The Quality of Japanese Quail Eggs After Administration of *Bifidobacterium sp*. and *Guazuma ulmifolia* Leaf Extract

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Abstract

This study aimed to determine the effect of *Bifidobacterium sp*. and *Guazuma ulmifolia* leaf extract on Japanese quail egg production, including egg mass, haugh unit (HU), and egg yolk colour. A total of 96 quails were in the early stages of production, which were randomized into four treatments and six replications. The treatments were (T0) without *Bifidobacterium sp*. and *G. ulmifolia* leaf extract, (T1) 0.2% *Bifidobacterium sp*., (T2) 0.2% *G. ulmifolia* leaf extract, and (T3) 0.2% *Bifidobacterium sp*. + 0.2% *G. ulmifolia* leaf extract. Egg mass data was collected in the third and fourth week of the treatment period, while the HU data and egg yolk colour were carried out on the last week of the treatment period. The treatment groups showed significant differences in egg mass. Groups T2 and T3 showed significant differences in egg yolk colour. The combination of feed additives can increase the value of HU but not significantly (p>0.05). In conclusion, the combination of 0.2% *Bifidobacterium sp*. and 0.2% *G. ulmifolia* leaf extract in drinking water can produce the highest egg quality.

Keywords: *Bifidobacterium sp*., *Guazuma ulmifolia*, egg mass, haugh unit, yolk color

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INTRODUCTION

Based on statistical data from the Directorate General of Livestock and Animal Health (2021), reported that the quail population in Indonesia from 2018 to 2020 has increased, but egg production continues to alleviate. The production of quail eggs is determined by the consumption of feed and the nutritional content in the feed. Improving the quality of the feed can also improve the quality of the eggs produced.

Improving the quality of the feed can be solved using feed additives (Haryuni *et al*., 2017). The addition of feed additives generally can be in the form of antibiotics, probiotics, phytobiotics, prebiotics, enzymes, organic acids, and essential oils (Magdalena *et al*., 2014).

Probiotics are feed additives in the form of microorganisms that improve the microfloral when consumed in sufficient quantities (Karspinska *et al*., 2001). Bifidobacterium is a bacterium that can produce acetic, formic, and lactic acids from sugar fermentation. These bacteria can also produce bacteriocins that are able to stimulate antibody (Noorrahman, 2019).

Feed additives that are safe to use other than probiotics are phytobiotics. *Guazuma ulmifolia* leaf is one of the herbal plants that can be found in Indonesia. The compounds contained in their leaves include tannins, flavonoids, saponins, alkaloids, sterols, glucose, phenolic acids, and calcium oxalate (Dewoto, 2007). Flavonoid bioactive compounds are known to improve the digestive process of feed, stabilize intestinal microflora and optimize the digestive tract (Ramiah *et al*., 2014).

This study aimed to determine the potential of the probiotic *Bifidobacterium sp*. and *G. ulmifolia* leaf extract on egg mass, haugh unit (HU), and quail egg yolk color on Japanese quail egg quality.

MATERIALS AND METHODS

This study has been declared ethically feasible by the Research Ethics Commission of

Universitas Brawijaya (021-KEP-UB-2022). This study was conducted from February – April 2022 at the Animal Laboratory, Faculty of Veterinary Medicine, Universitas Airlangga.

This study used 96 female quail (Coturnix coturnix japonica) the age of eight weeks, a concentration of $1.2x10^9$ CFU/ml isolate probiotic *Bifidobacterium sp*., the concentration of 25% the leaf extract of *G. ulmifolia*, commercial feed BP 104® from Charoen Pokphand. Enclosed battery cages with feed and drink containers, digital scales with an accuracy of 0.01 grams, rotary evaporator, masks, gloves, cage cleaners, and disinfectants, a yolk color fan on a scale of 6-16, a depth micrometer, and egg tray.

Extraction of *G. ulmifolia* leaves were carried out by a maceration process using 70% alcohol with a ratio of 1:2, i.e. 1 kg of *G. ulmifolia* flour was macerated in 2 liters of 70% alcohol for 2x24 hours, then repeated for 2x24 hours. Further, filtering was carried out to obtain the results in the form of a macerate. The obtained macerate was put into a rotary evaporator at a temperature of 40°C at a speed of 55 rpm.

This study was conducted with four treatments and 24 replications, respectively i.e. (T0) Control, (T1) *Bifidobacterium sp*. 2 ml/liter of drinking water, (T2) *G. ulmifolia* leaf extract 2 ml/liter of drinking water, (T3) *Bifidobacterium sp*. 2 ml/liter of drinking water + *G. ulmifolia* leaf extract 2 ml/liter of drinking water.

Egg mass data was collected when the quail was 11 weeks old in the third and fourth weeks of treatment. Egg mass was obtained by dividing the total egg weight produced by the quail population (Latif *et al*., 2017). Data collection on the HU value and egg yolk color were carried out when the quail was 12 weeks old in the fourth week of the treatment period. The HU value was obtained by calculating the albumin height with a Depth Micrometer and using Haugh's formula HU = 100 log formula ($H+7.57–1.7^w$), while the yolk color was measured using a yolk color fan on a scale of 6-16.

The data obtained were analyzed using the Analysis of Variance (ANOVA) method. Then, if the treatment has a significant effect ($p<0.05$), then it is continued with Duncan's multiple tests. The entire data was analyzed using SPSS 26.0.

RESULTS AND DISCUSSION

Probiotics are viable microorganisms and non-pathogenic organisms that can improve the health of the host, by balancing the diversity of intestinal microbes, improving the intestinal barrier function, and improving the quality of external and internal eggs (Lokapirnasari *et al*, 2019).

In the T1 group, the *Bifidobacterium sp*. was significantly different from the T0 group (Table 1), due to probiotics are able to inhibit the growth of pathogenic microbes (Huda *et al*., 2019) so that the nutrients absorbed by quail do not compete with pathogenic bacteria. This condition causes better absorption due to enhanced nutrient availability, so there is an increase in the quality of egg production that gets affects the egg mass (Astawa *et al*., 2018).

In T2 with the adding *G. ulmifolia* leaf extract, egg mass also increased in average value compared to T0 group (Table 1). This is presumably because of the flavonoid compounds in *G. ulmifolia* leaves have antibacterial properties that can inhibit the growth of pathogenic bacteria in the digestive tract so that in the end it will increase nutrient absorption (Edi *et al*., 2018).

In group T3 there was the highest increase in egg mass, followed by T1 and T2 (Table 1). This indicates the addition of *Bifidobacterium sp*. and *G. ulmifolia* Lamk leaf extract. each 2 ml/liter of drinking water had a positive effect on egg mass. Cath *et al*. (2012) stated that egg production and egg weight can affect egg mass, if the level of egg production and egg weight is high, egg mass will also be high. In line with this study, the highest quail egg production and weight were obtained at T3, followed by T1 and T2, with an average value higher than T0, so that it is directly proportional to the mass of eggs produced (Table 1).

The results of the one-way ANOVA analysis on egg HU did not show a significant difference ($p>0.05$) between the treatment and the T0 group. In this study, the average value of HU ranged

Table 1. Egg quality in the end of study

Variables	T0	T1	T2	T3
Egg Mass (g/quail)	7.58^{a}±0.40	8.34^{b}±0.20	8.26^{b}±0.16	8.98^{c}±0.33
Haugh Unit (HU)	92.44^{a}±1.48	92.61^{a}±1.48	92.47^{a}±1.50	93.20^{a}±1.97
Yolk Color	9.31^{a}±0.52	9.81^{ab}±0.45	10.21^{c}±0.55	10.26^{c}±0.43

^{a,b,c} Different superscripts in the same column showed significant differences (p<0.05).

from 92.44-93.21 with the value of each group being T0 of 92.44; T1 of 92.61; T2 of 92.48; and T3 of 93.21 (Table 1). The mean value of HU in this study was higher than the average value of HU in the study of Siadati *et al*. (2018), ex. 86.82-92.96 in quail with the addition of probiotics, and the average value is not much different from the research of Rahayu *et al*. (2019) which is 89.69-93.78 which combines probiotics with *G. ulmifolia* leaf extract in quail laying.

There was an increase in the HU value of each treatment compared to the T0 group, but based on the results of one-way analysis of ANOVA, the addition of *Bifidobacterium sp*. and or *G. ulmifolia* leaf extract. as much as 2 ml/liter of drinking water for 28 days, it is suspected that the performance has not yet reached the stage of increasing the HU value so that it did not showed a significant difference when compared to the T0 (Table 1).

The HU value in each treatment had good quality (quality I). It follows SNI (2006), which classifies the HU value of eggs into quality groups, including quality I with a HU value of > 72, quality II with a HU value of 62-72, quality III with a HU value of 50-60, and quality IV with a HU value of ≤ 50. The higher the HU value of an egg indicates, the better quality of the egg.

Yuniarti *et al*. (2013), explained that one of the factors that affect the HU value of eggs is the height of albumin, while the density of albumin determines the height of albumin. Albumin density is influenced by the protein content in the ration. In this study, the crude protein content in each treatment was the same, which was 18.37%, so the effect of protein on egg HU was not significantly different (Table 1).

The results of one-way ANOVA analysis on egg yolk colour showed significantly different results (p<0.05) compared to the T0 group. Duncan's test results showed that T0 was significantly different from T2 and T3, but not significantly different from T1. The order of egg yolk colour from the highest is T3 of 10.26; T2 of 10.21; T1 of 9.81; and T0 of 9.31 (Table 1).

In the T1 group, the yolk colour increased but this did not show a significant difference from the T0, while the T2 and T3 groups had a significant increase compared to the T0 and T1 (Table 1). The increase in egg yolk colour was caused by the combination of *G. ulmifolia* leaf extract. which contains carotenoids that can be efficiently absorbed and utilized by quail with the help of *Bifidobacterium sp*. so that it can increase the colour of the egg yolk. In *G. ulmifolia* contains various active chemical compounds, including alkaloids, flavonoids, saponins, tannins, mucilage, carotenoids, phenolic acids, and resins (Suharmiati, 2003). Sujana *et al*. (2006), stated that feeds containing carotenoid pigments, especially beta-carotene and xanthophylls, affect the colour of the yolk. This beta-carotene compound has a role as a precursor to vitamin A, which functions as a pigment in the yolk.

G. ulmifolia leaf extract also contains flavonoids, alkaloids, and other phenolic compounds that act as natural antioxidants (Morais *et al*, 2017). Using *G. ulmifolia* leaf extract. in the ration, was able to significantly increase the colour of the yolk. The higher colour score of the yolk, the better quality of the egg.

The results of this study have an average egg yolk colour score that is higher than compared to the study of Widiyanto and Indrawan (2018) which has an average egg yolk colour score of 6.5-7 in quail eggs given probiotic supplementation and is almost the same report from Avci *et al*. (2012) ie 9.8-10.80 in quail eggs with the addition of tomato extract.

CONCLUSION

Bifidobacterium sp. and *G. ulmifolia* leaf extract in drinking water can increase egg mass, and improve the HU value and the color of quail egg yolk. The combination of probiotics *Bifidobacterium sp*. and *G. ulmifolia* leaf extract in drinking water with a dose of 2 ml/liter of drinking water can be applied by farmers to improve the performance of quail.

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