

APPARENT DIGESTIBILITY AND NITROGEN UTILIZATION OF GROWING RABBITS FED CASSAVA PEEL MEAL ENRICHED WITH MINERAL SALT WITH OR WITHOUT LYSINE

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ABSTRACT

Utilization of cassava peel meal (CPM) by livestock specie have some limitations due to its high cellulose content, cyanide and low protein content. However, its potential as animal feed can be improve by subjecting to different processing methods and additive inclusion. This study was carried out to investigate the Digestibility and Nutrient Utilization of CPM fed to growing rabbits, enriched with mineral salts, with or without lysine. A total of sixteen (16) rabbits were used for the experiment. The rabbits were randomized into four experimental units, comprising four replicates per treatment, with one rabbit per replicate in a Completely Randomized Design (CRD). The feeding trial lasted for fifty six (56) days. Four experimental diets were compounded to contain table salt with lysine, table salt without lysine, trona with lysine and trona without lysine for T1, T2, T3 and T4 respectively. Apparent Nutrient Digestibility and Nitrogen Utilization were determined. Data collected was subjected to analysis of variance (ANOVA), using SPSS version 20 and differences between means was separated using LSD. Significant ($P<0.05$) variations was observed in the apparent nutrient digestibility of the rabbit fed CPM based diets, enriched with trona and lysine (T3), with a significant higher value (%) of 67.22, 62.44, 63.42, 65.56 and 78.03, for the digestibility dry matter, crude protein, crude fibre, nitrogen free extract and total digestible nutrient respectively. Nitrogen utilization recorded higher ($p<0.05$) and consistent improved values for nitrogen intake, retain nitrogen and percentage nitrogen retained in the trona with lysine (T3) supplemented diet. It was concluded that cassava peel meal (CPM) enriched with trona and lysine could be used as replacement for maize in rabbit diet.

Keywords: Growing Rabbit, Apparent Digestibility, Nitrogen Utilization, Mineral Salt, Lysine

INTRODUCTION

There is a well-established deficiency of animal-based protein in human diets throughout Africa and the majority of developing nations worldwide (Bawa *et al.*, 2009). The production of animals with short gestation periods, like rabbits, which make better use of unconventional feed resources, is essential to meeting the growing demand for animal protein brought on by population growth, land area shrinkage, the desire to feed millions of people, and ensuring food security (Jiwuba *et al.*, 2016). However, insufficient and expensive feed ingredients, primarily caused by rivalry between humans and monogastric animals, have an impact on rabbit production for quick meat yield (Agunbiade *et al.*, 2002). Between 65 and 75 percent of the overall cost of production goes towards feed, making it the primary input in animal production (Makinde *et al.*, 2017). This makes using unconventional, agro-industrial wastes as a substitute energy source necessary. One such alternative energy source is CPM, or cassava peel meal. However, because of its low protein level, dustiness, high cellulose content, and cyanide content, using cassava peel meal for livestock feeding has certain drawbacks. Therefore, preparing it and adding additives to help with its use in animal diets can enhance its potential as animal feed. By increasing the assimilation of low-quality amino acids into the diet, lysine has been shown to affect low-quality protein that has inadequate and/or imbalanced amino acid utilisation. This has no effect on performance in terms of growth, feed efficiency, and carcass traits (Bamgbose *et al.*, 1997). By promoting gastrointestinal enzymes and supporting caecum microbial development, minerals such as trona and salts may help improve the digestibility of the different elements in the diet (Khattak *et al.*, 2006). Mineralisation and the addition of lysine, an amino acid, to cassava-based diets may improve their digestibility and utilisation considerably when compared to their raw form (Khattak *et al.*, 2006). Therefore, the purpose of this study is to assess the apparent nitrogen utilisation and nutrient digestibility of growing rabbits given cassava peel meal supplemented with mineral salts, either with or without lysine.

MATERIALS AND METHODS

Experimental Location, Design and Management of Experimental Animals

The study was conducted at the rabbitary unit of the teaching and research farm of Prince Abubakar Audu University, Anyigba. The study site is located on latitude 07° 30'N and latitude 07° 9'E and with an average altitude of 420m above sea level. The area falls within tropical wet and dry climate region of guinea savannah, with average rainfall of 1600mm and daily temperature range of about 25-35°C (Ifatimehin *et al.*, 2011). A total of sixteen

weaner rabbits aged 6-8 weeks were used for this study. The trial adopted was a completely randomized design (CRD), to evaluate the response to four dietary treatment, where each treatment had four (4) replicates per treatment, with one rabbit per replicate. The rabbits were housed in wooden hutches measuring 63.50cmX63.50cmX63.50cm, length, breath and heights respectively and raised 25 cm from ground level. The hutches were thoroughly washed and disinfected, then allowed to dry for 7days before the animals were brought in. The rabbits were kept in individual clearly marked hutch and provided with a weighed amount of feed, forage and clean drinking water daily. They were allowed to acclimatize for one week on the control diet before the commencement of the feeding trial, which lasted for 56days. Data for digestibility and nitrogen utilization were collected at the end of the feeding trial. Data collected were subjected to one-way analysis of variance (ANOVA) and means that were significantly different were separated by Least Significant Difference using SPSS window version 16.

Table 1: Gross composition of the experimental diet

Ingredient	UTCPM (SALT+LYSINE)	UTCPM (SALT- LYSINE)	UTCPM (TRONA+LYSINE)	UTCPM (TRONA- LYSINE)
Maize	22.00	22.00	22.00	22.00
UTCPM	28.00	28.00	28.00	28.00
Soybean Meal	20.00	20.00	20.00	20.00
Maize Offal	26.00	26.00	26.00	26.00
Bone Meal	3.00	3.00	3.00	3.00
Salt	0.25	0.45	0.00	0.00
Trona	0.00	0.00	0.25	0.45
Methionine	0.39	0.40	0.40	0.40
Premix	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00
Calculated				
Crude Protein (%)	19.81	19.23	18.07	18.63
Energy (kcal/kg)	2946.00	2892.12	2931.98	3002.74

UTCPM = Urea Treated Cassava Peel Meal

RESULTS AND DISCUSSION

From Table 2, it can be observed that results on apparent nutrient digestibility of the growing rabbits fed CPM based diet supplemented with mineral salt with or without lysine showed significant variation ($p < 0.05$) for all the parameters evaluated except ether extract. The significant difference ($p < 0.05$) recorded could be as a result of the nutrient utilization from the diets. A higher significant difference was recorded in T3 (trona + lysine) for nutrient dry matter (DM), crude protein (CP), crude fibre (CF), nitrogen free extract (NFE) and total digestible nutrient (TDN). Nutrient utilization of any feed stuff is as a result of the digestibility of the ingested feed Deiltel *et al.* (2012), which is influenced by the amount of nutrient present in the experimental diets and requirement for animal metabolic processes. The value range of 58.2% to 62.94%, 61.78% to 63.42%, 62.24% to 63.16% and 63.23% to 65.87% for CP, CF, Ether Extract and NFE respectively significantly corroborate with the study reported by Evans *et al.* (2023), when weaned rabbits fed sun dried cassava peel meal as replacement for maize growth performance and apparent nutrient digestibility coefficient. Also, trona utilization show higher digestive characteristics as compared to the salt treatment group with or without lysine. Moreover, salt without lysine tends to have consistent lower values in all the parameters evaluated. This could imply that minerals present in trona aids stimulation of the digestive tract of the rabbits than the salt. The result obtained in this study could imply that rabbits fed CPM diet supplemented with trona + lysine group had higher rate of digestion and utilization of the feed, thereby stimulating body weight gain.

The nitrogen utilization of rabbits fed UTCPM based diets supplemented with trona or salt with or without lysine is showed in Table 3. The N-intake, faecal-N, Urine-N, retained-N and N-retention % values ranged from 17.26 – 18.00, 1.92 – 2.06, 0.13 – 0.22, 15.15 – 15.91 and 87.15 – 88.39 % respectively. Significant variation ($P < 0.05$) were observed in the parameters evaluated, except for faecal nitrogen where rabbits on T4 recorded the highest value of 2.06, however, value obtained were closely similar. The highest values of 18.18g/d, 15.91g/d and 88.39% for nitrogen intake, retained nitrogen and percentage retained nitrogen were recorded in rabbits fed trona + lysine. The highest nitrogen intake by rabbit in T3 (trona + lysine), could be as a result of the higher feed intake recorded in the treatment group. The relatively higher intake in the feed ingested could be as a result of the high microfloral present in the caecum of the rabbits, which increase the microbial utilization by the rabbits fed the trona + lysine supplemented CPM diet. Dry matter intake and digestibility have been reported as a limiting factor in feed

utilization since it affects the overall performance of the animal which may result in a low microbial utilization of the feed (Brahmantiyo *et al.*, 2014). The faecal nitrogen value obtained in the study showed no significant ($P>0.05$) variation among the treatments. This could be attributed to re-ingestion of faeces (ceacophage) thereby ensuring proper utilization of nitrogen before expelling faeces (Fasuyi and Aletor, 2005).

Table 2: Apparent Nutrient Digestibility of growing rabbits fed Cassava Peel Meal based-diet supplemented with Mineral Salt with or without Lysine.

Parameters (%)	UTCPM (SALT+LYSINE)	UTCPM (SALT- LYSINE)	UTCPM (TRONA+LYSINE)	UTCPM (TRONA- LYSINE)	SEM	LOS
Dry Matter	64.15 ^b	62.22 ^c	67.22 ^a	63.76 ^b	1.39	*
Crude Protein	62.94 ^a	58.92 ^c	62.44 ^a	60.67 ^b	1.04	*
Crude fibre	62.38 ^a	61.78 ^b	63.42 ^a	62.29 ^a	1.83	*
Ether Extract	62.55	62.24	63.16	62.48	1.42	NS
Nitrogen Free Extract	65.87 ^a	63.23 ^b	65.56 ^a	64.95 ^b	1.28	*
Total Digestible Nutrient	73.19 ^b	69.64 ^c	78.03 ^a	72.94 ^b	1.17	*

^{abc} means with different superscripts across the same row are significantly different ($P<0.05$). SEM = Sum of Error of Mean. LOS = Level of Significance, NS = Non-Significant, * = Significant, UTCPM= Urea Treated Cassava Peel Meal

However, urine showed lower expelled nitrogen from the trona with or without lysine. Value range of 0.13 to 0.22 obtained were however lower than 0.56 to 0.81 reported by Mattioli *et al.* (2017) for rabbit fed oregano extract and vitamin E. The value of retained nitrogen % (88.39%) recorded in the trona + lysine diet was higher than that of the other treatment groups. This observation could be as a result of the residual anti-nutrient which might be present in the feed that aided in trapping down the bye pass protein, hence a high N-retention as reported (Fadare *et al.*, 2017). The high nitrogen utilization of animals on trona+lysine supplemented cassava peel meal-based diets may be an indication of proper utilization of the feed by the rabbits as compared to other treatment groups.

Table 3: Nitrogen Utilization of growing rabbits fed Cassava Peel Meal based-diet supplemented with Mineral Salt with or without Lysine.

Parameters	UTCPM (SALT+LYSINE)	UTCPM (SALT- LYSINE)	UTCPM (TRONA+LYSINE)	UTCPM (TRONA- LYSINE)	SEM	LOS
Nitrogen Intake	17.26 ^b	17.43 ^b	18.00 ^a	17.81 ^a	0.11	*
Faecal Intake	1.92	2.02	1.96	2.06	0.10	NS
Urine Intake	0.19 ^a	0.22 ^a	0.13 ^b	0.17 ^{ab}	0.05	*
Retained Nitrogen	15.15 ^b	15.19 ^b	15.91 ^a	15.58 ^a	0.19	*
Retained Nitrogen %	87.27 ^b	87.15 ^b	88.39 ^a	87.48 ^b	0.73	*

^{abc} means with different superscripts across the same row are significantly different ($P<0.05$). SEM = Sum of Error of Mean. LOS = Level of Significance, NS = Not Significant, * = Significant, UTCPM= Urea Treated Cassava Peel Meal

CONCLUSION

From this study, it can be concluded that, urea treated cassava peel meal enriched with trona + lysine can be use as replacement for maize in rabbit diet. There is a better utilization of the diets by the rabbits, without any adverse effect on the apparent nutrient digestibility and nitrogen utilization evaluated.

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