

# The Effect of Wheat Bran Dietary Fibre on Cholesterol Content of Egg Yolk Laying Ducks

*by* Suci Wulandari

---

**Submission date:** 18-Feb-2021 01:11PM (UTC+0700)

**Submission ID:** 1512110561

**File name:** Pantaya\_2020\_IOP\_Conf.\_Ser.\_Earth\_Environ.\_Sci.\_411\_012040.pdf (692.84K)

**Word count:** 3042

**Character count:** 14918

**PAPER • OPEN ACCESS**

## The Effect of Wheat Bran Dietary Fibre on Cholesterol Content of Egg Yolk Laying Ducks

To cite this article: D. Pantaya *et al* 2020 *IOP Conf. Ser.: Earth Environ. Sci.* **411** 012040

View the [article online](#) for updates and enhancements.

**The 17th International Symposium on Solid Oxide Fuel Cells (SOFC-XVII)**

**DIGITAL MEETING • July 18-23, 2021**

**EXTENDED Abstract Submission Deadline: February 19, 2021**



## The Effect of Wheat Bran Dietary Fibre on Cholesterol Content of Egg Yolk Laying Ducks

D. Pantaya<sup>1</sup>, R. A Effendi<sup>1</sup>, S Wulandari<sup>1</sup> and U. Suryadi<sup>1</sup>

<sup>1</sup>Animal Science Department, Politeknik Negeri Jember, Indonesia.

Email : dadieek@yahoo.com

**Abstract.** To determine the influence of level of wheat bran supplementation on production performance, and egg yolk cholesterol traits of laying ducks, 48 laying ducks (40-week-old) were randomly assigned into four groups with 4 replications of 3 birds each. Treatment 1 ducks were received the control diet without wheat bran contained 17,21 % CP and 2917 kkal ME/kg. Treatment 2,3 and 4 ducks were received the basal diet supplemented with 10,20 and 30% wheat bran for 8-weeks. Results showed that dietary supplementation of wheat bran had no effect ( $P>0.05$ ) on laying ducks egg production and feed egg ratio over the entire feeding period. Yolk cholesterol content was lower ( $P<0.05$ ) in all wheat bran supplementation at one day after treatment. There were decreased ( $P<0.05$ ) contents of yolk cholesterol compared to ducks fed control diet but no difference was exhibited in egg yolk cholesterol among diet with wheat bran supplementation. It could be concluded that wheat bran supplementation could lower an egg yolk cholesterol levels and improve the egg quality in laying ducks.

### 1. Introduction

Duck eggs are recognized as a complete source of protein, lipids, vitamins and other nutrient, but egg also contains a high level of cholesterol which is strongly associated with several pathologies of cardiovascular disease. The current recommended for daily intake of cholesterol is less than 300 mg and some people limit their egg consumption to avoid increasing the level of blood cholesterol [1]. Therefore, some efforts to reduce of cholesterol in the eggs consumption not only for healthy aspect but also be beneficial for poultry industries. Recently some feed supplement already used to regulate the egg yolk cholesterol level such as probiotics [2] and essential plants oil [3]. It has previously reported that crude fiber lowered concentration serum cholesterol by inhabiting cholesterol absorption. There have been some studies reporting the effects of fiber on the cholesterol concentration. [4] have reported that sun flower meal, rice bran and alfalfa fiber. In this study egg cholesterol can be decreased by mechanism hypocholesterolemic effect in the presence of fiber substances. This process can suppress the process of lipolysis in the liver.

Wheat bran is a by product of flour milling process and consist of the protective layers of wheat grains. It contains considerable amounts of protein, amino acids, and a good source of B-group vitamins but low metabolizable energy [5]. Nevertheless, the use of wheat bran in poultry feeding is limited due to the high fiber content. The fibre content of wheat bran is primarily arabinoxylan. The long polymers of arabinoxylan have a high water holding capacity and increased intestinal viscosity. Despite these findings, the application of wheat bran in the diets of duck layers

1  
has not been fully documented. The aim of the current study was to determine the effects of wheat bran dietary fibre on cholesterol content of egg yolk laying duck.

## 2. Material and Methods

### 1 Birds, Diet, Experimental Design

A total of 48 laying ducks (Khaki Campbell) at the age of 27 weeks were used for the 2 weeks study. Started treatment at 28 until 30 weeks laying ducks. Birds were randomly divided into four dietary treatments, control diet (P0), contain 10% wheat bran on diet (P1), contain 20% wheat bran on diet (P2) and contain 30% wheat bran on diet (P3) with 4 replicates of 3 ducks per replication. For water given by ad libitum. Ducks in each replication were kept in (150 cm length × 100 cm width × 150 cm height) in one areas. Cage was used in outdoor house with roof tile and used rice husk for litter. Before started treatments, ducks was fed with control diet for 21 days and at day 22 until day 30 ducks fed diet combine with wheat bran for diet adaptation. The control diet was a corn, soybean meal, commercial feed, palm oil and rice bran. Table 1 shown formulation of diets and chemical composition of diets. Crude protein, fat, energy were analysed according to the method of AOAC [6].

**Table 1. Formulation Diets and Chemical Composition**

	Treatments			
	Control	10% WB	20% WB	30% WB
Corn meal (%)	30	36	35	22
Duck Layer Concentrate (%)	25	25	25	24
Rice Bran (%)	44,5	26	16	20
Wheat Bran (%)	0	10	20	30
Palm Oil (%)	0,5	3	4	4
Total	100	100	100	100
Metabolism Energy (kkal/kg)	2917,00	2945,20	2867,25	2700,90
Crude Protein (%)	17,21	17,13	17,48	18,11
Crude Fiber (%)	2,85	3,64	4,58	5,72
Calsium (%)	3,10	3,10	3,10	2,98
Phospor (%)	0,48	0,57	0,67	0,75

WB = Wheat Bran

### 1 Feed Intake and Productions Performance

Mortality and health status of hens were observed daily during the experimental period. Eggs from each replicate was counted and weighed daily to measure laying rate and average egg weight. Feed consumption was record weekly in each replicate and calculated as g per day per hen. Feed conversion ratio was expressed as g feed per g egg. Egg weight and the egg production rate were also recorded for all treatments in the acclimation period to guarantee the similar pre-experimental values. The calculation of egg production and feed egg ration shows below this.

$$\text{Henday} = \frac{\text{Total produced of Eggs}}{\text{Total population}} \times \text{Feed Consumption (g)}$$

$$\text{Feed Egg Ratio} = \frac{\quad}{\text{Weight of Eggs (g)}}$$

### Egg Quality

The egg quality measured in this research egg weight, egg thick shell, albumin height, yolk height, yolk colour score and haugh unit. That measure collected with randomly design with 4 replications at 4 days for eggs collecting sample. In 2 days, 5 days, 10 days and 12 days after treatments diets. The eggshell thickness was detected based on the average thickness of rounded end and pointed end. Egg weight was record during start treatments until the end of treatments. Egg weight measured with digital balancing, albumin height, yolk height and haugh unit measured with caliper. Yolk colour score measured with yolk colour fan. Haugh unit Formulation according to [7] :

$$\text{HU} = 100 \log_{10} (\text{H} - 1.7\text{W} \cdot 0.37 + 7.57)$$

$$\text{H} = \text{Albumin height (mm) and W} = \text{Egg weight (g)}$$

### Egg Yolk Cholesterol

Egg yolk cholesterol were measure in this research 8 times for collecting samples at 4 treatments with 3 replications. That eggs collected at day 1, days 3, days 6, days 9, day 11, days 13, days 14 and days 15 after treatments. Cholesterol of egg tested with 1 g sample into centrifuge tube have contents 10 mL alcohol aceton solution (1:1) after that boiled and centrifuge with 3000 rpm during 15 minutes. Steam supernatan until remain the residue and dilute in chloroform solution. Put that supernatan in dark room and measured with wave length absorbance 680 nm until 10 minutes (changed green colour). Compare with cholesterol standard solution. Formulation for calculation cholesterol levels [8] :

$$\text{Egg Cholesterol} \left( \frac{\text{mg}}{100 \text{ g}} \right) = \frac{\text{sample absorbance}}{\text{standard absorbance}} \times 0,4 (\text{concentration standard}) - \frac{100}{\text{Sample weight}}$$

## 3. Result and Discussion

### Feed Intake and Productions Performance

The average of feed consumption shown in **Table 2**. According statistical analysis, feed consumption in each treatments haven't any differences. Feed consumption in this research is 199 g/day/bird. Feed consumption formulation according isoprotein and isoenergy components. While, hemicellulose (NDF-ADF) shown linear increase concentration with wheat bran percentation in feed. Therefore, with same feed intake, protein consumption and energy metabolism except hemicellulose consumption. Hemicellulose consumption in feed with wheat bran have higher than control feed, this was matched with aim of research for knowed crude fiber in duck feed. The average of egg production, egg weight and hen day shown in **Table 2**. According statistical analysis, productions performance haven't any differences in feed with wheat bran and control feed. From this result shown, high hemicellulose consumption haven't effect in production of laying duck, laying duck can toleranced high hemicellulose in feed. From before research by Bidura et al [9] 15% wheat bran in hen feed can reduced 2,91% egg production than control feed but in this research used ducks haven't any differences. According to report from [10] ducks more toleranced `with high crude fiber in feed caused duck secum can more digested crude fiber. High cruber fiber can fermentated in duck secum with bacteria and changed to energy. So that, in this research, haven't effect in productions

performance caused fiber conversion optimization capabilities to VFA (*volatile fatty acid*) and become energy for ducks [11].

**Table 2.** Effects Wheat Bran Contain In Diets On Performance Of 28 Weeks Laying Ducks

	Wheat Bran (%)				SEM	P-value
	0	10	20	30		
Feed Consumption, g	194.6	196.9	193.1	199.9	1.48	0.31
Egg Weight, g	70.76	68.19	73.27	70.41	1.04	0.37
Egg Production, %	71.25	65.88	66.07	64.45	1.49	0.85
Feed Egg Ratio, g/g	4.39	5.42	4.73	5.40	0.26	0.54

SEM: *Standart Error of Mean*

**Table 3.** Effects Wheat Bran Contain In Diets On Egg Quality Of 28 Weeks Laying Ducks

Egg Quality	Wheat Bran (%)				SEM	P value
	0	10	20	30		
<b>Day 2</b>						
Shell thickness, mm	0.026	0.018	0.021	0.024	0.002	0.24
Albumin height, mm	0.129	0.119	0.125	0.136	0.004	0.91
Yolk height, mm	0.355	0.418	0.371	0.395	0.014	0.46
Haugh Unit	152.66	151.60	153.07	151.24	0.432	0.45
Yolk Colour	12 <sup>a</sup>	13 <sup>a</sup>	14 <sup>b</sup>	13 <sup>a</sup>	0.408	0.02
<b>Day 5</b>						
Shell thickness, mm	0.020	0.024	0.024	0.024	0.001	0.59
Albumin height, mm	0.111	0.121	0.111	0.099	0.005	0.58
Yolk height, mm	0.346 <sup>a</sup>	0.402 <sup>b</sup>	0.383 <sup>a</sup>	0.393 <sup>a</sup>	0.014	0.03
Haugh Unit	151.38	150.67	150.73	150.41	0.206	0.91
Yolk Colour	13 <sup>a</sup>	13 <sup>a</sup>	14 <sup>b</sup>	13 <sup>a</sup>	0.250	0.03
<b>Day 10</b>						
Shell thickness, mm	0.029	0.025	0.025	0.024	0.001	0.59
Albumin height, mm	0.107	0.105	0.109	0.116	0.002	0.83
Yolk height, mm	0.394	0.405	0.404	0.350	0.013	0.45
Haugh Unit	150.03	149.59	150.55	151.40	0.389	0.08
Yolk Colour	12 <sup>a</sup>	12 <sup>a</sup>	14 <sup>b</sup>	13 <sup>a</sup>	0.479	0.003
<b>Day 12</b>						
Shell thickness, mm	0.026	0.029	0.024	0.021	0.002	0.08
Albumin height, mm	0.115	0.110	0.128	0.095	0.007	0.67
Yolk height, mm	0.386	0.405	0.410	0.398	0.005	0.81
Haugh Unit	150.14 <sup>a</sup>	149.44 <sup>a</sup>	153.22 <sup>b</sup>	150.98 <sup>a</sup>	0.821	0.05
Yolk Colour	12 <sup>a</sup>	12 <sup>a</sup>	13 <sup>b</sup>	13 <sup>a</sup>	0.250	0.003

SEM: *Standart Error of Mean*

### Egg Quality

Egg quality profil shown in **Table 3**. From analysis statistical result haven't any differences treatment feed with wheat bran and control feed to egg shell thickness, albumin height, yolk height, haugh unit and yolk color. From that result, wheat bran used in duck feed haven't effect in egg quality, haven't effect in sheel thickness suspected wheat bran added not affect to mineral utilization such as calsium and phospor. Haven't effect in shell thickness caused by haven't differences too in feed consumption. The researchers reported, were not relations between mineral consumption with

internal egg quality like albumin height. While yolk colour suspected related with carotenoid consumption. In this research haven't effect in yolk colour caused same carotenoid consumption.

Piliang et al [12] reported yolk colour caused carotenoid intake and haven't yolk colour changed shown carotenoid utilization by crude fiber hemmicellulose. Haven't effect in shell thickness shown wheat bran added in duck feed still within tolerance and haven't effect to in mineral utilization for duck egg shell thickness. In feed treatments have same concentration.

#### Egg Yolk Cholesterol

The average of egg yolk cholesterol were have been studied from day 1 until day 15 (Table 4) in duck feed treatment with wheat bran had higher than duck feed control (641,29 vs 470,12 mg/100g). Egg yolk cholesterol decreased by 26,69%. Hemicellulose content namely pentosan in wheat bran very difficult to digest by digestive tract of monogastric animal and that is can affect feed digestion [13]. Pentosan in wheat bran can decreased egg yolk cholesterol in digestive tract, pentosan caused rate of digesta become fast so when nutrition absorption for cholesterol formation who syntesis in heart become decreased and produced low egg yolk cholesterol. According [14] crube fiber can help absorb cholesterol when nutrition absorption in intestine. Cholesterol absorbed will thrown away with feces.

**Table 4.** Effects Wheat Bran Contain In Diets On Egg Cholesterol (mg/g) Of 28 Weeks Laying Ducks (n=4)

Days Treatments	After	Wheat Bran (%)				SEM	P value	-
		0	10	20	30			
1		601.03 <sup>a</sup>	440.92 <sup>b</sup>	524.75 <sup>b</sup>	461.76 <sup>b</sup>	36.02	0.004	
3		628.48 <sup>a</sup>	470.32 <sup>b</sup>	478.34 <sup>b</sup>	430.30 <sup>b</sup>	43.49	0.003	
6		617.51	557.06	556.16	490.66	25.90	0.09	
9		672.80 <sup>a</sup>	442.47 <sup>b</sup>	447.74 <sup>b</sup>	533.52 <sup>b</sup>	53.77	0.001	
11		552.03	392.69	-	370.80	49.46	0.56	
13		622.31 <sup>a</sup>	448.69 <sup>b</sup>	385.95 <sup>b</sup>	438.98 <sup>b</sup>	51.33	0.001	
14		747.53 <sup>a</sup>	464.59 <sup>a</sup>	453.20 <sup>b</sup>	438.98 <sup>b</sup>	74.00	0.004	
15		645.93 <sup>a</sup>	426.63 <sup>b</sup>	489.91 <sup>b</sup>	505.54 <sup>b</sup>	46.24	0.001	

SEM: *Standart Error of Mean*

#### 4. Conclusion

According this research, feed treatments in laying duck with wheat bran and control feed can be concluded haven't any differences in feed consumption, productions performance and egg quality. But, in egg yolk cholesterol have any diferences with control feed and treatments feed with wheat bran. Egg yolk cholesterol reduced by 26,69% from 641,29 to 470,12 mg/100g.

#### 5. Acknowledgement

This study supported by INDOFOOD SUKSES MAKMUR Tbk in the programs INDOFOOD Riset NUGRAHA (IRN) 2018.

#### 6. References

- [1] Diez-Espino, J,F J Basterra-Gortari,J Salas-Salvado,P Buil-Cosiales,D Corella,H Schroder,R Estruch,E Ros,E Gomez-Gracia,F Aros,M Fiol,J Lapetra,L Serra-Majem,X Pinto,N Babio,L Quiles,M Fito,A Marti, andE Toledo. 2017. Egg consumption and cardiovascular disease according to diabetic status: The PREDIMED study. *Clinical nutrition (Edinburgh, Scotland)* 36(4):1015-1021.

- [2] Djoussé, L and J M Gaziano. 2008. Egg Consumption and Cardiovascular Disease and Mortality The Physicians' Health Study. *The American journal of clinical nutrition* 87(4):964-969.
- [3] Elson, C E, G L Underbakke, P Hanson, E Shrago, R H Wainberg, and A A Qureshi. 1989. Impact of lemongrass oil, an essential oil, on serum cholesterol. *Lipids* 24(8):677-679.
- [4] McNaughton, J L. 1978. Effect of dietary fiber on egg yolk, liver, and plasma cholesterol concentrations of the laying hen. *The Journal of nutrition* 108(11):1842-1848.
- [5] Pantaya, D. 2005. Penambahan enzim dari cairan rumen untuk meningkatkan kandungan energi metabolis wheat bran. *Majalah Ilmiah Peternakan* Vol 8 No 1:2-9.
- [6] AOAC. 2005. Official Method of Analysis (18th Ed). *Association of Official Analytical Chemists International, Maryland, USA*. 7. H.
- [7] Haugh R. 1937. The Haugh unit for measuring egg quality U.S. *Egg Poultry Mag.* 43, 552- 555, 572-573.
- [8] Schunack, W., Mayer. K. & Haake. M., 1990, *Senyawa Obat Buku Pelajaran Kimia Farmasi*, Edisi 2, diterjemahkan oleh Wattiemena, J. R. & Soebito S., Yogyakarta, Gadjah Mada University Press, 654.
- [9] Bidura, I G. N. G., Puspani, E., Warmadewi, D.A., Susila, T.G.O., Dan Sudiastira, I W. 2014. Pengaruh Penggunaan Bran Terfermentasi Dengan Ragi Tape Dalam Ransum Terhadap Produksi Telur Ayam Lohmann Brown. *Majalah Ilmiah Peternakan*, Vol 17 No 1, Hal 4-9
- [10] Yuwanta, Tri. S.U. 2004. *Dasar Ternak Unggas*. Yogyakarta: Kanisius.
- [11] Sutrisno, R. 2011. Penggunaan Beberapa Tingkat Serat Kasar dalam Ransum Itik Jantan Sedang Bertumbuh. *Jurnal Penelitian Pertanian Terapan* Vol. 11 (3): 112-118
- [12] Piliang, W.G., A. Suprayogi, N. Kusmorini, M. Hasanah, S. Yuliani, dan Risfaheri. 2001. Efek Pemberian Daun Katuk (*Sauropus androgynus*) Dalam Ransum Terhadap Kandungan Kolesterol Karkas dan Telur Ayam Lokal. Lembaga Penelitian Institut Pertanian Bogor Bekerjasama dengan Badan Penelitian dan Pengembangan Pertanian.
- [13] Schutte JB, De Jong J, van Weerden EJ, van Baak MJ. 1992. Nutritional Value Of D-Xylose and L-Arabinose for Broiler Chicks. *Bri Poult Sci* 33:89-100.
- [14] Vranjes V, Wenk C. 1995. The Influence Of Extruded vs Untreated Barley In The Feed, With And Without Dietary Enzyme Supplement On Broiler Performance. *Animal Feed Sci and Tech*, 21-32.



# The Effect of Wheat Bran Dietary Fibre on Cholesterol Content of Egg Yolk Laying Ducks

---

## ORIGINALITY REPORT

---

<b>11</b> %	<b>13</b> %	<b>6</b> %	<b>14</b> %
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

---

## PRIMARY SOURCES

---

<b>1</b>	<b>www.tandfonline.com</b> Internet Source	<b>7</b> %
<b>2</b>	<b>Submitted to Padjadjaran University</b> Student Paper	<b>5</b> %

---

Exclude quotes    On  
Exclude bibliography    On

Exclude matches    < 3%