Scientific Papers. Series D. Animal Science. Vol. LXIII, No. 1, 2020
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

EFFECT OF SUBSTITUTION OF GOROHO BANANA (*Musa acuminafe* sp.) STEM MEAL FERMENTED WITH *Trichoderma viridae* IN RATION ON BLOOD LIPID PROFILES AND MEAT QUALITY OF BROILER CHICKEN

Marie NAJOAN, Fenny WOLAYAN, Florencia SOMPIE, Betty BAGAU

Sam Ratulangi University, Faculty of Animal Husbandry,
Jl. Kampus Unsrat, Manado City, 95115, North Sulawesi, Indonesia

Correspondence author email: najoanmarie@yahoo.com

Abstract

The purpose of this research was to determine the substitution of goroho banana (Musa acuminafe sp.) stem meal fermented with Trichoderma viride on blood lipid profiles and meat quality of broiler chicken. One hundred and twenty day old chick CP 707 divided into 20 unit cages, each unit consisted of 6 chickens. Complatelly Randomised Design (CRD) was used in this research with 4 treatments and 5 replications. The treatments were: R0 = 100% corn without goroho banana stem meal fermented, R1 = 95% corn + 5% goroho banana stem meal fermented, R2 = 90% corn + 10% goroho banana stem meal fermented and R3 = 85% corn + 15% goroho banana stem meal fermented. Parameter measured were blood lipide profiles (triglyceride, total cholesterol, HDL, LDL) and meat cholesterol. The results showed that substitution of goroho banana stem meal fermented had a significant effect (P<0.05) on a decreased in blood trigliseride, blood cholesterol and meat cholesterol, R3 has significant different (P<0.05) lowest compared to the other treatments (R0, R1 and R2). On the other hand there were no significant effect (P>0.05) on blood HDL and LDL among the treatments. It can be concluded that goroho banana (Musa acuminafe sp.) stem meal fermented with Trichoderma viride can be substituted up to 15% corn meal in ration which improved the meat quality.

Key words*: blood lipids, broiler, goroho banana stem, meat cholesterol, Trichoderma viride fermented.*

INTRODUCTION

Goroho banana (*Musa acuminafe* sp.) is one of the typical types of bananas which is very popular with consumers, especially in the areas of the city of Manado and Minahasa so many places selling fried foods that use it because it has a distinctive taste and is consumed by diabetics. As a result, many banana stems are just thrown away as trash that disturbs the aesthetics of the environment. Utilization as a banana bar in general has not been popular, there is no information. The use of goroho banana stems is possible as a feed because in terms of composition the goroho banana stems contain enough nutrients needed by livestock. Chemical analysis shows that the banana goroho stem (*Musa acuminafe* sp.) contains protein (2.53%), fat (1.49%), ash (12.93%) and crude fiber (23.48%) and gross energy 3723 kcal (Laboratory analysis, 2012). Efforts to improve nutrition have been carried out through fermentation with a protein yield of 4.86%, crude fiber 22.03., Fat 0.94, Ca 0.42, P 0.18 and Gross Energy 3156.67 kcal/kg (Najoan et al., 2016). Even though the increase is only about 47.94% for protein and the decrease in crude fiber is only about 6.72% but it is hoped that biologically fermented products have a higher beneficial value in influencing the performance and quality of broiler carcasses, even as a low-fat feed and easy crude fibre exploited can affect the cholesterol content in broiler meat. This content lipid value could be conversed as energy value and accumulated in adipose tissues (Rumokoy, 2012)

Najoan et al. (2019) reported goroho banana stem meal fermented with *Trichoderma viride* have bioactive compounds such as flavonoid, vitamin C, vitamin E and tannin. The present study was conducted to investigate the effect of goroho banana stem meal fermented with *Trichoderma viride* in diet on blood fat profiles and meat cholesterol of broiler chicken.

MATERIALS AND METHODS

The experiment was carried out experimentally using a Completely Randomized Design (Steel and Torrie, 1995) with 4 treatments and 5 replications. Each test uses 5 chickens. The number of chickens used was 100 tails. Treatment consisted of: R0: Without replacement of corn, R1: Replacement of corn by 5% goroho banana stem meal fermented, R2: Replacement of corn by 10% goroho banana stem meal fermented and R3: replacement of corn by 15% goroho banana stem meal fermented.

Material goroho banana stem and fungi *Trichoderma viride* showed in Figures 1 and 2. Fermentation process can be seen in Figure 3. Parameters observed were serum cholesterol, triglycerides, LDL, and HDL and meat cholesterol. The composition of nutrients and metabolic energy ration constituent feed ingredients, feed composition ration treatment and nutrient composition of experiment can be seen in Table 1.

Table 1. Composition and nutrients contents of diet

Feed ingredients	Treatments			
	R0	R1	R2	R3
	----------%----------			
Yellow corn	57.00	54.15	51.30	48.45
Goroho stem meal Fermentation	0.00	2.85	5.70	8.55
Fine rice bran	5.00	5.00	5.00	5.00
Coconut meal	9.00	9.00	9.00	9.00
Soybean meal	15.00	15.00	15.00	15.00
Fish meal	12.00	12.00	12.00	12.00
Coconut oil	1.00	1.00	1.00	1.00
Top Mix	1.00	1.00	1.00	1.00
Nutrien	R0	R1	R2	R3
Crude Protein (%)	21.37	21.18	20.88	20.82
Crut fiber (%)	8.37	8.26	8.16	8.05
Crude fat (%)	4.12	4.73	5.34	5.96
Calcium (%)	1.24	1.23	1.23	1.22
Phospor (%)	1.03	1.29	0.99	0.98
Metabolizable energy (kcal/kg)	3101.23	3101.08	3100.3	3100.06

(*) Analyses of Laboratory Chemistry and Animal Feed of Faculty of Animal Science, Padjadjaran University, UNPAD (2016)

Blood samples were taken at the end of the study with 1 chicken in each unit of the Experiment. Blood samples taken through the brachial vein then analyzed to determine cholesterol, triglyceride, HDL and LDL level, and meat samples on the breast and thighs were analyzed to determine meat cholesterol.

Figure 1. Goroho Banana Stem

Figure 2. Fungi *Tricoderma viridae*

Figure 3. Fermentation process

RESULTS AND DISCUSSIONS

The results of the measurement of total cholesterol, triglyceride, HDL, LDL and meat cholesterol are presented in Table 2. The results of statistical analysis showed that GE addition in ration had significant effect ($P<0.05$).

Table 2. The level of LDL, HDL, and cholesterol

Parameters	Level of goroho banana stem meal			
	R0	R1	R2	R3
Triglyceride (mg/dl)	67.60	61.00	53.80	42.00
LDL (mg/dl)	37.20	36.40	36.00	35.00
HDL (mg/dl	77.20	78.00	78.60	79.20
Total cholesterol (mg/mg))	143.20	133.60	124.40	118.60
Meat cholesterol	124.60	100.20	89.20	68.80

Triglycerides

There was a significant ($P < 0.05$) decrease in the level of triglyceride in birds use banana goroho stem meal of treatment (Table 2). HDL level compared to R0, R1, R2, and R3. HDL is a lipoprotein which maintains the balance of cholesterol so that it is not accumulated in the cell. This balance is managed by the sterol slough off from membrane at the same rate with the number of cholesterol synthesis entering the liver (Hasanudin et al., 2013). Triglycerides can be found as grains of levels the body of broilers are less than 150 mg/dl. Triglyceride measured in this study was found in treatment R0 (67.60 mg/dl) and decrease with supplementation of goroho banana stem meal fermented levels 15% (R3) (42.00 mg/dl). The indicate goroho banana stem meal fermented is have a flavonoids content. Farida et al. (2009) reported that banana peel flavonoids can enhance the activity and levels lipoprotein lipase and there by lower triglyceride levels.

Besides decrease, the triglyceride levels in the blood caused the goroho banana stem meal fermented have saponin and tannins content that able to inhibit the absorption of triglycerides in the intestine so that reducing the number of triglycerides in the blood. This work is in line with research Noorrafiqi et al. (2013) state that the saponins can bind the bile salts and cholesterol to micelles forms that cannot be absorbed by the intestine. Also, the saponin will increase the cell regeneration that influences the decrease in triglycerides. Lipid substance in broiler meat could influence its quality (Rumokoy and Toar, 2014).

Low Density Lipoprotein (LDL)

Average serum LDL level of broiler chicken in the present study was presented in Table 2. There is a no significant ($P<0.05$) difference between R0, R1, R2 and R3. It showed that the LDL level in all treatment groups remained within in the normal range of ≤ 130 ml/dl. This indicates that chickens feather meal did not give significant effect to Broiler LDL blood level ($P > 0.05$). It was in line with others researchers who worked with different feed mixtures state that banana goroho stem meal fermented give no effect on LDL levels in broiler blood.

LDL content in this research tendency decrease in the levels of goroho banana stem meal fermented this indicates. Decreased blood cholesterol levels are followed bay LDL levels because there is a direct relationship between cholesterol and LDL (the higher the blood cholesterol level, the higher the LDL levels). This is reinforced by the opinion of Motgomery et al. (1993) that LDL plays a role in providing cholesterol in the body tissue, so LDL levels in the blood are influenced by cholesterol concentrations. LDL levels in the study range 35.00-37.20 mg/dl, above normal LDL < 130 mg/dl (Basmatioglu and Ergul, 2015).

Hight Density Lipoprotein (HDL)

Average serum HDL level of broiler chicken in the present study was presented in Table 2. There is a no significant difference ($P < 0.05$). HDL is a lipoprotein which maintains the balance of cholesterol so that it is not accumulated in the cell. HDL (High Density Lipoprotein) often named as a good cholesterol because it is a lipoprotein that transports lipid from periphery to hepar (Hasanudin et al., 2013). The function of HDL is to carry the remain cholesterol which is not being used into the liver. This remain cholesterol will be using as a precursor in the formation of bile salt and steroid hormones. The remain cholesterol which is not being used will be excreted (Rosidi I., 2003). HDL The normal HDL levels in the blood of broiler chickens is 66.5-97.7 mg/dl (Situmorang and Martha, 2014), whereas according to Basmaciglu and Ergul, 2005, is ≥ 22 mg/dl. In this study, HDL levels presented in Table 2. It showed HDL there is increasing tendency, but one-way ANOVA analysis of HDL level showed that there was no significant difference between control (R0). Guilaume et al. (2006) who reported the flavonoid can increase HDL. According to Muray et al. (2012), HDL is a lipoprotein that transports lipids from the periphery to the liver. The HDL molecule is relatively small compared to other lipoproteins, so 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 anti-oxidant properties that can prevent the occurrence of LDL oxidation

Total Cholesterol

Cholesterol is an essential structural component that forms the cell membrane and the lipoprotein externa layer. In the body, cholesterol is the precursor of all steroidal compounds. The quantification results of total cholesterol were presented in Table 2. The normal standard of total cholesterol of broiler chickens is 128-140 mg/dl according to Silva et al. (2007). It showed that the total cholesterol in this study range (118.40-143.20 mg/dl) as the normal range.

The lowest levels of total cholesterol in treatment were due to a goroho banana stem meal fermented contents a bioactive compounds such as flavonoids, tannin and vitamin. Hashemi and Davoodi, 2011, state that the compounds have bioactive substances can increase the metabolism of carbohydrates, proteins and fats in the body.

Further explained that the compound inhibits absorption of cholesterol in the intestine, so causing a decrease in cholesterol concentration of cholesterol in the blood. This matter will lead to increase of cholesterol synthesis in the liver for conversion into bile acid and secreted in to the intestine. This process leads to increase the cholesterol excretion through the faces and therefore contributes to decreasing the cholesterol levels in the blood. Asmarini (2012) state that the bile acid secretion is required cholesterols the primary raw material. That is lead to increase the acid bile secretion and influence on the decrease of cholesterol levels in the blood.

Meat Cholesterol

Broiler fed diet containing goroho banana stem meal fermented in the diet produce meat with low cholesterol content showed in Table 2. The low cholesterol content of meat was obtained with the addition of gohoro banana stem meal fermented replace corn in the diet. The higher level to addition of goroho banana stem meal in the diet, the lower cholesterol content in meat produced. Flavonoid in goroho banana stem meal fermented has an effect to reduce cholesterol in blood serum trough inhibiting micelle formation in small intestine so that decrease intestinal cholesterol absorption (Vermeer et al., 2008). While cholesterol in the body can be eliminated through its conversion by liver into bile acids which is bound to glycine and taurine to form bile salts and secreted to duodenum which is then degraded by microbes in the gut and excreted together with faeces, so that body cholesterol content decrease. Decrease in meat cholesterol levels along with an increase in the level of banana goroho stem meal fermented of 15 % in the ration until 118 mg/100 g. The lower meat cholesterol content in this treatment is due to the increasing use banana goroho stem meal fermented in the ration, so that the content of bioactive compound increases in the diet. Increasing the content of bioactive compounds such as β-carotene, flavonoid and vitamin. Bioactive compounds inhibit the action of the enzyme HMG-CoA reductase (Hydroxymetyl glutary-CoA) which plays a role in the formation is inhibited cholesterol (MCGilvery and Goldstein, 1996; Nuraini, 2006)

CONCLUSIONS

Goroho banana (*Musa acuminafe* sp.) stem meal fermented with *Trichoderma viridae* can be substituted up to 15% corn meal in ration which improved the meat quality.

ACKNOWLEDGEMENTS

This research work was carried out with the support of DIPA Universitas Sam Ratulangi Kementerian Riset, Teknologi dan Pendidikan Tinggi Nomor: SP DIPA - 042.01.2.400959/2019

REFERENCES

Asmariani, W., Probosan, E. (2012). Pengaruh Pemberian Buah Pepaya (*Carica papaya* L.) Terhadap Kadar Kolesterol LDL dan Kolesterol HDL pada Tikus Sprague Dawilwey dengan Hipokolesterolemia. *J.Nutr.College*, 1(1), 268-264.

Basmaciglu. I., Ergul, A. (2005). Reseach on the factor affecting cholesterol content and some other characteristic of eggs in laying hens. *Turk.J.Vet Anim.Scie.*, 29, 157-164.

Guilaume, R, Sonia, P., Patrick, C., Simone, L., Benoid, M., Charles, C. (2006). Favorable impact of lower caloric cranberry juice, consumption on plasma HDL cholesterol, caloric cranberry juice consumes on plasma HDL cholesterol concentration. *J.Nutr*., 6, 234-245.

Hashemi, S.R., Davoodi, H. (2011). Herbal Plants and their Derivatives as Growth and Health promoters in Animal Nutrition. *Vet Res Commun*., 35, 169-180.

Mongomery, et al. (1993). Biokimia Suatu Pendekatan Biooritasi Kasus Yokyakarta, Universitas Gajah Mada.

Murray, R.K., Bender, D.A., Bothan, K.M., Kennelly, P.J., Weil, P.A, Rodwell, V.W. (2012). *Harper's Illustrated Biochemistry*. USA: The Mc Graw-Hill Companies. Inc. Publishing House.

Najoan, F., Wolayan, B., Bagau, F.N., Sompie, N. (2017). The effect of *Trichoderma viridae* usage of nutritional value on goroho banana stem (*Musa acuminafe* sp). *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, 17(1).

Noorrafiqi, M.I., Yasmina A., Hendriyono, F.X. (2013). Efek jus buah karamunting (*Melastoma malabathricum* l.) terhadap kadar trigliserida serum darah tikus putih yang diinduksi propiltiourasil. *Berkala Kedokteran*, 9(2), 219-227

Rumokoy, L.J.M. (2012). Precursor adipocyte development as media of lipid metabolism. *Jurnal Lassalian*, 9(2), 25-31.

Rumokoy, L.J.M., Toar, W.L. (2014). *The content of lipids in intramuscular adipose as a quality determinant of cattle meat production. International Congress: Challenges of Biotechnological Research in Food & Health*, 144-146. http://repo.unsrat.ac.id/976/1/Publikasi_Laurentius-Wisje_di_Surakarta_2015.pdf

Silva, P.R.L., Freitas Neto, O.C., Laurentiz, A.C., Junqueira O.M., Fagliari, J.J. (2007). Blood serum components and serum protein test of hybro-PG broilers of different ages. *Rev. Bras. Cienc. Avic*., 9, 229-232.

Steel, R. G.D., Torrie, J.H. (1980). *Principles and Procedures of Statistics: A Biometric Approach*. New York, USA: McGraw-Hill Book Co. Publishing House.

Situmorang, R., Martha, I.K. (2014). Perbedaan kadar triglyceride setelah pemberian eksrak dan rebusan daun salam (*Eugenia polyantha*) pada tikus Spraque dawley yang diberiinggi lemak. *J. Nutr college*, 3, 26-33.

Vermeer, M.A., Mulder, T.P.J., Molhuizen, H.O.F. (2008). Thea amins from black tea, especially thea flavin-3-gallate, reduce the incorporation of cholesterol into mixed micelles. J. *Agric. Food Chem.*, 56, 12031-12036.