INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN MULTIDISCIPLINARY EDUCATION

ISSN(print): 2833-4515, ISSN(online): 2833-4531

Volume 03 Issue 02 February 2024

DOI: 10.58806/ijirme.2024.v3i2n10, Impact factor- 5.138

Page No. 203 - 208

Effect of Including Noni Leaves Meal into Basal Diet on Ca and P Intake and Digestibility in Landrace Crossbred Pig

David A. Nguru[1], Sabarta Sembiring[2], I Made S. Aryanta[3], Ni N. Suryani[4], Tagu Dodu[5], Simon E. Mulik[6], Alvrado Bire Lawa[7], Alberth N. Ndun[8], Nautus S. Dalle[9]

[1,2,3,4,5,6,7,8]Animal Science Study Program, Graduate Program, University of Nusa Cendana

[9]Programs of Animal Husbandry Study, Faculty of Agriculture and Animal Husbandry, Universitas Katolik Indonesia Santu Paulus Ruteng

ABSTRACT:The study aimed at evaluating the effect of including noni meal leaves (TDM) into basal diet on Ca and P intake and digestibility in landrace crossbred pig. Data intake and feces collection was carried out for 2 weeks. There were 12 male piglets 1-2 months of age with 10.50-21.50 (average 16.70) kg (CV 18.76%) initial body weight used in the study. Randomized block design 4 treatments with 3 replicates procedure was applied in the trial. The treatment diets offered were: R0: 100% basal diet without TDM; R1: 98% basal diet + 2% TDM; R2: 96% basal diet + 4% TDM; and R3: 94% basal diet + 6% TDM. Variable evaluated were: intake and digestibility of Ca and P in pig. Statistical analyisis found that including noni leaves meal is not significant (P>0.05) in increasing either intake or digestibility of either Ca or P in pig. The conclusion is that including 2, 4, 6 % noni leaves into basal diet tends to increase both intake and digestibility of both Ca and P in pigs.

KEYWORDS: pig, noni leaves, Ca, P, intake, digestibility

INTRODUCTION BACKGROUND

Pigs are prolific meat-producing monogastric livestock, capable of growing quickly and efficiently converting feed into meat to meet the needs of animal protein for the community. This is because pigs have advantages, including: fast growth, good feed conversion and are able to adapt to diverse environmental conditions and carcass percentages can reach 65-80% (Siagian, 2014 in Wibawa et al. 2019). Most people use commercial feed added with chemical antibiotics that are useful for killing parasites in the digestive system of pigs. However, the mixture of antibiotics in commercial feed that is not in accordance with the recommendations and the specified dose can cause residues in the resulting livestock products (Bahri et al., 2005 in Etikaningrum and Iwantoro, 2017) This is supported by Anggitasari et al, 2016 the use of antibiotics can cause negative effects in the form of residues that can be harmful to consumers. Therefore, it is necessary to have an alternative to chemical antibiotics.

Oni leaves are one of the plants that can be used as natural antibiotics. Noni, whose Latin name is Morinda citrifolia, is one of the tropical plants that has the potential to meet the needs of pigs, is easily found in various places, and is efficacious as a medicinal plant. Noni has antibacterial activity, antitubercolosis, antitumor, analgesic, hypothesizing, imonology (Usha et al., 2010) anti-cancer, antioxidant, anti-inflammatory, and cardiovascular activity (Chan-Blanco et al., 2006), 2006) petroleum ether extracts and water extracts of noni leaves have been shown to have antibacterial activity against E. coli and S. aureus bacteria (Usha et al., 2010) acubin, L asperyloside, alizarin and several anthraquinone substances have been proven as anti-bacterial substances.

The results of the analysis of the fodder laboratory of the Faculty of Animal Husbandry Jambi (2004) found that noni leaf flour contains 87.10% (BK), 9.02% (PK), 24.99% (SK), and 4382 Kcal/gross energy. By influencing the many benefits of the noni plant, it is expected to have a positive impact on the digestion of pigs, especially for calcium and phosphorus, therefore it is necessary to conduct a study entitled "The Effect of the Use of Noni Leaf Flour (Morinda citrifolia) in Basal Rations on Consumption and Digestibility of Calcium and Phosphorus in Peranakan Pigs"

RESEARCH MATERIALS AND METHODS

Research Materials

Livestock and Cage

The materials used were 12 male landrace sows aged 1-2 months and weighing between 10-20 kg. The cages used in this study were individual cages with enternit roofs, rough cement floors and cement walls of 12 plots, each plot measuring 2m x 1.8m and a floor slope of 2o and equipped with separate feed and water containers.

Equipment

The equipment used consisted of Morizt Goats brand hanging scales with a capacity of 100 kg with the smallest scale of 0.5 kg for weighing pigs, Lion Star brand sitting scales with a capacity of 15 kg with the smallest scale of 0.05 kg for weighing rations and feces, buckets, brooms.

Feed Research

The feed ingredients used in the preparation of the research ration consisted of rice bran, corn flour, KGP-709 concentrate, mineral-10, coconut oil and noni leaf flour.

The nutritional content of feed ingredients can be seen in Table 1, while the composition and nutritional content of the basal ration can be seen in Table 2.

Table 1. Nutrient Content of Feed Ingredients.

Feed ingredients	Nutrient content (%)						
	BK (%)	EM (kkal/kg)	PK (%)	LK (%)	SK (%)	Ca (%)	P (%)
Corn Flour [a)]	89	3420	9,4	3,8	2,5	0,03	0,28
Rice bran	87,5	2200	13,5	8,2	13	0,03	0,12
KGP-709 Concentrate [b)]	90	2700	36	3	7	4	1,6
Mineral -10[C)]	-	-	-	-	-	43	10
Coconut oil	-	8600	-	-	-	-	-
Mengkudu leaf flour[d)]	87,10	4382	9,02	8,65	24,99	10,30	0,25

Notes: [a)] NRC (1998), [b)] PT KGP, (2014). [c)] PT Medion, [d)] Suy (2015)

Table 2. Composition and Nutrient Content of Basal Ration *)

Feed ingredients	Nutrient content							
	Composition	BK (%)	EM (kkal/kg)	PK (%)	LK (%)	SK (%)	Ca (%)	P (%)
Yellow corn	42	37,38	1436	3,95	1,60	1,05	0,01	0,12
Fine bran	20	17,2	440	2,7	1,64	2,6	0,01	0,02
KGP-709 Concentrate	37	33,3	999	13,32	1,11	2,59	1,5	0,59
Mineral - 10	0,5	0	0	0	0	0	0,22	0,05
Coconut oil	0,5	0	43	0	0	0	0	0
Jumlah	100	29,39	2918,4	19,97	4,35	6,24	1,71	1,78

Notes: *) nutrient content calculated based on Table 1

RESEARCH METHODS

The research method used a Randomized Group Design (RAK) with an experimental design adapted to variations in pig body weight. The number of treatment rations used were 4 treatments with 3 replications so that there were 12 experimental units:

R0 : Basal ration without noni leaf flour (TDM)

R1 : 98% Basal Ration + 2% TDM

R2 : 96% Basal Ration + 4% TDM

R3 : 94% Basal Ration + TDM 6%

RESEARCH PROCEDURE

Preparation of noni leaf flour

The mengkudu leaves used in this study were fresh mengkudu leaves that were picked and then dried under the sun for 7 days and then finely ground to be used as feed ingredients. Metode Penelitian

Metode penelitian menggunakan Rancangan Acak Kelompok (RAK) dengan rancangan percobaan yang disesuaikan dengan variasi bobot badan ternak babi. Jumlah ransum perlakuan yang digunakan 4 perlakuan dengan 3 ulangan sehingga terdapat 12 unit percobaan:

R0 : Ransum Basal Tanpa Tepung Daun Mengkudu (TDM)
R1 : 98% Ransum Basal + TDM 2%
R2 : 96% Ransum Basal + TDM 4%
R3 : 94% Ransum Basal + TDM 6%

Ration mixing procedure

The feed ingredients used to make up the ration are ground to obtain the same particle size and the feed is weighed according to the quantities listed in Table 3. After completion of weighing, feed ingredients are mixed starting from the least to the most composition so that the ration is evenly mixed. Noni leaves were added to the feed at 2% (R1); 4% (R2); 6% (R3), while mixed until evenly distributed then the ration was ready for use.

Randomization Procedure

Before starting randomization, the research animals were first weighed in order to know the initial body weight variation, then numbered from the smallest body weight to the largest body weight. Due to the group randomized design used, the animals were grouped into three groups according to initial body weight with four animals per group. Treatment randomization was conducted within each group.

Table 3. Average Initial Weight of Randomized Pigs (kg)

Group	R0	R1	R2	R3
I	10.5	12	14	15
II	17.5	17	16	15.5
III	21.5	18.5	18	18.5
Total	49.5	47.5	48	49
Average	16.5	15.8	16	16.3

Feeding of Rations and Drinking Water

The ration was weighed based on the daily requirement of 5% of body weight of landrace sows (Whittemore, 1993). The ration was given twice a day in the morning and evening in dry form while drinking water was given ad lidbitum and always replaced or added with new water when the water ran out or was dirty. Cage cleaning and bathing of livestock were done twice a day in the morning and evening.

How to collect feces

Feces collection is carried out before feeding, where fresh feces are weighed and recorded in weight, then dried in the sun, weighed and recorded in weight. Feces collection was carried out for 14 days (2 weeks) at the end of the study. After the study was completed, the feces were mixed evenly and 200g of each treatment unit was taken, thus obtaining 12 samples for analysis in the laboratory.

Variables Studied

The variables studied were:
1. Calcium Consumption (Ca)
2. Ca consumption = total ration consumption (grams) x dry matter ration (%) x Ca ration.
2. Calcium Digestibility (Ca)

Calculated by the formula according to the instructions of Tillman et al. (1989) is:

KCCa =X 100%

$$KCCa = \frac{I-F}{I} \text{ X } 100\%$$

Description:
KCCa = Calcium digestibility/digestibility efficiency (%).
I = Amount of Calcium (Ca) consumed.
F = Amount of (Ca) excreted through feces.
(Ca feces = Total feces x % BK feces x Ca from Lab analysis)
3. Phosphorus (P) consumption
4. P consumption = Total ration consumption (grams) x ration dry matter (%) x P ration..
4. Digestibility of Phosphorus (P)

Calculated by the formula according to the instructions. Tillman et al. (1989) are:

$$KCP = \frac{I-F}{I} \text{ X } 100\%$$

Description:

KCP = Phosphorus digestibility/digestibility efficiency (%)
I = Amount of Phosphorus (P) consumed
F = Amount of Phosphorus (P) excreted through feces
(P feces = Total feces x % BK feces x P Lab analysis results).

RESULTS AND DISCUSSION

Results of Experimental Ration Analysis

Table 4. Nutrient content of treatment rations from laboratory analysis

Nutrient Content (%)	Treatment Type			
	R0	R1	R2	R3
Dry matter (%)[1)]	91,04	90,80	90,46	90,40
Organic matter (%BK)[1)]	79,80	79,20	78,84	78,80
Crude Protein (%BK)[1)]	19,60	19,98	20,44	20,87
Crude Fiber (%BK)	6,20	6,79	7,41	7,90
Crude Fat (%BK)[1)]	3,01	3,03	3,10	3,15
Calcium (%BK)[1)]	1,71	1,75	1,80	1,90
Phosphorus (%BK)[1)]	1,01	1,03	1,04	1,05

Notes: 1) Results of Prosimony Analysis of Soil Chemistry Laboratory Faperta Undana, 2018

The results of laboratory analysis of the treatment rations shown in (Table 4) the content of dry matter and organic matter contained in the treatment rations decreased with increasing use of noni leaf flour in the basal ration, but the content of crude protein, crude fat, calcium and phosphorus increased, The nutritional content of all treatment rations is in accordance with the nutritional requirements for stater phase pigs, namely 18-20% protein, Ca and P content of treatment rations 1.71%-1.90% and P 1.01%-1.05 while the requirements for stater pigs are Ca: 0.70%, P: 0.60% (NRC, 1998), so it meets the needs of pigs.

Effect of treatment on ration consumption

Average calcium (Ca) mineral consumption of research pigs is shown in Table 5.
The results of analysis of variance (ANOVA) showed that the treatment had no significant effect (P>0.05) or in other words, there was a tendency to increase ration consumption. It is assumed that the rations given have relatively the same effect on livestock. High and low ration consumption is influenced by palatability and energy contained in the ration (Sinaga et al., 2011). Palatability depends on the smell, taste, texture and shape of the food consumed by livestock. Ration palatability is related to the satisfaction aspect of a ration and the amount of ration consumed by livestock (Timbulus et al., 2017).The averages of the variables studied are shown in Table 5.

Table 5. Variables studied.

Variable	R0	R1	R2	R3	SEM
Ration consumption (gram/head/day)	1.950[a]	1.879[a]	2.117[a]	2.142[a]	0.67
Ca consumption (gram/head/day)	30,36[a]	29,86[a]	34,47[a]	36,79[a]	14,09
P consumption (gram/head/day)	17,93[a]	17,57[a]	19,91[a]	20,33[a]	2,08
Ca digestibility (%)	88,62[a]	89,64[a]	90,75[a]	91,61[a]	5,01
P digestibility (%)	68,73[a]	77,67[a]	78,53[a]	78,60[a]	25,47

Notes: Mean values with the same superscript in the same row indicate no significant difference (P>0.05).

Wardiny & Sinar, (2011) described the distinctive aroma of noni leaves and the slightly bitter taste assumed to have been reduced by drying and making flour. Processing noni leaves in the form of flour aims to reduce the particle size to reduce the selection of feed ingredients by pigs (Nguru et al., 2022).

The increase in ration consumption is also caused by the smooth digestive system of pigs. The digestive system of pigs is smooth because noni leaf flour in vitro has anthalmentic activity which is quite good against Ascaris lumbruicoides worms in the intestine (Darusman 2002 dalam Wardiny & Sinar, 2011). Hariana, (2008) reported that noni leaf flour contains protein, lime, iron, carotene, ascorbins, triterpenoid alkaloids, morindin, morindo (facilitates defecation) and soranjidiol (facilitates the release of urine).

Effect of Treatment on Mineral Calcium (Ca) Consumption

The average calcium (Ca) mineral consumption of research pigs is shown in Table 5.

The results of analysis of variance (ANOVA) showed that the treatment had no significant effect (P>0.05) or in other words, there was a tendency to increase Ca mineral consumption. It is assumed that the increase in Ca mineral consumption in rations using noni leaf flour up to 6% level is higher, while the level of ration consumption is relatively the same.

This is because ration consumption is influenced by the physical form of the ration, body weight, sex, environmental temperature, hormonal balance (Moede et al., 2017) dan Poluan et al. (2017) added that the difference in ration consumption is due to age, environment and the content of food substances of all experimental rations are the same.

Effect of Treatment on Calcium (Ca) Mineral Digestibility

The average Ca mineral digestibility of the study animals is shown in Table 5.

The results of analysis of variance (ANOVA) showed that the treatment had no significant effect (P>0.01) or in other words, there was a tendency to increase Ca mineral digestibility. It is assumed that the increase in Ca mineral digestibility is due to the higher Ca mineral content in rations using noni leaf flour up to 6% level, while the level of ration consumption is relatively the same. The increase in Ca mineral digestibility is due to the high Ca mineral content. Sumadi, (2017) reported that if the Ca mineral content in the ration is high, the digestibility will increase. MC Donald dkk, (2002) in (Sumadi, 2017) argue about the factors that affect the digestibility of food substances, among others: the composition of feed ingredients, the ratio of the composition of one feed ingredient to another, feed treatment, enzyme supplementation in livestock and the rate of feeding.

Effect of Treatment on Phosphorus (P) Mineral Consumption

The average P mineral consumption of the research animals is shown in Table 5.

The results of analysis of variance (ANOVA) showed that the treatment had no significant effect (P>0.05) or in other words, there was a tendency to increase the consumption of mineral P. It is assumed that the increase in consumption of mineral P in the ration using noni leaf flour up to 6% level is higher, while the level of ration consumption is relatively the same.

The consumption of mineral P is due to the higher content of mineral P in the ration treated with R3. This is because in noni leaves there are proxeronin and proxeronase compounds that function to accelerate the absorption of food substances into the digestive system and harmonize the work of cells in the body. Sumadi, (2017) reported an increase in mineral P consumption if the need for mineral P also increases. Sinaga et al., (2011) describe that the high liking of feed ingredients is seen from the high consumption of feed ingredients. Fauzan et al., (2016) reported that the high liking of feed ingredients is seen from the high consumption of feed ingredients.. Fadly et al., (2016) also reported that feed consumption is closely related to palatability.

Effect of Treatment on Phosphorus (P) Mineral Digestibility

The average digestibility of mineral phosphorus (P) is shown in Table 5:

The results of the analysis of variance (ANOVA) showed that the treatment had no significant effect (P>0.05) or in other words there was a tendency to increase the digestibility of mineral P. It is assumed that the increase in the digestibility of mineral P is due to the content of mineral P in the ration using noni leaf flour up to 6% level is higher, while the level of ration consumption is relatively the same. The increase in P mineral digestibility is due to the higher P mineral content in the ration treated with noni leaf flour up to 6% level. Sumadi, (2017) reported that the digestibility of a feed ingredient is a reflection of the high and low useful value of feed ingredients. So the higher the digestibility value of feed ingredients, the higher the useful value of feed ingredients.

CONCLUSION

Based on the results obtained from this study, it can be concluded that:

1. The use of noni leaf flour as much as 2%, 4% and 6% in basal rations tends to increase consumption and digestibility of Ca and P.
2. The use of noni leaf flour up to 6% shows the consumption rate and digestibility of Ca and P tend to increase.

SUGGESTIONS

1. Noni leaf meal is recommended to be added in pig rations to improve feed consumption and digestibility. 2. Further research needs to be done by increasing the level of noni leaf flour more than 6%, to get the maximum level of its use in pig rations.

REFERENCES

1) Rahadi, S. Chan-Blanco, Y., Vaillant, F., Mercedes Perez, A., Reynes, M., Brillouet, J. M., & Brat, P. (2006). The noni fruit (Morinda citrifolia L.): A review of agricultural research, nutritional and therapeutic properties. In Journal of Food Composition and Analysis (Vol. 19, Issues 6–7, pp. 645–654). https://doi.org/10.1016/j.jfca.2005.10.001
2) Fadly, M., Tanwiriah, W., & Asmara, Y. I. (2016). Pemberian Tepung Buah Mengkudu (Morinda citrifolia L.) Dalam Ransum Terhadap Lemak Abdominal Dan Kadar Kolesterol Daging Ayam Sentul (Gallus domestica In Students e-Journal.
3) Fauzan, R., Tanwiriah, W., & Asmara, Y. I. (2016). Pengaruh Penambahan Tepung Mengkudu Dalam Ransum Terhadap Performa Ayam Sentul The Effect Of Noni Meal In The Ration On Performance Of Sentul Chicken.
4) Hariana, A. H. 2008. Tanaman Obat dan Khasiat 3. Penebar Swadaya. Lombok Barat.
5) Moede, F. H., Gonggo, S. T., & Ratman, R. at al. (2017). The Influence of A Long Time Fermentation Againts bioethanol level of Starch Sweet Potati is Yellow (Ipomea batatas L). Jurnal Akademika Kimia, 6(2), 86.
6) Nguru, D. A., Telupere, F. M. S., & Wielawa, E. D. (2022). Effects of the use of Fermented Gamal Leaf Flour as a

Concentrate Substitute on Performance of the Landrace Breeding Pigs. Jurnal Sain Peternakan Indonesia, 17(2), 91–96.

7) Poluan, W., Montong, P., Paath, J., & Rawung, V. (2017). Weight Gain, Feed Consumption And The Efficiency Of Growing Pigs To Slaughter With Palm Sugar In Drinking Water. Jurnal Zootek, 37(1), 50–61.
8) Sinaga, S., Sihombing, D. T. H., Kartiarso, & Bintang, M. (2011). Kurkumin Dalam Ransum Babi Sebagai Pengganti Antibiotik Sintetis Untuk Perangsang Pertumbuhan. Jurnal Ilmu-Ilmu Hayati Dan Fisik, 13(2), 125–132.
9) Sumadi, I. K. (2017). Ilmu Nutrisi Ternak Babi. In Ilmu Nutrisi Ternak Babi.
10) Timbulus, M. C., Montong, P. R. R. I., Mirah, A. D., Siswosubroto, S. E., Peternakan, F., & Sam, U. (2017). Grower Production Performance Use Flour Coffee Pulp As Substitution Materials To A Parts Of Fine Bran On Feed. Zootek Journal, 37(2), 242–251.
11) Usha, R., Sashidharan, S., & Palaniswamy, M. (2010). Antimicrobial Activity of a Rarely Known Species, Morinda citrifolia L. In Ethnobotanical Leaflets (Vol. 14).
12) Wardiny, M., & Sinar, A. E. T. (2011). Substitusi Tepung Daun Mengkudu Dalam Ransum Meningkatkan Kinerja Ayam Broiler. Jurnal Matematika, Sains Dan Teknologi, 12(2), 92–100.
13) Chan-Blanco, Y., Vaillant, F., Mercedes Perez, A., Reynes, M., Brillouet, J. M., & Brat, P. (2006). The noni fruit (Morinda citrifolia L.): A review of agricultural research, nutritional and therapeutic properties. In Journal of Food Composition and Analysis (Vol. 19, Issues 6–7, pp. 645–654).
14) Fadly, M., Tanwiriah, W., & Asmara, Y. I. (2016). Pemberian Tepung Buah Mengkudu (Morinda citrifolia L.) Dalam Ransum Terhadap Lemak Abdominal Dan Kadar Kolesterol Daging Ayam Sentul (Gallus domestica In Students e-Journal.
15) Fauzan, R., Tanwiriah, W., & Asmara, Y. I. (2016). Pengaruh Penambahan Tepung Mengkudu Dalam Ransum Terhadap Performa Ayam Sentul The Effect Of Noni Meal In The Ration On Performance Of Sentul Chicken.
16) Hariana, A. H. (2008). Tanaman Obat dan Khasiat 3. Jakarta Penebar Swadaya.
17) Moede, F. H., Gonggo, S. T., & Ratman, R. at al. (2017). The Influence of A Long Time Fermentation Againts bioethanol level of Starch Sweet Potati is Yellow (Ipomea batatas L). Jurnal Akademika Kimia, 6(2), 86. https://doi.org/10.22487/j24775185.2017.v6.i2.9238
18) Nguru, D. A., Telupere, F. M. S., & Wielawa, E. D. (2022). Effects of the use of Fermented Gamal Leaf Flour as a Concentrate Substitute on Performance of the Landrace Breeding Pigs. Jurnal Sain Peternakan Indonesia, 17(2), 91–96. https://doi.org/10.31186/jspi.id.17.2.91-96
19) Poluan, W., Montong, P., Paath, J., & Rawung, V. (2017). Weight Gain, Feed Consumption And The Efficiency Of Growing Pigs To Slaughter With Palm Sugar In Drinking Water. Jurnal Zootek, 37(1), 50–61.
20) Sinaga, S., Sihombing, D. T. H., Kartiarso, & Bintang, M. (2011). Kurkumin Dalam Ransum Babi Sebagai Pengganti Antibiotik Sintetis Untuk Perangsang Pertumbuhan. Jurnal Ilmu-Ilmu Hayati Dan Fisik, 13(2), 125–132.
21) Sumadi, I. K. (2017). Ilmu Nutrisi Ternak Babi. In Ilmu Nutrisi Ternak Babi. https://simdos.unud.ac.id/uploads/file_pendidikan_1_dir/bb14ef3cfe5cb8247900aed1768b2947.pdf.
22) Timbulus, M. C., Montong, P. R. R. I., Mirah, A. D., Siswosubroto, S. E., Peternakan, F., & Sam, U. (2017). Grower Production Performance Use Flour Coffee Pulp As Substitution Materials To A Parts Of Fine Bran On Feed. Zootek Journal, 37(2), 242–251.
23) Usha, R., Sashidharan, S., & Palaniswamy, M. (2010). Antimicrobial Activity of a Rarely Known Species, Morinda citrifolia L. In Ethnobotanical Leaflets (Vol. 14).
24) Wardiny, M., & Sinar, A. E. T. (2011). Substitusi Tepung Daun Mengkudu Dalam Ransum Meningkatkan Kinerja Ayam Broiler. Jurnal Matematika, Sains Dan Teknologi, 12(2), 92–100.
25) Whittemore. C. 1993. The Science of Pig Produktion, Logman Scientific and Technical. England.