

Conference Paper

Dietary Supplementation Effects of Noni (*Morinda Citrifolia* L.) Fruit Flour on Uric Acid and Blood Glucose of Quails (*Coturnix Coturnix Japonica*) Layer Phase

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Abstract

This study was aimed to determine the effect of noni fruit flour in ration on uric acid and blood glucose of quails layer phase. The research was conducted from March to May 2015 at Faculty of Animal Husbandry Universitas Padjadjaran. One hundred commercial quails aged 4 weeks were randomly allocated to four treatment groups as T₁, T₂, T₃ and T₄. The quails in the control group (T₁) were given normal basal diet without the addition of noni fruit flour, while as other groups (T₂, T₃, T₄) were supplemented with 0.25, 0.50, and 0.75% noni fruit flour respectively with 25 quails per treatment group replicated five times with five quails per replicate in a Complete Randomized Design (CRD). The blood samples were randomly collected, five birds per replicate at the end experimental period (7th week) and analyzed for the estimation of uric acid and blood glucose. The results revealed that blood glucose was significantly ($p > 0.05$) increased in the groups fed noni at various levels when compared to the control. Further, a significantly ($p < 0.05$) proportional decreasing in blood uric acid levels was found with increase in the level of dietary noni fruit flour, with highest reduction in the group supplemented with 0.5% noni fruit flour (T₃) compared to the control group and in the group supplemented with 0.25% (T₂) for blood glucose. In conclusion, dietary inclusion of noni fruit flours had beneficial effect with regard to its ability in reducing the blood uric acid levels and increasing blood glucose of quails.

Keywords: Quail, uric acid, blood glucose, Noni.

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1. Introduction

Morinda citrifolia L. (commonly known as Noni) has been used in folk remedies over the years and has a broad range of therapeutic effects, including antibacterial, antiviral, antifungal, antitumor, analgesic, hypotensive, anti-inflammatory and immune enhancing effects [1]. The effect of oral administration of the bioactive principles isolated from *Morinda citrifolia* L. was studied in streptozotocin induced diabetic nephropathy rats to assess the anti-diabetic nephropathy activity in terms of glucose, protein, urea,

uric acid, creatinine in serum, potassium, sodium, alkaline phosphatase and urinary creatinine [2]. Streptozotocin induced animals showed high level of protein compared to control group. The increased serum protein level is due to increased renal failure with progressive atrophy of the nephrons. Treatment of diabetic nephropathy rats with *Morinda citrifolia* fruit extract has been found to decrease the damage of kidney and has restored the level of glucose, protein, urea, uric acid, creatinine, potassium, sodium and kidney alkaline phosphatase to that of normal level.

Morinda citrifolia (Noni) is rich in proxeronine, which combines with enzymes in the body to form an essential substance known as xeronine. It activates the immune system at cellular level thereby repairing and protecting kidney from damage. Noni has a number of active substances believed to health, that there are 160 phytochemical (minerals, vitamins, protein and other nutrients) that have been identified in noni [3, 4]. The active substances spread on the fruit, flowers, leaves, stems and roots of noni. The most complete the phytochemical composition contained in the noni fruit [4]. Noni contains a number of active substances included in the group of antioxidants. Antioxidants function in protecting cells from the harmful effects of oxidative stress. Oxidative stress is a state of the body is unable to neutralize free radicals amount of waste from the body. Antioxidants in the body are to minimize oxidative damage from the level of cells, tissues, even organs. Damaged cells can spread into the disease, it is important to maintain healthy antioxidants [3].

Flavonoids are naturally present in fruits, vegetables, grains, tea, wine, roots, stems, flowers and bark. Flavonoids contained in plants mostly bind to sugar molecules as glycosides and very rarely in the form of a single compound. In general, flavonoids to boost immune function such as anti-allergic, antiviral and antioxidant. Flavonoids are active in stimulating the performance of white blood cells (basophils, neutrophils, lymphocytes T and B, eosinophil), red blood cells, platelets, smooth muscle and hepatocytes [5].

Alkanoid an alkaline organic compounds that function in maintaining health by neutralizing toxins that enter the body. Noni contains many precursor forming called proxeronine. Proxeronine is converted into xeronine by the enzyme proxeroninase. Xeronine will improve and activate the protein molecules are broken, after activation of proteins will serve to improve the structure of the cells, as a means of transport of nutrients into the cell membranes, regulating hormones, antibodies and set the action of the enzyme [6].

Laying quail layer phase is a period when it began to produce eggs, generally aged 42 days or 6 weeks. Egg production is affected by the governance in the maintenance layer including seed selection, feeding and drinking, health and comfort of the cage includes cage density, air circulation, lighting and temperature [7].

2. Materials and Method

2.1. Experimental design

The research trial was conducted at Faculty of Animal Husbandry, Universitas Padjadjaran, Jatinangor - Sumedang, Indonesia from Maret 2015 to May 2015. A total of one hundred quails aged 4 weeks were randomly allocated to four treatment groups as T₁, T₂, T₃ and T₄ with 25 quails. The quails in the control group (T₁) were given normal basal diet without the addition of noni fruit flour, while as other groups (T₂, T₃, T₄) were supplemented with 0.25, 0.50 and 0.75% noni fruit flour respectively, were utilized for the study. The quails were randomly allocated to four treatments groups as T₁, T₂, T₃ and T₄ with 25 quails per treatment group, replicated five times with five (5) quails per replicate in a Completely Randomized Design (CRD). The quails in the first group (T₁) were given normal basal diet (without addition of noni fruit flour), while other groups (T₂, T₃, T₄) were supplemented with 0.25, 0.5 and 0.75% noni fruit flour respectively. The diets and water were supplied *ad libitum*. The materials used to construct ration consisting of maize, fine bran, soybean meal, fish meal, CaCO₃, topmix, methionine powder and noni fruit powder. The quails were reared in cages with coefficient of variation as 9.054%. The experimental ration was prepared having protein content 20% and metabolizable energy 2900 kcal/kg.

2.2. Processing

The Noni Fruit Flour was processed according the method of [8]. Noni fruit was cleaned and be sliced about 1 cm, then dried in oven 60°C for about 10-12 hours. After that, dried noni slices were powdered and then mixed in the feed according to the treatments.

2.3. Collection of samples

Blood samples were collected at the end of experimental period i.e. 7th week from randomly selected five quails from each treatment group, 3 ml of blood from each quail using needle and syringe into a labelled sterilized bottle containing ethylenediamine tetra-acetic acid (EDTA) and samples were used for estimation of blood glucose [9] and uric acid [10].

TABLE 1: Uric acid and blood glucose of quailblood varying levels of *Morinda citrifolia* L.in the diet.

Parameter	Treatment			
	T ₁	T ₂	T ₃	T ₄
Uric Acid (mg/dl)	5.40±1.23 ^{ab}	5.32±1.01 ^{bc}	4.52±0.98 ^{cd}	6.98±1.28 ^a
Blood glucose(mg/dl)	313.4±33.37 ^b	353.2±39.70 ^a	302.4±23.20 ^{bc}	293.4±12.97 ^d

2.4. Statistical analysis

Data collected were subjected to analysis of variance (ANOVA) [11] and Duncan's multiple range test was used to test the significance of difference between means. Differences were considered significant at $p < 0.05$.

3. Result and Discussion

The data of uric acid and blood glucose have been presented in Table 1. The results revealed that dietary inclusion of noni fruit flour in quails showed significant ($p < 0.05$) decreased in the blood uric acid levels of various treatment groups (T₂, T₃ and T₄) when compared to the control group (T₁). The effect on blood uric acid could be attributed to the active compounds present in noni fruit flour. The results revealed that blood uric acid levels decreased significantly ($p < 0.05$) in the groups supplemented with noni fruit flour when compared to the control. A proportional decreasing trend in blood uric acid levels was found when the level of noni fruit flour in diet increased, with highest reduction of 4.52 ± 0.98 mg/dl in the group supplemented with noni fruit flour (T₃) compared to 5.40 ± 1.23 mg/dl in the control group (T₁). The increase of uric acid level in the blood, a condition known as Hyperuricemia, predisposes quails to gout. The clinical manifestations of gout results from deposition of monosodium urate or uric acid crystals from supersaturated body fluids [2]. One of the factors contributing to hyperuricaemia is overproduction of uric acid by hydroxylation of xanthine which is catalyzed by xanthine oxidase. Xerone also serves to wide the pores of the cell membrane that helps in supplying cell molecules such as proteins. Cells use proteins to maintain and improve working efficiency of these cells [1]. Flavonoids are antioxidants that can protect the progressive destruction of pancreatic β cells as a result of oxidative stress. Moreover, tannin is known to stimulate the glucose uptake by increasing the tissue sensitivity to insulin and prevent adipogenesis [12]. Both these effects help to increase the blood glucose levels. Glucose is one of the major metabolites closely related to the sustainability of energy supply for the implementation of physiological and biochemical functions in the body [13]. Glucose is the main carbohydrate needed as a precursor for the energy citric acid cycle and is a substrate that is easily used by most of the body's cells for energy purposes [14]. In the present study, the use of noni

fruit flour increased the blood glucose levels in quails, thus imparted them with more energy to carry out various physiological and biochemical functions of the body than the control group.

4. Conclusion

It could be concluded, that the dietary inclusion of noni fruit flour in quails layer phase had beneficial effects, regard to its ability in reducing the blood uric acid levels and increasing blood glucose level, however, further studies in this regard with different inclusion levels are warranted.

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References

- [1] Adriani, L., Rochana, A., Yulianti, A., Mushawwir, A. and Indrayani, N. 2014. *Profil Serum Glutamate Oxaloacetat Transaminase (SGOT) and Serum Glutamate Pyruvate Transaminase (SGPT) Level of Broiler that was Given Noni Juice (Morinda citrifolia L.) and Palm Sugar (Arenga pitata). Lucari Stiintifice-Seria Zootehnie 2014.* 1-5.
- [2] Becker, M.A., Ralph, S., Robert, L.W., Patricia, A.M, Denise, E., William, A.P., Janet, S. and Nancy, J.R. 2005. *Febuxostat compared with allopurinol in patients with hyperuricemia and gout. N Engl J Med, 353:2450-2461.*
- [3] Widowati, W. 2008. *Potensi Antioksidan sebagai Antidiabetes. Jurnal Kedokteran-Maranatha. Vol. 7 No. 2. Februari 2008.*
- [4] Chan-Blanco, Y., Vaillant, F., Perez, A. M., Reynes, M., Brillouet, J. and Brat, P. 2005. *The Noni Fruit (Morinda citrifolia L.): A Review of Agricultural Research, Nutritional and Therapeutic Properties. Journal of Food Composition and Analysis, Vol. 19(2006): 645 - 654.*
- [5] Padmavathy, S, R. Jeyachandran, L. Cindrella 2008. *Ethnopharmacological importance of Morinda citrifolia L. African Journal Tradit Complement Altern Med. November, 2008.*
- [6] Wang, M.Y, West, B., Jensen, J. C., Nowicki, D., Chen, S., Palu, A. K. and Anderson, G. 2002. *Morinda citrifolia (Noni): A literature review and recent advances in Noni Research. Acta Pharmacol Sin, Vol. 23(12): 1127-1141.*

- [7] Wuryadi, S. 2013. *BerternakPuyuh*. PT. Agro Media Pustaka. Jakarta.
- [8] Hidayati, A. 2006. *Penggunaan tepung Buah Mengkudu (Morinda citrifolia) untuk meningkatkan kualitas Pakan Ayam Ras*. GAMMA, Vol. 2(1): 17-24.
- [9] Bergman, M. and Felig, P. 1984. *Self-monitoring of blood glucose levels in diabetes*. Principles and practice. *Arch Intern Med*, 144: 2029-2034.
- [10] Roche, 2014. Elecsys Brahms pct. Cobas, Roche Diagnostics, 9: 1-5.
- [11] Steel, R.G.D. and Torrie, J.H. 1980. *Principles and Procedures of Statistics*. McGraw Hill Book Company.
- [12] Muthusamy, V. S., Anand, S., Sangeetha, K. N., Sujatha, S., Balakrishnan, A and Lakshmi, B. S. 2008. *Tannins present in Cichorium intybus enhance glucose uptake and inhibit adipogenesis in 3T3-L1 adipocytes through PTP1B inhibition*. *Chemico-Biological Interactions*. 174(1) : 69-78.
- [13] Klasing, K.C. 2000. *Comparative Avian Nutrition*. Department of Avian Science, College of Agricultural and Environmental Sciences University of California Davis Californi, USA. CAB Internasional.
- [14] Hazelwood, R.L. 2000. *Pancreas in Sturkie Avian Physiology*. Ed C.C Whittow, Fifth Ed, Academic Press.