Quality of eggs from fermented dragon fruit (*Hylocereus polyrhizus*) flour fed Isa Brown

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Abstract. The objective of this study was to study the quality of eggs coming from Isa Brown chickens nourished with fermented dragon fruit peel (*Hylocereus polyrhizus*) dietary for 4 weeks. The experimental design used was Completely Randomized Design (CRD) with 3 treatments for 5 replications in which each consisted of 10 chickens; so that the total number of chickens was 150 heads aged 85 weeks. The given treatments were R0: feed without fermented dragon fruit peel flour in their diet, R1: feed with 5% fermented dragon fruit peel flour in their diet, and R2: feed with fermented dragon fruit peel flour + 1% Calcium in their diet. Variable observed: egg production, egg weight, exterior and interior eggshell weight, egg thickness, HU. The results showed that treatment of R0, R1, and R2 are not significantly different (P>0.05) for yolk colors, pH, Index but % egg production, egg weight, HU, egg thickness R1 and R2 is significantly different (P>0.05) than R0. Conclude this research that quality of egg Isa Brown gave ration fermentation four skin dragon fruit (*Hylocereus polyrhizus*) 5% (R1) and with fermentation dragon fruit peel flour + 1% Calcium (R2) increase the egg production, egg weight, HU, egg thickness.

1. Introduction

Isa Brown chicken is one of meat and egg-producing poultries that is increasingly reared by Balinese community. Balance diet containing either macro and micronutrients is one factor that influences and has important role in laying period. Many factors interact affecting to optimal production of However, the maintenance of Issa Brown chickens faced with a variety of problems such as the increasing feed prices are enough sharply because the feed is a primary need at the cost of approximately 60-70%. The high price of feed indirectly requires that farmers are looking for alternative feed ingredients so it can lower the feed costs and maximize revenues.

According to Dewi et al. [1] and Ahmad [2], *Saccharomyces cerevisiae* yeast can increase fibrous fiber digestibility and can act as a probiotic in poultry. Another benefit of fermentation products is to suppress the enzyme activity of 3-hydroxy-3-methylglutaryl-Co-A reductase that serves to synthesize cholesterol in the liver [3] and can decrease the amount of broiler fat [4]. Application of feed technology is absolute must be applied in the optimization of waste utilization. Application of supplementation technology utilizing superior *Saccharomyces cerevisiae* origin of yeast is very potential developed.
According to Mustika et al. [5], dragon fruit peel is an agricultural waste that has not been widely used by the community, especially in Indonesia. According Citramukti [6] part of dragon fruit, 30-35% is peel and still rarely or even not been fully utilized, although some studies have reported peel dragon fruit contains high antioxidant and contents phenolics in the dragon fruit peel amounted 28.16 mg/100 g, in addition to having antioxidant also contain anthocyanins [7].

Research on dragon fruit peel for livestock feed is still rarely done according to Mustika et al. [5] dragon fruit peel can be given up to the level of 1% and Rosa et al. [8] can be given up to the level of 4%, without have negative effects on the body of livestock. Dewi et al. [1] used 5, 7% dragon fruit peel fermentation by Saccharomyces cerevisiae to increase performance broiler chickens at 5 weeks and Dewi et al. [9] gave significantly to increased productivity Lohman brown 23 aged. But shell quality a little bit thinner than commercial ration. While for From the description above, the researcher using dragon fruit peel meal without and fermented plush calcium as a feed ingredient in diets for egg quality for Issa Brown.

2. Materials and Methods

2.1. Animal, ration and feeding treatment
This research conducted over weeks, located in Teaching Farm, Bukit Campus Faculty of Animal Science, Udayana University. A total of 85 weeks with average body 1710 ± 15 g were kept in individual cages of 30 x 30 x 35 cm.

2.2. Diets
Diets used in this research were independently prepared by recommendation Scott et al. [10] which consists of yellow corn, fish meal, soybean meal, rice bran, dragon fruit peel meal, dragon fruit peel meal fermented, coconut oil, premix and CaCO\(_3\). Diets given is iso energy (2900 Kcal/kg) and iso protein (20%), and commercial ration.

2.3. Instrument
Instruments used in this research were a diet and drinking water, torch lighting cage, machine grinding feed, knife, bowl, spoons stirrer, scissors, paper labels, markers, plastic bags, oven, stove, pans, trays, thermometer, wood, bamboo, wire, sprayer and digital scales.

2.4. Research methods
In this research, there are two stages making process meal dragon fruit peel, first making of dragon fruit peel meal is fresh dragon fruit peel chopped small, then dried and ground up into flour. Second process namely the making of dragon fruit peel meal fermented with Saccharomyces Sp. In the process of fermentation, the solution is ready for use. Fermentation process dragon fruit peel chopped small, be dried, inserted in a plastic, then moistened with solution fermentation, closed tightly (3-5 days), after it is dried, ground into flour and ready for use.

2.5. Research design
The design used was Completely Randomized Design (CRD) with 3 treatments, 5 replications in which each replication consisted of 10 chickens so that the total chicken used was 150 heads 85 weak aged. The treatments given were R0: ration without fermentation dragon fruit peel flour, R1: ration with 5% fermentation dragon fruit peel flour, and R2: ration with fermentation dragon fruit peel flour + 1% Calcium.

2.6. Observed variables
Variables observed are egg production, egg weight, exterior and interior eggshell weight, egg thickness, HU.
3. Result and Discussion
The results showed that treatment of R0, R1, and R2 are not significantly different (P>0.05) for yolk colors, pH, Index but % egg production, egg weight, HU, egg thickness R1 and R2 is significantly different (P<0.05) than R0.

According to McDonald et al. [11], energy and protein ration can be used the productivity. According to Weiss and Hogan [12], the material having the antioxidant content of livestock can reduce the effects of free radicals such as increasing feed consumption. According to Mustika et al. [5], it is because free radicals can cause oxidative stress in livestock resulting in lower feed consumption. Oxidative stress is a state of imbalance between the amount of free radicals and antioxidants in the body that can trigger the occurrence of cell damage and lowered immune system [7].

Table 1. The effect of treatment for egg quality of Isa Brown

| Variable                  | R0          | R1          | R2          | SEM |
|---------------------------|-------------|-------------|-------------|-----|
| Egg Production (%)        | 68.00\(^b\) | 70.00\(^a\) | 71.00\(^b\) | 3.6 |
| Egg Weight (g)            | 60\(^a\)    | 62\(^a\)    | 63\(^b\)    | 0.9 |
| Egg Index                 | 81\(^a\)    | 82\(^a\)    | 81\(^a\)    | 0.60|
| Egg shell weight (g)      | 6.1\(^a\)   | 6.3\(^a\)   | 6.4\(^a\)   | 0.102|
| Egg shell thickness (mm)  | 0.379\(^b\) | 0.389\(^a\) | 0.399\(^a\) | 0.06|
| Egg yolk colour           | 8.7\(^a\)   | 8.9\(^a\)   | 9\(^a\)     | 0.02|
| HU                        | 93\(^a\)    | 96\(^a\)    | 98\(^a\)    | 1.2 |

Note: 1) R0: ration without fermentation dragon fruit peel flour, R1: ration with 5% fermentation dragon fruit peel flour, and R2: ration with fermentation dragon fruit peel flour + 1% Calcium 2) Means with different superscript at the same row differ significantly (P<0.05), 3) Standard Error of Mean

One of the candidates is dragon fruit peel which is not generally utilized. The dragon fruit peel is potential as a natural colorant [13] an antibacterial against nine bacteria of food pathogen [14] and natural antioxidant [15]. The average egg production for 85 weeks is shown in Table 1. Diet without flour peel dragon fruit produced significantly lower (P<0.05) egg production (HD) as compared to both treatments R1 and R2. This is presumably due to the same nutrients supply, such as protein, energy, and fat, derived from a similar amount of feed consumption. The amount of energy, protein, and fat consumptions can affect egg production. Energy and nutrient needs for the formation of eggs are obtained from daily feed intake [16]. High egg production is usually positively correlated with increasing egg mass because egg mass is the result of egg production multiplied by egg weight [17] and further [18] explained that the egg mass is influenced by egg weight and egg production.

The results of studies on eggshells weight showed non-significant different (P>0.05) between R0, R1, and R2. But in eggshell thickness showed a significant difference (P<0.05) and treatment R2 diet resulted in higher (P<0.05) eggshell thickness compared to R1 and R0. This is due to the reduced eggshell thickness and eggshell weight with the increased egg size. The average of eggshell thickness was 0.36 – 0.389 Mm. The eggshell thickness had the same relative value because the treatment diets have relatively similar Ca dan P contents. The quality of eggshell thickness can be influenced by many factors including mineral, calcium, magnesium and phosphorus are the major inorganic constituents of the eggshell [19]. According to Kebreab et al. [20] the higher calcium intake can improve the quality of the eggshell. According to Mine and D’Siva [21], standard yolk composition of bird’s egg ranging from 32% - 35%, egg whites 52% - 58% and eggshell 9% - 14%.

The results showed that the Haugh unit ranged between 93-98, with the R2 treatment showing higher results than the other treatments. Haugh unit value was not different because each egg was stored in the same place and time. Factors affecting the value of Haugh units were time and place of
egg storage, age, the strain of livestock, nutrients, disease, and supplementation (Vit C or E) [22]. Further results by Omara [23] reported that the dietary combination of protein, methionine and choline did not significantly affect the Haugh unit.

4. Conclusion
This research has justified that the addition of fermented dragon (*Hylocereus polyrhizus*) fruit peel flour in their diet has successfully increased the egg production (egg weight, hu, and thickness) of the Isa Brown chickens.

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