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Research Article

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The Effect of Fermented Purple Sweet Potato *(Ipomoea batatas* L.) Skin on Blood *Malondialdehide* (MDA), Sugar and Uric acid Concentration of Bali Duck

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ABSTRACT

An experiment was carried out to determine the effect of fermented purple sweet potato (*Ipomoea batatas* L) skin in diets on *Malondialdehide* (MDA), sugar and uric acid of Bali duck blood. Seven treatment diets were used in a completely randomized design (CRD) consisted of control diet A (diet without containing purple sweet potato skin), diet B containing 5% purple sweet potato skin, diet C containing 10% purple sweet potato skin, diet D containing 15% purple sweet potato skin, diet E containing 5% fermented purple sweet potato skin, diet F containing 10% fermented purple sweet potato skin and diet G containing 15% fermented purple sweet potato skin. Five ducks were used with four replications in each treatment. The variables observed as of: blood *Malondialdehyde* (MDA), level of sugar, level of uric acid, feed anthocyanin consumption and antioxidant capacity. In general, it showed that addition of fermented purple sweet potato skin in the diets significantly reduced blood *malondialdehyde* (MDA), level sugar and uric acid. However, the MDA content of duck blood in the treatment B, and sugar content of duck blood in the treatment B, C, and D were found similar to the control diet (P>0.05). Fermented purple sweet potato skin in diets significantly reduced anthocyanin consumption and antioxidant capacity. In contrast, diet without fermented purple sweet potato skin in diets were not significantly different to anthocyanin consumption (P.<0.05) compared to control diet.
It can be concluded that fermented purple sweet potato *(Ipomoea batatas* L) skin in diets could improve MDA blood, sugar and uric acid concentration of Bali duck.

Key words: *fermented purple sweet potato skin, MDA, sugar, uric acid and Bali duck blood*

INTRODUCTION

Food containing antioxidant compounds is essential to maintain healthy body. It can be obtained from leaves, fruits and tubers. Antioxidant substances can neutralize free radicals [8]. The presence of free radicals in the body or tissue cells can cause damage to cellular components such as lipids, proteins and nucleic acids and carcinogenic mutations [22]. Purple sweet potato (*Ipomoea batatas* L.) is one of the foods that contain compounds of antioxidants due to the presence of anthocyanin substances. Anthocyanins scattered on the leaves and tubers of purple sweet potato [27] but the fact of purple sweet potato tuber skin has not been proven so further study related to utilization of agricultural waste as an alternative feed ingredients is required. Purple sweet potato produce approximately 20% of fresh skin and 50% dry weight if being dried but relatively high fiber content ballpark is necessary fermented with *Aspergillus niger* since it can increase nutritional value of rations, including an increase in anthocyanin levels and lower crude fiber content of purple sweet potato [24].

Free radical activity can be determined by the amount of *malondialdehyde* (MDA) being produced. The amount of MDA positively correlated with the levels of cholesterol in the blood [26]. It was further reported that major consumption of antioxidants ration will decrease MDA in meat accompanied by a decrease in cholesterol levels. Pamungkas [10] reported that extract of leaves and tubers of purple sweet can lower blood sugar levels in mice because of anthocyanin compounds can inhibit the activity of the enzyme α-glucosidase so sugar produced will decrease and affect sugar content in blood. Yandya *et al.*,[27] mentioned that administration of purple sweet potato leaf meal (*Ipomoea batatas* L.), noni leaf (*Morinda citrifolia* L.) and betel leaf (*piper beetle* L.) can decrease blood glucose, uric acid and blood cholesterol of Bali ducks. Sumardika and Jawi [20] conveyed that purple sweet potato extract can improve lipid profiles and *Dismutaser Superoxide* (SOD) in rats fed with high cholesterol content.

Yasa and Jawi [7] reported that administration of ethanol extract of purple sweet potato (*Ipomoea batatas* L.) can reduce blood glucose level and increase amount of antioxidants in rats fed with high glucose. In this case, ration containing fermented purple sweet potato skin on antioxidant capacity of diet, *Malondehaldehide* (MDA), sugar, and blood uric acid are essential to be applied to Bali ducks.

MATERIAL AND METHODS

The research was conducted at Guwang village, Gianyar District, Bali for 10 weeks. The test of antioxidant capacity, anthocyanins diets and blood *Malondialdehyde* (MDA) was carried out in the Laboratory of Analytical, Udayana University for two weeks. Moreover, the analysis of blood sugar and blood uric acid were carried out at the Laboratory of Blood, Wangaya Hospital, Denpasar, Bali for a week. One hundred and fifty Bali ducks were used in the study (3 weeks of age) with range body weight of 287.07 $\pm$ 0.34 grams obtained from duck collectors from Gianyar regency.

Table .1. Feed Composition of Ducks (3 – 12 weeks of age)

Ingredients (%)	Treatment						
	A	B	C	D	E	F	G
Yellow corn	55.36	54.98	49.98	47.32	54.98	49.98	47.32
Soybean	9.37	13.45	11.55	13.88	13.45	11.55	13.90
Copra meal	11.31	9.82	9.82	7.28	9.82	9.82	7.28
Fish meal	10.13	9.10	10.29	10.29	9.10	10.29	10.29
Rice bran	13.26	7.00	7.00	5.56	7.00	7.00	4.06
Purple sweet potato skin	-	5.00	10.00	15.00	-		
Fermented purple sweet potato skin					5.00	10.00	15.00
Mineral B12	0.50	0.50	0.50	0.50	0.50	0.50	0.50
NaCl	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Coconut oil	-	-	-	1.50	-	-	1..50

Table 2 Chemical composition of Duck Feed (3 – 12 weeks of age)

Chemical Composition	Treatment						
	A	B	C	D	E	F	G
Metabolizable Energy (Kcal/kg)	2900.00	2928.25	2928.90	2926.18	2926.25	2948.90	2935.18
Crude Protein (%)	17.93	18.08	17.98	18.18	18.18	18.08	18.28
Ether Extract (%)	5.94	5.43	5.46	5.46	5.42	5.45	5.45
Crude Fiber (%)	4.82	4.41	4.54	4.02	4.38	4.52	4.02
Calcium (%)	1.4	1.04	1.14	1.26	1.04	1.14	1.26
Phosphor Available (%)	0.73	0.69	0.70	0.71	0.69	0.71	0.71

Notes: A is control diet (without purple sweet potato skin), B is diet containing 5.00% purple sweet potato skin, C is diet containing 10.00% purple sweet potato skin, D is diet containing 15% purple sweet potato skin, E is diet containing 5.00% Fermented purple sweet potato skin, F is diet containing 10% fermented purple sweet potato skin, and G is diet containing 15.00 % fermented purple sweet potato skin.

Biofermentation with *Aspergillus niger* solution on Purple Sweet Potato (*Ipomoea batatas L)* skin

Purple sweet potato skin was mashed and mixed with *Arpergillus niger* solution clenched undecomposed inserted into burlap sacks and incubate for a week. After being fermented then dried and ready for the experiment. Seven treatments including control diet were used in a completely randomized design, consisted of: control diet A (without containing purple sweet potato skin), B is diet containing 5.00% purple sweet potato skin, C is diet containing 10.00% purple sweet potato skin, D is diet containing 15% purple sweet potato skin, E is diet containing 5.00% fermented purple sweet potato skin, F is diet containing 10% fermented purple sweet potato skin and G is diet containing 15.00 % fermented purple sweet potato skin. Five ducks in homogeneous age and live weight were used with four replications in each treatment. The variables observed as of: *Malondialdehyde* (MDA) blood, level of sugar, uric acid, feed anthocyanin consumption and feed antioxidant capacity.

Data Analysis

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

RESULTS AND DISCUSSION

The duck fed ration without purple sweet potato (treatment A) produce 6,58µL/mL *malondialdehyde* (MDA) of duck blood (Table 3). In contrast, it could reduce insignificant blood levels of MDA (P> 0.05) in treatment B, whereas the administration of treatment C, D, E, F and G can lower blood MDA levels were significantly different (P <0.05) compared to treatment A. Higher consumption of anthocyanin treatment will affect the ability to neutralize free radicals [8], thus giving treatment C, D, E, F and G could decrease value of MDA. Jawi *et al.*, [7] stated that bigger amount of purple sweet potato extract fed to rats decreased value of MDA. Yadnya *et al.*, [26] also found that greater level of fermented purple sweet potato consumed so MDA in duck meat produced will decrease within their cholesterol level. sugar and uric acid levels in ducks A is equal to 72.75% and 9.885% which is shown in Table 4. In treatment B, C, and D can reduce insignificant blood sugar and blood uric acid ducks (P> 0.05), whereas treatment with the administration of E, F and G can reduce blood sugar and blood uric acid which was significantly different (P <0.05) compared to treatment A. It depends on the ability antioxidants to inhibit the formation of sugar, or ability of antioxidants to inhibit the action of the enzyme α- glucosidase [10], thus resulting sugar can be reduced. or ability of antioxidants to inhibit the formation of uric acid. Martoharsono [9] conveyed that uric acid formation is highly dependent protein concentration or amino acids and activity of enzymes assist in the formation of uric acid. Yadnya *et al.*, [27] mentioned that administration of purple sweet potato leaf flour, beetle leaf and noni leaf could reduce blood sugar and uric acid of ducks since alkaloid compounds able to inhibit activity of enzymes in the formation of glucose and uric acid.

Table 3. Blood m*alondialdehide* (MDA), sugar and uric acid concentration of Bali ducks

Variabel	Treatment							SEM
	A	B	C	D	E	F	G	
Malondialdehide (MDA)(µL/mL)	6,58a	6,45a	5,85b	3.32c	2,38d	1,61e	1,64f	0,18
Sugar (%)	72,75a	69,67ab	65,5abc	66,5ab	65.5ab	54,75cd	53,25d	3,47
Uric acid (%))	9,88a	5,96b	4,82bc	4,54bc	4,09cd	3,31cd	3,00d	0,49

Description : A is control diet (without purple sweet potato skin); B is diet containing 5% purple sweet potato skin\; C is diet containing 10% purple sweet potwto skin; D is diet containing 15% purple sweet potato skin; E is diet containing 5% fermented purple sweet potato skin; F is diet containing 10% fermented purple sweet potato skin and G is diet containing 15% fermented purple sweet potato skin.
Values in the same row with different superscripts are significantly different (P<0,05)
SEM *: Standard Error of the treatment Means*

Feed consumption, Feed antioxidant capacity and Feed anthocyanin consumption

Feed consumptions of Bali ducks in treatment C, D, E, F, and G were significantly lower (P<0.05) except treatment B was not significantly than those in control diet (P>0.05). On the contrary, feed antioxidant capacity of ducks in treatment B, C, D, E, F and G were significantly higer than control diet. Moreover, anthocyanin consumption of ducks in treatment B, C, and D were not significantly different (P>0.05) but with treatment E, F can significanly higher (P<0.05) than control diet (Table 4).

Table 3. Feed consumption, feed antioxidant capasity, feed anthocyanin consumption in Bali duck during 10 weeks

Variable	Treatment							SEM
	A	B	C	D	E	F	G	
Feed consumption (kg/duck)	5,755a	5,693a	5,560b	5,46bc	5,566b	5,442bc	5,341c	40,16
Feed Antioxidant Capasity (%)	59,64f	60,36e	73,49d	74,26c	74,26c	75,76b	79,79a	0,11
Feed anthocyanin consumption (gr/duck)	143,8d	143,9d	147,1cd	145,5cd	150,83b	148,56bc	199,7a	1,48

Description : A is control diet (without purple sweet potato skin); B is diet containing 5% purple sweet potato skin; C is diet containing 10% purple sweet potwto skin; D is diet containing 15% purple sweet potato skin; E is diet containing 5% fermented purple sweet potato skin; F is diet containing 10% fermented purple sweet potato skin and G is diet containing 15% fermented purple sweet potato skin.
Values in the same row with different superscripts are significantly different (P<0,05)
SEM *: Standard Error of the treatment Means*

The result indicated that consumption of treatment C, D, E, F and G were significantly lower (P<0.05) than that treatment A. Anthocyanin in purple sweet potato as prebiotic is essential for the growth of microbes that are not pathogen. Provision of purple sweet potato without fermented bacteria can degrade significantly pathogen so nutrient absorbed increased and affected to feed antioxidant capacity and anthocyanin.

Feed antioxidant capacity has positive correlation with anthocyanin consumption. Kumalaningsih [8] stated that there is a trend of higher anthocyanin content could effect to greater antioxidant capacity. According to Yadnya [26], feed antioxidant capacity depend on feed anthocyanin consumption.

CONCLUSION

It was concluded that offered fermented purple sweet potato skin in diet can improve

malondialdehyde (MDA), level of sugar and uric acid of Bali duck blood.

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REFERENCES

1. Anggorodi, R. 1984. Science General Fodder. Publisher PT Gramedia, Jakarta.
2. Alfaatih, M. Eko, Widodo and Natsir, M.H. 2008. The use of sweet potato flour Waste Purple (*Ipomoea batatas* L) in the ration of Broiler Production, Department of Food nutrition ternak Fapet, UB.
3. Argawal, S. Rao, A.V. Role of Antioxidant Lycopene in Cancer and heart desease. *J. Coll. Nutr.* **2000,** 19 (5): 563-569.
4. Hasim and Yusuf, M. Anthocyanin-rich sweet potato. "Healthy Food Options. Sinar Tani Edition August 20 to 26, **2008.**
5. Hillbom, Oxidant, antioxidant and stroke. Fronies in Bioscience, **1999,** 15: 67-71.
6. Ishida, H. H.Suzukno, N. Sugiyama, S. Innami., T. Tadokoro, Akio Maekawa. Nutritive evaluation on Chemical Components of Leaves, stalks and Stems of Sweet Potatoes (*Ipomoea batatas* poir). *J. Food Chemistry*, **2000,** 68: 359-367.
7. Jawi, I. M. D. Ngh. Suprapta, A. A. Ngh Subawa. Sweet Potatoes purple MDA.Lowering Blood and Liver Mice after Maximum Physical Activity, *Jurnal Veterinary*, June **2008.**
8. Kumalaningsih, S. Antioxidant SOD (superoxide dismutase) antioxidants. **2008.**
9. Martoharsono, S. Biochemistry II. Gadjah Mada University Press, **1984,** Yogyakarta.
10. Pamungkas, D.D.A. **2012.** Potential Root Extract and Purple Sweet Potato Leaves as Inhibitors of α - glucosidase. Thesis. Department of Chemistry. Faculty of Mathematics and Natural Sciences, Bogor Agricultural Instutut, Bogor.
11. Plummer, D.T. **1977.** An Introduction to Practical Biochemestry. Mc. Grand Hill, Book Co. Ltd. New Delhi.
12. Prangdimurti, E. D. Mushtadi, D.M. Astawan., F.R. Zakaria. **2006.** Antioxidant Capacity and Leaf Extract hypocholesterolemic Suji.
13. Ratih. **2012,** Benefits beyond purple sweet potato.
14. Robert, M. Muskulin M. Godean, G. Tisier, J.M. Action of Anthocyanosides on The Permeablity of Blood Brain barries., Robert, L (Editor). Fronher of Matrix Biology. Bael-Koger, Thought Chem. **1979,** 7: 336-49.
15. Rumiasih, P.S. Hardjowono and Pr. Matitaputty, P.P Keteren. **2011.** Use of Beluntas, Vitamin C and E as antioxidants to reduce off-odor and Cihateup Alabio duck meat. 1) The department of Animal Husbandry Science and Technology, Faculty of Animal Science, Bogor Agricultural University, Bogor. 2) Livestock Research Institute, PO. Box 21, Bogor, 1600.
16. Roeswandy, Utilization of palm Lumpur *Aspergillus niger* Fermentation the ration of the Peking duck carcass age of 8 weeks *Agribusiness Livestock Journal*, 2(2): **2006.**
17. Roni, IGst. K., Ni and Ni Luh M.S. Sukmawati Pt. Sriyani. **2010.** Effect of Supplementation of Syzygium polyanthum Walp in rations containing different crude fiber, Research Report. Faculty of Animal Husbandry, Udayana University.
18. Setyawardani, T, Ningsih, D. Fernando, D. and Arcarwah. Effect of pineapple and papaya extracts on the quality of meat duck as culled. Bulletin Ranch, Published by the UGM, Yogyakarta, Supplementary edition, December **2001.**
19. Steel, R.G.D and J.M.Torrie.**1989.** Priciples and Procedure of the statistic. Mc.Graw, Hill Book Co. Inc., New York, London.
20. Sumardika, IW and I M. Jawi The effect of leaf extract of purple sweet potato (*Ipomoea batatas* L.) on the lipid profile and superoxide dismutase (SOD) mice blood serum. Prisiding. International, 3rd *International Conference on Biociences and Biotechnology*, Bali, September 21 to 22, **2011.**

21. Susanto, I. 2009. "PacarAir." Diakses April 7, **2010**.
22. Thannical, V.J. Fanburg, B.L. Reactive oxygen species in cell signaling. *Lung Cell Mol J.Physiol Am Physiol*, **2000,** 279: 1005-1028.
23. Trisnawati, W. Rai, M. and Adijaya, N. **2005.** Adaptation of the three varieties of sweet potato (Ipomoea batatas), the diversity of chemical composition and reperensi panelists. BPTP Bali. Grading USDA.1977.Poultry Manual. US. Government Publishing Office Washisngton DC.
24. Yadnya, T.G.B. and Trisnadewi, A.A.A.S. inproving the Nutrive of Purple sweet potato (Ipomoea batatas L) through Biofermentation of Aspergillus niger as Feed Containing Antioxidant Substance. 3rd *International Conference on Biosciences and Biotechnology*, Bali, September 21 to 22, **2011.**
25. Yadnya, T.G.B. Partama, I.B.G. and Trisnadewi, A.A.A.S. **2012.** Effect of ration containing purple sweet potato (*Ipomoea batatas* L) fermentation of Aspergillus niger on ration digestibility, protein retention, and Body Weight Added bali ducks. Proceedings of the 2012 FAI Semnas ISBN: 978-602 - 18810-0 - 2. Mercu Buana University of Yogyakarta.
26. Yadnya, T.G.B. **2013.** Utilization Study of Effects of Purple Sweet Potato (Ipomoea batatas L) fermented in the diet on performance, carcass quality and meat duck Bali cholesterol levels. Dissertation. Proram Graduate Studies, University of Udayana.
27. Yadnya, T.G.B. Trisnadewi, A.A.A.S. Aryani, G.A. and IGL.Oka. 2014. Leaves of Purple Sweet Potato *(Ipomoea batatas* L), Noni (*Morinda citrifolia* L) and Beetle *(beetle Piper* L) in the Diets improved Blood Chemical Profile of Bali Duck. *J. Biol.Chem. Research.* **2014,** 31(1): 538-545 ISSN 0970 -4973 (Print).