

## Research article

# Impact of Fermented Dragon Fruit Peel (*Hylocereus Sp.*) Juice in Drinking Water on the Performance and Quality of Japanese Quail Eggs

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**ORCID**Gusti A.M.K. Dewi <https://orcid.org/000-002-8121-3897>**Abstract.**

The purpose of this 10-week study was to examine the impact of fermented dragon fruit peel (*Hylocereus* sp.) juice in drinking water on the performance and quality of Japanese quail eggs. A total of 200 two-week-old quails were included using a completely randomized design that included five treatments and four replications, each with ten quails. R0 = drinking water without dragon fruit peel juice; R1 = drinking water containing 1% dragon fruit peel juice; R2 = drinking water containing 1% fermented dragon fruit peel juice; R3 = drinking water containing 3% dragon fruit peel juice; R4 = drinking water containing 3% fermented dragon fruit peel juice. The performance and quality of the Japanese quail eggs were measured. The study's findings revealed that treatments R2, R3, and R4 significantly improved quail performance, body weight gain, final body weight, FCR, and egg quality, weight, HU, and yolk color when compared to R0.

**Keywords:** dragon fruit peel juice, performance, eggs quality, Japanese quail

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## 1. Introduction

Quail is very potential and efficient and quickly produces sources of animal protein both from eggs and meat to overcome the problem of malnutrition (stunting) in the community so that production needs to be increased. There are 14,43 Million in 2017 quail livestock in Indonesia which is a commodity that is starting to be in demand in the community [1] Indonesia, namely the Japanese quail (*Coturnix-coturnix japonica*) is bred as a producer of eggs and meat [2].

According to [3] that food safety problems of animal origin in the community include contamination of pathogenic microbes and antibiotic residues in meat and eggs as a side effect of antibiotic residues microbes and antibiotic in feed that act as Antibiotic Growth Promoter (AGP). Since the use of AGP is prohibited at 2018 by government, poultry workers and farmer are to fine and using herbs to replace them as natural antibiotic (curcuma, dragon fruit peel, etc.) as well as microbes that help in forming

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immunity in poultry without residues, as well as imbalance intestinal microflora [4] and [5].

According to [6], dragon fruit peel is an agricultural waste that has not been widely used by the community, especially in Indonesia, [7] 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 [8].

According to [?] and [6] dragon fruit peel is an agricultural was waste that one alternative for providing cheap and competitive feed, is through the use of waste, both agricultural and industrial was such as grape waste and dragon fruit peel waste [? ]. The steps that be taken to overcome this problem are to use dragon fruit peel [9] and [10]. Dragon fruit peel contains phytochemical compounds which include catechins, phenols, hydroquinone, flavonoids, triterpenoids, steroids, saponins, tannins, alkaloids [11]

One of way to increase nutrient content and reduce crude fiber needs to be treated with yeast *Saccharomyces cerevisiae* ,which can also increase protein digestibility, crude fiber in pollard and dragon fruit peel fermentation was obtained by researchers [12] ; [13] ; [14] in feed for ducks and native chickens. According [6] that the content of catechins can function, as an antibacterial so that the absorption of nutrients can be more optimal, besides that the content of saponins contained in dragon fruit peel can affect the amount of feed consumption. According to [15], dragon fruit peel in general can inhibit as much as 83.48% of free radicals. The red color peel of dragon fruit indicates the high contend of phenolic active substances. Which confer a degree of protection against pathogen microorganisms and modify conditions in the gastrointestinal tract [16] ; [17] end reduce the pathogen microorganisms and improving intestinal tract health.

However , no report is available on giving dragon fruit peel juice either unfermented or fermented in drinking water, on performance and quality of eggs of quail (*Coturnix - coturnix japonica*) 0-10 weeks aged.

## 2. Materials and Method

### 2.1. Animal, ration and Feeding Treatment

This research conducted over 10 weeks and this research is located atMengui Village, Denpasar Regency, Bali Province and Poultry Laboratory at Campus Faculty of Animal

Science, Udayana University. A total of DOQ Coturnix coturnix japonica used in this study.

### 2.1.1. Diets

The ration uses in this study was a commercial ration for laying quail QQ504 S produced by PT.Sierad Produce Tbk.The nutritional content of the QQ 504 S quail ration can be seen in Table 1.

TABLE 1: Nutritional Content of Commercial Ration Nutritional QQ 504 S PT. Sierad Produce Tbk.

Nutritional Conent		Totally
Water content (%)	Max	13,00
Proteins (%)	Max	20,00-22,00
Fat (%)	Max	4,00
Fiber (%)	Max	6,00
Ash (%)	Max	13,00
Calcium (%)		3,00-3,50
Available Phosphorus (%)	Min	0,40
Lysine (%)	Min	1,20
Methionine (%)	Min	0,60
Methionine + Cystine (%)	Min	0,90
Tryptophan (%)	Min	0,22
Threonine (%)	Min	0,70
ME (Kcal/kg)	Min	2700,00
Total Aflatoxin (ppb)	Max	40,00

Source: Nutrient content QQ 504 S ration PT. Sierad Produce Tbk.

### 2.2. Instrument

Instrument used in this research is a diet and drinking water, torch lighting cage, machine grinding feed, knife, bowl, spoons stirrer, scissors, paper labels, markers, plastic bags, wood, bamboo, wire, plastic carpet, sprayer and digital scales *Egg Multi Tester*.

### 2.3. 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 put into

the juice machine and ready for use true drinking water. Second process namely the making of juice dragon fruit peel fermented with *Saccharomyces Sp.* (Ahmad, 2005) [17]. In the process of fermentation, juice dragon fruit peel fermentation by adding *Saccharomyces Sp.* allowed to stand for 3 days and after 3 days the solution is ready for use.

## 2.4. Research Design

An experiment to evaluate of extract dragon fruit peel in drinking water quail was arranged by *Completely Randomized Design* (CRD) with five treatments and four replications in which each replication consisted of 10 quail so that the totally used was 200 birds. The treatment given were: R0= drinking water without extract dragon fruit peel ,R1: R0= drinking water with 1% extract dragon fruit peel , R2= drinking water with 1% extract fermented dragon fruit peel ,R3= drinking water with 3% extract dragon fruit peel ,R4= drinking water with 3% extract fermented dragon fruit peel .

## 2.5. Variable Observed

The variables measured: performance and production of the quails

## 2.6. Data analysis

Data were analysed statistic by ANOVA and when there are significant differences continued test Duncan [18].

## 3. Results and Discussion

The results obtained from the performance of quail aged 1-9 weeks given extract dragon fruit peel and extract fermentation dragon fruit peel through drinking water can be seen in Table 3.1. The initial body weights of quails in treatment R0, R1, R2, R3 and R4 each had an average value from 20.20 g - 20.45 g the statistically were not significantly different ( $P>0.05$ ). This is because to obtain a homogeneous or uniform initial body weight of quail and to obtain research material that is in accordance with the design used, with homogeneous weights. The results obtained from the performance of quail aged 0-10 weeks give extract dragon fruit peel and extract fermentation dragon fruit peel through drinking water.

TABLE 2: Performance of quail aged 0 -9 weeks given extract dragon fruit peel and extract fermentation dragon fruit peel through drinking water.

Variables			Treatment					SEM
			R0	R1	R2	R3	R4	
Initial	body	weight	20.20 <sup>a</sup>	20.38 <sup>a</sup>	20.45 <sup>a</sup>	20.23 <sup>a</sup>	20.27 <sup>a</sup>	0.32
Final	body	weight	193.11 <sup>c</sup>	196.69 <sup>b</sup>	198.97 <sup>ab</sup>	211.78 <sup>a</sup>	232.76 <sup>a</sup>	0.30
Body	weight	gain	172.9 <sup>c</sup>	176.31 <sup>b</sup>	178.52 <sup>b</sup>	191.53 <sup>a</sup>	212.49 <sup>a</sup>	2.60
Feed	consumption		570.0 <sup>a</sup>	560.57 <sup>a</sup>	558.47 <sup>a</sup>	556.25 <sup>a</sup>	559.15 <sup>a</sup>	2.72
Drinking	water		2058.2 <sup>a</sup>	2051.50 <sup>a</sup>	2050.75 <sup>a</sup>	2055.75 <sup>a</sup>	2049.24 <sup>a</sup>	2.70
consumption (ml/bird)								
FCR			3.29 <sup>a</sup>	3.17 <sup>a</sup>	3.12 <sup>a</sup>	2.91 <sup>b</sup>	2.63 <sup>b</sup>	0.05
Egg weight (g/eggs)			10.70 <sup>a</sup>	10.86 <sup>a</sup>	11.56 <sup>b</sup>	11.25 <sup>b</sup>	11.54 <sup>b</sup>	0.23
Egg yolk colour			5.00 <sup>b</sup>	5.25 <sup>b</sup>	5.75 <sup>a</sup>	5.80 <sup>a</sup>	5.96 <sup>a</sup>	0.32
Haugh Unit ((HU)			82.34 <sup>b</sup>	83.22 <sup>b</sup>	86.00 <sup>a</sup>	86.80 <sup>a</sup>	88.20 <sup>a</sup>	0.65

Notes: 1) R0 = drinking water without dragon fruit peel juice; R1 = drinking water 1%with

dragon fruit peel juice ; R2 = drinking water 1%with fermented dragon fruit peel juice; R3 = drinking water 3% with dragon fruit peel juice; and R4= drinking water 3% with fermented dragon fruit peel juice.

2) The same superscript on the same line shows no significant difference ( $P > 0.05$ ).

3) SEM “Standard Error of Treatment Means”.

The final body weight and body weight gain of quails is had an average 193.11-232.76 g/bird and 172.91-212.49 b/bird which were statistically significantly ( $P < 0.05$ ). The content of phytochemical compounds contained in dragon fruit peel has a good effect on the health of quails thereby increasing ration consumption but has not been able to increase the final body weight of the control treatment. According to [19], the phytochemical compounds found in dragon fruit peel include phenols, hydroquinone's, flavonoids, triterpenoids, steroids, saponins, tannins, and alkaloids. The final body weight and body weight gain of quails is influenced by the feed consumed which has the same nutrients so as to produce the different to body weight gain ,this is in a line with the opinion of [20]. which states that the quality and quantity of rations affect body weight , and according to[21] that the factors that affect initial body weight are the amount of feed consumed, the rate of travel of the feed in the digestive tract, the physical form of the feed, the composition of the feed and the balance of the nutritional content of the feed.

The results showed that the quail can get treatment R0,R1,R2,R3 and R4 gave Japanese quail given which doesn't or fermented dragon fruit peel through drinking water in its intestines affects nutrition, health, performance and productivity, the role of fermented dragon fruit peel stimulate gut maturity and immunity, besides helping to break down mucus, inhibiting pathogenic bacteria. Microbes also help stimulate growth by breaking down indigestible food materials and producing volatile fatty acids and vitamins. This is in accordance Mustika et al.(2014 ) [22]. and Susanti et al.(2012) [23]. the skin of red dragon fruit contains saponins which can affect the amount of feed consumption and alkaloids , flavonoids and Saponins that saponins causes a bitter taste so that it will reduce palatability, but with gave increased the body weight and body weight gain . Figure 1.

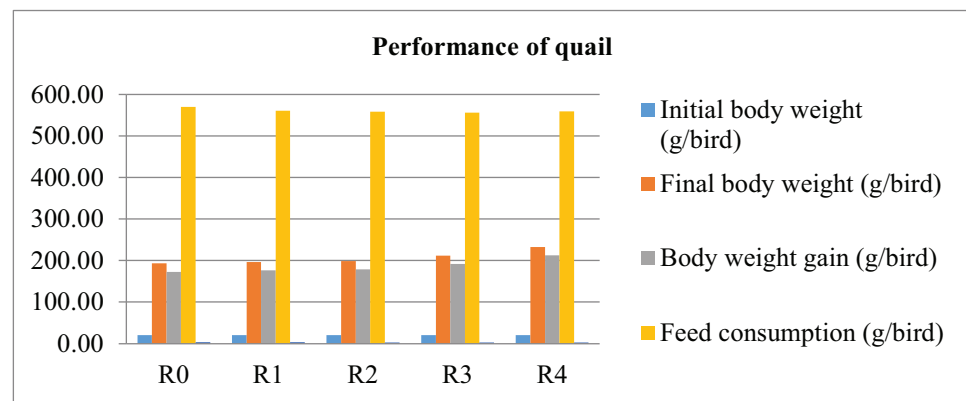
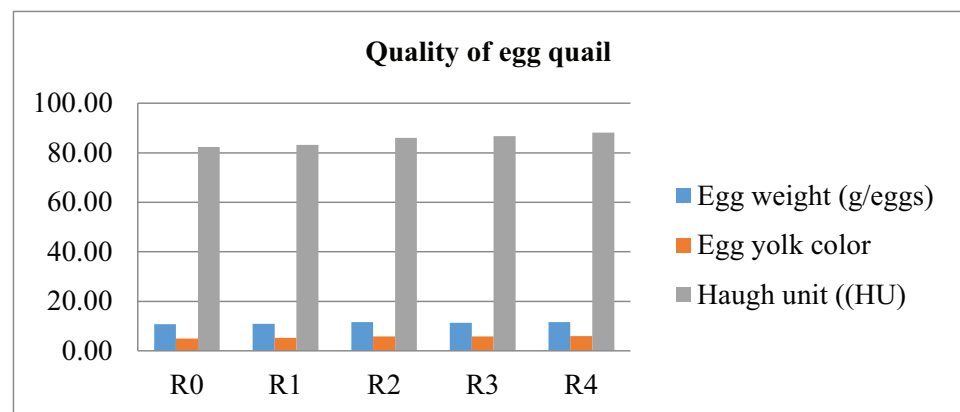


Figure 1: Performance of quail.

The ratio between feed and water consumed gave raised level of water have high mineral content or nutrition impact to microbial pathogen used as bird welfare and or water and feed suitability indicator. Water in addition to being a vital nutrient, is involved in many aspects of poultry metabolism including body temperature control, digestion and absorption of feed, transport of nutrient, and the elimination of water products, via urine, from the body [24]. The nutrients that are absorbed from the digestive tract can be disposed of in the body in several ways. They may be used immediately as a source of energy, heat production and performance.

The feed conversion ratio (FCR) on all quail given the treatment results were significantly different ( $P < 0.05$ ). Treatment. Feed conversion ratio (FCR) are used to reflection of performance. FCR is closely related to ration consumption and body weight gain. Supplementation in water can significantly decrease feed conversion ratio, reflected by [25]. that Supplementation of yeast *Saccharomyces* spp. can increase body weight gain and final body weight, feed efficiency in ducks. This is in accordance with the opinion of [26] which states that the difference in feed conversion is due to

differences in ration consumption and body weight gain. Factors that affect FCR are the quality of the ration, the technique of giving, the form and consumption of the ration and the body weight of the livestock [27]. According to [28], that the ration conversion is a measure of efficiency in the use of rations. The lower conversion value of the ration, the better the livestock in the absorption of the ration. [29]. stated that the low ration conversion rate means that the number of rations used produce 1 kg of meat is getting less. Drinking water is the most important requirement for quail, because the quail consumes twice as much water as the ration. Water consumption in this study did not a significant difference ( $P>0,05$ ) between treatments. The results of the study showed that treatment R2, R3 and R4 appears increased productivity (quality eggs weight, HU, eggs colour) of the quail significantly than R0 Table 1. and Figure 2.



**Figure 2:** Productivity and egg quality of quail.

The average yellow color in this study showed results were non significantly different from the treatment of quail given drinking water with the addition of dragon fruit peel extract at 1%(P2), 3% (P3) and 3%(P4) treatment. There is a lot of influence on the color of the yolk where the dragon fruit peel contains anthocyanin substances that can act as antioxidants. The color of the egg yolk is influenced by xanthophyll dyes which are widely found in the hydroxy -carotenoid group and also due to the relationship between the nutrient content of the ration [29]. The results of the HU analysis showed that the provision of drinking water with the addition of dragon fruit peel juice the treatment of 1% (P1),3%(P3) had no-statistically effect ( $P>0,05$ ) on HU. This has no effect on the freshness of the eggs, especially for high egg whites (still good) and because egg whites have a positive correlation with the value of HU [29] and [30]. added that there is a positive correlation between the albumin value and the HU value, namely the higher the albumin value, the higher the resulting Haugh Unit value. The higher the egg white, the higher the value of HU, the better the quality of the egg and also shows that the eggs are still new and fresh [31], so it was categorized as AA quality

eggs. HU values more than 72 are categorized as AA quality eggs, HU values 60-72 as A quality eggs, HU values 31-60 as B quality eggs, and Haugh Unit values less than 31 are categorized as C quality eggs USDA in [32]. Albumin height and Haugh Units measure the viscosity of the thick albumin, furthermore some of others internal and external quality traits of the egg were estimated using following formulae on the basis of the aforementioned measures [33].

## 4. Conclusion

The quails gave of dragon fruit peel extract without or fermented 1% as 3% in drinking water has effect increased on performance and productivity of egg production (egg quality).

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