Serum Biochemical Indices Of Rabbit Doe Fed Biscuit Diets Containing Moringa Oleifera Lamm Based On Urban Organic Waste

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Abstract. The aim of this study was to determine the serum indices of rabbit doe fed biscuit diets containing Moringa oleifera lamm based on urban organic waste. A total of 25 rabbits doe were used divided into 5 groups based on body weight with 5 treatments in each group. T0 was the control diet while T2, T4, T6, and T8 received additional 2%, 4%, 6%, and 8% moringa leaf meal, respectively. The treatment was given during pregnancy until the kit was 21 days old. Blood samples collected from rabbits does on the last day of study and evaluated for serum biochemical indices, data obtained were analysed statistically. The variables observed were cholesterol, glucose, total protein, albumin, globulin, creatinine, and urea. The results showed that cholesterol, total protein and albumin in the blood serum of rabbit doe were significantly different ($P<0.05$) while glucose, globulin, creatinine, and urea were similar ($P>0.05$) between the groups. Giving Moringa leaf meal up to 8% in biscuit diet was able to reduce cholesterol content in the blood from 75.10 mg/dl to 58.20 mg/dl. Total protein in blood serum increased from 6.94 g/dl to 8.24 g/dl. This increase in total protein seems to be influenced by a significant increase in albumin from 4.08 g/dl to 5.58 g/dl. The other variables still have values in the normal level such as controls.

1. Introduction

Rabbits are pseudoruminants that can survive well even if they only eat forage such as leaves, straw, and roots. Oryctolagus cuniculus (Rabbit) is currently being recommended as a high-quality protein feed for countries with low meat production [1]. Rabbits have a short gestation period of 28-31 days, early sexual maturity of 5-6 months, which makes them highly productive, and their ability to re-breed immediately after giving birth makes the generation interval be short; these characteristics make them more productive in a short period of time [2][3]. However, the production quality of rabbits and their products has not been fully recognized in Indonesia because breeding is the main limiting factor in the maximum performance of rabbits [4].

As a result of their high reproductive advantage, rabbits have been recommended to be a source of gap protein deficiency. In a similar vein, [5] reported that rabbit production increased. As much as 65% of the total cost of rabbit production for feed, therefore the cost of buying rabbit feed becomes expensive for breeders [6]. The use of forage as rabbit feed is very important because it is cheap, easy to obtain and can be digested effectively by rabbits. Besides being a feed source, forage can be given as a plant-therapy for these diseases [7] [8] a large number of plants have been tested to ascertain their possible and potential health effects. Several medicinal plants are widely used as aphrodisiacs to

relieve serial dysfunction or as fertility enhancing agents, and are known to increase nutritional value [9] [10] [11].

Laboratory analysis showed that the crude protein concentration in Moringa leaves was about 25% with the amount of tannins (1-23g/kg) in all fractions of Moringa plants and amino acids containing high levels of sulfur [12] [13]. The leaves are highly nutritious, such as vitamins A, B, and C, Ca, Fe, P and Protein [14][15]. Moringa is a vegetable that is easy to grow and reproduce in tropical dry land, its availability and low price. This plant has a high adaptability, mostly on marginal land. Moringa is rich in protein and essential amino acids. As an ingredient with high quality protein and essential amino acids, Moringa tree has a high contribution to increasing growth [12] and the level of organism health, especially to improve the health of rural communities, supplements for pregnant women [16] [17] and to improve body conditions type 2 diabetics [18][19]. Moringa is also known as a magic tree plant, because it contains bioactives such as protein and amino acids that are useful for overcoming malnutrition [14]. Therefore, many types of research have been carried out, especially in relation to growth and repair metabolism.

Moringa leaf flour is known as a medicinal plant with a high crude protein (CP) content, there are several reports of animal feeding trials, and few reports on its effect on animal blood serum. This prompted the design of this experiment to determine the serum biochemical index of the diet of doe rabbit biscuits containing moringa oleifera lamm based on urban organic waste.

2. Methods and Materials

2.1 Experimental Animals

Twenty-five female local rabbits that were pregnant (partured) were put into individual cages. At the same time also prepared 6 male rabbits. Mating between male rabbits and female rabbits is done naturally. All female rabbits are conditioned to receive the same management, environment and hygienic conditions. The battery is placed 80 cm above ground level in a well-ventilated area. The cage is equipped with a feeder and a nipple drinker. The formulation of treated rabbit moringa biscuits contained different concentrates and milled Moringa leaves at different levels. Fresh Moringa leaves obtained from Blora Regency were dried and ground then mixed with other feed components which eventually became a complete feed (concentrate and leaf meal) which was formed into biscuits. Biscuits were given 6 pieces a day and water was made adlibitum or available to animals during the experimental period [20]. The composition of nutrients and the proportion of concentrates are based on the standard of crude fiber and protein required by does rabbit as shown in Table 1.

Table 1. Compotition of diet experiment (Moringa biscuit)

Type of feed	T0 (%)	T2 (%)	T4 (%)	T6 (%)	T8 (%)
Moringa leaves meal	0	2	4	6	8
Dried water spinach	10	10	10	10	10
Indigofera leaves	10	10	10	10	10
Teak leaves	5	5	5	5	5
Bamboo Leaves	3	3	3	3	3
Banana Leaves	5	5	5	5	5
Guava Leaves	3	3	3	3	3
Soy sauce dregs	7	7	7	7	7
Bread waste	8	8	8	8	8
Soybean meal	15	15	15	15	15
Pollard	8	8	8	8	8
Rice bran	5	5	5	5	5
DDGS	5	5	5	5	5
Molasses	5	5	5	5	5
Mill corn	10	10	10	10	10

Premix	1	1	1	1	1
Nutrien content					
Dry Matter	87,31	88,09	89,88	90,66	91,45
Crude Protein	17,17	17,60	18,03	18,46	18,89
Extract Ether	5,28	5,37	5,46	5,55	5,64
Crude Fiber	11,36	11,58	11,80	12,02	12,24
Ash	10,37	10,56	10,75	10,95	11,14

2.2 Blood Sample Analysis

Blood samples were taken at the end of the feeding period, to evaluate the blood serum index. Blood samples of ± 3 cc were taken from the vein behind the rabbit's ear, then centrifuged at 3000 rpm to separate serum and plasma. Blood serum was put into an eppendorf tube and stored at -20°C.

2.3 Statistical Analysis

Block Randomized Design was used as experimental design consists of 5 bloks and 5 treatments. The treatments were T0, T2, T4, T6, T8 = *moringa* leaves the amount of 0, 2, 4, 6, 8 % respectively. The data collected then analyzed by analysis of variance and followed by least significant difference test with used microsoft excel for windows.

3. Results and Discussion

Table 2 above shows the blood serum biochemistry of doe fed a diet of Moringa biscuits. Diet treatment between doe had a positive effect ($p<0.05$) for serum biochemical parameters except glucose, albumin and creatinine which did not show a significant difference ($p>0.05$) between the treatment groups. The total protein results showed that there was a significant difference ($P<0.05$) between the treatment groups. T0 (Control) has the lowest value (6.94 g/dl) while T8 has the highest value (8.24 g/dl). The values obtained in this study, however, were within the normal range for healthy rabbits as reported by [21] ; indication of nutritional adequacy of dietary protein in this study.

Table 2. Serum Biochemical Indices

	T0	T2	T4	T6	T8
Cholesterol (mg/dL)	75,10 ± 4,51^{a}	65,20 ± 5,54^{b}	62,80 ± 9,109^{b}	58,00 ± 7,71^{b}	58,20 ± 8,40^{b}
Glucose (mg/dL)	72,80 ± 12,64	71,60 ± 7,47	80,60 ± 9,91	76,20 ± 9,36	89,80 ± 8,,43
Total Protein (g/dL)	6,94 ± 0,27^{a}	7,38 ± 0,41^{ab}	7,56 ± 0,61^{abc}	7,92 ± 0,81^{bc}	8,24 ± 0,36^{c}
Albumin (g/dL)	4,08 ± 0,08^{a}	4,12 ± 0,02^{a}	4,42 ± 0,36^{a}	4,74 ± 0,40^{ab}	5,58 ± 1,58^{b}
Globulin (g/dL)	2,86 ± 0,30	3,26 ± 0,34	3,14 ± 0,66	3,18 ± 1,09	2,66 ± 1,59
Creatinine (mg/dL)	1,16 ± 0,21	1,28 ± 0,11	1,18 ± 0,04	1,18 ± 0,22	1,34 ± 0,15
Ureum (mg/dL)	33,34 ± 6,26	35,98 ± 1,90	36,72 ± 2,63	35,78 ± 1,26	36,42 ± 5,40

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Total protein and albumin also showed significant differences ($P<0.05$) between the experimental treatments and were within the normal physiological range for healthy rabbits. The range of values (6.94 – 8.24 g/dl) for total protein and (4.08 – 5.58 dl/l) for albumin obtained in this study

were within the normal range of reported albumin serum (3.5 – 6.5 g/dL) by [22] which is an indication of proper liver function in rabbits. Abnormal albumin serum usually indicates a change of systemic proteins. Globulins were also in the normal range (1.5-3.3 g/dl) reported by [23] which describes high resistance and good immunity to disease in experimental animals. This may be due to the ethnoveterinary nature of *Moringa oleifera* as reported by [24].

Cholesterol values were significantly affected ($P<0.05$) by the treatment diet. This is in accordance with the results of a study which reported that the juice extracted from Moringa leaves can be used as a hypocholesterolemic agent. The decrease in cholesterol levels of rabbits fed Moringa biscuits is in agreement with previous results by [27][28][29][18] which showed that local chickens, broilers, laying quail and mice fed Moringa had higher levels of cholesterol and lipids liver. The occurrence of hypolipidemia due to Moringa leaves was explained by [30] who reported that Moringa oil from the wild contains phytosterols including campesterol, stigmasterol, and -sitosterol. -sitosterol is a plant sterol with a structure similar to cholesterol, except for the substitution of an ethyl group on the C 24 side chain. It can reduce cholesterol by lowering its concentration in plasma of LDL.

This reduction in serum cholesterol levels in rabbits fed the *Moringa oleifera* diet may reflect a decrease in lipid distribution and so the Moringa leaf diet can reduce cholesterol serum [25], This ultimately helps reduce cholesterol deposition in the intestines and muscles; so that the resulting meat production is low in fat. These results also indicate that diet *Moringa oleifera* can be used to produce animal products with lower cholesterol levels. The cholesterol values obtained in this study were still within the normal range for rabbits (35.0-66.0mg/dl) as reported by [26] except T0 were found 75,10 mg/dl.

The urea value was not significantly different ($p>0.05$) between the treatment groups. The higher urea levels at T4 and T8 can be caused by increased activity of the enzymes urate ornithine carbonoyle transferase and arginase. Low blood serum urea in test animals is an indication that amino acids in *M. oleifera* are balance, because high blood urea levels indicate poor protein quality or excess tissue catabolism associated with protein deficiency. Amino acid imbalance will result in an increase in blood urea concentration. The results of this study may highlight that *M. oleifera* has high quality protein as reported [31]

4. Conclusions

From this study, it was concluded that moriga biscuit did not affect the serum biochemical of blood doe rabbits. It may recommended as feeding to reduce cholesterol in blood serum. Research with more comprehensive variables is needed.

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