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Effects of The use of Fermented Gamal Leaf Flour as A Concentrate Substitute on Performance of the Landrace Breeding Pigs

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ABSTRACT

This study aimed to evaluate the effect of fermented gamal leaf flour as a substitute for concentrate in the basal ration on the performance of landrace crossbreed pigs. The materials used in this study were 16 landrace crossbred male pigs at the starter phase aged 1–2 months, with an average of 7.56 kg and KV of 40.68%. The design was a randomized block design with four treatments and four replications. The treatments were R0: basal ration + 100 concentrate without fermented gamal leaf meal (FGLF), R1: basal ration + 90% concentrate + FGLF 10%, R2: basal ration + 80% concentrate + FGLF 20%, R3: basal ration + 70% concentrate + 30% FGLF. The results of variance showed that the use of fermented gamal leaf flour (FGLF) as a substitute for concentrate in the basal ration of landrace crossbreed pigs had no significant effect (P>0.05) on performance. This study concluded that using fermented gamal leaf flour as a substitute for concentrate in basal rations in landrace crossbreed pigs gave relatively the same results up to 30%.

Key words: gamal leaf flour, performance, consumption

INTRODUCTION

One of the problems farmers face is the difficulty of meeting feed availability sustainably both in quality and quantity. Efforts to find cheap feed ingredients and the discovery of appropriate technology in their utilization are still being carried out to help solve the feed supply. An efficient feeding strategy is to utilize abundant local resources and of nutritional value for livestock, namely gamal leaves. (Savitri et al., 2012) reported that the crude protein content in gamal leaves reached 25.7%.

The use of gamal leaves in pigs is not as great as in ruminants because of their different digestive systems. In double-hulled cattle such as ruminants the ability to digest crude fiber and neutralize anti-nutrients is relatively higher (Suryani et al., 2015) while (Timbulus et al., 2017) in pigs the digestive system is single-hulled (monogastric), so the ability to digest crude fiber and the ability to neutralize anti nutrients is very limited. Therefore, an innovation must be carried out to increase the value of the benefits of gamal leaves. In addition, in gamal leaves there are anti-nutritional substances such as tannins and coumarins which cause low consumption. Tannins can reduce digestibility because the nature of tannins is to protect protein.

Meanwhile, coumarin stimulates a distinctive pungent odor that livestock do not like (Sikone & Bira, 2016). Therefore, there is a need for innovation to optimize the nutritional content of gamal leaves, so that their use in pigs is increasing using fermentation. Ratu et al., 2015 reported that fermentation is one way that has been proven to reduce anti-nutrients. Using yeast (Saccharomyces cerevisiae) has proven to be effective in fermentation and can increase the value of the benefits of feed ingredients. The fermentation process can occur due to microbial activity that causes physical changes, aroma and nutritional content (Ahmad, 2005). Saccharomyces cerevisiae is a microbe that contains single-cell protein. It has been proven to be very useful in feed fermentation, increasing the protein content of feed and indicated to contain tannase enzymes that can break down tannin compounds (Ratu et al., 2015). Therefore, Saccharomyces cerevisiae is expected to be able to decompose tannin compounds in tamarind seeds so that it can be utilized optimally by livestock.

MATERIALS AND METHODS

Research Time, Place, and Equipment

The research has been carried out in Fatukanutu Village, Amabi Oefeto District, Kupang Regency. The adjustment period was during the first 2 weeks. Data collection on consumption and body weight gain was for 8 weeks, while feces data were collected in the last 2 weeks of the study period, so the length of the study was 10 weeks. The livestock used were

Landrace crossbreeds at the age of 1-3 months, totaling 16 cows with an initial weight of 3-14.5 kg (average 7.8 kg; KV 40.68%).

Research Ration

The ration materials used were rice bran, corn flour, concentrate KGP-709, mineral-10 and coconut oil. The ingredients of the ration and its nutritional content are shown in Table 1, while the composition and nutritional content of the basal ration are in Table 2, and the nutritional content of each treatment is in Table 3.

Table 1. Ration materials and nutritional content of basal rations.

Feed ingredients	Nutritional content (%)						
	DM (%)	EM (kkal/kg)	CP (%)	Fat (%)	Fiber (%)	Ca (%)	P (%)
Cornstarch [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
Concentrate KGP709[b)]	90	2700	36	3	7	4	1.6
Mineral -10[C)]	-	-	-	-	-	43	10
Coconut oil	-	8600	-	-	-	-	-
Fermented gamal leaf flour[d)]	92	19.89	25.17	2.9	20.27	2	0.13

Description: [a)] NRC (1998), [b)] PT Sirat, (2014). [c)] PT Medion, [d)] Rudin (2014)

Table 2. Composition and nutrient content of basal ration *)

Feed ingredients	Composition	Nutritional content						
		DM (%)	EM (kkal/kg)	CP (%)	Fat (%)	Fiber (%)	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
concentrate KGP- 709	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	100	0	0	0
Amount	100	29.39	2918.4	19.97	4.35	6.24	1.71	1.78

Note: *) The nutrient content is calculated based on Table 2

Table 3. The nutritional content of each treatment

Ration	Composition	BK[a] (%)	EM[b] (kkal/ kg)	PK[a] (%)	LK[a] (%)	SK[a] (%)	Ca[a] (%)	P[a] (%)
R0	100	88.18	2918.40	19.97	4.85	6.24	1.71	0.78
R1	100	91.79	2951.90	20.80	5.04	6.94	1.76	0.79
R2	100	92.78	2919.39	21.23	4.99	7.25	1.81	0.79
R3	100	94.64	2902.79	21.81	5.04	7.75	1.86	0.79

Note. a. Prosimat analysis results of Soil Chemistry Laboratory Undana Faperta, 2021
b. The results of prosimate analysis of the Animal Feed and Nutrition Laboratory of the Kupang State Agricultural Polytechnic

Cages and Equipment

The cages used were individual cages with zinc roofs with rough cement floors and iron-concrete walls as many as 16 plots, each plot measuring 0.8m x 1.5m x 1.2m and equipped with feed and water containers. The equipment used consisted of a metal hanging scale with a capacity of 100 kg to weigh livestock every week, a Kenmaster brand sitting scale with a capacity of 15 kg with the smallest scale of 100g to weigh feed every day, a bucket to fill drinking water, a broom to clean the cage, a shovel to lift feces, sacks to accommodate feces when drying under the sun.

Research Treatments

The research method used a Randomized Block Design *Terminalia catappa* with an experimental design adapted to variations in body weight of pigs. The treatment ration used was 4 treatments with 4 replications so there were 16 experimental units. The treatment consists of:

R0 : Basal Ration + 100 concentrate
R1 : Basal Ration + 90% concentrate + 10% FGLF
R2 : Basal Ration + 80% concentrate + 20% FGLF
R3 : Basal Ration + 70% concentrate + 30% FGLF

Research Procedure for Making Fermented Gamal Leaf Flour

The research procedure consists of:
1. The first stage is gamal leaf fermentation
• Gamal leaf collection
• Aerated
• After drying then milled into flour
• Mixed with tape yeast with a ratio of 1 kg of gamal leaf flour: 3 grams of tape yeast and 600 ml of water
• After that put in a container and tightly closed
• Duration of fermentation for 48 hours
• Before being given to livestock fermented feed aerated first.

Ration Mixing

Each ration material will be weighed according to its composition (corn, rice bran, concentrate and fermented gamal leaf flour). The ration materials were mixed starting from the least composition to the highest composition so that the rations were evenly mixed according to the treatment (R0 to R3). Furthermore, the mixture of each ration is put into a sack for each treatment that has been labeled with the treatment.

Research Livestock Randomization Procedure

Before randomization, livestock were weighed first to obtain initial body weight, then numbered the cage (numbers 1-16). After that, the coefficient of variation between the initial body weight was calculated. The group's determination was based on the coefficient of variation in body weight. The first randomization of treatment was carried out in each group. Suppose there is a difference in total/average initial body weight between the treatment groups. In that case, adjustments are made using limited randomization of the treatment for livestock in the group until all treatment groups have an equal/balanced total/average weight.

Ration Sampling Procedure for analysis

The basic ingredients of the ration in the form of corn and rice bran and fermented gamal leaf flour were taken every 100g for each ingredient and then analyzed proximately at the Soil Chemistry Laboratory, Faperta Undana. Meanwhile, concentrate kg p-709, mineral 10 and cooking oil have nutritional content or label on the package. After knowing each feed ingredient's nutritional content, the treatment ration's nutritional content was calculated based on the composition of each treatment.

Procedure for Giving Ration and Drinking Water

The rations given to livestock were previously weighed based on daily needs, namely 5% based on weekly livestock body weight and the rations were given twice a day, namely in the morning (at 07.00 a.m), and in the afternoon (04.00 p.m). Meanwhile, drinking water is provided to livestock on an ad libitum basis (without limits). Cleaning of cages and bathing of livestock is carried out once a day, namely in the morning (06.00 a.m).

Research Variable

Ration Consumption

Consumption of rations is obtained from the number of rations given minus the remaining rations for one day of administration.

$$\text{WG} = \frac{\text{Final weight(kg)} - \text{initial weight(kg)}}{\text{maintenance time (day)}}$$

Weight Gain

WG is obtained from the final body weight minus the initial body weight divided by the length of maintenance time with the formula:

Ration Conversion

The ration conversion is obtained from the number of rations consumed divided by the increase in body weight of the livestock.

Data Analysis

The research method used was a Randomized Block Design (RBD) in pigs with four treatments and four replications. The resulting data will be analyzed using Analysis of Variance (ANOVA).

RESULTS AND DISCUSSION

Effect of Treatment on Research Livestock Performance

The average effect of using fermented gamal leaf flour in basal rations as a substitute for 709 concentrate on the performance of pigs can be seen in table 5.

Table 5. Average Treatment of Research Livestock Performance

Variable	Treatment				P-Value	SEM
	R0±SD	R1±SD	R2±SD	R3±SD		
Ration intake (g/head/d)	1,209±243.74[a]	1,236±280.06[a]	1,250±144.30[a]	1,267 ±416.21[a]	0.92	14,445.92
Daily body weight gain (g/head/d)	415±48.65[a]	425±33.48[a]	429±23.90[a]	435±46.45[a]	0.73	648.68
Ration conversion	2.48±0.23[a]	2.47 ±0.51[a]	2.46 ±0.24[a]	2.45±0.68 [a]	1.00	0.07

Note: The mean value shows that the treatment is not significantly different (P>0.05).

Ration Consumption

The average ration consumption of pigs that received R3 treatment was 1,267 grams/head/day, followed by R2 treatment of 1,250 grams/head/day then by R1 treatment of 1,236 grams/head/day and those receiving R0 treatment of 1,209 grams/day. tails/day. However, based on the results of the analysis of variance (ANOVA), it showed that the treatment had no significant effect (P>0.05) on ration consumption. Fermentation technology used on gamal leaf flour provided the same nutrients as the control ration. It is in line with the statement (Wea, 2013), which reported that the ration that received fermented feed with tape yeast had no significant effect (P>0.05) on the consumption of the ration. It is because fermentation involves enzyme reactions produced by microorganisms that can change the physical and chemical forms of complex organic matter into (Moede et al., 2017). It can be assumed that using FGLF as a substitute for commercial concentrate in basal rations for pigs did not significantly increase in ration consumption. The results of the consumption of this ration indicated that the substitute for FGLF in the ration showed the same level of palatability. Although empirically the use of fermented gamal leaf flour as a substitute for concentrate in the basal ration caused the consumption value of the ration to increase.

There was no difference in ration consumption due to the same age, environment and nutrient content of all experimental rations (Poluan et al., 2017). Suhendra et al., 2020 stated that these factors that affect ration consumption are the smell of feed, feeding, environmental conditions or cage temperature and the availability of drinking water. Meanwhile, according to (Moede et al., 2017) ration consumption is influenced by the physical form of the ration, body weight, gender, environmental temperature, and hormonal balance.

Weight Gain

The average daily body weight gain in pigs that received R3 treatment was 435 grams/head/day, followed by R2 treatment of 429 grams/head/day then by R1 treatment of 425 grams/head/day and those receiving R0 treatment of 415 grams /head/day. However, based on the results of the analysis of variance (ANOVA) showed that the treatment had no significant effect (P>0.05) on daily body weight gain. It is in line with the statement (Wea, 2013), which reported that the ration of receiving fermented feed with tape yeast had no significant effect. (P>0.05) on body weight gain. Daily body weight gain reflects the pigs' ability to digest feed to be converted into weight (Kabelan et al., 2021). Sinaga, 2010 stated that the increase in the weight of the pigs was influenced by the level of ration consumption, the quantity and quality of the ration.

(Ninengah & Aryanta. I Made Suaba, 2020) State that the increase in body weight of pigs is influenced by the protein and crude fiber content in the ration. According to NRC (1998) protein and crude fiber requirements for starter phase pigs are 23.0% and 3.0%, respectively. Whereas in the treatment ration the protein content was more than 23.0% and the fiber content was more than 3.0%, the use of FGLF in the ration did not significantly increase. This is due to the good ability to digest feed due to the crude fiber content in the ration which is still able to be digested by the digestive enzymes of pigs (Sembiring et al., 2020). (Sinaga et al., 2011) stated that an animal's growth rate depends on the ability to digest or accommodate the amount of food (nutrient content) for the needs of body tissues. It shows that the replacement of FGLF in the treatment ration had a nutritional content that was not much different. However, the use of fermented gamal leaf flour as a substitute for concentrate in the basal ration caused the value of daily body weight gain to increase.

Increased consumption of rations tends to increase daily body weight gain and vice versa(Saud et al., 2018). The quality of the ration can cause the absence of the effect of treatment on body weight gain and the amount of ration consumed is relatively the same (Tefa et al., 2017). If pigs consume rations with the same dose of food, the livestock will give a relatively similar response in the form of consumption and weight gain (Amtiran et al., 2018). (Andika et al., 2015) stated that the increase in body muscle of an animal is determined by the availability and adequacy of the nutrition of the feed consumed.

Ration Conversion

The average feed conversion in pigs that received R0 treatment was 2.48 grams/head/day, followed by R1 treatment of 2.47 grams/head/day and R2 treatment of 2.46 grams/head/day and those who received treatment R3 of 2.45 grams/head/day. However, based on the results of the analysis of variance (ANOVA), it showed that the treatment had no significant effect ($P>0.05$) on the ration conversion. It is in line with the statement (Wea, 2013), which reported that the ration that received fermented feed with tape yeast had no significant effect ($P>0.05$) on the conversion of the ration.

Feed conversion is strongly influenced by energy and protein requirements for growth, basic living needs and other functions (Ly et al., 2017). According to the NRC, the energy needs of the starter phase of pigs are 3700 Kcal and 18.0% protein. In contrast, the energy and protein content contained in the ration is sufficient but the ability of the pigs to digest nutrients properly. There was no treatment effect on ration conversion because the nutritional content, especially crude protein, metabolic energy, and level of ration consumption and body weight gain of the research pigs were relatively the same. It means that livestock's ability to digest food and the adequacy of nutrients for basic life and growth is relatively the same (Salea et al., 2016). It is in line with (Rumerung, 2015), who states that the factors influencing the conversion of rations are nutrition, livestock breed, environment, livestock health and the balance of the ration provided. It is also supported by the opinion (Tanggur et al., 2016), which states that the conversion value of the ration can be influenced by several factors, including environmental temperature, the rate of travel of the ration through the digestive tract, physical form and level of consumption rations.

The value of a ration is not only shown by the value of ration consumption and the rate of body weight gain, it is also reflected in the ration conversion value. A ration conversion value, where the ration conversion describes the large number of rations used for growth and the lower the conversion rate indicates that the more efficient an animal is in converting rations into meat (Heryfianto et al., 2015)

CONCLUSION

The use of fermented gamal leaf flour up to a level of 30% in the basal ration gave a relatively similar effect on performance.

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