

## THE ADDITION OF FRESH GARLIC (*Allium sativum* L.) IN DUCK FEED REDUCES CHOLESTEROL CONTENT OF DUCK EGG

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### ABSTRACT

The objective of this study was to determine the effect of feeding fresh garlic to ducks on decreasing the cholesterol level of duck eggs. This study composed of two treatment groups. The duck in the first group (control) was fed local feed without supplemented with fresh garlic, while in the second group was fed with local feed and supplemented with 50 grams of fresh garlic/duck/day. Egg yolk cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), and triglycerides (TG) analysis were carried out at the end of the study using the ether extract method and then with the Cholesterol Oksidase Para Amino Penazone (CHOD-PAP) or enzymatic color test. Data was analyzed using t-test. The results showed that fresh garlic reduced total cholesterol, LDL fraction, and triglyceride, but increased the HDL fraction of duck egg yolk. The total cholesterol, LDL fraction, and triglyceride of duck egg yolks dropped by around 15.98 mg/dL (8.06%), 10.40 mg/dL (12.97%), 64.92 mg/dL (12.71%), respectively, while the HDL fraction increased by 11.40 mg/dL (19.32%) The results of this study indicated that fresh garlic can be used to produce specific products such as low cholesterol and low fat duck eggs.

Key words: cholesterol, duck eggs, fresh garlic

### ABSTRAK

Tujuan dari penelitian ini adalah mengetahui pengaruh pemberian bawang putih segar terhadap penurunan kadar kolesterol telur itik. Dalam penelitian ini digunakan dua perlakuan yaitu perlakuan pertama (kontrol) adalah pemberian pakan lokal tanpa diberikan bawang putih segar, sedangkan perlakuan kedua adalah pemberian pakan lokal dengan diberikan 50 g/ekor/hari bawang putih segar. Analisis kadar kolesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), dan triglycerides (TG) kuning telur dilakukan pada akhir penelitian dengan metode ekstrak ether dan selanjutnya dengan prosedur Cholesterol Oksidase Para Amino Penazone (CHOD-PAP) atau test warna enzimatik. Data dianalisis menggunakan uji t. Hasil penelitian menunjukkan bahwa pemberian bawang putih segar dapat menurunkan kadar total kolesterol, fraksi LDL, dan kadar trigliserida kuning telur itik, serta menaikkan kadar fraksi HDL kuning telur itik. Kadar total kolesterol kuning telur itik turun sekitar 15,98 mg/dl (8,06%), fraksi HDL naik 11,40 mg/dl (19,32%), fraksi LDL turun 10,40 mg/dl (12,97%), dan kadar trigliserida turun sekitar 64,92 mg/dl (12,71%). Hasil penelitian ini menunjukkan bahwa bawang putih segar dapat digunakan untuk menghasilkan produk spesifik seperti telur itik rendah kolesterol dan lemak.

Kata kunci: kolesterol, telur itik, bawang putih

### INTRODUCTION

Several research on cholesterol in relation to the diseases such as atherosclerosis, stroke, coronary heart disease, and liver cancer has been reported previously (Anonymous, 2015). Consumption of food containing high cholesterol resulted in high plasma cholesterol, thus cholesterol are classified as a dangerous food ingredient. Cholesterol is a product of animal metabolism which is found in foods derived from animals such as meat, liver, brain, and egg yolk. The cholesterol content of duck egg is quite high based on a research conducted by Jaya *et al.* (2015).

Some research which have been previously conducted on measuring the cholesterol level in laying hens (Sharma *et al.*, 1979; Jaya and Syamsuddin, 2004; Utama and Sri, 2005), quails (El-Habbak *et al.*, 1989), broilers (Horton *et al.*, 1991; Konjufca *et al.*, 1995 and Jaya, 1997; Dono, 2010), and rats (Priskila, 2008; Wignjoesastro *et al.*, 2014) after fed with garlic addition in feed, showed that there is a reduction of cholesterol level in blood and meat. However the studies on duck egg cholesterol levels is still limited. Therefore, the efforts to reduce cholesterol levels of duck eggs need to be done, such as by adding fresh garlic (*Allium sativum* L.) in feed since ducks able to consume fresh ingredients.

### MATERIAL AND METHODS

This cross-sectional study was carried out in the "Mong Gelemong" Duck Farmer Group for 6 weeks using 100 laying ducks which divided into two groups. Group I was control group which given only local feed and Group II was given local feed added with 50 g of fresh ground garlic for 6 consecutive weeks. Each group consisted of 50 ducks which maintained in individual cages. The animal was fed restrictedly, while drinking water was given *ad libitum*. On day 43rd, some evaluations on total cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL), and triglyceride (TG) content in yolk; and the level of consumption and conversion of feed, egg production and weight were performed.

The examination of cholesterol, HDL, LDL, and TG levels was carried out by separated the yolk from the white using a yolk separator and weighed. Two egg yolks were shaken until homogeneous, then 5 ml of homogeneous egg yolk and 5 ml of alcohol-acetone 1:1 (v/v) solution were added into test tube. The test tube was immediately covered with aluminum foil and mixed until the filtrate clumped, heated in hot water until the solution boiled then stored for 3 minutes. The mixture was centrifuged at 8000 rpm for 10 minutes followed by filtration.

## Experimental Procedure

The examination of egg yolk total cholesterol was carried out by filled test tubes with 10 µL of yolk filtrate and mixed with cholesterol reagents until the volume was 1000 µL except for one tube which only contained cholesterol reagent and distilled water as blank solution, then incubated for 10 minutes. Then the absorbance was measured by spectrophotometer with the wavelength of 546 nm and a factor of 853 for yolk total cholesterol and a factor of 1040 for egg yolk triglycerides.

The examination of egg yolk HDL was carried out by added 200 µL of egg yolk filtrate with 500 µL of HDL reagent, then centrifuged for 10 minutes at 3000 rpm to obtain the supernatant. Subsequently, 100 µL of the supernatant was mixed with HDL reagent until the volume was 1000 µL except for one tube which contained only HDL reagent and distilled water as blank solution, followed by incubated for 10 minutes. The absorbance was then measured using spectrophotometer with a wavelength of 546 nm by a factor of 325.1. Similar procedure was implemented to examine egg yolk LDL, except for using 100 µL of LDL reagents and a factor of 519.4. Data was analyzed using t-test.

## RESULTS AND DISCUSSION

During the research, the duck was not exposed to a deadly disease and only 1 mortality was observed. The mortality was considered as sudden death due to stress factor and was not attributed to the effect of the treatment of feeding fresh garlic. The average data of total cholesterol, HDL fraction, LDL fraction, and TG of duck eggs analyzed are presented in Table 1.

### Total Cholesterol Level of Duck Egg Yolk

Table 1 showed that there had been a significant decrease ( $P \leq 0.01$ ) in total cholesterol levels of duck egg yolk due to the administration of fresh garlic. As compared to control, total cholesterol dropped around 15.98 mg/dL (8.06%). Overall, this study revealed that the higher the administration of fresh garlic, the lower the total cholesterol level of duck egg yolks. This was in

line with the research conducted by Jaya *et al.* (2004) which stated that there was a decrease in the cholesterol content of Arabic chicken eggs when they were given a garlic capsule. Similarly, Jaya (1997) also found that there was a decrease in cholesterol content of broiler chicken after fed with diet containing garlic flour.

### HDL Fraction Level of Duck Egg Yolk

The main function of HDL fraction is in terms of its ability to take cholesterol from peripheral tissues, carried to the liver to be degraded and the results of cholesterol breakdown will then be excreted through bile. From these function, it can be interpreted that the higher the HDL fraction, the better for the animal body because more cholesterol deposits from peripheral tissues can be transported to the liver to be removed through bile.

From Table 1, it can be seen that the administration of fresh garlic in laying duck feed greatly affected ( $P \leq 0.01$ ) the HDL fraction levels of duck egg yolk. Furthermore, feeding 50 g of fresh garlic/duck/day increased 11.40 mg/dL (19.32%) HDL fractions of duck egg yolk. Jaya *et al.* (2004) state that the higher the HDL fraction, the better for the body, and result in a decrease in total cholesterol levels.

### LDL Fraction of Duck Egg Yolk

Overall this study showed that feeding fresh garlic significantly ( $P \leq 0.01$ ) reduced the LDL fraction of duck egg yolk. The lowest LDL fraction of duck egg yolk (69.80 mg/dL) observed in the administration of fresh garlic as much as 50 g/duck/day, while the highest LDL fraction (80.20 mg/dL) was found in a duck that was not given fresh garlic (control). The difference amount between these 2 treatment group was around 10.40 mg/dL (12.97%). The results of this study indicated that the higher the administration of fresh garlic, the lower the LDL fraction of duck egg yolk. This was in line with the research conducted by Jaya *et al.*, (2004) that LDL has the main function of being able to deposit the cholesterol in the tunica intima of blood vessels so it can aggravate atherosclerotic plaque in the area. Therefore, the lower level of LDL fraction, the better for the body and can cause a decrease in total cholesterol levels.

**Table 1.** The average level of total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), and triglycerides (TG) of duck egg yolk due to the effect of fresh garlic feeding (mg/dL)

Parameters	Fresh garlic feeding (g/duck/day)	
	0	50
Cholesterol	198.30±53.56 <sup>a</sup>	182.32±28.66 <sup>b</sup>
HDL fraction	59.00±7.82 <sup>a</sup>	70.40±11.60 <sup>b</sup>
LDL fraction	80.20±34.90 <sup>a</sup>	69.80±27.52 <sup>b</sup>
TG	510.98±54.46 <sup>a</sup>	446.06±64.07 <sup>b</sup>

<sup>a,b</sup>Different superscripts within the same row indicate significant differences ( $P \leq 0.01$ )

**Table 2.** The average feed consumption, egg weight, egg production, and feed conversion of laying ducks

Parameters	Fresh garlic feeding (g/duck/day)	
	0	50
Feed consumption (g/duck/day)	145.10±31.09 <sup>a</sup>	150.85±27.03 <sup>a</sup>
Egg weight (g)	66.30±3.35 <sup>a</sup>	67.00±3.45 <sup>a</sup>
Egg production (eggs/day)	30.00±14.65 <sup>a</sup>	31.00±12.76 <sup>a</sup>
Feed conversion	2.19±0.12 <sup>a</sup>	2.25±0.17 <sup>a</sup>

<sup>a</sup>Similar superscripts within the same row indicate not significant differences ( $P \geq 0.05$ )

### Triglyceride Levels of Duck Egg Yolk

Feeding fresh garlic significantly ( $P \leq 0.01$ ) reduced the triglyceride levels of duck egg yolk. The lowest triglyceride levels of duck egg yolk (446.06 mg/dL) occurred in laying ducks gave 50 g of fresh garlic/duck/day, while the highest (510.98 mg/dL) was found in laying ducks that was not fed with fresh garlic (control). The big difference was a decrease of around 64.92 mg/dL (12.71%).

### Feed Consumption, Egg Weight, Egg Production and Feed Conversion

The average feed consumption, egg weight, egg production and feed conversion of laying ducks after being fed with fresh garlic during the study were listed in Table 2.

Table 2 revealed that the administration of fresh garlic did not affect ( $P \geq 0.05$ ) feed consumption/duck/day. Although not significantly different, numerically there was a tendency for an increase in feed consumption. This means that the administration of fresh garlic can increase feed consumption due to the content of garlic which stimulates the appetite of the laying ducks. Similar result was also observed in egg weight, egg production and feed conversion. Feeding fresh garlic numerically increase egg weight and production as well as feed conversion but did not significantly differ compared to control group ( $P \geq 0.05$ ). This finding was closely related to feed consumption, in which the more feed was consumed the higher egg weight and production was produced.

### CONCLUSION

Fresh garlic feeding can reduce levels of total cholesterol, LDL fraction, and triglycerides, but it increase HDL fraction of duck egg yolk. The results of this study indicated that fresh garlic can be used to produce specific products such as low cholesterol and low fat duck eggs.

### ACKNOWLEDGEMENT

Acknowledgments are directed to the Directorate General of Research and Development Strengthening,

Ministry of Research, Technology and Higher Education for funding assistance through the Applied Product Research scheme for 2017 budget year.

### REFERENCES

- Anonymous. 2015. Bawang putih untuk menurunkan kadar kolesterol. **CDK-226**. 42(3):192 (Abstr.).
- Dono, N.D. 2010. Kualitas daging ayam broiler yang mendapatkan tepung bawang putih dan tepung temulawak dalam ransum. **JITV**. 15(2):81-87.
- El-Habbak, M.M.E., K. Saleh, M.S. Arbid, A.G. Hegazi, and H. Sofy. 1989. Influence of garlic (*Allium sativum* L.) on some biological and biochemical changes in Japanese quail with special reference to its hypocholesterolemic activity. **Arch. fur Geflu.** 53:73-79.
- Febyan, S., H. Wijaya, J. Adinata, and J. Hudyono. 2015. Peranan allicin dari ekstrak bawang putih sebagai pengobatan komplemen alternatif hipertensi stadium I. **CDK-227**. 42(4):303-306.
- Horton, G.M.J., M.J. Fennell, and B.M. Prasad. 1991. Effect of dietary garlic (*Allium sativum*) on performance, carcass composition and blood chemistry changes in broiler chickens. **Canada J. Anim. Sci.** 71:939-942.
- Imelda, M. and S. Kurniawan. 2013. Peranan garlic (bawang putih) pada pengelolaan hipertensi. **CDK-209**. 40(10):746-750.
- Jaya, I.N.S. 1997. Pengaruh Penambahan Bawang Putih (*Allium sativum* L.) dalam Pakan pada Kadar Kolesterol Ayam Broiler. **Tesis**. Program Pascasarjana Institut Pertanian Bogor. Bogor.
- Jaya, I.N.S. and C. Syamsuddin. 2004. Pengaruh Pemberian Kapsul Bawang Putih (*Allium sativum* L.) terhadap Penurunan Kadar Kolesterol Ayam Petelur. **Research Report Staff Research Grant TPSDP Universitas Mataram**. Mataram.
- Jaya, I.N.S., D.K. Purnamasari, and T.S. Binetra. 2015. Kajian Mengenai Kandungan Kolesterol Telur Itik dan Telur Asin di Pulau Lombok sebagai Antisipasi terhadap Respon Wisatawan yang Berkunjung ke Pulau Lombok. **Laporan Penelitian Fundamental DIKTI**. Universitas Mataram. Mataram.
- Konjufca, V., G.M. Pesti, and R.I. Bakalli. 1995. The influence of dietary garlic powder on the cholesterol content of broiler chickens. **Poult. Sci.** 1(1):15 (Abstr.).
- Priskila, M. 2008. Pengaruh Pemberian Ekstrak Bawang Putih (*Allium Sativum*, Linn.) terhadap Penurunan Rasio antara Kolesterol Total dengan Kolesterol HDL pada Tikus Putih (*Rattus norvegicus*) yang Hiperkolesterolemik. **Tesis**. Fakultas Kedokteran Universitas Sebelas Maret Surakarta. Solo.
- Sharma, R.K., R.A. Singh, R.N. Pal, and C.K. Aggarwal. 1979. Cholesterol content of chicken egg as affected by feeding garlic (*Allium sativum* L.), sarpagandha (*Rowlfia serpentina*) and nicotinic acid. **Haryana Agr. Uni J. Res.** 9:263-265.
- Sutama, S.I.N. and A.L. Sri. 2005. Pengaruh suplementasi bawang putih (*Allium sativum* L.) terhadap produksi dan kandungan kolesterol telur ayam hysex brown. **Anim. Prod.** 10(3):168-173.
- Wignjosoesastro, C., Z. Arieselia, and Dewi. 2014. Pengaruh bawang putih (*Allium Sativum* L.) terhadap pencegahan hiperkolesterolemia pada tikus. **Damianus J. Med.** 13(1):9-16.