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Digestibility of Pelletized Cassava *(Manihot esculenta)* Leaf Meal Based Diet in Rabbits (*Oryctolagus cuniculus*)

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Abstract

The study was conducted to determine the digestibility of the formulated ration with different levels of Cassava Leaf Meal (CLM) fed to New Zealand White Rabbits. There were four (4) treatments considered in the study: Treatment 1-0% CLM/Control, Treatment 2-10% CLM, Treatment 3-20% CLM, and Treatment 4-30% CLM. The study was laid out in a Completely Randomized Design with six (3) replications. Before the start of the digestibility trial, the different formulated rations were subjected to proximate analysis. A seven-day digestibility trial was conducted where twelve (12) rabbits were used to serve as experimental animals for the trial. The fecal samples for the whole duration of the trial were collected and oven-dried at 80°C until a constant weight was attained. The dried feces were analyzed for their proximate composition at the Cagayan Valley Integrated Agricultural Laboratory (CVIAL) and the results were used to determine the digestibility of the feed nutrients of the treatment diets. This study revealed that feeding the rabbits with 10% CLM resulted in better digestibility in terms of Dry matter, Crude Protein, Crude Fiber, and Ash. Based from the findings, It is then recommended that CLM at 10% level is a good alternative source of protein in rabbit production. A similar study should also be conducted using other forage materials with high protein content with the same inclusion levels on their digestibility.

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Introduction

Rabbit production is a potential animal enterprise that is fast becoming popular in developing countries like the Philippines that can contribute to the alleviation of animal protein shortages. The Rabbit meat industry in the country is growing and the demand is increasing, brought about by the increase in prices of pork due to the African Swine Fever (ASF) outbreak in 2019. With this problem, rabbitry is now being considered as a possible animal production enterprise that will help alleviate the deficiency of animal protein sources. It is a good alternative source of animal protein because it is healthier, more nutritious, and better tasting compared to other types of meat.

The potential of rabbit meat as a good quality or nutritious food stemmed from its higher protein content, lower fat, lower sodium, and cholesterol contents compared with other meat sources such as beef, pork, mutton, and chickens (McLean-Meyinsse *et al.,* 1994, Aderemi and Wuraola, 2010.). The other advantage of rabbits over other monogastric is their ability to thrive on green forage, food wastes, and agricultural by-products (Uko, 1999;; Abubakar; Doma *et al.*, 2006), Ogunsipe and Agbede *et al.*, 2010.

Rabbit occupies a unique niche in that it is a mini livestock that is easy to manage, highly prolific, and has a short generation interval. Rabbits are renowned for their fecundity and prolificacy (Biobaku and Dosunmu, 2003) and their ability to utilize forages (Aduku and Olukosi, 1990). Studies have also shown that rabbit meat is low in fat and cholesterol (Biobaku and Oguntona, 1997), thus making the flesh a desirable one for diabetics, hypertensive, and middle-aged people.

The cost of feeding rabbits is, however, very high (Adeyemi *et al.*, 2008). This problem is exacerbated by the high cost of imported feed ingredients like maize and soybean. Thus, nutritionists, scientists, and agriculturists need to research the use of unconventional feedstuffs that are cheap, readily available and possibly substitute for more expensive protein (ground nut cake and soybean meal) and energy sources (maize) in the future (Onyimonony and Onukwufor, 2003; Obun and Adeyemi, 2012).

Among possible sources of cheap protein are leaf meals from some plants, such as cassava. From an animal nutrition perspective, cassava leaves have been utilized as individual ingredients in rabbit feeding (Agunbiade *et al.*, 1999, 2001a, 2001b, 2002, 2004; Okonkwo *et al.*, 2010). The nutritive value of cassava leaf meal (CLM) has been reviewed by Lancester and Brooks (1983). West *et al.* (1988) indicated that the proximate composition of CLM is favorably compared with the composition of other feedstuffs such as soybeans and maize.

It is important to provide an economically balanced diet for these animals using non-conventional feedstuffs that can substitute the nutritive value of common ingredients that is readily available, which will reduce the feed cost in producing rabbits. It is in this context that the digestibility of cassava leaf meal as a base diet in rabbits be studied since it is forage that is readily available and possesses a nutritive value comparable to some common high protein and energy ingredient sources.

Materials and methods

Twelve 12-13 week-old rabbits were used in the study. The experimental animals were the New Zealand variety which is the most common and has been bred the most extensively for meat. New Zealand rabbits have large, broad, and muscular bodies.

The experimental cages for the rabbits were based on the recommended space requirement per rabbit. Two long cages were made with a dimension of 40 x 40 x 240 cm. per cage and divided into 6 individual cages measuring 40 x 40 x 40 per hutch to contain the 12 heads of rabbits that were used for the whole duration of the study.

The cages were provided with a wood partition in between them to minimize the interaction of the

experimental animals. Nets were provided under the cages per cage to collect the feces of the rabbits'. The rabbits were fed the following ingredients: yellow corn, rice bran, soybean oil meal, coco oil, limestone, Dicaphos DL-methionine, L-lysine, vitamin premix, and salt. The composition and calculated nutrient analysis of the different diets are presented in Table 1.

Data gathered and statistical analysis

The digestibility of the different treatment diets was evaluated based on the apparent digestibility of the nutrients. All data gathered were subjected to Analysis of Variance (ANOVA) using MEGASTAT (version 10.4) following a Completely Randomized Design (CRD). Significant differences among treatment means were compared using the Least Significant Difference (LSD).

Results and discussion

Dry Matter.

Percentage Dry Matter (%DM) of the different CLM diets ranged from 51.75 to 75.43 which showed significant differences. Comparison among means revealed that T_1 and T_2 significantly differed with T_3 at P≤0.05 and T4 at P ≤ 0.01.

This shows that the T1/Control and T2 10% CLM diets have higher digestibility. Likewise, T3 also differed significantly with T4 at P ≤ 0.01. This may be due to the lesser crude fiber present in the feed as compared to the other treatments with higher CLM levels.

Table 1. Composition and calculated nutrient analysis of formulated diets fed to rabbits with different levels of cassava leaf meal.

Composition	T1(0%CLM)	T2(10%CLM)	T3(20%CLM)	T4(30%CLM)
Corn	50.25	47.24	48.78	50
Rice Bran D1	13.1	12.3	8.0	5
Soybean Oil Meal	15	10	5	-
Fish Meal	2	2	3	4
Molasses	3	3	3	3
Copra meal	13	12	9	5.05
Cassava Leaf Meal	-	10	20	30
DL-Methionine	0.15	.16	.17	.18
L-Lysine	-	0.1	.2	.27
Limestone	1.3	1	.45	-
DicaPhos	1.4	1.4	1.6	1.7
Salt	0.3	0.3	0.3	0.3
Vit/Min Premix	0.5	0.5	0.5	0.5
Total (%)	100.00	100.00	100.00	100.00
Price/kg	16.18	14.53	13.40	12.20
	T1(0%CLM)	T2(10%CLM)	T3(20%CLM)	T4(30%CLM)
Calculated Analysis				
Crude Protein (%)	16.40	16.18	16.09	15.94
Metabolizable Energy (Kcal)	2772.29	2703.32	2676.79	2659.52
Calcium (%)	1.02	1.03	1.02	1.03
Available (%)Phosphorus	0.65	0.65	0.65	0.66
Methionine (%)	0.41	0.40	0.40	0.40
Lysine (%)	0.70	0.69	0.71	0.71

Crude Protein

Significant differences were also obtained in the Crude Protein (CP) digestibility of the different treatments. Treatment 2 with 70.63 %, varied significantly with T_3, (20% CLM) and T*4* (30% CLM) with 52.92 and 55.93%, respectively, at P≤ 0.01, but not with T_1 (control). On the other hand, the digestibility of T_1, T3 and T4 revealed no significance

on their treatment means.

Crude Fiber

The digestibility of the Crude Fiber (CF) in the diets revealed that T_2 (10%CLM) diet achieved the highest digestibility with 32.35, followed by T_3 (20% CLM) with 26.87, T_4 (30% CLM) with 25. 55 and T_1 (control) with the lowest at 16.91%. Significant results were obtained on their treatment means when analyzed. Comparison among means showed that T_2 and T_3 significantly differed with T_1 but not with T_4 at P≤ 0.01; however, when the latter treatment was compared with T_1, an insignificant result was recorded.

Table 2. Digestibility of cassava leaf meal diets.in percent.

Treatments	Digestibility (%)				
	DM	CP	CF	EE	ASH
T1- 0% Control	75.28a	65.49ab	16.91bc	64.42a	43.35a
T2- 10% CLM	75.43a	70.63a	32.35a	59.74ab	47.42a
T3- 20% CLM	66.98b	55.93b	26.87ab	51.75ab	40.77a
T4- 30% CLM	51.75c	52.92b	25.55ab	39.96c	27.45b
ANOVA Result	**	**	**	**	**
C.V. (%)	3.44	12.22	5.40	15.9	15.9
$LSD_{0.05}$	9.15	14.10	9.67	16.19	11.92
$LSD_{0.01}$	13.31	20.52	14.08	23.55	17.34

Note: Means with common letters are not significantly different with each other using LSD.
ns– not significant.
*significant at 5% level of significance.
**significant at 1% level of significance.

Ether Extract

On the basis of Ether Extract (EE), the Treatment 1 (control) diet obtained the highest digestibility with 64.41, followed by T_2 with 59.74, T_3 with 51.75, and T_4 with 39.96%, wherein significant differences among treatments were present. Comparison among means revealed that T1 significantly differed with T_4 but not with T_2 and T3 at P≤ 0.01. Likewise, T2 differed significantly with T1 but not with T3 at P≤ 0.05.

Ash

Significant results were recorded on the digestibility of ash on the treatment diets. Treatment 2 had 47.42 followed by T_1 with 43.35, T_3 with 40.77 and T_4 with 27.45. When treatment means were compared, significant differences were present. Treatment 1 T_2 and T_3 had better digestibility than T_4 at P≤ 0.01.

The digestibility coefficients obtained in this study are within the range reported elsewhere (Omole *et al.*, 2005; Oluremi and Nwosu, 2002). In general, the digestibility coefficients declined with an increased level of CLM inclusion in the diets of each nutrient and this agreed with the reports of Bassendina (1969), Omole *et al.* (2005) and Olorunsanya *et al.* (2007), who observed a decrease in nutrient digestibility with increased levels of crude fiber in the diet. This may be a result of the masking effect of crude fiber on the bacteriostatic activity in the caecum which affects the microbial protein synthesis and fermentative ability of the caecum, thereby resulting in decreased caecum microbial population (Okonkwo *et al.*, 2010).

Conclusion

Based on the study, results revealed that feeding the rabbits with 10% CLM in their diets showed better digestibility in terms of Dry Matter, Crude Protein, Crude Fiber and Ash. It is then recommended that CLM at 10% level is a good alternative source of protein in rabbit production.

A similar study should also be conducted using other forage materials with high protein content with the same inclusion levels on their digestibility.

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