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The Effectiveness of Adding Red Fruit Dregs (*Pandanus conoideus L*) as a Feed Additive on the External and Internal Quality of Quail Eggs

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----------*ABSTRACT*----------
This study aimed to evaluate the addition of red fruit dregs (Pandanus conoideus L) as a feed additive on quail eggs' external and internal quality. The research materials are 200 laying quails aged 30 days. The experiment's method is a completely randomized design divided into five treatments and four replications using ten quails per experimental unit. The treatments tested are P0 (basal feed), addition of red fruit dregs to feed P1 (0.25%), P2 (0.5%), P3 (0.75%) and P4 (1%). The variables used in this study are egg weight, egg index, yolk index, white egg index, shell thickness, shell weight, and egg yolk color score. Data were analyzed using ANOVA and continued with Duncan Multiple Range Test if there is a significant result. The result showed that the dregs of red fruit have a highly significant effect (P <0.01) on the eggs' external quality; those are egg weight and shell thickness, and the eggs' internal quality in the form of white egg index and egg yolk color score. However, it has no significant effect (P> 0. 05) on eggs' external quality; those are egg index and eggshell weight, also egg internal quality, that is, egg yolk index. Thus, this study concluded that the provision of 1% red fruit dregs could improve quail eggs' external and internal quality.

Keywords*: red fruit dregs, additives, egg quality, laying quail.*

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I. INTRODUCTION

Quail is poultry that is widely cultivated in Indonesia. The quail population has increased quite well from 2015; the total population of 13,782,000 birds increased to 14,107,000 heads in 2019, so the increase reached 0.6% / year. The need for feed will continue to increase along with the development of the quail population. In order to optimize the performance of the main feed, many livestock business actors add other feed. Additional substances in animal feed are commonly called feed additives. According to Natsir, Sjofjan, Eko W, and Eny Sri W (2013), feed additives are classified based on their nature. There are 2 groups; the first is nutritive additives, for instance, vitamins and minerals. The second is non-nutritive, for instance, acidifiers, probiotics, prebiotics, enzymes, and phytobiotics. Nowadays, there are more and more animal feed additives made from phytogenic ingredients. The phytobiotics in additional animal feed allegedly contain bioactive compounds that are beneficial to livestock.

Red fruit (Pandanus ConoideusLamk) is an endemic fruit or native plant that grows wild in Maluku and Papua (Bourke, 2005). The active substances in red fruit include tocopherol (vitamin E), alpha-tocopherol, and beta-carotene, which function as antioxidants that can ward off free radicals. Based on the research conducted by Yuanita(2009), red fruit dregs contains unsaturated fatty acids in the form of oleic acid (5162.9 mg Al/100gr), linoleic acid (omega 6) (438 mg Al/100gr), linolenic acid (omega 3) (201 mg Al/100gr). Tocopherol (vitamin E) in the body functions as a natural antioxidant, while beta-carotene is the initial form of vitamin A, which functions as an antidote to free radicals. Based on this content, the dregs of the red fruit are still suitable for use as a feed additive.

As one of the animal protein-producing commodities, quail eggs need to be considered based on their quality because it affects consumer interest in terms of external and internal quality. Determination and measurement of egg quality include two things, namely external quality, which includes egg weight, egg index, shell thickness, shell weight, and internal quality, including egg yolk index, white egg index, and egg yolk color score. Egg weight is influenced by several factors, including poultry, the season for laying eggs, genetics, bodyweight of the mother, and the feed consumed.

Based on the description above, it is necessary to research to determine the effect of adding red fruit dregs as a feed additive to quail eggs' external quality and internal quality.

II. MATERIAL AND METHODS

Material

The study used 200 laying quails (Coturnix coturnix japonica) aged 30 days divided into 5 treatments and 4 replications, each replication containing 10 quails with body weights between 125-127gr / head.Feeding was done 2x a day with the amount of feed as much as 25g / head / day, while drinking water was given ad libitum. Red fruit dregs with different levels were added to the basal diet consisting of corn, wheat flour, soybean meal, meat and bone meal, glutter, wheat bran, DDGS, palm oil, methionine, lysine, and cystine.The results of the proximate analysis of the feed used for the study are compiled in Table 1 and the results of the analysis of antioxidants and red fruit dregs dye used as feed additives in research feed can be seen in Table 2.

Table 1. Analysis Result of Research Feed Nutritional Content

Nutrient	Basal feed	Red Fruit Dreg
Crude Protein (%)	20.52	29.58
Dry Material (%)	88.01	95.05
Water Content (%)	11.99	4.95
Ash Content (%)	13.02	2.47
Crude Fat (%)	5.73	25.37
Crude Fiber (%)	3.29	18.82
Ca		1.32
P		0.061

Source: 1. Results of Proximate Analysis of Basal Feed in the Laboratory of Animal Nutrition and Feed, University of Brawijaya

2. Results of Proximate Analysis of Red Fruit Dregs at Balitkabi Malang

Table 2. Biochemical Content of Red Fruit Dregs

Analysis	Analysis Results
β-Carotene	197.69 µg/g
Total Carotenoid	276.54 µg/g
Anthocyanins	33.74 mg/100gr
AntioxidantsIC50	5.282 µg/ml

Source: 1.Antioxidant analysis result of State Polytechnic Laboratory of Malang

2.Beta-carotene and total carotene analysis result of Food and Nutrition Laboratory Research, Gajah Mada University, Yogyakarta

3. Anthocyanin analysis results of the Postharvest BB (Center for Post-Harvest Agricultural Research and Development) laboratory in Bogor

Methods

The method used was a field experiment applying a completely randomized design (CRD) using ANOVA, grouped into 5 treatments and 4 replications. If there is a significant difference in the study results, thewriters will conduct Duncan's Multiple Range Test. Each replication contained 10 quail with the level of distribution red fruit dregs in the feed as follows:

P0 = Basal feed

P1 = Basal feed + 0.25% red fruit dregs

P2 = Basal feed + 0.5% red fruit dregs

P3 = Basal feed + 0.75% red fruit dregs

P4 = Basal feed + 1% red fruit dregs

The variables observed in this study were egg weight (gram/egg), egg shape index, egg yolk index, white egg index, eggshell thickness (mm), eggshell weight (grams/egg), and egg yolk color score.

III. RESULT AND DISCUSSION

The results of the research on the use of red fruit dregs as a feed additive on the external and internal quality of eggs which include egg weight, egg shape index, egg yolk index, egg white index, eggshell thickness, shell weight, and yolk color score can be seen in Table 3.

Table 3. Results of External and Internal Quality of Quail Eggs

Variable	Treatment				
	P0	P1	P2	P3	P4
Egg Weight (gr/egg)	10.40 ± 0.17^{a}	10.80 ± 0.17^{b}	10.97 ± 0.08^{b}	11.47 ± 0.26^{c}	11.47 ± 0.26^{c}
Egg Index	79.57±3.04	81.39±4.92	80.19±1.04	78.65±0.94	79.05±1.09
Egg Yolk Index	0.507±0.15	0.517±0.14	0.497±0.03	0.499±0.01	0.491±0.02
Egg White Index	0.088 ± 0.004^{b}	0.071 ± 0.004^{ab}	0.067 ± 0.008^{a}	0.072 ± 0.012^{ab}	0.068 ± 0.001^{a}

Eggshell Thickness (mm)	0.241±0.004[a]	0.247±0.003[ab]	0.254±0.002[b]	0.258±0.002[bc]	0.264±0.005[c]
Eggshell weight (gr/egg)	1.045±0.006	1.089±0.008	1.090±0.006	1.088±0.007	1.125±0.005
Egg Yolk Color Score (1-15)	4.95±0.443[a]	6.15±0.574[ab]	6.55±0.191[b]	7.25±0.191[bc]	8.40±1.071[c]

Note: - Superscript notation (a-c) on the same line shows a substantial distinctness (P <0.01) and tangible (P> 0.05)

Egg Weight

The statistical analysis results in Table 3 demonstrate that the addition of red fruit dregs to the feed shows a very significant difference (P <0.01). The score in Table 3 shows that the highest egg weight is obtained in the P4 treatment (12.12 ± 0.17d) gr/egg, which occurs by adding 1% of red fruit dregs. According to the proximate results, it occurs due to the dregs of red fruit, which contains relatively high protein, that is 29.58%. As 50% of the dry weight of an egg is protein and the consumption of other substances in the feed, the additive protein content can affect the weight of the egg. The average egg weight in this study is 10.8 - 12.12 gr/egg. The factors that influence egg weight are the natural pattern of egg production, feed and maintenance, and genetics. The natural pattern of egg production is that the eggs produced when they are just starting to lay eggs are small and get bigger until the egg weight is stable.

Egg Index

Table 3 shows no significant effect in adding red fruit dregs to the egg index (P> 0.05). The analysis results prove that the highest average egg index score is P1 with the addition of 0.25% red fruit dregs in the feed. Sudrajat (2014) stated that the egg shape index obtained tends to be taper with an average of around 81.73%.Genetic, breed, and the processes that occur during egg formation, principally when the egg passes through the magnum and isthmus, will affect the egg's index.

The protein content in the feed does not affect the shape of the eggs, and it occurs because of the factor that most influences the egg index is genetics. Each quail produces a unique egg index since the egg index is an inherited trait. The variation in the egg index caused by egg rotation in the reproductive organs occurs due to the rhythm of the reproductive tract pressure or is determined by the reproductive tract's lumen diameter. The egg index is influenced by several factors, including the oviduct's muscles, albumen volume, and isthmus size, species, heredity, early laying period, egg production phase, and the parts through which the eggs pass (Zita et al., 2013).

Egg Yolk Index

The statistical analysis results in table 3 indicate that the addition of red fruit dregs to the feed does not significantly affect the egg yolk index (P> 0.05). The analysis shows that the highest average value of egg yolk index is P1 with the addition of 0.25% red fruit dregs in the feed. Alkanet al (2010) stated that the egg yolk index measurement is a method to determine the conditions inside the eggs in general by comparing the height and diameter of the egg yolk. Fresh eggs have an egg yolk index value ranging from 0.33 to 0.50, with an average egg yolk index of 0.42. The longer the eggs are stored, the yolk index value decreases due to the increase in the yolk's size due to water displacement.

The hormone estrogen stimulates the formation of egg yolk. Estrogen is a hormone stimulating the biosynthesis of vitellogenin in the liver. At the same time, vitellogenin is the essential ingredient in the formation of egg yolk. Vitellogenin, which is synthesized in the liver with the hormone estrogen's help, is secreted into the bloodstream to the gonads, increasing the concentration of vitellogenin in blood. Thus, ripe egg yolk is formed and ready to be ovulated (Herve et al., 2019). The formation of egg yolk affects the weight of the eggs produced, and if the yolk that is formed is more extensive, the generated egg will be heavier. Following the idea of Santos et al. (2011), the bigger the yolk produced, the heavier the egg weight is and vice versa.

Egg White Index

The result of statistical analysis in table 3 shows that the addition of red fruit dregs to the feed proves a significant difference to the white egg index (P <0.05). The average value indicates that the highest egg weight is obtained in treatment P0 (0.088 ± 0.04b) without red fruit dregs.

The function of measuring the egg white index is to adjust the quality of the egg white. The longer the eggs are stored, the quality of the egg whites will decrease. The decrease in egg white quality is due to room temperature, which invokes the evaporation of H2O and CO2 during storage. Egg whites contain much water; hence, during the storage time, this is the part that is most easily damaged. The longer the eggs are stored, the smaller the egg white index value is due to the accelerated degradation of ovomocin in increasing pH (Suardana and Swacita, 2009).

Eggshell Thickness

The statistical analysis in Table 3 demonstrates that the addition of red fruit dregs to the feed to shell thickness had a significant effect (P <0.01). The analysis shows that by adding1% red fruit dregs in the feed, the highest average shell thickness is P4 (0.263 ± 0.005); this is due to the high calcium and phosphorus content in red fruit dregs. Besides, it is also following the proximate results, which are 1.32% and 0.06%.

The thickness of the quail eggshell has an average of 0.22 mm. Park et al. (2016) stated that the minerals that enact a pivotal role in the process of eggshell formation are calcium and phosphorus. The thicker the eggshells, the smaller the pores, thus inhibiting egg quality decline due to evaporation and decay. Therefore, it can be said that the thicker the shells, the more egg quality is maintained. Some factors that affect eggshell quality include genetics, age of birds, ambient temperature, feed, and disease. The age of birds affects the formation of eggshells; the older the birds are, the thinner the shells are produced because birds' reproductive function has decreased due to increasing age (Duman et al., 2016).

Eggshell Weight

The result of statistical analysis in Table 3 indicates that the addition of red fruit dregs to the feed does not significantly affect eggshell weight (P> 0.05). The highest yield is treatment P4 (1.125 ± 0.005) gr/egg with the addition of 1% red fruit dregs.

Eggshell weight is influenced by the thickness of the shell and membrane of the egg. According to Yuwanta (2010), quail egg shells' weight is around 0.56 - 0.9 grams. The thicker the eggshell, the higher the weight and vice versa. The weight of the shells affects the weight of the eggs as a whole.

Egg Yolk Color Score

The egg yolk color score is measured using the Egg Yolk Color Fan by matching it with its color. The analysis results in table 3 indicate that the addition of red fruit dregs to the egg yolk color score is very significant (P <0.01). The increase in the yolk color is obtained due to the high content of carotenoids in red fruit dregs, which is 276.54 µg / gr.

Egg yolk color is influenced by carotene pigments (Kang et al., 2003). According to Yuwanta (2010), the color of egg yolk is determined by the β-carotene content found in the yolk. The color of poultry egg yolk is orange-yellow due to carotenoids containing a lot of zeaxanthin, cryptoxanthin, and lutein (xanthophyll). Each bird can change the carotene pigment into egg yolk color (North and Bell, 1992).

IV. CONCLUSION

The results of this study show that red fruit dregs had a very significant effect (P <0.01) on the external quality of eggs in the form of egg weight and shell thickness, as well as the internal quality of eggs in the form of white egg index and egg yolk color score. However, red fruit dregs have no significant effect (P> 0.05) on the external quality of eggs in egg index and eggshell weight and on the internal quality of eggs in the form of egg yolk index. This study concludes that the provision of 1% red fruit dregs can improve quail eggs' external and internal quality.

REFERENCE

[1]. Alkan, S., Karabag. K., Galic. A., Karsli. T., Balcioglu. M. S. 2010. Effects of selection for body weight and egg production on egg quality traits in Japanese Quails (*Coturnix coturnix japonica*) of different lines and relationships between these traits. Research Article. 16 (2): 239 – 244.

[2]. Bourke, R.M., 2005. Indigenous Fruit in Papua New Guinea. Departement of Human Geography.Research School of Pacific and Asian Studies. The Australian National University. Camberra

[3]. Duman, M., Sekeroglu. A., Yildirim. A., Eleroglu. H., Camci. O. 2016. Relation between egg shape index and egg quality characteristic. Europ.Poult.Sci. 80: 1 – 9.

[4]. Edi, D. N., Natsir. M. H., Djunaidi. I. H. 2018. The effect of dietary teak leaf (*Tectona grandis* Linn. *f*) on egg quality of laying hens. Scholars Journal of Agriculture and Veterinary Sciences. 5(9): 490 – 497.

[5]. Herve, T., Raphael. K. J., Ferdinand. N., Herman. N. V., Marvel. N. M. W., D'Alex. T. C., Vitrice. F. T. L. 2019. Effects of ginger (*Zingiber officinale*, Roscoe) Essential oil and laying performances, serum metabolites, and egg yolk antioxidant and cholesterol status in laying Japanese quail. Journal of Veterinary Medicine. 1 – 8.

[6]. Kang et al,. (2003). Use of lycopene, Anantioxidant carotenoid, in laying hens for egg yolk pigmentation. Asian-Aust.J.Anim. Sci. 16(12); 1799 – 1803.

[7]. Natsir. M. H, O. S Jofjan, E Widodo, and Eny Sri W. 2013. Inovasi Produksi Aditif Pakan Alami melalui Teknologi Proteksi Mikroenkapsulasi dengan *Microwave* oven Termodifikasi Sebagai Pengganti Antibiotik Pada Unggas. Penelitian Unggulan Perguruan Tinggi (M). Universitas Brawijaya. Malang.

[8]. North, M. O. & D. D. Bell. 1992. Commercial Chicken Production Manual. 4th Edition. An AVI Book Published by Van Nostrand Reinhold, New York.

[9]. Park, J. H., Song. T. W., Kim. I. 2016. Egg production, egg quality and cecal microbial populations of layers fed diets supplemented with fermented phytogenic feed additive. Tirkish Journal of Veterinary and Animal Sciences. 40: 660 – 666.

[10]. Santos, T. C., Murakami. A. E., Fanhani. J. C., Oliveira. C. A. L. 2011. Production and reproduction of egg and meat type quails reared in different group sizes. Brazilian Journal of Poultry Sciences. 13(1): 9 – 14.

[11]. Suardana, I. W. dan I. B. N. Swacita. 2009. HigieneMakanan. Kajian Teori dan prinsipdasar. Udayana University Press, Denpasar.

[12]. Sudrajat D, Kardaya D, Dihansih E, Puteri SFS. 2014. Performa produksitelurburungpuyuh yang diberiransummengandungkromiumorganik. JITV 19(4): 257-262.
[13]. Yuanita, I., S. Murtini., dan Imam Rahayu. 2009. Performa dan KualitasKarkasAyamPedaging yang DiberiPakanTambahanAmpasBuah Merah (Pandanus conoideus). Seminar Nasional TeknologiPeternakan Dan Veteriner 2009. Hal. 586-593.
[14]. Yuwanta, T. 2010. Telur dan KualitasTelur. Gadjah Mada University Press, Yogyakarta.
[15]. Zita, L., Ledvinka. Z., Klesalova. L. 2013. The effect of the age of the Japanese quails on certain egg quality traits and their relationship. VeterinarskiArhiv. 83 (2): 223 – 232

Selly Wijaya, et. al. "The Effectiveness of Adding Red Fruit Dregs (Pandanus conoideus L) as a Feed Additive on the External and Internal Quality of Quail Eggs." *The International Journal of Engineering and Science (IJES)*, 10(04), (2021): pp. 49-53.