IOP Conference Series: Earth and Environmental Science

PAPER • **OPEN ACCESS**

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To cite this article: S Nusantoro *et al* 2024 *IOP Conf. Ser.: Earth Environ. Sci.* **1338** 012019

IOP Conf. Series: Earth and Environmental Science 1338 (2024) 012019 doi:10.1088/1755-1315/1338/1/012019

Utilization of golden apple snail egg as feed additive in laying hen

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Abstract. Naturally bioresources play an important role as bio-additive sources in animal production. The eggs of golden apple snails could be a source of carotenoid, particularly astaxanthin. The goal of this experiment was to assess the impact of the eggs of golden apple snails on the growth performance of laying chickens. A feeding trial comprising three treatments of ration that were incorporated with various levels of golden apple-snail eggs was fed to the laying chickens. After two weeks of the experiment, the growth performance of the bird was assessed. The incorporation of the golden apple snail eggs in the ration affected the feed intake of laying chicken but not growth and feed conversion.

1. Introduction

Chicken egg is one of the essential food ingredients in Indonesia because of its function in providing animal protein at an affordable price. World protein consumption from chicken eggs reaches 11%, equivalent to 4 g protein/capita/day [1]. Consumption of purebred chicken eggs in Indonesia shows an ever-increasing trend, an average of 2.76% from 2010. The government pays attention to increasing the productivity of laying hens [2].

The problem currently faced is consumer preferences for quality eggs and healthy/functional organic products [3]. The scientific innovation that has been carried out to improve the quality and production of chicken eggs is fortification through feed [4]. Carotenoids are determinants of egg quality and are synonymous with functional foods [5][6][7,8]. Chicken egg carotenoids are carried out by the mother and transmitted during egg yolk formation [9,10]. Since chickens cannot internally synthesis carotenoids [11], it must be supplemented through feed.

Golden apple snail (*Pomaceae canaliculata*) is an invasive species that is a problem for the ecosystem[12] and is a rice pest that is detrimental to agriculture[13]. Golden snail eggs have a carotenoid content of 313.48 ppm, higher than carrots (60–80 ppm) or corn (15–55 ppm) [14][15][16,17]. Golden snail eggs are abundant and relatively cheap, and their nutritional composition allows golden apple snail eggs to have the potential to be used as a feed supplement, particularly for egg quality and chicken production performance.

So far, the scientific information regarding golden apple snail eggs (GSE) supplementation is still limited to brighten the color of fish

[18,19] and improve the quality of Arabic chicken eggs [20]. This scarcity of scientific information can be considered a driving factor for research to reveal golden snail eggs as biofortification for laying hens. The goal of the present experiment was to determine the inclusion of golden apple snails on growth performance of laying chicken in the stage of pre-laying period.

2. Material and method

The animal experimentation has followed the code of ethics guidelines in researches of Universitas Brawijaya Malang, approval No.118-Kep-UB-2022. Seventy two Isa-Brown laying chickens strain (*Gallus gallus domesticus*; 12 weeks old; average initial body weight was 1176.58 g/bird) were assigned in a completely randomized design. We used three iso-energetic (2910 kcal/kg) and iso-protein (18.04% of crude protein) dietary treatments, as the following;

- MF; maize-based diet, consisting of 50% maize (served as positive control)
- B; rice-based diet (served as basal diet consists of 50% broken rice, without golden apple snail meal)
- GSE; basal diet supplemented with 2% golden apple snail meal.

Chickens reared in a commercial galvanis cages in an open system housing. Lightning was following natural daylight. Each group of treatment was replicated 6 times and 4 birds per replication. Feeding and drinking were available 24 hours. The feeding trial was conducted for two weeks. Statistical analysis of all data was conducted using a one-way analysis of variance after checking for their homogeneity of variances and normal distribution. Duncan post hoc was assigned for daily feed intake.

3. Result and discussion

The growth performance of laying chicken is depicted in Figure 1. Feed intake of chicken was affected by dietary treatment ($P<0.05$). The chickens fed MF showed high feed intake compared to other treatment, but chicken treat by B and GSE resulted similar feed intake. After two weeks, the body weight was not affected by the treatment ($P>0.05$), resulting the value of 1363.33 until 1436.33 g/birth. The dietary treatment did not have any effect on the final body weight ($P>0.05$). The treatment had no impact on the increase in body weight, being in the range of 197.79 and 258.17 g/bird. Feed conversion was not affected by the treatment ($P>0.05$). It is in the range of 3.00 until 4.11

Several factors affect feed consumption in animals, such as the dietary energy, dietary protein, genetic, age, and rearing management. In the present experiment, these factors are similar. The elevating feed intake of chicken fed MF was addressed to maize as a main ingredient. Maize is commonly palatable to chicken, comparing with other foodstuffs such as rice, wheat, and millet. The equal results of growth in this experiment were addressed to the similar content of protein and energy in the feed, chicken strain, and management were similar.

Feed conversion is mainly determined by feed quality. In this research, that factor was conditioned to be homogeneous. The conversion of feed is calculated using the proporsion of feed consumption value and the gain of body weight. Feed conversion of birds that were given B and GSE are lower due to lower consumption than MF, while the output in the form of weight for each treatment is identical.

Golden apple snail is a source of carotenoids, particularly astaxanthin. The effect of dietary astaxanthin on feed intake in chicken is inconsistent. Supplementation of astaxanthin for maize-based ration did not affect feed intake [21][22]. Compared to the maize-based diet, the declining feed intake of bird-fed GSE meal in this experiment was attributed to the less palatable basal diet. In the context of weight gain and feed conversion, the inclusion of 2% GSE showed better results, although it statistically did not differ. The performance of laying chicken in the present experiment showed that golden snail eggs have good nutritional value so they can be used as a supplement/feed additive for laying hens.

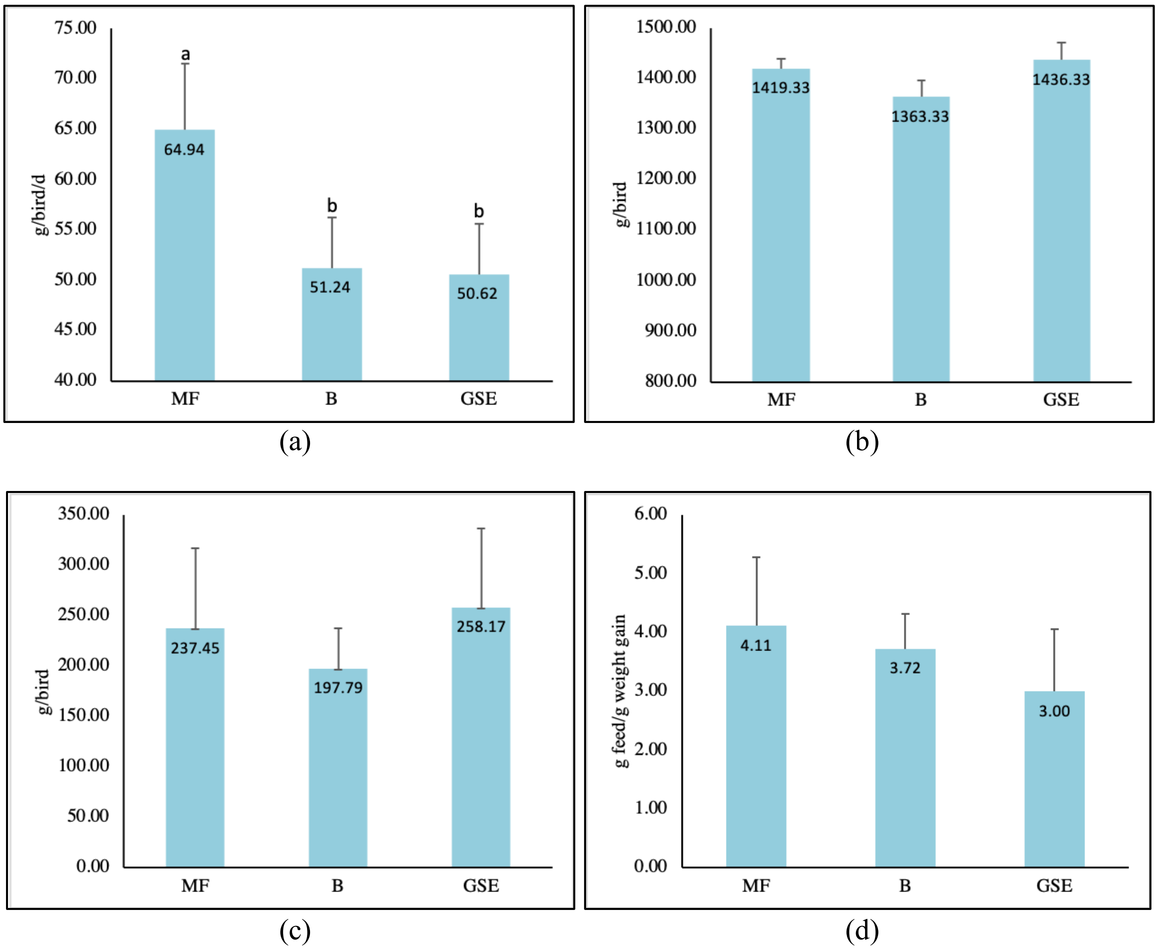

Figure 1. Growth performance of laying chicken during experimental period (Values are means, bars are represent standard deviation, x-absis is dietary treatment); (a) Feed intake (different letter above each bar indicate significant results of Duncan's post hoc), (b) final body weight, (c) weght gain, (d) feed conversion.

It is expected that the GSE meal could be utilized by laying hen and the performance of chicken fed GAS would be comparable to those chicken fed maize-based ration. The data acquired from this research showed that the hypothesis is proven. The production performance of laying chicken in this experiment showed that golden snail eggs have good nutritional value so they can be used as a supplement/feed additive for laying hens. Overall, the inclusion of GAS in the chicken diet was comparable to the positive control of this experiment. To conclude, the GAS can be utilized as a feed supplement for laying hens in the pre-laying period.

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