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**Submission date:** 28-Mar-2023 05:14AM (UTC+0700)

**Submission ID:** 2048444123

**File name:** Sahara\_2021\_IOP\_Conf.\_Ser.\_Earth\_Environ.\_Sci.\_810\_012006.pdf (432.71K)

**Word count:** 3121

**Character count:** 15558

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## The Potential of Pure Chitosan in Increasing Eggshell Thickness Silver Arabic Chicken (*Silver brakel kriel*)

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**Abstract.** The quality of chicken eggs is greatly influenced by the nutrient ration consumed. Chitosan is a crustacean waste product that is biodegradable and anti-germ so it is suitable to be given to poultry. The purpose of this study was to see the effect of chitosan on the external quality of chicken eggs. The study used a completely randomized design (CRD) with 6 treatments and 5 replications, each replication consisting of 2 Arab chickens aged 4.5 months. The study was conducted for 7 weeks. The treatments given were: R0 (control ration without chitosan), R1 (ration + chitosan 0.5%), R2 (ration + chitosan 1%), R3 (ration + chitosan 1.5%), R4 (ration + chitosan 2%), R5 (ration + chitosan 2.5%). The results showed that chitosan had the potential to improve the external quality of eggs. The dose of chitosan 1.5% in the ration was significantly higher ( $P < 0.05$ ), increasing the thickness of the eggshell of all treatments, while the egg index and egg weight still showed the same value ( $P > 0.05$ ). The conclusion of this study was that the dose of 1.5% chitosan in the ration had a shell thickness 32.56% higher than the control.

### 1. Introduction

Eggs are animal protein from poultry which is needed by the body. Whole chicken eggs generally contain 13% protein [1], present in the form of a single or conjugated protein, the albumen part contains 10.30% protein and the yolk contains 16.15% protein. Egg quality must be protected from damage so that egg nutrients are maintained. One effort that can be done to slow egg damage is to increase the thickness of the eggshell. Eggs that have thick shells make it easier to store eggs, extend their shelf life, and thus slow down egg deterioration. The quality of eggshells depends on the ability of the birds to absorb calcium in the feed. Meanwhile, the quality of the eggshell is determined by the thickness, weight, and structure of the eggshell [2]. More eggshells are built up by calcium in the form of a  $\text{CaCO}_3$  compound [3] stated that the chicken eggshells that wrap the eggs weigh 9-12% of the total egg weight and contain 94% calcium carbonate, 1% calcium phosphate, and 1% magnesium carbonate. So it can be seen that the material that makes up the eggshell consists of  $\text{CaCO}_3$ , which is about 94%. The weakness of this egg is that it has a time limit for consumption because the quality of the eggs changes rapidly due to the evaporation of gas and water from the eggs. This is of course an obstacle and it is necessary to find a solution to maintain the quality of the eggs so that the nutrients in them are not damaged. Efforts that can be made are 1) protecting and maintaining the quality of the ration from contamination of microorganisms 2) by strengthening the immunity of chickens so that they are not easily infected with germs 3) accelerating the normal metabolism of chickens so that the intake of egg-forming nutrients runs smoothly. In this study, chitosan met the requirements to be used as a ration mixture because it had antimicrobial properties and enzyme immobilization. The administration of chitosan is expected to create a healthier and more conducive atmosphere in the digestive tract so that absorption can run optimally. In an in vitro study, 1.5% chitosan significantly increased protein digestibility higher than all treatments, namely 84.38% or 11.20% higher than the control [4]. Increased protein digestibility also promotes better absorption of minerals, especially



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calcium as an egg-forming material. The purpose of giving chitosan in this study was to improve the quality of the shells as an indicator of increasing the external quality of eggs.

## 2. Materials and Methods

This study used 60 female Arab chickens in the production phase. Chickens are kept in the cage with a load of 2 for 1 cage. The cage is equipped with a place to eat and drink and provide lighting. Chickens are reared for 9 weeks; consisting of 2 weeks of basal ration adaptation period and 7 weeks of treatment. The treatments given are :

R0 = basal ration without chitosan (Control)

R1 = basal ration containing 0.5% chitosan

R2 = Basal ration containing 1% chitosan

R3 = basal ration containing 1.5% chitosan

R4 = basal ration containing 2% chitosan

R5 = basal ration containing 2.5% chitosan

The rations were prepared with a crude protein content of 16.635% and metabolic energy of 2853.80 kcal/kg. Chickens were given rations 2 times a day (morning and evening), and drinking water was given *ad libitum*. In the last 2 days of the study, all eggs were collected to collect research data. The parameters measured were: egg index, egg weight, and shell thickness. Egg index is calculated based on the ratio between egg width and egg length times 100% [5]. Egg weight is obtained by weighing the eggs before they are cracked, using digital scales expressed in grams. Eggshell thickness is obtained by measuring the thickness of the shell, which is done by breaking the egg, then removing the contents of the egg. Clean the inner eggshell using a tissue. Shell thickness is measured with a screw micrometer. The data obtained were analyzed using analyzed of variance (ANOVA) according to the design used and if there is a real difference, it will be followed by a further test of Duncan's Multi Range Test (DMRT) [6].

## 3. Results and discussion

Good quality eggs will extend the shelf life. Egg quality indicators can be seen from the outer and inner performance of the eggs. Research data can be seen in Table 1.

**Table 1.** Effect of chitosan in rations on the physical characteristics of eggs

Treatments	Parameters					
	R0	R1	R2	R3	R4	R5
Egg Index	76.22 ± 0.60	76.04 ± 1.80	77.42 ± 1.09	77.64 ± 1.10	77.23 ± 0.85	76.68 ± 0.89
Egg weight (g/egg)	41.41 ± 2.43	39.54 ± 2.07	41.67 ± 3.03	41.72 ± 1.23	41.07 ± 0.93	40.34 ± 2.50
Eggshell thickness (mm)	0.43a ± 0.06	0.48ab ± 0.01	0.50bc ± 0.03	0.57c ± 0.08	0.49bc ± 0.03	0.49bc ± 0.02

Informations : R0 (Control ration without chitosan), R1 (ration + chitosan 0.5%), R2 (ration + chitosan 1%), R3 (ration + chitosan 1.5%), R4 (ration + chitosan 2%), R5 (ration + 2.5% chitosan)

### 3.1. Egg index

The index of eggs produced in this study was the same ( $P > 0.05$ ), ranging from 76.04% - 77.64% with an average of 76.87%. Egg shape is strongly influenced by the diameter of the isthmus of the chicken, the wider the isthmus diameter, the shape of the egg tends to be round, but if the diameter of the isthmus is narrow, the shape of the egg becomes oval [7]. Apart from isthmus diameter, egg shape is also influenced by genetic factors and the age of the chicken. The egg index will decrease progressively as the chicken ages or the chickens get older. The egg index in this study was balanced because the age and type of chicken used were also uniform. Generally, good chicken eggs are oval in

shape so that the blunt and pointed ends of the egg are clearer. This will make it easier to store eggs. The oval shape of the eggs ranges from 72% - 76%. The chicken egg index obtained by [8] crossing Merawang with Arabic chicken ranges from 0.76 to 0.80. or 76% -80%. The normal chicken egg index according to [9] is 70% - 80%. This means that the egg index in this study fulfills the normal egg index and is oval in shape. The results of the study by [10] with probiotic treatment found that the egg index of laying hens was 71.13% - 77.2% with an average of 74.62%. Based on the data from several research results on the egg index, it appears that there is a slight difference in results because they come from different types of treatment. This difference is very likely due to differences in genetics, age, phase of egg production, isthmus size, and volume of albumen produced. So giving chitosan in this study (Table 1) with an average egg index of 76.8% is an oval egg shape.

### 3.2. Egg weight

The weight of Arabic chicken eggs obtained by the addition of chitosan in this study was balanced ( $P > 0.05$ ), which ranged from 39.54 to 41.72 g with an average of 40.96 g. The weight of this egg belongs to the native chicken. [11] research results on free-range chickens obtained egg weights of 38 - 42 g. Meanwhile, the classification of eggs based on SNI (2008) is the weight of eggs <50 g (small), 50-60 g (medium), > 60 g (large) [12]. That is, based on SNI (2008) the weight of Arabic chicken eggs in this study is included in the small group. The egg weight of IPB D1-G7 is 40.54 g [13] which is lower than the egg weight of this Arabic chicken. According to [14], the weight of Arabic chicken eggs is 42.7 g. The weight of this egg depends on the age of the hen when laying the eggs, ration consumption and absorption of nutrients, especially protein. If high protein intake in the body will increase egg weight. In addition, egg weight is also influenced by ration consumption and age at first laying of eggs. In this study, giving chitosan which was given for 7 weeks into chicken rations also showed the same ration consumption [15] so it was predicted that protein intake was the same for egg formation. The weakness of this study is that the research time is short, and it is not sufficient to follow the course of the body's metabolism to complete absorption into the target cells, so that it is not expressed in the product.

### 3.3. Eggshell thickness

The effect of chitosan treatment on shell thickness showed a significant value ( $P < 0.05$ ). The administration of 1.5% chitosan into the ration showed that the shell thickness was 0.57 significantly higher than the control (without chitosan) which was 0.43 mm. In this study it was seen that 1.5% chitosan administration was able to increase the shell thickness 32.56% higher than the control (without chitosan). This means that chitosan has a function in accelerating mineral metabolism. If calcium absorption is high and deposits into the blood for egg formation are optimal, the thickness of the shells increases. [16] stated that a good shell thickness for the market is 0.3 - 0.33 mm so that it is not easily broken. The thick shell protects the eggs from damage due to microbial contamination thereby extending their shelf life. [17] stated that eggshell thickness is influenced by genetic traits, calcium in feed, hormones, environment, and management. The thickness of Arabic chicken eggs as a result of research [18] by giving papaya leaf waste in the form of flour and juice is 0.39 - 0.40 mm. The thickness of Lohman Brown chicken eggshells aged 18-22 weeks with the provision of fermented dragon fruit flour is 0.376-0.395 mm [19]. The differences in shell thickness values obtained from the results of this study were influenced by the calcium content of the feed and the genetic characteristics of the livestock. The results of the study chitosan administration obtained higher eggshell thickness, namely 0.43 - 0.57 mm. This means that the ration has a direct effect on the thickness of the eggshell. In this study, it has been proven that chitosan can improve protein digestibility in vitro. The administration of 1.5% chitosan increased protein purity by 84.38%, which was significantly higher than the control (without chitosan) which was 75.88% [4]. Protein deficiency will slow down and damage the growth of reproductive organs which will have an impact on egg production [20]. In this study, it is predicted that good protein digestibility will accelerate the absorption of calcium into the body of livestock due to the presence of Ca binding protein (CaBP) bonds (through active membrane transport). The absorption and transportation of minerals, especially calcium, are always related to Ca binding protein (CaBP) [21]. This phenomenon is also supported by the statement of [22] that the

mass of calcium in meat can be influenced by protein intake which has a role in the calcium transport mechanism known as calcium-binding protein (CaBP) which functions as a carrier of calcium into intestinal mucosal cells and into the blood vessels and then circulated to the tissue that is needed. Calcium is in synergy with protein in certain processes in the body [23]. Therefore better protein digestibility will accelerate the absorption of calcium into eggs.

#### 4. Conclusions

Chitosan with a dose of 1.5% was the most optimal for increasing the thickness of the Arab chicken eggshell to 0.57 mm, while the index and egg weight still showed the same value for all treatments.

#### References

- [1] Winarno F G and Koswara S 2002 *Telur: Komposisi, Penanganan dan Pengolahannya* (Bogor-M-Brio Press)
- [2] Permana D, Lamid M dan Mulyati S 2014 Perbedaan potensi pemberian bahan substitusi tepung limbah udang dan cangkang kepiting terhadap berat telur dan kerabang telur itik. *Agroveteriner*. **2**(2) 81-88
- [3] Rahmawati W A dan Nisa F C 2015 Fortifikasi Cangkang Telur pada Pembuatan Cookies (kajian Konsentrasi Tepung Cangkang Telur dan baking Powder *Jurnal Pangan dan Agro Industri* **3**(3) 1050-1061
- [4] Sahara E, Sandi S dan Yosi F 2020 Chitosan Inhibition Test Against E coli and Digestibility of the Ration in the in vitro methode. *Jurnal Pendidikan Matematika dan IPA* **11**(2) 230-242
- [5] Suprijatna E, Umiyati A dan Ruhayat K 2005 *Ilmu Dasar Ternak Unggas Cetakan I* (Jakarta-Penebar Swadaya)
- [6] Steel R G D dan Torrie J H 1991 *Prinsip dan Prosedur Statistika. Suatu Pendekatan Biometrik* Alih Bahasa Bambang Sumantri (Jakarta-PT. Gramedia)
- [7] Yumna M H, Zakaria A dan Nurgartiningih V M A 2013 Kuantitas dan kualitas telur ayam Arab (*Gallus turcicus*) Silver dan Gold. *J. Ilmu-ilmu Peternakan* **3**(2) 19-24
- [8] Widayanti N, Daryati S dan Afnan R 2019. Produksi Telur Ayam Persilangan Merawang dengan Arab *Jurnal Ilmu Produksi dan Teknologi Hasil Peternakan* **7**(3) 120-122
- [9] Abidin Z 2003 *Membuat dan Mengelola Mesin Tetas Semi Modern* (Jakarta-Agromedia Pustaka)
- [10] Dwyana Z, Ambeng, Haedar N dan Hasikha N 2019 Pengaruh pemberian probiotik terenkapsulasi pada pakan ayam petelur terhadap kolesterol telur ayam *Jurnal Ilmu Alam dan Lingkungan*. **10**(1) 29-34
- [11] Hartono T A, Puger A W, dan Nuriyasa I M 2014 Kualitas Telur Lima Jenis Ayam kampung Yang Memiliki warna Bulu Berbeda *Peternakan Tropika* **2**(2) 153-162
- [12] Badan Standarisasi Nasional 2008 *Telur Ayam Konsumsi* (Jakarta-SNI 01- 39262008 BSN)
- [13] Habiburahman R, Darwati S, Sumantri C, Rukmiasih 2020 Produksi Telur dan Kualitas Telur Ayam IPB D-1 G7 Serta Pendugaan Nilai Ripitabilitasnya *Jurnal Ilmu Produksi dan Teknologi Hasil Peternakan* **8**(2) 97-101
- [14] Dwyanto K dan Prijono S N 2007 *Keanekaragaman Sumber Daya Hayati Ayam Lokal Indonesia* (Jakarta-Pusat Penelitian Biologi Lembaga Ilmu Pengetahuan Indonesia)
- [15] Sahara E, Sandi S, Yosi F, Alexa R 2020 Pengaruh Pemberian Kitosan dalam Ransum terhadap Peforma Ayam Arab Silver *JINTP* **2**(1) 35-41
- [16] Soeparno, Rihastuti R A, Indratiningsih dan Triatmojo S 2011 *Dasar Teknologi Hasil Ternak Fakultas Peternakan Universitas Gadjah Mada* (Yogyakarta-Gadjah Mada University Press)
- [17] Oguntunji A O and Alabi O M 2010 Influence of high enviromental temperature on egg production and shell quality: a review. *World's Poultry Science J.l* **66** 739-750
- [18] Muharlien dan Ani Nurgartiningih V M 2015 Pemanfaatan limbah daun pepaya dalam bentuk tepung dan jus untuk meningkatkan performans produksi ayam Arab *Re. j. of life sci.* **2**(2) 93-100

- [19] Kurniawan A, Dewi G A M K, and Wiyana I K A 2019 *Pengaruh Pemberian Tepung Kulit Buah Naga (Hylocereus polyrhizus) Terfermentasi dalam ransum terhadap Kualitas Eksternal dan Internal Telur Ayam Lohmann Brown Umur 18-22 Minggu*
- [20] Manurung T L, Praseno K, Saraswati T R 2013 Panjang dan Bobot oviduk setelah pemberian tepung kunyit dan tepung ikan pada puyuh (*Coturnix coturnix japonica*). *Buletin Anatomi dan Fisiologi* **XXI**(2): 29-34
- [21] Mentari S A, Mahfudz L D dan Suthama N 2014 Massa protein dan lemak daging pada ayam broiler yang diberi tepung temukunci (*Boensenbergia pandurata* ROXB) dalam ransum *Anim. Agri. J.* **3** (2) 211-220
- [22] Syafitri Y E, Yudianto V D dan Suthama N 2015 Pemberian Ekstrak Daun Beluntas (*Pluchea indica* Less) dan Klorin terhadap Massa Kalsium dan Massa Protein Daging pada Ayam Broiler *Animal Agriculture J.* **4**(1) 155-164
- [23] Heryandi Y 2006 Perbaikan kualitas telur ayam ras melalui perubahan waktu pemberian dan kandungan protein ransum *Jurnal Peternakan Indonesia* **11**(3) 261-271

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