

SUSTAINABLE ENVIRONMENT AGRICULTURAL SCIENCE (SEAS)

<https://ejournal.warmadewa.ac.id/index.php/seas/index>

E-mail: info.seas@warmadewa.ac.id

Volume 1, Issue 2, October 2017, Pages: 46-51

Received: July 10, 2017

Revised: August 24, 2017

Accepted: October 16, 2017

Effect of Moringa (*Moringa oleifera*) Leaf Meal Supplementation in Broiler Chicken Ration on Weight of Internal Organs, HDL and Triglyceride Levels

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Abstract

This study aims to examine the effect of Moringa leaf meal on broiler chicken ration to the weight of internal organs, triglyceride levels and HDL. The material used in the study was 60 broiler chicken age 2 weeks strain CP707. The design used Completely Randomized Design (RAL) with five treatments and four replications in each treatment. The five treatments are 100% commercial rations without moringa leaf meal as control and 100% commercial rations with 3%, 6%, 9% and 12% moringa leaf meal. Parameters observed included, liver weight, gizzard weight, meat triglyceride levels, and HDL levels of meat. The data obtained were analyzed by completely randomized design. If among the treatments showed significant differences, then the study will be continued by Duncan's multiple-range test. From the results of this study it can be concluded that the addition of moringa leaf meal at level 10% in the ration is the optimal level to decrease the triglyceride of meat without disturbing the HDL content in the meat and the addition of moringa leaf meal up to 12% in the ration does not give a negative effect on the weight of internal organs.

Keywords: Broiler Chickens, HDL, Internal Organ, Triglycerides

1. Introduction

Development of broiler livestock business, generally using concentrate feed with high chemical additives. This causes the occurrence of chemical accumulation in broiler meat, when consumed by humans will endanger health. Consumers are now beginning to care about the ingredients that can interfere with the health of broiler chickens, such as fat content. The fats found in broiler chicken generally consist of triglycerides (neutral fat), phospholipids and cholesterol. Triglycerides is the main form stored in the body of livestock as an energy reserve. The high content of fat in the tissues is affected by the levels of triglycerides in the serum derived from fatty synthesis in the liver. As with triglycerides, cholesterol in the body is mainly obtained from the synthesis in the liver. The amount synthesized depends on the body's needs and amounts obtained from food: such as carbohydrates, proteins or fats.

Preventing the build up of chemicals in broiler meat can be done by mixing with natural ingredients, without reducing the quality of the ration. Added natural ingredients are Moringa leaf meal. *Moringa oleifera* is a plant that can meet almost all the nutritional needs of the body, because it contains 29.6% protein, 48 antioxidants, 18 amino acids, vitamins and minerals. Compounds contained in moringa can stimulate the bile duct wall secrete bile and stimulate the release of pancreas sap to improve the digestion of feed ingredients.

2. Material and Methods

The research was conducted in Banjar Raden, Tua Village, Marga Subdistrict, Tabanan Regency. The study lasted for 6 weeks. Chicken used in the research is broiler chicken strain CP 707 as much as 60 chicken with average body weight $231 \text{ g} \pm 5\%$. The feed given is stater rations (511), manufactured by PT. Charoen Pokphand Indonesia is shaped "Crumble" and *Moringa oleifera* leaf meal. Mixing and weighing rations are done weekly. Drinking water for chicken research is sourced from the PDAM and provided on *ad libitum*.

The study was designed using Completely Randomized Design (CRD) with five treatments and four replications. Each replication uses three (3) 2-week-old chickens. The five treatments were P0 100% commercial ration without addition of moringa leaf meal as a control, P1, P2, P3 and P4 were 100% commercial rations with 3%, 6%, 9% and 12% moringa leaf meal.

Disease prevention is done by sanitizing and disinfecting the enclosure and equipment, vaccinating "New Castle Desiesis" (ND) on the fifth day (5) through eye drops and gumboro vaccination at week two through nasal drops.

Randomization was done by taking a random chicken as many as 60 chicken to be weighed and looked for average weight, then placed randomly on 20 plots of cages. Each plot of cage is filled with three (3) chickens.

Moringa oleifera leaf meal production is done in a way, first the leaves are separated from the branch and then dried under the sun to dry with a sign when squeezed will sound. After drying the leaves smoothed with a blender, then filtered. Moringa leaf meal is ready mixed with broiler chicken ration.

The parameters were observed to include liver weight, gizzard weight, triglyceride levels, and HDL (*High Density Lipoprotein*) breast meat.

Data collection techniques, triglyceride levels, and HDL and internal organs were done at the end of the sixth week, then the laboratory analyzes were conducted at the Nutrition and Animal Feed Laboratory of Udayana University Faculty of Animal Husbandry at Sudirman Street Denpasar. The nutritional composition and its the ration from Moringa powder [1] were presented in Table 1 and 2.

Table 1
Nutrition of Moringa Powder [1]

Composition	Nutrition (%)
Protein content (%)	29.61
Rough Fat (%)	7.48
Fiber (%)	8.98
Ash (%)	10.13
BETN (%)	43.80
Energy Metabolism (kkal/kg)	1318.20

Tabel 2
Nutritional Composition of The Ration [1]

Nutrients	Treatment					Standard ²⁾
	P0	P1	P2	P3	P4	
ME (kkal/kg)	2900	2939.55	2979.09	3018.18	3058.18	2800-3000
Protein (%)	21-23	21.89	22.78	23.67	24.56	21-23
Fat (%)	5.00	5.22	5.44	5.67	5.90	5.0-8.0
Calcium (%)	0.90	0.96	1.02	1.08	1.14	0.9-1.1
Phospor (%)	0.60	-	-	-	-	0.7-0.9
Max Ash (%)	7.00	7.30	7.61	7.91	8.22	3.0-5.0
Water Content (%)	13.00	13.23	13.45	13.68	13.90	-
Max. Crude Fiber (%)	5.00	5.27	5.53	5.81	6.08	5.0-5.5

3. Results and Discussion

3.1 Level of Triglycerides of Broiler Meat

According to [2] the factors that influence the synthesis of triglycerides by the liver are foods that contain lots of carbohydrates, high free fatty acid circulation, are high insulin levels and low glucagon levels. The decline in fatty acid synthesis in the liver is a major contributing factor to the decrease in triglyceride synthesis in the liver which results in a decrease in triglyceride concentration in the blood and triglycerides in meat.

Factors affecting Triglyceride levels are carbohydrates, crude fiber rations and free fatty acid circulation [2]. The normal value of chicken meat [3] is total cholesterol (52-148 mg/dl), triglycerides (< 150 mg/dl), and HDL (> 22 mg/dl).

The results of the study (Table 3 and Figure 1) showed that the addition of moringa leaf meal in commercial ration significantly ($p < 0.05$) to the reduction of triglyceride levels of broiler chicken, the addition of 3% moringa leaf meal on ration real decreased 22.38% triglyceride level by Control, addition of 6% moringa leaf meal decreased 21.24% triglyceride levels of broiler meat compared to control, addition of 9% maize leaf meal significantly decreased the triglyceride level of meat by 41.95% (lowest) of control and 28.37% in addition 12 %.

Table 3
Level of Triglycerides Broiler Meat by the Addition of Moringa Leaf Meal

Treatment	Average (mg/100g)	Notation
100% commercial ration (P0)	151.19	a
100% commercial ration + 3% moringa leaf meal (P1)	117.35	bc
100% commercial ration + 6% moringa leaf meal (P2)	119.08	b
100% commercial ration + 9% moringa leaf meal (P3)	87.76	d
100% commercial ration + 12% moringa leaf meal (P4)	108.29	bc

The triglycerides are synthesized in the liver [4]. The higher the fatty acids produced by the process of lipogenesis of carbohydrates, proteins and amino acids, the triglycerides synthesized in the liver also increase and directly affect their concentration in the blood and flesh. Triglycerides are a glycerol ester. Triglycerides are formed from 3 fatty acids and glycerol. Fat is stored in the body of triglyceride form. When the cell needs energy, the lipase enzyme in the fat cells breaks down triglycerides into glycerol and fatty acids and releases them into the blood vessels and by cells that require them to be burned and produced energy, carbon-dioxide (CO_2) and water (H_2O) [5] states that triglycerides are fat-shaped as a result of food metabolism not only in the form of fat but also foods that are in the form of carbohydrates and protein are excessive, nor is entirely needed as an energy source [6]. The triglycerides are the main fats stored in chicken body tissues. About 95% of triglycerides come from the ration and 5% are synthesized in the body [7].

Moringa leaf meal contains active substances as antioxidants and allegedly can affect the fat content in the body [8]. The content of phytonutrien in moringa leaf meal, can stimulate the release of pancreatic sap that secretes lipase enzymes to break down fatty acids and glycerol, so that reduced fat is formed [9]. Fatty acids result from the action of lipase absorbed by the small intestine, with the help of bile, the fat absorbed into the bloodstream through the porta vein to the liver and then synthesized in the liver to triglyceride. Fats (triglycerides) that enter the bloodstream can be directly stored in the tissue. The results of the study were supported by [10] with that with the addition of basil leaves treatment in the diet up to 6% level showed that the meat cholesterol obtained during the study was 62-81 mg/100g with the average is 71 mg/100g.

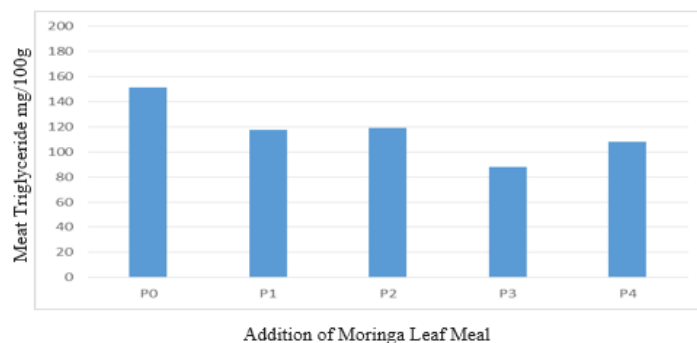


Figure 1
Level of Triglycerides of Broiler Meat with the addition of Moringa Leaf Meal

3.2 HDL Levels of Broiler Meat

The results of the HDL content of broiler meat in the study that was given by addition of moringa leaf meal in the ration showed significantly different results in all treatments compared with control (Table 4 and Figure 2). The mean HDL result of broiler chicken research was 35.63-39,13 mg / dl, greater than the mean minimum HDL value of normal range. The normal HDL range is > 22mg / dl [3].

Tabel 4
HDL Level of Broiler Meat with the Addition of Moringa Leaf Meal

Treatment	Average (mg/100g)	Notation
100% commercial ration (P0)	45.49	a
100% commercial ration + 3% moringa leaf meal (P1)	39.13	b
100% commercial ration + 6% moringa leaf meal (P2)	38.12	b
100% commercial ration + 9% moringa leaf meal (P3)	35.63	b
100% commercial ration + 12% moringa leaf meal (P4)	36.21	b

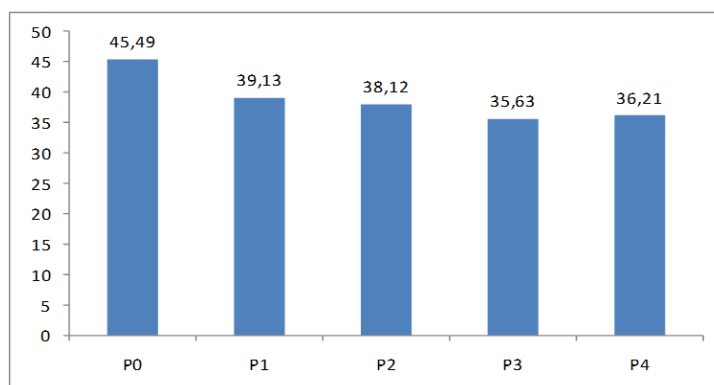


Figure 2
HDL Level of Broiler Meat with the Addition on of Moringa Leaf Meal

High Dencity Lipoprotein (HDL) are lipoprotein that transports lipids from the periphery to the liver. Lipoproteins are transport vehicles for cholesterol and triglycerides because they are not soluble in the blood. HDL molecules relatively small compared to other lipoproteins, it can pass through the vascular endothelial cells and enter the intima to transport back the cholesterol collected in the macrophages. In addition, HDL also has antioxidant properties that can prevent the occurrence of LDL oxidation. HDL levels are influenced by the environment and genetic, among other feed given [11].

The results showed that the addition of Moringa leaf meal in broiler ration produced lower levels

of HDL broiler meat but still in the normal range.

3.3 Liver Weight of Broiler Chicken

The result of research analysis showed that the addition of maize moringa leaf meal in ration did not show significant difference ($P > 0.05$) to liver weight of broiler chicken (Table 5).

Tabel 5
Liver Weight of Broiler Chicken with the Addition of Moringa Leaf Meal

Treatment	Average (g)	Notation
100% commercial ration (P0)	44.06	a
100% commercial ration + 3% moringa leaf meal (P1)	44.32	a
100% commercial ration + 6% moringa leaf meal (P2)	43.89	a
100% commercial ration + 9% moringa leaf meal (P3)	44.05	a
100% commercial ration + 12% moringa leaf meal (P4)	43.90	a

The process of detoxification of waste metabolism results from the body played by the liver and pancreas. Cells and organs can perform the detoxification process well when in a healthy state, otherwise when the cell is in a weak state, it will be further damaged by toxins, therefore the health of the liver needs to be maintained. Several factors that cause weakening of the liver include nutrient deficiency, stress, depression and fatigue [12]. Moringa leaf meal has been shown to have antioxidant benefits that can be used as a preventive measure against the liver or liver structure [13]. The use of Moringa leaf meal in the ration is expected to maintain the normal function of the liver to be able to perform the detoxification process well as well as performing its function as a complementary digestive organs.

The liver is the largest internal organ in the body, the weight of the liver is also associated with the age and condition of the livestock body. The average weight of chicken liver is 3% of body weight [14]. In this research we get the data of the weight of the liver for all treatments are in the range of 43.89-44.32 gr. The results showed that the addition of moringa leaf meal in the ration to 12% did not stimulate the function of the organ and can maintain the normal weight of the liver.

3.4 Gizzard Weight of Broiler Chicken

The results of gizzard weight in the study are shown in Table 6 as follows:

Tabel 6
Gizzard Weight of Broiler Chicken with the Addition of Moringa Leaf Meal

Treatment	Average (g)	Notation
100% commercial ration (P0)	18.76	a
100% commercial ration + 3% moringa leaf meal (P1)	18.84	a
100% commercial ration + 6% moringa leaf meal (P2)	19.45	a
100% commercial ration + 9% moringa leaf meal (P3)	18.75	a
100% commercial ration + 12% moringa leaf meal (P4)	17.85	a

Gizzard or rempela is an important organ in the feed mill process. Gizzard serves to minimize mechanical particles feed. Because of its function, the stomach or gizzard has unique muscles, strong and thick layers. The type of feed consumed and the size of the livestock, are factors that can affect the size of the gizzard [14]. The content of crude fiber treatment rations ranged from 5.00-6.08% to increased with increasing levels of moringa leaf meal use, but the increase had no effect on gizzard weight (Table 6). This suggests the possibility that the total large fibers are indeed increasing, but the components of the crude fiber constituents, such as cellulose, hemicellulose, lignin, pectin, musilase,

and gum do not stimulate organ function.

4. Conclusion

From the results of this study it can be concluded that the addition of moringa flour at level 10% in the ration is the optimal level to decrease the triglyceride of broiler meat without disturbing the HDL content in the meat and the addition of moringa leaf meal up to 12% in the ration does not give a negative effect on the weight of internal organs.

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