the study, the effect of treatment on egg weight did not differ markedly so that the volume of yolk did not differ markedly. There are results that have no real effect because the active compounds of tannins in tamarind seeds and brotowali are in the content of herbal dregs. Function of tannins will react with proteins found in egg centipedes which have properties resembling animal skin collagen so that the tanning process occurs in the form of brown deposits that can close the pores of the egg centipede to be impermeable to gas and air, so that it will cause to minimize water evaporation and remove CO_2 it will make the formation of egg yolk volume not optimal [16].

3.4 Adding Herbal Dregs to Egg White Volume (Albumen)

The effect of adding herbal dregs on the yellow colour in table 2, based on the results of the study showed that (P<0.01) the treatment had a very significant different influence on the colour of the yolk. The results showed the best egg yolk colour in treatment 4 with the addition of 1% herbal dregs the average egg yolk colour was 3.19± 0.26. This states the use of herbal dregs as a treatment material and given with different levels will see differences in egg yolk colour in each treatment.

The results of this study on egg yolk colour have a score of 1-3 if based on other studies this score is relatively lower than the research of giving kemuning leaves in drinking water of female malon quail which produces egg yolk colour 4 which gives no real effect because the β-caroten contained in the kemuning leaves does not affect [17]. The lighting in this study is relatively short, which is 10 hours, while the lighting needed by production quail is around 16 hours [18]. Quails that get longer light will have the opportunity to consume more feed so that the nutritional needs needed by livestock are fulfilled. Feed given to quails contains β-carotene, xanthophyll, and curcumin dyes produced from herbal dregs which will be absorbed by the digestive tract organs so that it will affect the colour of the yolk [19]. Main colour pigment in herbal dregs ferementation is curcumin obtained from turmeric. Turmeric has active compounds in it essential oil and curcumin which act as natural antioxidants to repair a tissue. Curcumin can provide a natural yellow pigment to egg yolks.

This increase in egg yolk colour score is thought to be related to the deposition of the yellow pigment from curcumin at the time of egg yolk biosynthesis. While other colour pigments β-carotene and xanthophylls that feed containing more β-carotene and xanthophylls can affect the colour of the yolk in eggs [20]. β-carotene is a fat-soluble hydrocarbon and acts as a dye and antioxidant [21]. Xanthofil is a substance that can affect the pigmentation of egg yolk colouring [22].

4 Conclusion

Based on the results of the study, it can be concluded that different herbal dregs treatments have a real effect on the colour of quail egg yolks. Giving 1% herbal dregs in basal feed gives the best results due to the content of curcumin, β-carotene and xanthophyll.

References

1. Direktorat Jenderal Peternakan dan Kesehatan Hewan, Kementerian Pertanian Republik Indonesia, Statistika Peternakan dan Kesehatan Hewan: Quail Population (Direktorat Jenderal Peternakan dan Kesehatan Hewan, Kementerian Pertanian Republik Indonesia, 2022)
2. R. Resmi, H. Handoko, W. A. Sumadja, M. Maksudi, W. Saputra. *Pertumbuhan Ternak Puyuh (Coturnix-Coturnix Japonica) Yang Diberi Bungkil Kepayang (Pangium Edule Reinw)*, in Prosiding Seminar Nasional Pembangunan Pertanian Berkelanjutan Berbasis Sumber Daya Lokal, Jambi, Indonesia (2018)
3. S. W. Nursal, W. S. Juwita, J. Biogenesis **2**, 64-66 (2006)
4. H. Sudarwati, M. H. Natsir, V. M. A. Nurgiartiningsih, Statistika dan Rancangan Percobaan: Penerapan dalam Bidang Peternakan (UB Press, Malang, 2019)
5. Y. Deantara, *Evaluation of Nutrient Content, Gross Energy, pH, and Density of Fermented Herbal Dregs using Aspergillus oryzae and Sacchromyces cerevisiae as Poultry Feed Ingredients*. Thesis Universitas Brawijaya (2023)

6. A. Dewansyah, *Effects of Vitamin A Supplementation in Rations on Quail Egg Production and Quality*, Thesis Faculty of Agriculture, Sebelas Maret University Surakarta (2010)
7. USDA (United State Departemen of Agriculture), *Shell Egg Grades and* Standards (2000)
8. S. Lestari, R. Malaka, S. Garantjang, J. Sains dan Teknologi **13**, 184-189 (2013)
9. Budiman, Jurnal Agrisistem **16**, 16-19 (1991)
10. W.G. Piliang, W.G, *Strategy for Providing Sustainable Animal Feed through the Utilization of Alternative Energy*, IPB Bogor (1990)
11. M. H. Natsir, *Use of Natural Acidifier Mixture and Phytobiotics Through Encapsulation with Microwave Oven as Broiler Feed Additive*, PhD Thesis, Universitas Brawijaya (2013)
12. T.H. Quan, T.H, S. Benjakul, Journal Food Science and Technology **56**, 1104-1115 (2019)
13. B.Rizal, A. Hintono, Nurwantoro, Jurnal Animal Agriculture **1**, 208- 218 (2012)
14. T. Kurtini, K. Nova, D. Septinova, Produksi Ternak Unggas (Anugrah Utama Raharja, Bandar Lampung, 2011)
15. S. S Park, J. Kim Man, E.Kim Jib, H.Kim Sung, W.C Kang, Korean Journal Poultry Science **39**, 49-59 (2012)
16. A. Zulkarnain, S. Suroyo, S. Sestilawarti, *Nilai Indeks Putih, Indeks Kuning Dan Haugh Unit Telur Ayam Ras Yang Di Rendam Menggunakan Ekstrak Daun Salam (syzygium polyantum)*, in Prosiding Seminar Nasional Teknologi Agribisnis Peternakan (STAP), 14 – 15 June, Purwokerto, Indonesia (2022)
17. D.M Suci, M.U. Nuha, Suryahadi, Jurnal Ilmu Nutrisi dan Teknologi Pakan **17**, 73-77 (2019)
18. M. Mustakim, M. Munir, I. Irmayani, Jurnal Gallus Gallus **1**, 88-98 (2023)
19. M. Hilmi, A.U. Prastujati, A.Khusnah, Jurnal Sain Peternakan Indonesia **13**, 111-118 (2018)
20. R. Sutrisna, P. Mayangsari, Rianti, K. Nova, Jurnal Ilmiah Petrnakan 3, 47-58 (2020)
21. J. D. Blount, P. F. Surai, D. C. Houston and A. P. Møller, Functional Ecology **16**, 445-453 (2002)
22. L.B. Argo, Tristiarti, I. Mangisah, Animal Agriculture Journal **2**, 445-457 (2013)