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EFFECTS OF REPLACEMENT VALUE OF KENAF GRAIN MEAL FOR PALM KERNEL CAKE IN CASSAVA PEEL BASED-DIET ON BLOOD PROFILE OF SHEEP

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ABSTRACT

Kenaf seed is an emerging non-conventional feed resource for ruminants. However, information about kenaf grain meal inclusion as a replacement for palm kernel cake in the ruminant ration is limited. Hence, the effects on the blood profile of West African Dwarf sheep fed cassava peel ration containing varying inclusion of palm kernel cake with kenaf grain meal was investigated. Sixteen female WAD sheep with an average live weight of 9.71± 0.05 kg were randomly distributed to four dietary treatments in a complete randomised design with four animals per treatment. The results showed that the Packed cell volume, haemoglobin and red blood cells were significantly highest ($p<0.05$) for sheep fed Diet 1 than other treatment groups fed Diets with kenaf grain meal inclusion.The WBC of sheep fed Diet 4 (0%PKC +25%KGM) was lowest (4.20 x 10^3 /µL) and highest (5.55 x 10^3 /µL) for sheep fed Diet 3 (5%PKC + 20%KGM).While the albumin, glucose and cholesterol levels of sheep were not affected ($p>0.05$) by the inclusion of kenaf grain meal, serum protein and urea were significantly affected ($p<0.05$). Serum urea was lowest (22.04 mg/dL) in sheep offered Diet 4 and highest (30.98 mg/dL) for sheep fed Diet 1. In conclusion, 20-25% kenaf grain meal could replace palm kernel cake in cassava peel based-diet without deleterious effects on the health status of West African Dwarf sheep.

Keywords: blood profile, kenaf grain, palm kernel cake, sheep

INTRODUCTION

The optimal performance of small ruminants have been hampered by poor nutrition and fodder quality and over-reliance on roughage-based diets or agro-industrial wastes largely deficient in nitrogen. Hence, investigations at improving the nitrogen content of the poor-quality roughages have led to the utilisation of several non-conventional protein-rich feed resources. Although remarkable improvements in weight gain have been documented (Omotoso *et al*., 2021), the effect of long term feeding of non-conventional feed resources as a replacement for a conventional ingredient in mixed ration on the health status of animals is an issue of concern. In Nigeria, Kenaf (*Hibiscus cannabinus* L.) plant is an emerging non-conventional feed resource for livestock though an industrial crop is mainly grown for jute and fibre industry. The high protein, dietary fibre with edible oil contents of kenaf seed (Cheng *et al*., 2016) are valuable nutritional attributes for its use in a total mixed ration of cassava peel-based diet for sheep (Omotoso *et al*., 2021) and ruminants on pasture. Palm kernel cake is a relatively rich protein and energy source but high in fibre contents enough to meet the requirements of ruminants. High rumen degradability of dietary protein of PKC may limit it as a suitable protein source for ruminants (Rahman *et al*., 2013). Deterioration of the blood components of sheep associated with copper toxicity caused by prolonged feeding of PKC or above the recommended percentage has been documented (Osama *et al*., 2019).In the same vein, feeding whole kenaf seed mealabove 20% could induce anaemic conditions in rabbits due to alteration of haematological and serum biochemical components (Odetola *et al*., 2012).Cassava peels with palm kernel cake in formulated ration are often supplemental feed of small ruminants when green herbages are scarce. However, no clear information on the blood profiles of small ruminants fed a ration containing non-viable kenaf seed. For the effects of the replacement value of non-conventional feed resources for conventional ones on the health status of animals, blood profile assessments are a vital indicator to ascertain the cause of deviation from the normal. Thus, this study investigated the effects of

replacing palm kernel cake with kenaf grain meal in cassava peel-based diet on blood profiles of West African dwarf sheep.

MATERIALS AND METHODS

The experiment was carried out at the sheep and goat unit of IAR&T,Moor Plantation, Ibadan.

Animals used for the experiment were given prophylactic treatments against ecto and endo-parasites during the adjustment period of 2-weeks followed by 84-days feeding trial. Sixteen female WAD sheep were used of an average live weight of 9.71± 0.05 kg. Four animals per treatment were assigned where each animal serve as a replicate in a complete randomized design..

Feed processing, feeding of animals and collection of blood samples

Dried kenaf grain was collected from the Kenaf and Jute Fibre Programme of the Institute of Agricultural Research and Training,Ibadan. Kenaf grain and dried cassava peels were crushed with attrition and hammer mills into small particle sizes of 1.5–2.5 mm to allow proper mixing with other ingredients and to prevent selective eating. All the ingredients were weighed and mixed separately according to the proportion into four experimental diets presented in Table 1.Experimental diets were offered separately to individual animals at 3% of the bodyweight at 08:00 hour.Wilted Guinea grass was fed as a basal diet to all the sheep at 2% of the bodyweight at 16:00 hour. Animals had access to clean water without restriction. At the end of the experiment, two sets of blood samples (approximately 10 mls) were collected from each sheep through a jugular vein puncture using a 10mls syringe fitted with a hypodermic needle before feeding. Blood of 5mls was drawn into labelled heparinized tubes to prevent coagulation for haematological parameters. The remaining 5mls of blood sample for serum analysis was poured into anti-coagulant free bottles which was allowed to coagulate at room temperature and centrifuged for 5 min at 3000 rpm. The supernatant sera were then stored in a freezer for subsequent biochemical analysis.

Laboratory analyses of feed, blood samples and statistical analysis

Samples of feed offered (experimental diets and guinea grass) were oven-dried to a constant weight, ground to pass through a 1mm screen and analysed for dry matter, crude protein, ash, crude fibre and ether extract contents according to the methods of AOAC (2005). The packed cell volume (PCV) for each sheep was measured as described by Jain (1993) and haemoglobin (Hb) concentration according to the procedure of Schalm *et al*. (1975). Red blood cell (RBC), white blood cell count (WBC) and differential WBC counts were determined using the Neubauer hemocytometer counting chamber. Serum total protein was determined using the biuret method. Albumin was determined using the bromocresol purple method. Blood urea nitrogen and glucose were determined by an enzymatic colourimetric method (Helmut and Yvette 1959). Cholesterol was measured by the method of Allain *et al*. (1974). Data obtained were subjected to analysis of variance while Duncan's Multiple Range Test was used to identify differences among means and significant differences declared at $p < 0.05$.

Table 1: Ingredient Composition (g/100g DM) of the Experimental Diets

Ingredients (kg)	Diet 1	Diet 2	Diet 3	Diet 4
Dried cassava peel	55.00	55.00	55.00	55.00
Corn bran	15.00	15.00	15.00	15.00
Palm kernel cake	25	10	5	-----
Kenaf Grain meal	-----	15	20	25
Soya bean meal	2.5	2.5	2.5	2.5
Di-calcium phosphate	1.0	1.0	1.0	1.0
Limestone	0.75	0.75	0.75	0.75
Premix	0.25	0.25	0.25	0.25
Salt	0.5	0.5	0.5	0.5
Total	100	100	100	100

RESULTS AND DISCUSSION

Table 2 shows the proximate composition of the experimental diets, guinea grass and main test ingredients. The DM values of the experimental diets varied from 88.80 to 88.95%, while the high CP content of Diet 4 (15.76%) compared to Diet 1 (14.73 %) elucidates the possibility of kenaf grain mealreplacing palm kernel cake to meet the protein requirement ruminants. The ether extract (2.84-3.14%) content increased with a higher percentage of kenaf grain meal inclusion and was within the range of 5-6% levels required to promote ruminal microbial activities in ruminants.The range of crude fibrecontent(17.85-23.38%) was not above therecommended levels for ruminants. Comparatively, the nutritive values of the experimental diets suggest the positive replacement value of kenaf grain meal for palm kernel cake in cassava peel-based ration for sheep.

Table 2: Proximate Composition (g/100g DM) of Experimental Diets and Tests Ingredients

Parameter	Diet 1	Diet 2	Diet 3	Diet 4	KGM	PKC	Guinea grass
Dry matter	88.81	88.80	88.87	88.95	93.23	93.80	88.76
Crude protein	14.73	14.93	16.22	15.73	21.44	18.44	8.60
Ether extract	2.84	2.95	3.08	3.14	3.48	6.82	2.85
Ash	7.48	7.33	7.15	7.27	5.40	5.21	9.04
Crude fibre	23.38	17.85	19.19	18.77	11.27	15.36	32.33

KGM= Kenaf grain meal; PKC= Palm kernel cake

Table 3 shows the haematological profile of WAD sheep fed experimental diets. Except for the lymphocyte and neutrophil, the PCV, Hb, RBC and WBC values differed significantly ($p<0.05$) though all the parameters were within the normal range (Latimer, 2011) for healthy sheep. The within the normal range of Hb and RBC values in this studysuggestthe absence of anaemic condition among the sheep and agrees with the findings of Shek Vugrovecki *et al*. (2017) for sheep. The relatively high Hb and RBC values of sheep fed Diets containingsole palm kernel cake or both palm kernel cake and kenaf grain meal (Diets 1-3) compared to Diet 4 (0%PKC + 25%KGM) could be due to the residual copper content in palm kernel cake, a precursor for heam synthesis. The values of WBC, neutrophils and lymphocyteamong treatment groups which fell within the normal range (4-12 x 10^3/µL, 10-50% and 40-75%)reported by Latimer (2011) indicated a sound immune system of the sheep to fight infections. Meanwhile, the lower WBC (4.20 x 10^3/µL) values in sheep fed Diet 4 (0%PKC + 25%KGM) could be from the tannin content in kenaf seed which aligned with Mahgoub *et al*. (2008) that tannin-rich feed reduced WBC of sheep.

Table 3: Haematological Parameters of West African Dwarf Sheep Fed Cassava Peel with Varying Inclusion of Palm Kernel Cake and Kenaf Grain Meal

Parameter	*Reference value	T1	T2	T3	T4	SEM
Packed cell volume (%)	27-45	38.00^a	34.00^b	28.50^c	29.00^c	1.24
Haemoglobin (g/dL)	9-15	12.10^a	10.95^b	9.95^c	9.50^c	0.32
Red blood cell (x10^6 µL)	9-15	12.04^a	10.18^b	9.22^b	9.06^b	0.31
White blood cell (x 10^3 µL)	4-12	5.18^a	5.33^a	5.55^a	4.20^b	1.98
Lymphocyte (%)	40-75	66.50	61.50	61.50	62.00	1.20
Neutrophils (%)	10-50	30.00	35.00	35.50	34.5	1.37

^{abc}= Means in the same row with different superscripts are significantly different ($p<0.05$)
*Reference ranges (Latimer, 2011)

Table 4 shows the serum profiles of sheep fed experimental diets. Replacement of palm kernel cake with kenaf grain meal in experimental diets did not affect ($p>0.05$) the albumin, cholesterol and glucose levels across treatment groups. Serum total protein values of sheep fed Diet 1 (6.33g/dL) though higher was

comparable to 5.58g/dL and 5.49 g/dL of sheep fed Diets 3 and 4, respectively. The higher (92.63mg/dL) glucose level observed in sheep fed Diet 4 relative to other treatment groups revealed the energy supplying potential of kenaf grain meal. However, serum total protein and urea values differed significantly ($p<0.05$) and varied from 22.04-30.98 mg/dL across the treatments. The significantly ($p>0.05$) lower urea levels of sheep fed Diet 4 revealed efficient nitrogen utilization of kenaf seed by ruminants. Hence, the possibility of reduced urea toxicity with higher inclusion levels of kenaf grain meal. Nevertheless, within the normal range of serum urea level (Latimer, 2011) across the treatment suggests normal renal function.

Table 4: Serum Profile of West African Dwarf Sheep Fed Cassava Peel with Varying Inclusion of palm kernel cake and kenaf grain meal

Parameter	*Reference value	T1	T2	T3	T4	SEM
Total Protein (g/dL)	5.9-7.9	6.33[a]	5.35[b]	5.58[ab]	5.49[ab]	0.16
Albumin (g/dL)	2.7-3.7	2.99	2.70	2.82	2.64	0.06
Cholesterol (mg/dL)	44-90	68.23	69.66	68.18	66.36	2.76
Glucose (mg/dL)	44-81	79.18	73.94	79.56	92.63	4.11
Urea (mg/dL)	10-35	30.98[a]	26.84[ab]	23.37[ab]	22.04[b]	1.49

[ab]= Means in the same row with different superscripts are significantly different ($p<0.05$)
*Reference ranges (Latimer, 2011)

CONCLUSION

From this study, it was evident that the replacement of palm kernel with kenaf grain meal in a cassava peel-based diet had no deleterious effects on the blood parameters of West African dwarf sheep.The low serum urea levels of sheep fed diets with kenaf grain meal inclusion compared to diets of sole palm kernel cake inclusion reflects efficient nitrogen utilization of kenaf seed by ruminants. Therefore, 20-25% kenaf grain meal could replace palm kernel cake in cassava peel ration for WAD sheep.

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