International Research Journal of Engineering, IT & Scientific Research
Available online at https://sloap.org/journals/index.php/irjeis/
Vol. 3 No. 3, May 2017, pages: 31~44
ISSN: 2454-2261
https://sloap.org/journals/index.php/irjeis/article/view/562

Supplementation of Moringa (Moringa oliefera) Powder into Ration in Increasing the Quality of Broiler's Meat

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Article history:

Received: 9 November 2016
Accepted: 30 March 2017
Published: 31 May 2017

Keywords:

broilers;
meat quality;
moringa leaf meal;
powder;
supplementation;

Abstract

Guaranteed broiler meat in term of health aspect is necessary currently. Fat and cholesterol contents on broilers are one of quality aspects that should be considered, in which high fat and cholesterol levels would give direct impact on the health of the consumer. Therefore efforts to reduce fat and cholesterol levels of broiler meat are considered to be important. One of the alternatives that could be carried is by supplementing Moringa leaves powder to the chicken ration. Active substances contained by Moringa leaves are expected reduce the fat and cholesterol levels. This research aimed to measure carcass weight, carcass percentage, sub-cutaneous fat and cholesterol contents of the broiler meats, which feed by the supplemented ration. The research used 60 strain CP 707 broiler chickens at an age of 2 weeks, for 5 weeks. The research applied Completely Randomized Design (CRD) method with 5 treatments and 4 repetitions. Those treatments are feeding chickens without Moringa leaves powder supplementation (P0), feeding with 3% Moringa leaves powder supplementation (P1), feeding with 6% Moringa leaves powder supplementation (P2), feeding with 9% Moringa leaves powder supplementation (P3) and with 12% moringa leaves powder supplementation (P4). Each treatment was repeated 4 times, in which each repetition consisted of 3 broiler chickens. The research lasted for five weeks. The variables that were measured were carcass weight, carcass percentage, subcutaneous fat, and cholesterol content of the meat. Base on a result of the research, it could be concluded that supplementation of Moringa leaves powder to the ratio could reduce a subcutaneous fat content of upper thigh and cholesterol of the meat, but did not reduce the weight and percentage of the carcasses. From the research, it could be suggested that research which aimed to lower the fat and cholesterol content of broiler meat may use 12% Moringa leaf meal as the supplement.

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1. Introduction

Background of the Study

The fat content of broiler chicken meat cholesterol is one of the quality aspects that need attention. Fat and high cholesterol will have a direct impact on the health of the consumer, so at this point, it takes broiler guaranteed health aspects. For children up to the age of adulthood, fat and cholesterol meat does not have negative consequences for them, because at that age is an age of growth. But at older ages, excessive fat and cholesterol will cause obesity and may also lead to the occurrence of atherosclerosis disease. Cholesterol contained in meat is feared could cause health effects for consumers patients with certain diseases. Nevertheless, the body needs cholesterol remains ranged between 1000 - 1500 mg a day. If the harmful cholesterol in the blood exceeds normal limits, because cholesterol is one of the causes blockages of the arteries (atherosclerosis). The metabolism of cholesterol is used as 1) forming the structure of cell membranes and plasma lipoproteins, 2) plasma membrane permeability, 3) a precursor in the synthesis of a steroid hormone that is needed for the production of vitamin D3 and Bile salts to emulsify dietary fat in the small intestine. Circumstances that caused the need for a study that resulted in the broiler chicken meat, fat content and low cholesterol.

Legume leaf meal began much tried, and it is a good alternative for livestock feed because of supply plentiful and cheap. One potential legume plants as animal feed is a plant moringa (Moringa oleifera). Plant moringa (Moringa oleifera) is a herbaceous plant of the order brassicales, family Moringa, Moringa genus and species of Moringa oleifera. which are often found in Indonesia as a hedge and has extensive benefits. All parts of the plant either leaves, flowers and roots can be used for food and medicine.

The scientific world has acknowledged that, for now, the Moringa plant is the most nutritious, contains more and more dense vitamins, minerals, powerful antioxidants highest, essential amino acids complete and plus other compounds that are needed by our body (Mardiana, 2013). Moringa plant contains more than 90 nutrients, more than 46 antioxidants and 36 anti-inflammatory compounds that occur naturally. That is why Moringa referred to as the best natural source of antioxidants. Moringa is also the best sources of fiber, beta-carotene even had four times greater than carrots, containing a lot of omega-3 oils and chlorophyll. Moringa is loaded with phytonutrients, phytonutrients is a nutritional plant that is believed to have the effect of supporting the health and cure various diseases, including anemia, asthma, shortness of breath, cholera, cough, diarrhea, infections of the eyes and the ears, fever, swollen glands, headache, joint pain, scurvy and many more. Moringa has long been used to combat cardiovascular disease and obesity, cholesterol, and is an important element in building and repair cells in the body Kurniasih (2012) states a significant decline in the levels of bad cholesterol in mice when powdered moringa added to the diet everyday normal mice. In the study also mentioned, the provision of Moringa leaves a very real impact on decreasing overall cholesterol levels. An overall reduction of cholesterol levels in the blood has a direct effect on reducing the potential for heart disease. Even a reduction in bad cholesterol levels as much as 25% can result in reducing rates of heart attacks, strokes and other cholesterol-related diseases by 50%. Research on the use of Moringa leaves has also been carried out by Astuti *et al.*, (2005) as well as Analiysa (2007), which conducts research on the use of Moringa leaf powder in the feed to the weight of internal organs, blood glucose, and blood cholesterol

broiler. Moringa leaves can be used as a supplement to increase the productivity of sheep and dairy cows Muro *et al.*, (2003) and Soetanto (2005), Based on this, the authors are interested in doing research on Moringa leaf powder supplementation in commercial broiler rations on carcass weight, the percentage of carcass and meat quality.

Problem of the Study

Does supplementation of Moringa powder in chicken's commercial ration could decrease the subcutaneous fat and cholesterol contents in Broilers' meat?

At what level of additional moringa leaf powder in the ration reduce the content of subcutaneous fat and cholesterol meat without loss and the percentage of broiler chicken carcasses?

Objective of the Study

The study aimed to investigate the rate and effect of Moringa powder supplementation for chicken's commercial ration toward the weight and percentage of carcass, and the subcutaneous fat and cholesterol contents in broilers' meat.

Benefit of the Study

The result of the study is expected to be a source of information for both academics and society, related to supplementation of Moringa powder into chicken's commercial ration toward the weight and percentage of carcass, and the subcutaneous fat and cholesterol contents in broilers' meat.

Hypothesis

Supplementation of Moringa powder to chicken's commercial ration could decrease the subcutaneous fat and cholesterol contents in broilers' meat without decreasing the weight and percentage of a carcass. The addition level of Moringa leaf powder is the higher will further reduce subcutaneous fat content and cholesterol broiler meat.

2. Materials and Methods

Research Design

The research applied the Completely Randomized Design (CRD) with 5 treatments and 4 repetitions. Those five treatments namely Broilers which fed without Moringa powder supplementation as the control group (Po), Broilers which fed with 3% Moringa powder supplementation (P1), Broilers which fed with 6% Moringa powder supplementation (P2), Broilers which fed with 9% Moringa powder supplementation (P3), and Broilers which fed with 12% Moringa powder supplementation (P4). Each repetition (trial unit) used 3 two-week old Broilers with homogeneous weight.

Location and Time of the Study

The research was conducted in Banjar Raden, Marga Sub-district, Tabanan regency, Bali province, and lasted for 5 weeks.

Tools and Materials

Broilers which were used in this research were two-week old Broilers strain CP-707, that bought from UD Setia Ternak in Tabanan. The research used 60 Broilers with almost homogeneous weight. Tools which were used in this research were tarpaulin to dry the Moringa leaves; plastic netting to cover the Moringa leaves from the wind; blender to blend the Moringa leaves into powder; basin to collect the Moringa powder; sieve to sift the Moringa powder; sticky-able to mark the Moringa powder based on five group of treatments; Tanita digital scale with a capacity of 5000 g and sensitivity of 1 g to weigh the Broilers; Nagami bench scale with a capacity of 10 kg and sensitivity of 50 kg to weigh the ration; stationary; plastic sheets to mix the commercial ration with Moringa powder; ration and drinking water boxes; thermometer; and surgical equipment.

Research Process

1) *Hencoop and Equipment*
The research used 20 plots of Battery Cage System with a length of 45 cm, a width of 45 cm, and height of 45 cm. The hencoop was made from wood slats, in which each scoop was equipped with ration box made from the pipe in length of 30 cm, accompanied by drinking box and 10-watt incandescent lamp.
Plastic sheets were placed under the coop to accommodate chickens' feces. The plastic was cleaned every day in maintaining the health of Broilers from ammonia odor.

2) *Ration and Drinking Water*
Ration which used in this research was the commercial ration for starter phased Broilers which were produced by PT. Charoen Pokphand Indonesia, and supplemented with Moringa powder.

Table 1
Nutritional Composition of the Ration

Nutrients	Treatments					Standar[2]
	P0	P1	P2	P3	P4	
ME (kcal/kg)	2900[1)]	2939.55	2979.09	3018.64	3058.18	2800-
Protein (%)	21.00-23.00	21.89	22.78	23.67	24.56	21-23
Fat (%)	5.00	5.22	5.44	5.67	5.9	5-8
Calcium (%)[4)]	0.90	0.96	1.02	1.08	1.14	0.9-1.1
Phosphor (%)	0.60	-	-	-	-	0.7-0.9
Ash (%)	7.00	7.30	7.61	7.91	8.22	3-5
Water Content (%)	13.00	13.23	13.45	13.68	13.90	-
Crude Fiber (%)	5.00	5.27	5.53	5.81	6.08	5.0-5.5

Notes:
1) Feed Brochure PT. Charoen Pokphand Indonesia
2) Based on the calculations (Scot *et al.*, 1982)
3) Based on the Indonesian National Standard (Indonesian National Standard, 1995)
4) Calcium is taken from (Funglie, 2001)

The rationing was carried out three times a day in the morning, afternoon, evening while the provision of drinking water was carried out in an ad libitum condition, in which the drinking water came from local tap water. The nutritional composition of the ration was presented in Table 1.

3) *Moringa Powder Execution*
Moringa leaves which used for this research were obtained from 'Sumerta' Kelod neighborhoods, East Denpasar district, Denpasar. The Moringa leaves were separated from their branches and dried. The dried Moringa leaves

were blended and sifted to produce Moringa powder before supplemented into the Broilers' ration. The nutritional composition of Moringa powder is presented in Table 2.

Table 2
Nutrition of Moringa Powder

Composition	Nutrients (%)
Crude Protein (%)	29.61
Crude Lipid (%)	7.48
Crude Fiber (%)	8.98
Ash (%)	10.13
BETN (%)	43.80
Metabolizable Energy*(Kkal.kg)	1318.20

Sources:
- Results of Laboratory Analysis of Nutrition and Fooder from Brawijaya University, Malang (2007)
- * Estimation of metabolizable energy by 70% GE based on (Patrick and Schaible, 1980)

4) *Broilers' Randomization*
From 100 Broilers which had been prepared, the researchers weighed those Broilers to determine the weight-average, before selecting 60 Broilers whose weight near to the average value. The selected 60 Broilers then put randomly in some trial units, in which each unit consisted of 3 Broilers with homogeneous weight.

5) *Ration Mixing Process*
Ration Mixing Process was done once a week. All of the materials which would be used were firstly scaled as required, continued by the ration mixing process. The mixing process was started from materials that contained higher Moringa percentage. As the supplemented rations were ready, those rations were stored in plastic bags which were labeled with codes based on kinds of the treatments.

6) *Prophylaxis*
A week before conducting the research, the hencoops had been disinfected with the biocide. At the age of two days, the Broiler chicks were given moxicolgyn HC as the antibiotic, and mediavit as the vitamin in one teaspoon dosage for two liters of drinking water. The antibiotic was aimed to prevent bacterial infections in the chicks' digestive system, while the vitamin was aimed to remedy and maintain their physiological function. Vaccination was carried out on the 5th day with ND vaccine through eye drops, which aimed to prevent New Castle Disease. The second vaccination was carried out on the 14th day with Gumboro vaccine.

7) *Sampling Process*
At the end of the study, the Broilers fasted for 12 hours and weighed. From each unit of treatment that consisted of three chickens, the researchers selected merely one chicken whose weight near to the average value. Generally, the sampling process resulted from 20 Broilers as samples. Those samples were slaughtered, drained from their blood, gutted, and cleaned from their feathers. The head and feet parts were cut from the whole chickens, so their carcasses could be gained. Those carcasses then weighed after separated from their breast meat and subcutaneous fat, while the breast meats result of in the oven until dry, mashed, and the cholesterol content was analyzed.

8) *Observation Variables*
Chicken carcass is the result of chicken slaughtering after separated from its blood, feathers, feet, head, and internal organs, except its heart, liver, and gizzard (Rasyaf, 1995). The carcass percentage is measured by dividing the carcass weight with the live weight and multiplied by 100%.
Subcutaneous fat is gained by separated the whole meat with its skeleton, along with skins from the breast, drumstick, and leg quarter parts, then weighed. Cholesterol content (mg/100 g) is the breast cholesterol at the certain period, which stated in mg/100 g [12].
Measurement of cholesterol meat is done based on the method Lieberman-Burchard (Kleiner and Dotti, 1962). The way it works is as follows: A total of ± 0.2 g sample is inserted into the tube-scale centrifuge 15. Then added

a mixture of alcohol ether 3: 1 up to 12 ml, and stir until well mixed. The solution was allowed to stand while shaken once or twice during the 30 minutes. Stirrer rinsed with alcohol ether 3: 1 and a volume equivalent to 15 ml, and then centrifuged at 3000 rpm for 15 minutes. The supernatant was transferred into a 50 ml beaker and heated in a water bath until dry. Extract the residue was dissolved in 2.5 ml of chloroform piecemeal or washed twice and put in a 10 ml test tube for volume equivalent to 5 ml. Five ml cholesterol standard (0.4 mg cholesterol in 5 ml of chloroform) into another test tube. Both were added 2 ml of acetic anhydride with 100 µl of concentrated H_2SO_4, then shaken until the resulting green color and kept for 15 minutes in a dark room. Further readings performed by using a spectrophotometer at a wavelength of 420 nm. Cholesterol values obtained from the calculation using the following formula: cholesterol (mg/100g) = absorbance sample/ absorbance standard x 0,4 x 100/sample weight.

9) *Statistic Analysis*
Data which were gained from the result of the study were analyzed by using variance from Completely Randomized Design (CRD). If there were significant differences (P<0.05) among the treatments, the process continued with Multiple Range Test by Duncan (Mardewi, Referenceset *al.*, 2015).

3. Results and Discussions

3.1 Carcass Weight and Carcass Percentage of Broilers

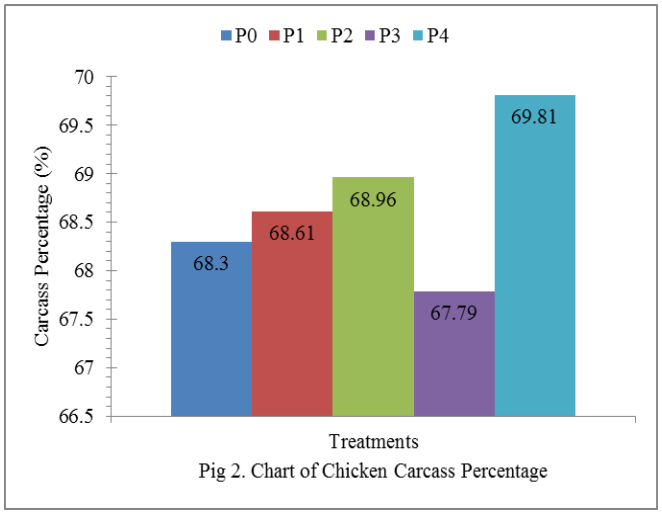
The measurement results carcass weight and the percentage of broiler chicken carcasses are presented in Table 3.

Table 3
Moringa Powder Supplementation (*Moringa Oleifera*) Into Ration toward Carcass Weight and Carcass Percentage of Broiler's

Variable	Treatments					SEM
	P0	P1	P2	P3	P4	
Carcass Weight (g)	1051,25[a]	1102[a]	1053,75[a]	1002,75[a]	977,25[a]	45,74
Carcass Percentage (%)	68,30[a]	68,61[a]	68,96[a]	67,79[a]	69,81[a]	6,29

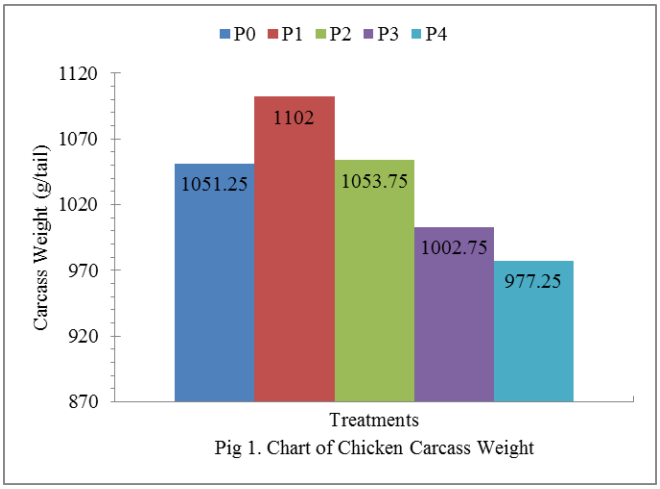
Note = The superscribed letter in the same row showed a significantly different influence (P<0.05)

Statistical analysis showed that supplementation of Moringa leaf powder in broiler chicken rations did not lower carcass weight and carcass percentage (P>0.05), although the figures show a decrease in carcass weight the greater the addition of moringa leaf powder. Chicken Yag get an extra 12% on the moringa leaf meal rations has the lowest carcass weight (P>0.05) compared with controls. As in Figure 1 shows that the carcass weight the highest obtained at treatment P1 (1102 g/tail), followed by P2 (1053.75 g/bird), P0 (1051.25 g/bird), P3 (1002.75 g/bird) and P4 (977.25 g/head). Subcutaneous and weight were not significantly different pieces. Final body weight and weight cut will affect carcass weight. A similar opinion was expressed by North and Bell (1990) that the addition of moringa leaf powder (Moringa oliefera) in broiler chicken rations 6 weeks old, did not affect the weight cut. According to the opinion of the (Soeparno, 1992), carcass weight is influenced by the weight of the chicken is cut. Carcass weight is one of the most important parameters in the evaluation system carcass. Carcass production is influenced by race, gender, age and slaughter weight in addition to nutritional factors. Bidura and Ramia (2004) Stated that the increasing slaughter weight carcass yield has increased as well, so hopefully, the meat portion to be larger. The higher the weight cut led to a fresh carcass weight and carcass percentage higher.



Pig 2. Chart of Chicken Carcass Percentage

The addition of Moringa leaf powder is not significant (P>0.05) increased the percentage of broiler chicken carcasses. The highest percentage occurred in chickens get an extra 12% Moringa leaf powder is equal to 69.81% and the lowest percentage in the chicken carcass which added 9% Moringa leaf powder is 67.79% (Table 3 and Figure 2). Carcass percentage is closely related to carcass weight, so supplementing Moringa leaf powder in the ratio does not affect the percentage of broiler chicken carcasses. Carcass percentage is the ratio between the weight of the carcasses with live weight multiplied by 100%. The percentage of carcasses affected by carcass weight, a weight of livestock, state, nation, livestock, the proportion of non-carcass parts, rations were given and how cutting.



Pig 1. Chart of Chicken Carcass Weight

3.2 Subcutaneous fat content of Upper Thigh, Thigh Down, The Chest and Cholesterol Broiler Chicken Meat

The addition of Moringa leaf powder in the ratio decrease (P<0.05) weight of subcutaneous fat thighs, the subcutaneous fat weight of the lowest found in chickens that received supplementation of diets with 12% of Moringa leaf powder. Chickens received rations with an addition of 0.3, 6 and 9% Moringa leaf powder showed no difference in the weight of subcutaneous fat upper thigh, although the figures show a decrease with increasing percentage increment Moringa leaf powder (Table 4). The results presented in Figure 3 that the sub-cutaneous fat content of the

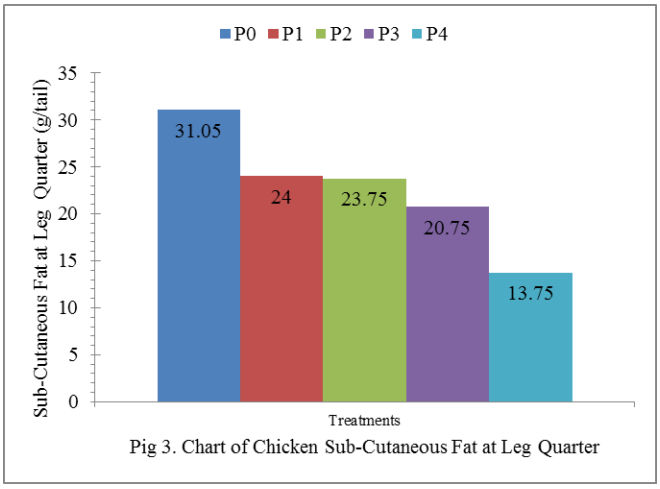
upper thigh in P4 (13,75g) differ markedly lower than the other treatments (P3, P2, P1, and P0) are respectively 20.75 g, 23,75g, 24,00g and 31,05g.

Table 4
Moringa powder supplementation (*moringa oleifera*) into ration toward sub-cutaneous fat and cholesterol contents of broiler's meat

Variable	Treatments					SEM
	P0	P1	P2	P3	P4	
Sub-cutaneous Fat at Leg Quarter (g)	31,05[a]	24,00[a]	23,75[a]	20,75[a]	13,75[b]	3,60
Sub-cutaneous Fat at Drumstick (g)	15,00[a]	14,75[a]	14,00[a]	13,25[a]	13,25[a]	1,91
Sub-cutaneous Fat at Breast (g)	37,05[a]	30,05[a]	28,00[a]	25,25[a]	22,00[a]	1,91
Meat Cholesterol (mg/100g)	133,26[a]	113,65[b]	97,31[c]	80,09[e]	82,27[d]	0,76

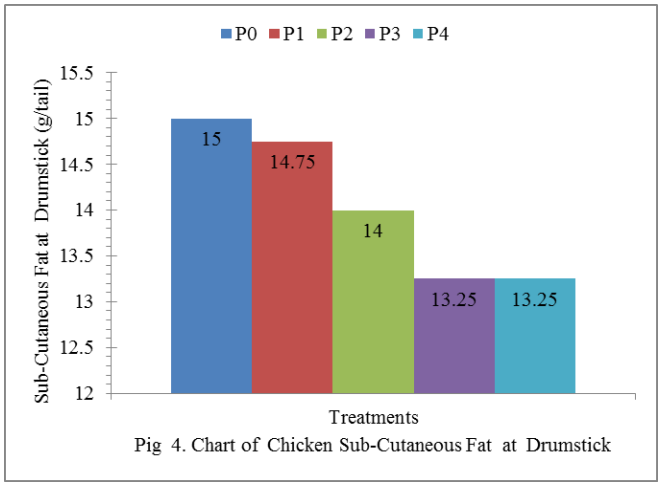
Note =The superscribed letter in the same row showed a significantly different influence (P<0.05)

Table 4 shows the heavy sub-cutaneous fat thighs are the numbers decreased (P>0.05), along with the increased amount of moringa leaf powder supplementation given. In Figure 4 visible results of subcutaneous fat thighs were not significant in each treatment that the control (P0) 15g, (P1) 14,75g, (P2) 14g, (P3) 13,25g and (P4) 13,25g. so does the weight of subcutaneous fat chest, showed different results was not significant (P>0.05), although the figures show a decrease, as seen in Figure 5, control (P0) 37,05g, adding 3% (P1) 30,05g, adding 6% (P2) 28g, the addition of 9% (P3) 25,25g and an additional 12% (P4) of 22g.



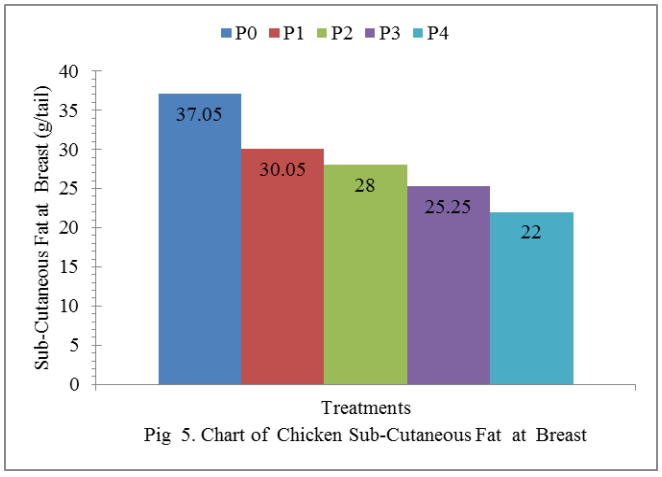
Pig 3. Chart of Chicken Sub-Cutaneous Fat at Leg Quarter

Fat is the network that the majority of growth in the last phase of physiological livestock segment. Broiler fat consists of fat the body cavity and subcutaneous fat (subcutaneous). Fat body cavity consists of abdominal fat, fat digestion system and the fat attached to the chest cavity. The fat formation is strongly influenced by the feed. Excess energy content and is not used by the body will be stored as fat. Fat contained in meat broiler the majority classified as saturated fat analyzed in this study come from fat under the skin of the upper thigh, thighs and chest.



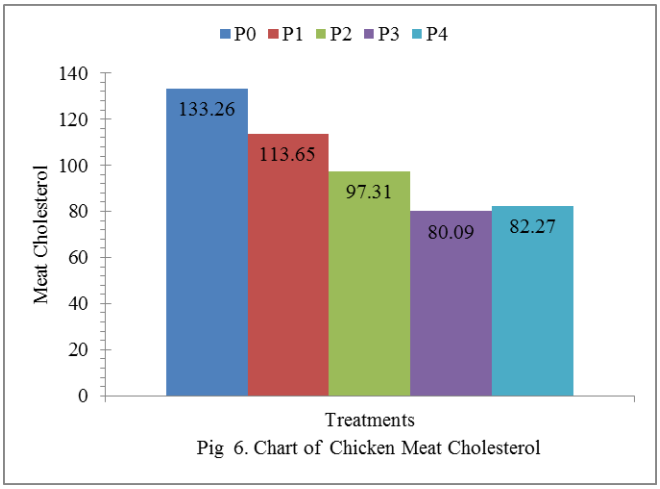
Pig 4. Chart of Chicken Sub-Cutaneous Fat at Drumstick

Fat is the network that the majority of growth in the last phase of a physiological tenrec segment. Its formation is strongly influenced by the feed. Much can be done to lower the fat content of meat, such as by increasing the content of crude fiber.



Pig 5. Chart of Chicken Sub-Cutaneous Fat at Breast

Much can be done to lower the fat content of meat, such as by increasing the content of crude fiber in the ration (Hadi, 1985). Crude fiber will affect the resulting fat, with the crude fiber ration flow rate increases, the absorption of fat in the intestine is inhibited by the crude fiber so that less can be absorbed into the body. Conversely, an increase in fat excreted through feces so that the fat content of the body including subcutaneous fat will decrease.



Pig 6. Chart of Chicken Meat Cholesterol

The cholesterol content of the meat of broiler chickens supplemented real Moringa leaf powder decreased (P <0.05) at all levels (Table 4). Similar to Figure 6, is the clearly visible decrease in the cholesterol content of meat compared with controls (133.26 mg/100g of meat). A decrease in the cholesterol content of the meat to its lowest on the addition of 9% Moringa leaf powder, which is 80.09 mg/100g of meat. According [12], the cholesterol levels are influenced by the amount of fat in the diet and metabolism. While fat diet supplemented flour Moringa leaf is higher than the fat content control diet, but cholesterol is produced is lower than the control. This is presumably due to the antioxidants in the flour leaves of Moringa (Moringa oleifera), the synthesis of cholesterol from the body through the conversion by the liver into acid more Bile. Then Bile will increase the release of Bile into the duodenum. This will reduce the synthesis of cholesterol which is the raw material of Bile. Production of Bile was obtained from cholesterol blood available. Bile, in addition to containing water, as well as Bile salts, Bile pigments, cholesterol, and lipids. Due Thus cholesterol levels to below due to the formation of Bile is consumed. Due to lower cholesterol levels, cholesterol absorption in the jejunum will be few and cholesterol that circulate throughout the body is also low, finally, cholesterol stored in the flesh will also below. Also stated that the Bile produced by the liver cells and then into the duodenum to aid the absorption process. Spending cholesterol from the body via several roads, namely the liver cholesterol to form Bile, released into the intestine and subsequent cholesterol Bile acids lost with feces, lost in the intestinal mucosa and skin, joined with hormone-steroid hormones and expelled with urine. Increased levels of Bile in the gut to the liver will lower cholesterol. Opinions Kurniasih (2012) also states that there is a substance called beta-sitosterol is a component in moringa can help solve the problem of cholesterol. Because these compounds are part of a family of plant sterols. Beta-sitosterol structure is quite similar to cholesterol. So it can trick the body to block the absorption of cholesterol from food.

4. Conclusion

Supplementation of 12% Moringa (Moringa oleifera) powder in chicken ration could increase the quality of Broiler's meat without decreasing the weight and percentage of Broiler's carcass.

Based on the result, the researchers suggested supplementation of 12% Moringa powder into Broiler's ration, to raise Broilers with lower subcutaneous fat and cholesterol contents.

Conflict of interest statement and funding sources
The author(s) declared that (s)he/they have no competing interest. The study was financed by the authors.

Statement of authorship

The author(s) have a responsibility for the conception and design of the study. The author(s) have approved the final article.

Acknowledgments

Our deep and sincere gratitude were presented to God for having granted us the ability and the opportunity to complete this paper. As well as, we have much appreciated to my friends for their support, suggestion, contribution in finishing this research. I would like thanking Suryasa that has given me a good advisement. Last but not least, I dedicated my dreadful thank to my friend who those as editor in IJCU of International Journal. Special thanks to the chairman of the foundation welfare Korpri Bali province Dr. Drs. Anak Agung Oka Wisnu Murti, M.si, the Rector of Warmadewa University (Prof. Dr. Dewa Widjana, the Dean of Agricultural Faculty of Warmadewa University, the Head of Animal Husbandry Department of Warmadewa University.

References

Analiysa. L. (2007). Effect of Flour Leaf Flour (Moringa Oleifera) In Animal Feed On Organs In, Blood Glucose And Cholesterol Broiler Chicken Blood. Faculty of Animal Husbandry, Universitas Brawijaya -Malang.

Astuti, N. R. D. P., Nugroho, E., & Aribowo, E. (2008). Sistem Penentuan Penerima Bantuan Langsung Tunai (BLT) Dengan Metode Analitycal Hirarchy Process. *Jurnal Informatika*, *2*(2).

Bidura, I. G. N. G., & Ramia, I. K. (2004). Pengaruh penggunaan agar dalam ransum terhadap penampilan, karkas, perlemakan, dan kolesterol darah itik Bali jantan umur 2-8 minggu. *Laporan Penelitian, Fakultas Peternakan, Universitas Udayana, Denpasar*.

Errington, J. (2000). Indonesian ('s) authority. In *Regimes of language: Ideologies, polities, and identities (Advanced Seminar Series)* (pp. 205-227). Santa Fe, NM: School of American Research.

Funglie. (2001). The Moringa Tree. The Multiple Attributes of Moringa, EWS. Dakar, Sinegal.

Hadi, S. M., Bhat, S. H., Azmi, A. S., Hanif, S., Shamim, U., & Ullah, M. F. (2007, October). Oxidative breakage of cellular DNA by plant polyphenols: a putative mechanism for anticancer properties. In *Seminars in cancer biology* (Vol. 17, No. 5, pp. 370-376). Academic Press.

Kleiner, I. S., & Dotti, L. B. (1962). Laboratory Instructions in Biochemistry. *Academic Medicine*, *37*(10), 1147.

Kurniasih, I. N., Liang, H., Möschwitzer, V. D., Quadir, M. A., Radowski, M., Rabe, J. P., & Haag, R. (2012). Synthesis and transport properties of new dendritic core–shell architectures based on hyperbranched polyglycerol with biphenyl-PEG shells. *New Journal of Chemistry*, *36*(2), 371-379.

Mardewi, N. K., Suwitari, N. K. E., Rukmini, N. K. S., Rejeki, I. G. A. D. S., & Astiti, N. M. G. R. (2017). Effect of Moringa (Moringa oleifera) Leaf Meal Supplementation in Broiler Chicken Ration on Weight of Internal Organs, HDL and Triglyceride Levels. *SEAS (Sustainable Environment Agricultural Science)*, *1*(2), 46-51.

Murro, J. K., Muhikambele, V. R. M., & Sarwatt, S. V. (2003). Moringa oleifera leaf meal can replace cottonseed cake in the concentrate mix fed with Rhodes grass (Chloris gayana) hay for growing sheep. *Livestock Research for Rural Development*, *15*(11), 1-4.

North, M. O., & Bell, D. D. (1990). *Commercial chicken production manual* (No. Ed. 4). Van Nostrand Reinhold.

Patrick, H., & Schaible, P. J. (1980). *Poultry: feeds and nutrition* (No. Ed. 2).

Piliang, W. G., & Djojosoebagio, S. (2006). Fisiologi nutrisi. *Volume I. Bogor Agricultural University*.

Rasyaf, M. (1995). Pengelolaan Usaha Peternakan Ayam Pedaging. *PT. Gramedia Pustaka Utama, Jakarta*.

Scot, M. L., Nesheum, M. C., & Young, R. J. (1982). Nutrition of Chicken, ML. *Scot and Associates Publishers. Ithaca. NY*.

Soeparno, H. (1992). Ilmu dan Teknologi Daging. *Universitas Gadjah Mada. Press, Yogyakarta*.

Soetanto, D. P., & Jack, S. L. (2013). Business incubators and the networks of technology-based firms. *The Journal of Technology Transfer*, *38*(4), 432-453.

Steel, R. G. D., Torrie, J. H., & Dickey, D. A. (1980). Principles and procedures of statistics: A biometrical approach. McGraw-Hill, New York. *Principles and procedures of statistics: A biometrical approach. 2nd ed. McGraw-Hill, New York.*

Utami, P., Mardiana, L., & PS, T. P. (2013). *Umbi Ajaib: Tumpas Penyakit*. Penebar Swadaya Grup.

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