

**Leaves of Purple Sweet Potato (*Ipomoea batatas* L), Noni (*Morinda citrifolia* L) and Beetle (*Piper beetle* L) in Diets Improved Blood Chemical Profile of Bali Duck**

By

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and I G.L. Oka

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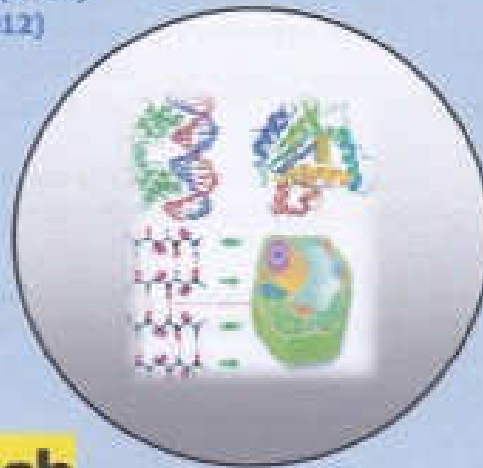
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RESEARCH PAPER

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## Leaves of Purple Sweet Potato (*Ipomoea batatas* L), Noni (*Morinda citrifolia* L) and Beetle (*Piper beetle* L) in Diets Improved Blood Chemical Profile of Bali Duck

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### ABSTRACT

*This experiment was carried out to study the effect of purple sweet potato (Ipomoea batatas), noni (Morinda citrifolia L) and beetle (Piper beetle L) leaves in diets on chemical profile of Bali duck blood. Four treatment diets were used in a completely randomized design (CRD) consisted of control diet A (diet without containing any leaves), diet B containing purple sweet potato leaf (Ipomoea batatas L), diet C containing noni leaf (Morinda citrifolia L) and diet D containing beetle leaf (Piper beetle L). Each treatment consisted of four replications and each replication consisted of four ducks. Variables observed in this study were level of uric acid, level of sugar, blood lipids profile including total cholesterol (TC), high density lipoprotein (HDL), low density lipoprotein (LDL), triglyceride (TGA) and consumption of antioxidant. In general, the results showed that addition of purple sweet potato, noni and beetle leaves in the diets were significantly reduced the total of blood cholesterol, HDL, LDL, TGA, level of uric acid and sugar. However, the HDL content of duck blood in the treatment B was found similar to the control diet ( $P > 0.05$ ). These results might be related to the intakes of antioxidant which were higher in treatments C and D compared to the control diet ( $P < 0.05$ ) but treatment B was not significantly different to the control group.*

*It was concluded that the leaves of purple sweet potato, noni and beetle in the diets could improve the chemical profile of Bali duck blood. When the three treatments (B, C and D) were compared, it seemed that beetle leaf was the most effective source of antioxidant in improving chemical profile of Bali duck blood.*

**Keywords:** Purple Sweet Potato, Noni, Beetle, Blood Chemical Profile and Bali Duck.

## INTRODUCTION

Duck is another preference of farmers in Indonesia and in Bali in particular to be raised in the field. Mostly farmers raise this bird extensively in the rice field and some of them keep intensively in the cages. Eggs and meat are the products of this bird which are used by people for food, but the problem is duck carcass or meat contains fat higher than chicken (Setyawardani et al., 2001). A certain technology is needed to improve their carcass quality in order to prevent consumers of duck meat from diseases such as heart disease and hypertension. Manipulation of feed may be carried out to overcome those problems since some plant leaves contain antioxidants which can reduce fat content of blood and meat such as purple sweet potato leaf (*Ipomoea batatas* L), noni leaf (*Morinda citrifolia* L) and beetle leaf (*Piper beetle* L). According to Suprpta et al. (2003), tuber of purple sweet potato contains anthocyanin an average of 110 mg per 100 g tuber, while Surya, et al., (2008) and Adm (2013) described that the leaves of purple sweet potato, noni and beetle contain anthocyanine, xeronine, and flavonoid and carvociol respectively as antioxidants. Antioxidants have a good function in reducing fat content in meat (Ishida et al., 2000). Free radicals can be neutralized by antioxidants and consequently LDL may not be oxidized (Hillbom, 1999). Agarwal and Rao (2000) reported that antioxidants can inhibit the activity of 3 hydroxy, 3-methyl-gluteryl-ko.A enzymes. It could decrease mevalonic acid produced from those enzymes, cholesterol levels in blood, meat and in the heart. Sumardika and Jawi (2011) reported that extract of purple sweet potato leaf (*Ipomoea batatas* L) given to hypercholesterolemia rats could reduce total cholesterol (TC) and LDL, but increased superoxide dismutase (SOD) and HDL. Noni leaf contains antioxidative mineral selenium (Se) besides xeronine, plant sterols, lysine, sodium, caprylic, arginine, proxeronine, multiple quinines, trace elements, phenylalanin and magnesium (Wake et al., 2002). Roni et al., (2010) described that walp leaf (*Syzygium polyanthum*) as source of flavonoids (antioxidants) could reduce the level of protein and uric acid in blood serum of ducks. Since lack of informations related to the utilization of herbal leaves on meat quality of ducks, this research was conducted to study the use of purple sweet potato leaf (*Ipomoea batatas* L), noni leaf (*Morinda citrifolia* L) and beetle leaf (*Piper beetle* L) as source of antioxidants in feed to improve blood chemical profile in Bali ducks.

## MATERIAL AND METHODS

This study was conducted at Guwang village, Gianyar district, Province of Bali for 15 weeks.

Test of antioxidant capacity was carried out at Microbiological Chemistry Laboratory,

Faculty of Agriculture, Udayana University. Blood chemical profile test was carried out at Nutrition Laboratory, Faculty of Animal Science, Udayana University for 4 weeks.

A total of 64 male ducks of 15 weeks old with homogenous live weights bought from duck farmer I Gde Adnyana at Gianyar regency were used in this experiment. Duck feed consisted of yellow corn, soybean, copra meal, rice bran, fish meal, salt (NaCl) and premix. Leaves of purple sweet potato, noni and beetle were allocated according to the treatments. The composition of the feed treatments is shown in the following table 1 and their chemical composition is shown in table 2.



Table 1. Feed Composition of Ducks (21 – 36 weeks of age).

Ingredients (%)	Treatment			
	A	B	C	D
Yellow corn	55.36	52.36	52.36	50.36
Soybean	9.37	12.37	12.37	12.37
Copra meal	11.31	11.31	11.31	11.31
Fish meal	10.13	10.13	10.13	10.13
Rice bran	12.23	7.23	7.23	7.23
Purple sweet potato leaf meal	-	5.00	-	-
Noni leaf meal	-	-	5.00	-
Beetle leaf meal	-	-	-	5.00
B12 mineral	0.50	0.50	0.50	0.50
NaCl	0.10	0.10	0.10	0.10
Coconut oil	1.00	1.00	1.00	1.00

Notes: A is Control diet (without purple sweet potato leaf, noni leaf, and beetle leaf); B is diet containing 5.00% purple sweet potato leaf; C is diet containing 5.00% noni leaf; and D is diet containing 5.00% beetle leaf.

Table 2. Chemical Composition of Duck Feed (21 – 36 weeks of age).

Chemical components	Treatments				Standard : Scott <i>et al.</i> , (1969)
	A	B	C	D	
Metabolizable Energy (Kcal/kg)	2912.10	2925.82	2923.08	2901.32	2900.00
Crude Protein (%)	18.23	18.35	18.33	18.29	18.00
Ether Extract (%)	6.03	6.00	6.39	6.00	6 – 9
Crude Fiber (%)	4.73	4.38	5.39	4.37	4 – 7
Calcium (%)	1.13	1.18	1.17	1.13	0.80
Phosphor available (%)	0.75	0.73	0.71	0.71	0.50

Notes: A is Control diet (without purple sweet potato leaf, noni leaf, and beetle leaf); B is diet containing 5.00% purple sweet potato leaf; C is diet containing 5.00% noni leaf; and D is diet containing 5.00% beetle leaf.

This study used two floors battery colony cages system with 16 partitions. Each partition of the cages has a plot size of 70 cm length, 70 cm width and 70 cm height. These cages were equipped with food trays and drinking water trays made of bamboo located at the external part of the cages, and lights.

A completely randomized design with four treatments including the control diet was used in this experiment.

The four treatments consisted of Control diet A (without containing purple sweet potato leaf (*Ipomoea batatas* L), noni leaf (*Morinda citrifolia* L) and beetle leaf (*Piper beetle* L); Treatment B (diet containing purple sweet potato leaf); Treatment C (diet containing noni leaf) and Treatment D (diet containing beetle leaf). Each treatment consisted of four replications and each replication consisted of four ducks with homogeneous age and live weight.

Variables measured in this study were blood lipid profile including total cholesterol (TC), high density lipoprotein (HDL), low density lipoprotein (LDL), and triglycerides (TGA), uric acid and blood sugar levels, feed intake and consumption of antioxidant.

#### Data Analysis

The data were analyzed using analysis of variance (Steel and Torrie, 1989). When the analysis was found significant, analysis was continued by using Duncan's Multiple Range test to find out which treatment-means were significantly different ( $P < 0.05$ ).

## RESULTS AND DISCUSSION

In general, the results showed that addition of purple sweet potato leaf (treatment B), noni leaf (treatment C) and beetle leaf in diets (treatment D) were significantly reduced the total cholesterol (TC), HDL, LDL and triglyceride (TGA) of Bali ducks blood (Table 3), except the HDL level in treatment B was not significantly different when compared to the control diet ( $P < 0.05$ ). These results might be related to the consumption of antioxidant between the above treatments which is shown in Table 4, where only treatment B was not significantly different to the control diet (A), while the other treatments (C and D) were significantly higher than the control diet. According to Agarwal and Rao (2000) antioxidant could inhibit enzymes activities of 3 hydroxy, 3 Methyl, Gluteryl-Ko.A reductase, reduce mevalonic acid, and consequently decrease the cholesterol production and LDL. The higher intakes of antioxidant in treatment C and D compared to treatment B and the control diet A (Table 5) might cause the lower lipid profile and concentration of sugar and uric acid in their blood.

Table 3. Blood lipid profile of Bali Ducks.

Variables	Treatments				SEM
	A	B	C	D	
Total Cholesterol (Mg/100ml)	158.33 <sup>a</sup>	138.66 <sup>b</sup>	127.00 <sup>c</sup>	112.50 <sup>d</sup>	1.70
HDL(Mg/100ml)	81.66 <sup>a</sup>	83.00 <sup>a</sup>	69.00 <sup>b</sup>	61.67 <sup>c</sup>	2.17
LDL (Mg/100ml)	46.33 <sup>a</sup>	36.06 <sup>b</sup>	35.33 <sup>b</sup>	30.00 <sup>b</sup>	1.25
TGA (Mg/100ml)	161.66 <sup>a</sup>	109.66 <sup>b</sup>	96.06 <sup>b</sup>	112.66 <sup>b</sup>	6.87

**Descriptions :** A is control diet (without purple sweet potato leaf, noni leaf and beetle leaf); B is diet containing 5% purple sweet potato leaf; C is diet containing 5 % noni leaf and D is diet containing 5% beetle leaf.

Values in the same row with different superscripts are significantly different ( $P < 0.05$ )

SEM: Standard Error of the treatment means.

These results were supported by Yadnya (2012) who also found that purple sweet potato could reduce total blood cholesterol and LDL of 3-15 weeks old Bali ducks. Syahrudin et al., (2011) reported that 21% of fermented noni leaf in diet fed to broiler chicken could reduce cholesterol content in their carcass and Prangdimurti et al., (2006) reported that suji leaf (*Pleomele angustifolia*) antioxidant could reduce cholesterol, improve superoxide dismutase (SOD) and increase antioxidant capacity. Other study in rats found that extract leaf of purple sweet potato could improve blood lipid profile and increase levels of SOD (Sumardika and Jawi, 2011).

It seemed that beetle leaf in treatment D of this study contained the most effective antioxidant which could improve the chemical profile of Bali duck blood in term of its lipids content. Blood lipid profiles of Bali ducks in this study also shows in Figure 1.

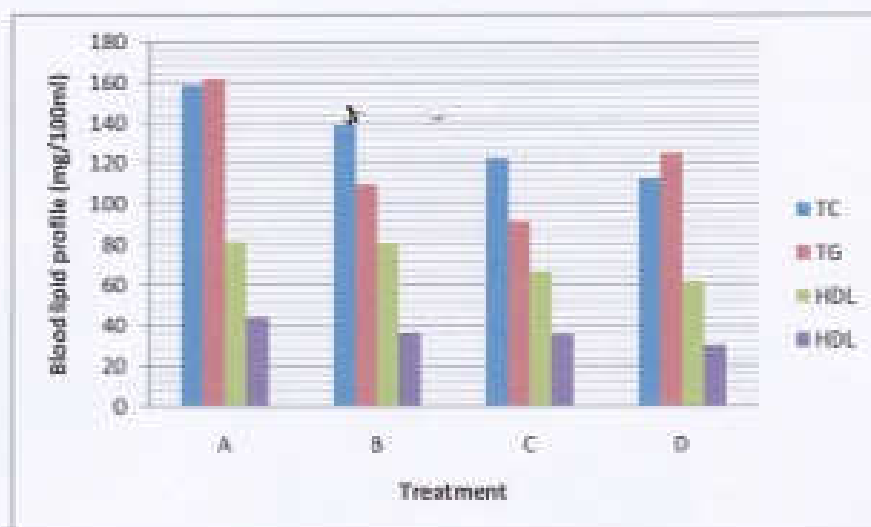


Figure 1 . Lipid profile of Bali duck blood.

**Descriptions :**

- A. Diets without purple sweet potato leaf, noni leaf and beetle leaf
- B. Diets containing 5 % purple sweet potato leaf
- C. Diets containing 5 % noni leaf
- D. Diets containing 5 % beetle leaf

TC:Total-Cholesterol; HDL: High Density Lipoprotein; LDL: Low Density Lipoprotein; TGA:Triglycerides

**Feed consumption, Antioxidant intake, Concentration of blood uric acid and sugar**

Feed consumptions of Bali ducks in treatment B, C and D were significantly lower than those in control diet. On the contrary, the antioxidant intakes of ducks in treatment C and D were significantly higher than in the control diet, while the intake of antioxidant of ducks in treatment B was not significantly different compared to the control diet (Table 4).

These results indicated that concentration of antioxidant in beetle leaf was higher than in noni and purple sweet potato leaves. According to Sun et al. (2008) and Adm (2013), there were different substances act as antioxidant in a certain plant leaf, such as anthocyanine in purple sweet potato leaf, xeronine in noni leaf, flavonoid and karvokiol in beetle leaf, etc.

Table 4. Feed consumption, antioxidant intake, concentration of uric acid and sugar in Bali duck blood.

Variable	Treatments				SEM
	A	B	C	D	
Feed-Consumption (kg/duck/15 weeks)	13,12 <sup>a</sup>	12,60 <sup>b</sup>	12,39 <sup>c</sup>	12,07 <sup>d</sup>	0,06
Antioxidant-intake (mg/duck/15 weeks)	53,70 <sup>c</sup>	55,47 <sup>c</sup>	62,11 <sup>b</sup>	73,35 <sup>a</sup>	1,88
Uric acid Concentration (%)	6,76 <sup>a</sup>	5,86 <sup>b</sup>	5,53 <sup>b</sup>	4,97 <sup>c</sup>	0,09
Sugar-Concentration (%)	138,67 <sup>a</sup>	128,33 <sup>b</sup>	121,00 <sup>c</sup>	102,00 <sup>d</sup>	1,99

#### Descriptions

- A is diet without purple sweet potato leaf, noni leaf and beetle leaf; B is diet containing 5 % purple sweet potato leaf ; C is diet containing 5 % noni leaf and D is diet containing 5 % beetle leaf

- Values in the same row with different superscripts are significantly different ( $P < 0.05$ )

- SEM: Standard Error of Treatment Means

Purple sweet potato leaf, noni leaf and beetle leaf in treatments B, C, and D could significantly reduce uric acid and sugar levels in Bali duck blood (Table 4). Ruthi (2010) described that purple sweet potato leaf also content same substances as in its tuber. The antioxidants substances in purple sweet potato leaf, noni leaf and beetle leaf could inhibit catalase enzyme glutamine synthetase activities. Their result of activities might reduce ammonia gas or form a new mutual amino acid in duck's body (Martoharsono, 1984). Roni et al. (2010) reported that diet containing bay leaves could decrease blood uric acid levels of 10 weeks old Bali ducks because of its antioxidant flavonoid and engenol. According to Adm (2013), alkaloid xeronine of noni leaf have a positive impact in stabilizing level of sugar in blood. The presence of antioxidants could capture and neutralize free radicals (Hillborn, 1999) so cells in pancreatic islets of Langerhans can be protected to produce insulin and inhibit the increase of blood sugar levels (Murray et al., 2009). Agung (2012) reported that beetle leaves contain beetlephenol, seskuiterfen and kavikal which might be used to recover from several diseases such as: diabetes mellitus, gout, hypertension and cholesterol.

## CONCLUSION

It was concluded that the leaves of purple sweet potato, noni and beetle in the diets could improve the chemical profile of Bali duck blood. When the three treatments (B, C and D) were compared, it seemed that beetle leaf was the most effective source of antioxidant in improving chemical profile of Bali duck blood.

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