

## Effects Of Mixed Fruit *Morinda citrifolia* L Juice and *Arenga pinnata* on Broiler Blood Lipid

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**Abstract:** *Morinda citrifolia* L / Noni is a native plant in Indonesia, is beneficial to improve the body's metabolism, because content many active compound and can reduce fat and cholesterol in the body *Arenga pinnata* also is widely grown in Indonesia, as a source of energy, the high composition content are sucrose, calcium, phosphorus. Widely used as an anti-stress so it is necessary to mix with *Morinda citrifolia* L. The research was conducted in the Laboratory of Poultry Production Animal Husbandry Padjadjaran University, West Java. The aim of this research was to study effect of mixed *Morinda citrifolia* L juice and *Arenga pinnata* addition in drinking water on broiler blood fat. Measured variables were Total Cholesterol, High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL) and Triglyceride. The experiment was arranged in Completely Randomized Design with four treatments of mixed *Morinda citrifolia* L juice and *Arenga pinnata*, were R0 = without *Arenga pinnata* (Ap) + *Morinda citrifolia* L (Mc) 0.3%; R1 = Ap 2% + Mc 0.3%; R2 = Ap 3% + Mc 0.3%; R3 = Ap 4% + Mc 0.3% with five replications. This treatment will tested using 100 broiler, two weeks old. Blood was taken at the end of the research. The result of research was analyzed using ANOVA and Duncan Multiple Range test. Mixed *Morinda citrifolia* L and *Arenga pinnata* was given for 3 weeks. Result showed that using 3% Ap and 0.3% Mc on R3, were decreased significantly ( $p < 0.05$ ) on Total Cholesterol, Low Density Lipoprotein (LDL) and Triglyceride, and no significantly difference for High Density Lipoprotein (HDL), although HDL content was not increasing but the ratio between LDL and HDL in all treatments was increased compared to the control, meaning that improvement occurred using mixed *Morinda citrifolia* L juice and *Arenga pinnata*.

**Key words :** *Morinda citrifolia* L, *Arenga pinnata*, Blood lipid, Broiler

### INTRODUCTION

*Morinda citrifolia* L (noni) is a native plant in Indonesia, and is already known as a healthy plant *Morinda citrifolia* L, contains glucoside, asetic acid, benzoic acid, glucose, heptonoat acid, linoleic acid, polysaccharides, potassium, scopoletin, selenium, sodium, seronine, calcium, L-arginine, iron, alanine (Kustiyah, 2003). Noni also contains vitamin A, C and B, and a variety of active components that are important for improve cell of the body: such as terpenoid compounds, damnacanthal, xeronine, proxeronine, anthraquinone, coumarin and scopoletin (Winarti, 2005).

*Morinda citrifolia* L, has been considered useful in many diseases, particularly atherosclerosis and dyslipidemia. (Schnorh, 1994). Research used different level of *Morinda citrifolia* L to evaluate the lipid content in blood cholesterol levels and triglycerides to improve hepatic cholesterol synthesis by increase HMG Co-A (3-hydroxy-3-methylglutaryl Co-A) activity and by the inhibition of lipoprotein lipase responsible for hydrolysis of plasma lipids (Boger *et al.*, 1997).

*Morinda citrifolia* L is one of the traditional medicinal plants which contain active ingredients antioxidants. Selenium, is an important function to activate glutathione peroxidase, which is one of the most important enzymes in the body that neutralize free radicals, which attack mainly fat molecules (Purbaya, 2002; Kusnindar and Rahmawati, 2003).

Several researchers have tested the antioxidant activity of

noni fruit, Wang and Su (2001), proved that noni juice is very potential to inhibit free radicals. Antioxidant activity of noni juice 2,80x more powerful than vitamin C, 1,40x stronger than pikogenol, and 1,10x more powerful than grape seed (Winarti, 2005). Molecular modifications in various tissues resulting in, an imbalance between protective antioxidants (antioxidant defenses) and increased production of free radicals. This is the initial oxidative damage known as oxidative stress. Negative impact on the cell membrane is a chain reaction of lipid peroxidation. The end result of a chain reaction is the dissolution of the fatty acid chain into a variety of compounds toxic to the cells, such as Malondialdehyde (MDA), ethane, and pentane (Purnomo, 2000).

Noni antioxidant compound can reduce oxidative damage (Setiawan and Suhartono, 2005b). Based on the source, there are two antioxidants, the antioxidant endogenous and exogenous. Endogenous antioxidant comes from the body itself, consisting of Super Oxide Dismutase (SOD), glutathione peroxidase, and catalase. Exogenous antioxidants obtained from outside through the food, to help the body fight, excess free radicals in the body. Increased supply enough antioxidants to help prevent clinical complications of some diseases (Setiawan and Suhartono, 2005b; Setiawan *et al.*, 2005a).

Research conducted Suweino (2004) proved that oral administration of noni juice can protect rat liver from damage caused by oxidative stress in CCl poisoning.

In accordance with Ahsani et al., (2013), xeronin could decrease the cholesterol levels in the blood, because it triggers the formation of the insulin hormone. The insulin will increase the number of Very Low Density Lipoprotein (VLDL) receptors (Solomon, 2002). And VLDL is the particle that contains rich triglyceride that carried the blood flow from the heart into body cells.

LDL oxidation has been recognized playing an important role in the initiation and progression of atherosclerosis. Methanol and ethyl extract of fruit, was showed to inhibit 88 and 96% respectively, to inhibit copper-induced oxidation of low density lipoprotein particles in vitro. Six lignans were isolated from ethyl extract of the fruit and has been showed to inhibiting effect of copper induced LDL oxidation (Kamiya et al., 2004).

Palm sugar comes from palm trees or *Arenga pinnata*. This tree is often found in the highlands in Indonesia. The tree grow an altitude of 20 meters, even up to 1400 meters above sea level with a diameter trunk is 65 cm approximately (Safari, 1995). Palm Sugar content carbohydrates disaccharides, composed of two monosaccharides glucose and fructose monomers are joined by ties of alpha 1, 2. (Nangoy et al., 2013).

Palm Sugar (*Arenga pinnata*) is believed to have a macro and micronutrient content of more than white sugar. Mikronutrient in palm sugar, among others: Mineral salts, Thiamine (vitamin B1) Riboflavin (vitamin B2) Nicotinic Acid (vitamin B3) pyridoxine (vitamin B6) Cyanocobalamin (vitamin B12) Ascorbic Acid (vitamin C) (Nangoy, et al., 2013).

One of the advantages Palm Sugar is the process of dissolution into the body fluids occurred over a long (slowly) because Palm Sugar is able to provide energy in a longer time span. In addition, the riboflavin metabolism in biological launch and repair cells to make stamina better (Susilowati, 2002). Research conducted by a group of students in Faculty of Animal Husbandry, Padjadjaran University, using Noni juice 2 ml / kg body weight, showed that the abdominal fat tends to decrease although the study did not show significant differences (Gunawan , 2013).

## MATERIALS AND METHODS

One hundred day old chick, used randomly with average body weight 50.10 grams, coefficient variation is 6.97%. The research was conducted in Poultry cage of Animal Husbandry, Padjadjaran University, Bandung Indonesia. This research was assigned randomly and studied for five weeks. The research was arranged in a Completely Randomized Design (CRD).with four treatments and each treatment was repeated five times. The dietary treatments are:

P0 = ration without *Arenga pinnata* (Ap) and *Morinda citrifolia* L Juice (Mc),

P1= ration with Ap 2% + Mc 0.3%,

P2= ration with Ap 3% + Mc 0.3%,

P3= ration with Ap4% + Mc 0.3%.

Data was analyzed of variance anova and followed by Duncan test with 5% significant level.

The basal feed was formulated with the basic ingredient such as corn, soybean meal, fish meal, coconut oil, with the addition of some essential amino acid like lysine and methyonine, premix and NaCl. The formulation of feed, based on standard nutrient requirements and energy. Data collected at the end of experiment and variables measured is Total Cholesterol, HDL, LDL and Triglyceride level.

Mature *Morinda citrifolia* L / noni fruits were purchase from the local market in Bandung. West Java, Indonesia. The preparation for noni juice is noni fruits were washed and blended, added water in 1: 2 (w/v)ratio and then filtered with filter cloth (Adriani et al., 2014).

## RESULTS AND DISCUSSIONS

Influence of treatment can be seen in Table 1.

Table 1. Effect Treatment On Broiler Blood Fat (mg/dL)

Treatment	R0	R1	R2	R3
	-----mg/dl-----			
Total				
Cholestrol	114.00 <sup>a</sup>	106.50 <sup>a</sup>	104.50 <sup>a</sup>	91.00 <sup>b</sup>
HDL	90.67 <sup>a</sup>	88.50 <sup>a</sup>	86.50 <sup>a</sup>	79.60 <sup>a</sup>
LDL	18.90 <sup>a</sup>	15.60 <sup>a</sup>	14.20 <sup>a</sup>	11.60 <sup>b</sup>
Triglyceride	22.33 <sup>a</sup>	12.08 <sup>b</sup>	19.00 <sup>a</sup>	12.00 <sup>b</sup>

Note: the similar superscript in the same row show non significant difference (p<0,05).

Total Cholesterol, LDL and Triglycerides, decreased in R3, and the highest of HDL in treatment R1. This study showed that the provision of drinking water containing *Morinda citrifolia* L and *Arenga pnniata* showed significant (p<0.05) difference on Total cholesterol, LDL and Triglyceride ,and no significant difference (p> 0.05) on HDL, despite not having the benefit of this research significantly but the ratio between LDL and HDL in all treatments was increased compared to the control, meaning that improvement occurred using mixkd *Morinda citrifolia* L juice and *Arenga pinnata* For more details, it can be seen in figure 1 The influence of treatment on blood lipids broiler.

The results of Sally research (2003) showed that the addition of *Morinda citrifolia* L juice, can reduce blood lipid levels, Low Density Lipoprotein (LDL), Triglycerides and increased High Density Lipoprotein (HDL), also can improve the histological structure of the vessels (medial thickening) of the aorta of mice were given a diet high-fat (Zaini, 2003).

Saponins in noni pulp, is able to increase the permeability of the intestine cell wall , increasing the nutrient absorption , so the feed conversion gave better result. Bintang et.al. (2008) reported that low levels of saponins can improve the inter-cell function of nutrient transport, but at high levels it can destroy the cells.

Active substances contained in *Morinda citrifolia* L are scopoletin, Xeronin and antraquinon. Scopoletin work to

widen and blood pressure so that it will improve the transportation of nutritional absorption in the gut so that it will redound to hypertrophy in body tissues, and in addition to the work (Chong *et al.*, 2004). Xeronin activate cells which results in improvement of the structure or function of cell, Antraquinon an anti-bacterial substance that serves pressing growth of pathogenic microorganisms, up to a third of active substances can increase chicken health (Chong *et al.*, 2004).

Coumarin compounds increase the secretion of bile and Nitric Oxide substance, which will trigger the excretion of cholesterol in the blood through faeces and blood cholesterol will decrease (Maslachah, 2005). Other substances that play a role in decreasing cholesterol levels is beta-carotene and flavonoids. In accordance with the results of research nurhayati, 2004, cited by Zainuddin, 2005, the content of beta-carotene in noni could decrease the cholesterol level in the blood. Beta-carotene can inhibit the action of HMG-CoA reductase, enzyme that plays a role in the formation of mevalonate in cholesterol biosynthesis. Inhibited the formation of mevalonate which will inhibit the formation of squalene and lanosterol. Both of these compounds will form cholesterol through a series of reactions (Nuraini *et al.*, 2008).

Based on the research results of Ford and nutrition research institute (FNRI), palm sugar has a glycemic index of 35 GI, when compared with other cave is much lower. The glycemic index is a measure of speed's food absorbed into blood sugar. The higher the glycemic index will increase blood sugar, according to Susilowati (2002) that palm sugar is softer on the stomach and the data can be staged so that the body's metabolism consumed rations would be better metabolized. Evident from the research mix noni juice and palm sugar showed blood lipid levels were slightly lower than using only noni alone. Giving Noni juice 2 ml / kg body weight, tends to decrease abdominal fat on broiler (Gunawan, 2013). Research from Adriani, et al (2014) showed that the Profil *Serum Glutamate Oxaloacetat Transaminase* (SGOT) and *Glutamate Pyruvate Transaminase* (SGPT) improve by using mixed *Morinda citrifolia* and *Arenga pnniata* at the same level.

#### ACKNOWLEDGMENT

The authors would like to express the most appreciation to a group of students who worked on *Morinda citrifolia* L research, at Animal Husbandry Faculty, Padjadjaran University.

#### CONCLUSIONS

Result showed that using 3% *Arenga Pinnata* and 0.3% *Morinda citrifolia* L. (R3) could decrease blood lipid, LDL decrease 38,6%, Total Cholesterol decrease 20,2%, Triglyceride 46,2%, compare to control. On the other hand, there were no significant difference found on HDL. Based on the results, using 3% *Arenga Pinnata* and 0.3% *Morinda citrifolia* L in the drinking water of broiler, gave the same response to HDL, but gave a best response on decreased Total Cholesterol, LDL and Triglyceride level.

#### REFERENCES

- Adriani, L., A. Rochana, A. Yulianti, A. Mushawwir and N. Indrayani. 2014. Profil Serum Glutamate Oxaloacetat Transaminase (SGOT) and Glutamate Pyruvate Transaminase (SGPT) Level of Broiler That Was Given Noni Juice (*Morinda citrifolia* L) and Palm Sugar (*Arenga pinnata*). *Scientific Papers Animal Sciences Lucrari Stiintifice Seria Zootechnie*, Iasi, Romania, ISSN L1454-7368, vol 62 (19), p 101-105.
- Ahsani, M., N. Iriyanti, dan S. Mugiyo. 2013. Using Various Types of Probiotics in Rations Against Fat and Cholesterol Levels on Arabic Chicken Egg Yolk Jurnal Ilmiah Peternak 1(1): 323-331.
- Bintang, I. A. K., A. P. Sinurat and T. Purwadaria. 2008. The Addition of Antibiotics and Noni Pulp as a Source of Bioactive Compounds Against Broiler Performance Jurnal Ilmu Ternak Vol. 13 (1): 7-12.
- Boger, R. H., S. H. Bode-Boger and R. P. Brandes. 1997. Dietary L-Arginine reduce the Progresting of Atherosclerosis Cholesterol Fed Rabbits Comparison with Lavostatin Circulation, Journal Intern Med. vol 96 : 1282-90.
- Chong, T. M., M. A. Abdullah, N. M. Fadzillah, O. M. Lai and N. H. Lajis. 2004. Anthraquinones production, hydrogen peroxide level and antioxidant vitamins in *Marinda elliptica* cell suspension cultures from intermediary and production medium strategies, Plant Cell Reports, ISSN 0721-7714, Vol. 22, p. 951-958.
- Gunawan, A. 2013. Effect of Fruit Noni (*Morinda citrifolia* Linn.) On The Carcass Weight and Abdominal Fat Broiler Chickens. Thesis Universitas Padjadjaran: Sumedang, p 28-33.
- Kamiya, K., Y. Tanaka, H. Endang, M. Umar and T. Satake. 2004. Chemical constituents of *Morinda citrifolia* fruits inhibit copper induced low density lipoprotein oxidation. J. Agric. Food Chem. 52:5843-5848.
- Kamiya, K., Y., Tanaka, H. Endang, M. Umar and T. Satake. 2005. New anthraquinone and iridoid from the fruits of *Morinda citrifolia*. Chem. Pharm. Bull. 53:1597-1599.
- Kusnandar, A and M. Rahmawati. 2003. Prevent Degenerative Diseases with food. Mirror Magazine World Medicine. No. 140, Jakarta: PT Kalbe Farma, p.41-47.
- Kustiyah 2003. The Effects of Dietary *Morinda citrifolia* extract on the Lipids serum Levels And the Progression of Abdominal Aortic Atherosclerotic Lesion of Wistar. Thesis, Diponegoro University, page 50-53.
- Maslachah, L. 2005. Potensi Ekstrak Mengkudu (*Morinda citrifolia*) terhadap Sekresi Nitric Oxide (NO) dan Endothel Pembuluh Darah Hiperkolesterolemia. Media Kedokteran hewan 22(3): 136.
- Nangoy, J. F., S. Darana, L. Adriani, T. Widjastuti, P. Edianingsih and H.A.W. Lengkey. 2013. Palm Sugar (*Arenga pinnata*) Implementation As Biosecurity Pre Transportation System On Blood Glucose And Glycogen On Boiler, Published in Scientific Papers. Series D.

Animal Science., ISSN 2285-5750; I , Vol. LVI , p272-276.

Nuraini, Sabrina and S.A. Latif. 2008. Chicken and Egg Performance Using Rations Containing Onggok Crasa *Neurospora* Fermentation. *Media Peternakan* 31(3): 195-202.

Purbaya, Jr. 2002. Recognizing and Leveraging Benefits Noni Fruit. CV. Pioneers Jaya: Bandung.

Purnomo, S. 2000. Oxidants, Antioxidants and Free Radicals. Complete Manuscript Book Symposium Against Aging Effects of Free Radicals in the Framework Lustrum IX FKUA 7 September 1995-2000.

Safari, A. 1995. Making Techniques Palm Sugar. Your work: Surabaya.

Sally, E. 2003. Effect of infusion Noni on Total Cholesterol, Triglycerides, LDL, and HDL blood serum of Mice (*Mus musculus*) After administration High Fat Feed. Thesis Faculty of Veterinary Medicine. Airlangga University, Surabaya.

Schnorh. 1994. Egg Consumption and High Density Lipoprotein Cholesterol, *Journal Intern Med.* 235:249-251.

Setiawan, B and E. Suhartono. 2005b. Role of Oxidative Stress and Antioxidants in Diabetes Mellitus. *Majalah Kedokteran Indonesia*, Vol 55, No. 2, pp 87-90.

Setiawan, B, E. Suhartono and Edyson. 2005a. Antioxidant Activity Test Noni Fruit Juice (*Morinda citrifolia* Linn) and Its Role As Advanced Glycation End Products Inhibitor (AGEs) Due Glycosylation Reactions. in *Berkala Ilmu Kedokteran* Vol.37, No. 1, 2005, p. 35-40.

Solomon, N. 2002. Tahitian Noni Juice: How Much, How Often, For What. Vineyard, UT: Direct Source Publishing, Inc.

Susilowati, D. 2002. Utilization of Waste water for Baking for Nata with Addition of Red Sugar. Muhammadiyah University Surakarta, Surakarta.

Suweino. 2004. The ability Sari Noni (*Morinda citrifolia*) in Preventing Oxidative Stress in Rats Due Giving CCl. Proceedings of the National Seminar and Pre-Congress PBBMI on October 2, 2004 in Yogyakarta.

Wang, M. Y. and C. Su. 2001. *Cancer preventive effect of Morinda citrifolia (noni)*. *Ann. NY Acad. Sci.* (no. 952): 161-168.

Wang, G.Y. and J.D. Keasling. 2002. Amplification of HMG-CoA reductase production enhances carotenoid accumulation in *Neurospora crassa*. *Metabol. Eng.* 4: 193-201.

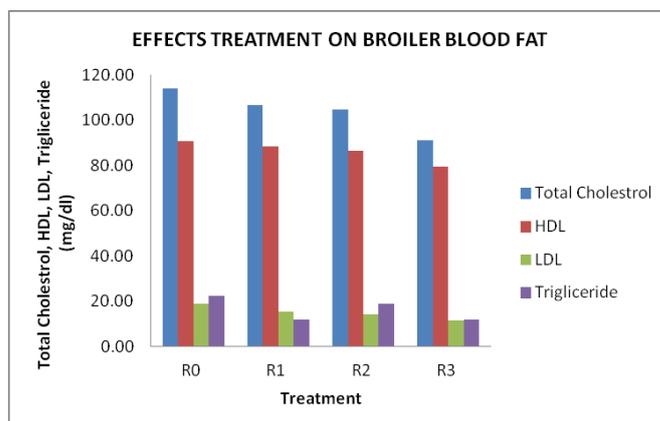
Winarti, C. 2005. Functional Beverage Development Opportunities from Noni fruit (*Morinda citrifolia* Linn). *Journal of Agricultural Research*, 24 (4), p 149-153.

Zaini, A. M. 2003. Infusum influence of Noni Fruit (*Morinda citrifolia* L) On Histopathologic Overview aorta of mice (*Mus musculus*) Males that given The High-Fat Diet. Thesis Faculty of Veterinary Medicine Airlangga University, Surabaya. P.20-28.

Zainuddin, D. 2005. Medicinal Plants Improve Efficiency and Health Poultry Feed. National Workshop on

Technological Innovation in Business Support livestock Poultry Competitive thing. 202-209.

Wang, G.Y. and J.D. Keasling. 2002. Amplification of HMG-CoA reductase production enhances carotenoid accumulation in *Neurospora crassa*. *Metabol. Eng.* 4: 193-201.



Picture 1. Treatment Effects on Total Cholesterol, HDL, LDL and Triglyceride on Broiler Blood



Picture 2. Palm Sugar (*Arenga pinnata*)



Picture 3. Noni Fruit (*Morinda citrifolia* L.)