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The effect of *Moringa oleifera* Lam leaf flour in diet on the growth and the feed conversion rate of local pig of East Timor

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Abstract

Moringa oleifera Lam leaf flour is one of the original feed from herbal plants, which is assumed to contain growth promoters and has complete amino acids to stimulate the growth of pigs. This study aims to find out the effect of *Moringa oleifera* leaf flour (MLF) in diet to increase the growth performance of East Timor local pig. A total of 20 local pig's male in growth phase with an average initial body weight of 15.35 ± 6.72 kg were used and the randomized block design with 4 treatments and 5 replications. The experiments were carried in this study in the following way: treatment T0 (0% MLF), T1 (3% MLF), T2 (6% MLF) and T3 (9% MLF) in diet. The variables observed were the initial body weight, final weight, daily body weight gain, consumption and FCR. The results showed that the treated of pigs in group 2 exhibited significantly different ($P < 0.05$) on daily body gain, final body weight and FCR than the group receiving treatment T0, T1 and T3. No different significances ($P > 0.05$) in the feed consumption was observed among the dietary treatment. We concluded that use of 6% MLF in diets could increase growth performance and improve feed conversion rate of local pigs.

Keywords: Local pigs, *Moringa oleifera*, consumption, conversion, growth

1. Introduction

Timor-Leste's local pigs which called "fahi timór" are still traditionally maintained by 71.58% of the household, with total local pig population about 419,169 pigs (FMRDTL, 2015) [6]. Traditional extensive maintenance without regard to the procedure of feeding both quantity and quality and without reproduction control, the system greatly affects to the production performance and need to take 2-3 years to achieving the ideal slaughtering weight. This causes high levels of fat in meat and can reduce consumer demand. Excess cholesterol content in food is one of the consideration factors for consumers in consuming foods of animal products (Maliandasari *et al.*, 2015) [5], which is characterized by hardening of the arterial walls and levels high fat (hyperlipidemia) in the blood especially cholesterol contain in food up to 80 mg / 100 gr (Murray *et al.*, 2009) [7]. Consuming food with excessive cholesterol is one of the factors causing generative diseases (Oetoro, 2009) [9]. Some elements of phytochemical compounds in MLF as an antibacterial, and contain β -carotene which act as carbohydrate color active substances, and in principle as one of the conditions for evaluating meat quality. Phytochemical compounds contained in MLF include: flavonoids, saponins, tannins, and several other phenolic compounds that have antimicrobial activity (Bukar *et al.*, 2010) [2]. Reduce blood cholesterol levels and increase HDL levels, whereas saponins are proven to be efficacious as anticancer, antimicrobial (Bidura *et al.*, 2017) [11].

The use of MLF in this study was carried out as a form of alternative feed in dietary is safely without endangering pig's health. Besides that, as information material regarding the use of active substances contained in MLF to improve the production performance, especially to stimulate the growth of local pigs. The purpose of this study to determine the influence of MLF in diet to improve the growth performance and improve feed conversion rate of East Timor local pigs.

2. Materials and Methods

2.1 Animals and experimental design: A total of 20 pigs male in growth phase were used and their initial average weight is 14.36 ± 6.92 , and randomly allocated to four treatments in a block randomized design, were used in a 75-d growth experiment.

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Pigs were allocated to four treatment and each treatment consisted of five replications with one pig per pen in randomly block design. The experiments were carried out in this study in the following way: treatment T0: without MLF in the ration; T1: with 3% of MLF in the ration; T2: with 6% of MLF in the ration and T3: with 9% of MLF in ration. The animals were given water and feed *ad libitum* during the experimental period of 75 days.

2.2 Growth performance traits and diets: The compositions of the diets are shown in Table 1. The diet was formulated and manufactured before starting the trial, without the inclusion of any antibiotic growth promoters or antibiotic growth promoter alternatives. The experimental diets were formulate on the basis of yellow corn, rice bran and soybean meal, supplemented with *Moringa oleifera* leaf flour. To get the ideal ration, it is formulated based on animals needs in accordance with NRC (1998)^[8] recommendations. Pigs had free access to experimental diets and drinking water. A combination of daylight and artificial light was used, with a 12-h light/dark cycle. The weight and feed disappearance were measured on day 0 and 90 post weaning for the calculation of average daily gain (ADG), average daily feed intake (ADFI) and feed conversion ratio (FCR).

Table 1: Nutrition composition of diets used in research (percentage as-fed-basis).

Total	T0	T1	T2	T3
ME Kcal/kg (% DM)	3236	3253	3269	3286
CP(% DM)	17,51	18,15	18,79	19,43
CF (%DM)	5,58	5,41	5,24	5,08
CL (%DM)	6,31	6,12	5,93	5,74
Ca (%DM)	0,10	0,18	0,26	0,33
P (%DM)	0,17	0,19	0,22	0,24

Obs.: ME: Metabolic energy; DM: Dry Matter; CP: Crude Protein; Ca: Calcium; P: Phosphor;

Source: Biochemistry and Nutrition Laboratory of UNDANA

Table 3: Effect of *Moringa oleifera* leaf flour in diets on pigs production performance

Variable	Treatment ¹				CV ³
	T0	T1	T2	T3	
Initial body weight (kg)	13,29±6,16a ²	15,64±10,67a	14,43±6,68a	14,09±6,92a	21,23
Last body weight (kg)	28,71±7,49a	30,61±11,29a	35,90±5,95b	28,05±2,54a	24,72
Daily weight (g/d)	171,40±20,52b	161,60±14,77b	237,60±11,95a	155,00±32,38b	16,05
Feed consumption (g/d)	962,50±40,01a	825,20±84,28a	905,70±82,58a	814,50±81,48a	9,24
FCR (feed consumption/ADG)	5,17±0,30b	4,26±0,97b	3,41±0,18a	4,70±1,07b	21,94

Description:

1. The basal diet without *Moringa oleifera* as a control (T0); Diet with *Moringa oleifera* 3% (T1); Diet with *Moringa oleifera* 6% (T2); Diet with *Moringa oleifera* 9% (T3).
2. Values with different letters on the same line indicate a real distinct real ($P < 0.05$).
3. CV: Coefficient of Variance; ADG: Average daily gain

The content of amino acids in MLF among others arginine, isoleucine, lysine and threonine serves as growth promoters can accelerate the growth of local pigs. The high quality feed can strengthen the circulation system and improve intestinal ability in the digestive process so can use the maximum nutritional application for animals growth (Hernandes *et al.*, 2004)^[4]. According to Gomes *et al.* (2019)^[3] that rations supplemented with *Moringa oleifera* Lam leaf flour could accelerate the growth of pigs higher than control rations.

4. Discussion

The average value of each treatment indicates that the diet T2 with MLF supplementation as much as 6% in diet resulted in

University (2018).

Table 2: East Timor *Moringa oleifera* Leaf Nutritional Content (% DM)

Composition	<i>Moringa Atauro</i>	<i>Moringa Casait</i>
Dry Matter (DM)	89,52	90,13
Organic Matter (OM)	90,37	89,90
Crude Protein (CP)	33,68	38,84
Crude Lipid (CL)	15,92	12,75
Crude Fiber (CF)	9,01	10,17
Carbohydrate (CHO)	40,77	38,31
Non N. Free Extract (NNFE)	31,76	28,15
Gross Energy(MJ/Kg)**	17,63	16,82
Gross Energy (Kcal/Kg)**	4.197	4.003
Metabolic Energy (ME)**	2.815,40	2.956,50

Source: Biochemistry and Nutrition Laboratory of UNDANA University (2018).

Orbs: ** Calculation of parameter's

2.3 Statistical Analysis: The data had have collected should be analysis with Multiple Analysis of Variance (MANOVA) and if be significant different ($P < 0.05$) on among the treatment group was continue with Duncan test according recommendation of Sampurna and Nindhia (2008)^[10].

3. Results

3.1 Local pigs production performance

The results of production performance shown in Table 3. The performance of local pigs that were given *Moringa* leaf flour (MLF) in diets had no significant effect ($P > 0.05$) on feed consumption and had significant effect ($P < 0.05$) on the final body weight and significantly lower effect on the feed conversion ratio (FCR). Teste Duncan reveal that the treatment T2 shows higher results when compared with T0 (without MLF in diet) and treatment T1 and T3 each with MLF as much as 3% and 9% in diets.

the highest average of DGW of local pigs around 237,60±11.95 g/day (with a range of 225.65-249.55g/day) or about 27.86% higher when compared with control treatment without 0% MLF in diet and the treatment T1 and T3 where each of them with 3% and 9% MLF in diets. These results indicate that the presence of amino acids in MLF, among others like arginine, isoleucine, lysine and threonine can serve as growth promoters and can accelerate the growth of local pigs. Dietary substances especially amino acids can strengthen the circulation system and improve intestinal ability in the digestive process so that the application of food nutrients maximally for the living staple and growth of pigs (Hernandes *et al.*, 2004)^[4].

The productivity of the pigs to be more efficient and profitable, it relies heavily on the understanding of the concepts of genetics, environment, health, management and nutrition of animals itself (Sumadi, 2018) ^[11]. It is further asserted that there are several factors that can affect the need for nutrient in local pigs, this requirement is a combination of genetic potential and growth rate as well as feed intake. Zahra (1996) ^[13] states that the weight of an animal is influenced by several factors include food and season. The growth of an animal is usually detected through measurements of weight that can be done by repeated weighing and presented as weight gain every day (Tilman *et al.*, 1998) ^[12].

The use of MLF as much as 6% in the diet T2 can suppress the feed conversion ratios (FCR) as much as 36.75% lower than other treatment, its means that, the pig only need 3.41 ± 0.18 to produce 1 kg body weight or meat. At the treatment T2 can increase pig's ability to change the feed as much as 3.23-3.59 kg to be 1 kg body weight when compared with treatment T0 as control (without MLF in diet), treatment T1 and T3 where the three treatment each require 5.27; 4.26 and 4.70 to produce 1 kg of body weight.

5. Conclusion

The use of *Moringa oleifera* leaf flour up to 6% in diets can increasing the growth performance and can pressing the feed conversion rate on East Timor local pigs.

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7. Conflict of interest declaration

We certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

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