The Effect of Dietary Candlenut Powder on Blood Profile and Meat Cholesterol Content of Broilers

(Pengaruh penambahan tepung biji kemiri terhadap profil darah ayam pedaging dan kandungan kolesterol daging)

Fitria Tridyana Putri[1], Edhy Sudjarwo[1] and Osfar Sjofjan[2]

[1] Department of Animal Production, Faculty of Animal Husbandry, University of Brawijaya,
[2] Department of Animal Nutrition and Feed Sciences, Faculty of Animal Husbandry, University of Brawijaya

ABSTRACT The purpose of this research was to investigate the use of candlenut powder (*Aleurites mollucana* (L.) Willd.) as feed additive on blood profile and meat cholesterol content of broilers. Materials used in this research were 200 day-old broiler chicks. Research method was *in vivo* on Completely Randomized Design with 5 treatments (P0 = basal diets only, P1 = basal diets + 0.25% candlenut powder, P2 = basal diets + 0.5% candlenut powder, P3 = basal diets + 0.75% candlenut powder, P4 = basal diets + 1% candlenut powder), each treatment was replicated 5 times. Variables measured were blood profile (erythrocyte, hemoglobin, mean corpuscular volume, and mean corpuscular hemoglobin) and meat cholesterol content. Data were analyzed by using Analysis of Variance. Data with significant different effects were further analyzed by using Duncan's Multiple Range Test. The results showed that candlenut powder usage as feed additive had a highly significant effect on ($P<0.01$) erythrocyte and hemoglobin levels. Candlenut powder also significantly affect ($P<0.05$) mean corpuscular hemoglobin (MCH), but did not significantly affect ($P>0.05$) mean corpuscular volume (MCV) levels. Broilers fed candlenut powder had lower ($P<0.01$) meat cholesterol content compared to those fed basal diets only. It might be concluded that the use of candlenut powder as feed additive at the level of 1% is safely recommended to give better blood profile and reduce meat cholesterol content of broilers.

Keywords: broilers, blood profile, candlenut powder, feed additive, meat cholesterol

ABSTRAK Tujuan penelitian ini untuk mengevaluasi pemanfaatan tepung biji kemiri (*Aleurites mollucana* (L.) Willd.) sebagai aditif pakan terhadap profil darah dan kandungan kolesterol daging ayam pedaging. Materi yang digunakan adalah 200 ekor day old chicks (DOC) ayam pedaging. Metode penelitian menggunakan percobaan *in vivo* pada Rancangan Acak Lengkap (RAL) dengan 5 perlakuan (P0 = pakan basal, P1 = pakan basal + 0.25% tepung biji kemiri, P2 = pakan basal + 0.5% tepung biji kemiri, P3 = pakan basal + 0.75% tepung biji kemiri, P4 = pakan basal + 1% tepung biji kemiri), setiap perlakuan diulang sebanyak 5 kali. Data dianalisis menggunakan analisis variansi (ANOVA) perbedaan yang signifikan dilanjutkan dengan Uji Jarak Berganda Duncan's. Hasil penelitian menunjukkan bahwa pemanfaatan tepung biji kemiri sebagai aditif pakan memberikan perbedaan yang sangat nyata ($P<0,01$) terhadap jumlah eritrosit dan hemoglobin. Tepung biji kemiri juga memberikan pengaruh yang nyata ($P<0,05$) terhadap *mean corpuscular hemoglobin* (MCH), tetapi tidak memberikan pengaruh yang nyata terhadap *mean corpuscular volume* (MCV) darah ayam. Ayam pedaging yang diberi pakan dengan penambahan tepung biji kemiri memiliki kandungan kolesterol daging yang lebih rendah ($P<0,01$) dibandingkan dengan yang hanya diberi pakan basal. Kesimpulan dari penelitian ini adalah bahwa penambahan tepung biji kemiri sebanyak 1% dapat memberikan profil darah yang lebih baik dan efektif untuk menurunkan kandungan kolesterol daging ayam pedaging.

Kata Kunci: ayam pedaging, imbuhan pakan, kolesterol daging, profil darah, tepung biji kemiri

INTRODUCTION

Feed cost represents about 60 to 70% of total cost in poultry production, so the feeding strategy is the most important factor affecting the profitability. For several decades, the use of Antibiotic Growth Promoters (AGPs) has practically accepted as one of the feeding strategies which could improve the profitability of poultry production. However, in the current perspective, the use of AGPs is no longer suitable to be used in animal production due to

their side effects such as residue in animal product and the development of resistant microorganisms. Hence, Indonesia has been officially banned the use of AGPs in animal production since January 1, 2018 (Regulation of Minister of Agriculture Republic of Indonesia, Number 14/Permentan/PK.350/5/2017).

The use of phytobiotics has been attracting interest to replace AGPs. One of the potential phytobiotics is candlenut (*Aleurites mollucana* (L.) Willd.). Rohaida (2014) noted that candlenut contains total phenol and total antioxidant in the amount of 127.6 mg/100 and 212.9 mg/100 g, respectively. Moreover, candlenut also could be used as a source of essential fatty acids for poultry. Rohaida *et al.*, (2014) reported that candlenut contains essential fatty acids in the form of linolenic acid (29.5%), linoleic acid (41.6%), oleic acid (21.6%), palmitic acid (4.9%), and stearic acid (2.4%). Recently, research on the effect of candlenut on blood profile and meat cholesterol content of broilers is still very limited. Therefore, the purpose of this research was to provide valuable information on the use of candlenut powder (*Aleurites mollucana* (L.) Willd.) as feed additive on blood profile and meat cholesterol content of broilers.

MATERIALS AND METHODS

A total of 200 one-day-old broiler chicks with the average initial body weight of 34.7±7.9 g/bird were reared until 35 days. The birds were randomly allocated into 25 pens with 8 birds per pen. The birds were fed 1 of 5 diets, either P0 = basal diets only, P1 = basal diets + 0.25% candlenut powder, P2 = basal diets + 0.5% candlenut powder, P3 = basal diets + 0.75% candlenut powder, P4 = basal diets + 1% candlenut powder. Each experimental treatment was replicated 5 times. During the experimental period, feed and drinking water were offered *ad libitum*.

Basal diet used in this study was BR1 commercial diet which contained 3,199 Kcal of metabolizable energy and 22.68% of crude protein. Candlenut powder was made by the following methods: candlenut was weighted

and then crushed by using food processor. After that, it was filtered by using powder filter and then air-dried under room temperature. Nutrient content of candlenut powder and experimental diets showed in Table 1.

Table 1. Nutrient content of candlenut powder and experimental diets

Nutrient content	CNP	P0	P1	P2	P3	P4
Dry matter (%)	96.59	88.67	88.69	88.71	88.73	88.75
Crude protein (%)	19.31	20.68	20.67	20.67	20.67	20.66
Ether extract (%)	2.23	3.32	3.32	3.32	3.32	3.31
Crude fiber (%)	65.29	6.22	6.37	6.52	6.66	6.81
Ash (%)	2.83	4.72	4.71	4.71	4.70	4.70
Gross energy (Kcal/kg)	7,559	2,374	2,381	2,388	2,396	2,403

CNP = candlenut powder, P0 = basal diets only, P1 = basal diets + 0.25% candlenut powder, P2 = basal diets + 0.5% candlenut powder, P3 = basal diets + 0.75% candlenut powder, P4 = basal diets + 1% candlenut powder

At the end of experimental treatment, one bird per each replicate was randomly chosen for analysis of blood profile and meat cholesterol content. Two ml of blood samples were collected from wing vein and placed into a vacutainer containing EDTA as anticoagulant. The birds were not fasted before blood collection. Erythrocyte, hemoglobin, mean corpuscular volume (MCV), and mean corpuscular hemoglobin (MCH) were measured by using Hematology Analyzer (Fahmi *et al.*, 2017). After blood sampling, the birds were then slaughtered, defeathered and eviscerated. Breast meat was collected and used for analysis of meat cholesterol content (AOAC, 2005).

Data were analyzed by using Analysis of Variance. Data with significant different effects were further analyzed by using Duncan's Multiple Range Test. Data were considered significant at $P<0.05$ and highly significant at $P<0.01$.

RESULTS AND DISCUSSIONS

The use of candlenut powder as feed additive had a highly significant effect ($P<0.01$) on erythrocyte and hemoglobin levels (Table 2). Broilers fed candlenut powder in P2, P3, and P4 had higher ($P<0.01$) erythrocyte and hemoglobin levels compared to those fed P0. The erythrocyte and hemoglobin levels of broilers in this study were closed to the previous findings. Kim *et al.,* (2013) showed

The Effect of Dietary Candlenut Powder on Blood Profile and Meat Cholesterol Content of Broilers (Fitria Tridyana Putri, *et al*)

64

that erythrocyte level of chicken was 2.40 to 2.70 10^6/mm^3. In another study, Talebi *et al.*, (2005) noted that hemoglobin level of broilers was 13.38 g/dL. The increase of blood lipid profile of broiler in this present study may be related with the essential fatty acid content in candlenut powder. Previously, Wiraprasidi *et al.,* (2017) explained that essential fatty acid had crucial role to support red blood cell formation. For that reason, the increase of candlenut supplementation in the diet may increase essential fatty acid intake and consequently could increase blood profile.

Table 2. Effect of candlenut powder as feed additive on blood profile and meat cholesterol content of broilers

Treatment	Erythrocyte (10^6/mm^3)	Hemoglobin (g/dL)	MCV (fl)	MCH (pg)	Meat cholesterol (mg/100 g)
P0	2.25 ± 0.05^A	9.96 ± 0.11^A	143.10 ± 1.78	42.82 ± 0.33^a	82.99 ± 0.18^D
P1	2.34 ± 0.00^{AB}	10.01 ± 0.08^A	144.80 ± 1.59	44.13 ± 0.37^b	80.49 ± 0.47^C
P2	2.46 ± 0.09^{BC}	10.87 ± 0.27^B	147.10 ± 1.74	44.15 ± 0.48^b	77.80 ± 0.36^B
P3	2.46 ± 0.09^{BC}	11.08 ± 0.38^{BC}	146.10 ± 3.56	44.52 ± 2.08^b	74.80 ± 0.46^A
P4	2.58 ± 0.09^C	11.31 ± 0.15^C	147.00 ± 2.48	45.22 ± 0.07^b	74.80 ± 0.49^A

P0 = basal diets only, P1 = basal diets + 0.25% candlenut powder, P2 = basal diets + 0.5% candlenut powder, P3 = basal diets + 0.75% candlenut powder, P4 = basal diets + 1% candlenut powder
[a-b] Different superscripts at the same column indicate significant differences at P<0.05
[A-D] Different superscripts at the same column indicate significant differences at P<0.01

Broilers in P1, P2, P3, and P4 groups had higher (P<0.05) MCH level compared to those in P0 group (Table 2). However, dietary treatments did not reveal any differences on MCV level of broilers. Previously, Fahmi *et al.*, (2017) found that diet supplemented with *Spirulina platensis* did not affect MCV level of broilers.

The use of candlenut powder was effective to reduce meat cholesterol content of broiler. Broilers fed P1, P2, P3 and P4 had lower (P<0.01) meat cholesterol content compared to P0 (Table 2). Previously, Al-Najdwi and Abdullah (2002) reported that cholesterol content of skinless broiler meat was ranged between 133-202 mg/100 g dry matter, while cholesterol content of whole broiler meat was ranged between 261 to 407 mg/100 g dry matter. The decrease of meat cholesterol content as affected by candlenut powder supplementation may be due to the present of essential fatty acid in candlenut powder. Previously, it was reported that the substitution of rapeseed oil for lard, in order to increase intake of essential fatty acid, could decrease

meat cholesterol content in broiler (Skrivan *et al.*, 2000)

CONCLUSION

It is concluded that the use of candlenut powder as feed additive at the level of 1% could give better blood profile and effective to reduce meat cholesterol content of broilers.

REFERENCES

Al-Najdawi, R. and Abdullah, B., 2002. Proximate composition, selected minerals, cholesterol content and lipid oxidation of mechanically and handdeboned chickens from the Jordanian market. J. Meat. Sci. 61:243-247.

AOAC, 2005. Official Methods of Analysis. Association of Official Analytical Chemists, Washington DC.

Fahmi, F.W., Widiastuti, E. and Sugiharto, S., 2017. The effect of feeding duration of *Spirulina platensis* in ration on red blood cells profile of broiler chicken (in Bahasa Indonesia). Jurnal Ilmu-Ilmu Peternakan, 27(3):54-62.

Kim, M.J., Parvin, R., Mushtaq, M.M.H., Hwangbo, J., Kim, J.H., Na, J.C., Kim, D.W., Kang, H.K., Kim, C.D., Cho, K.O. and Yang, C.B., 2013. Growth performance and hematological traits of broiler chickens reared under assorted monochromatic light sources. Poult. Sci. 92(6): 1461-1466.

Regulation of Minister of Agriculture Republic of Indonesia, Number 14/Permentan/PK.350/5/2017. Classification of animal drugs (in Bahasa Indonesia).http://perundangan.pertanian.go.id/admin/file/Permentan%2014-2017%20Klasifikasi%20Obat%20Hewan.pdf. Accessed 29 April 2018.

Rohaida A.R., 2014. Effects of ground candlenut (*Aleurites moluccana* (L.) Willd.) kernel on growth performance and fatty acid composition in broiler

chickens. M.Sc. Thesis. School of Graduate Studies. Universiti Putra Malaysia. Malaysia.

Rohaida A.R., Alimon, A.R., and Sazili, A. Q., 2014. Fatty acid composition of breast and thigh muscles of broiler fed diets supplemented with candle nut kernel meal subjected to different heat treatments. Mal. J. Anim. Sci. 17(1):47-60.

Skrivan, M., Skrivanova, V., Marounek, M., Tumova, E. and Wolf, J., 2000. Influence of dietary fat source and copper supplementation on broiler performance, fatty acid profile of meat and depot fat, and on cholesterol content in meat. British Poultry Science, 41(5), pp.608-614.

Talebi A., Rezaei, S.A., Chai, R.R. and Sahraei, R., 2005. Comparative studies on haematological values of broiler strains (*Ross, Cobb, Arbor-acres* and *Arian*). Int. J. Poult. Sci. 4(8): 573-579.

Wiraprasidi, I.P.A., Kawengian, S.E., and Mayulu, N., 2017. Faktor-faktor yang berhubungan dengan kadar hemoglobin pada ibu hamil di Puskesmas Lolak. Jurnal e-Biomedik (eBm). 5(2): 1-13.

The Effect of Dietary Candlenut Powder on Blood Profile and Meat Cholesterol Content of Broilers (Fitria Tridyana Putri, *et al)*

66