EFFECTS OF DIETARY LEVELS OF PALM KERNEL MEAL AND COBALT SUPPLEMENT IN SHEEP FED CASSAVA PEELING WASTES BASED DIET.

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ABSTRACT

A 56-day feeding trial was carried out to study the influence of palm kernel cake and cobalt mineral supplement on the feeding value of cassava peeling waste-based diet in the young sheep. The objectives of this study were to examine the feeding values of palm kernel cake in a cassava waste based diet fed to the sheep, and to examine the influence of dietary cobalt intake in a cassava waste- based diet fed to the sheep. Sixteen weanling West African Dwarf sheep of average initial live weight; 12.59 + 012kg were divided into four groups. Each group was randomly assigned to one of four treatment diets in a 2 × 2 factorial experiment. The animals were fed at 3% of their body weights. They were fe *adlibitum* with clean drinking water and mineralized salt lick throughout the 56-day. Dietary treatments consisted of two inclusion levels (7.74 and 37.53%) of palm kernel cake; and two inclusion levels (0, and 1.0 ppm) of cobalt supplement. The diets were;A – Low dietary level of palm kernel cake and low cobalt mineral supplement, B – Low dietary level of palm kernel cake and high cobalt mineral supplement, C – High dietary level of palm kernel cake and low cobalt mineral supplement, D – High dietary level of palm kernel cake and high cobalt mineral supplement The experiment lasted for 56 days involving sixteen (16) lambs in a factorial design used to evaluate the, average dry matter, and nutrient intake, nutrients digestibility, body weight gain, nitrogen retention. Body weight gains (g/day) in the sheep were measured, 7.55, 5.09, 23.72, 26.09 at the 56^{th} day measurement for dietary treatments A, B, C, and D respectively. The body weight gain values obtained in sheep on diet C and D were higher ($P<0.05$) than for those on diets A and B. At the 56^{th} days measurements, for the crude protein intake and crude fibre intake values obtained in sheep on diet C and D were higher ($P<0.05$) than for those on diets A and B. At the 56^{th} days measurements. Similar trends were obtained for nitrogen retention in sheep. It was concluded that sheep consuming high level of palm kernel cake in cassava peeling waste-based diet, benefited from dietary cobalt supplement in terms of body weight gain and nitrogen **retention**.

Key word : cassava peeling waste, cobalt mineral supplement, nitrogen retention and palm kernel cake Sheep

INTRODUCTION

Palm kernel cake is agro- industrial by –product which is obtained from palm oil extraction in cultivated tropical rain countries laying between 12^{o} N and 12^{o}N, such as Indonesia, Malaysia and Nigeria. Indonesia and Malaysia are the largest producer and exporter of palm oil and palm oil by- products. While Nigeria, Colombia and Thailand have recorded less than 10% of the world production. When the palm fruit are processed it produces palm oil, palm kernel cake and meal according to the method of extraction (Ahmed M.Abdeltawab el tal 2018)

Palm kernel cake has been used as a feed for various livestock production. Palm kernel cake is relatively high in minerals content were calcium 0.21- 0.34%, phosphorus 0.48 - 0.71%, Magnesium 0.16 - 0. 33%, zinc 40.5 – 50.0% potassium 0.76 - 0.93%, copper 20.5 – 28.9%, manganese 132 - 340ppm and iron 835 - 6130ppm (Ahmed M. Abdeltawab, et al, 2018)

Cassava (*Manihot esculenta crantz*) is an annual tuber crop which is grown in the equitorial regions of the world. Cassava tuber of either sweet or bitter cultivar can be processed to a variety of staple food commonly found among the low income rural dwellers in Africa and Asia continents (Phanthavong Vongsamphanh et tal 2018) The sweet cassava cultivar contains less than fifty milligrams of potential hydrogen cyanide per kilogram of fresh root while the bitter cultivar contains two hundred and fifty milligrams or more of potential hydrogen cyanide per kilogram of fresh root (Phanthavong Vongsamphanh et tal 2018). Consequently roots of sweet cassava cultivars are more favoured as food for man and his domestic animals over the roots of bitter cultivar which are used mainly for industrial purposes. However, the cyanide contents of sweet and bitter cultivars can be considerably reduced through processing. (Phanthavong Vongsamphanh et tal 2018)

Cobalt mineral is required for the biosynthesis of vitamin B_{12} that is essential for optimum production and reproduction in animals. The mineral element is a structural component of vitamin $B_{12,}$ representing about four percent of its chemical structure. (Jose- Ramiro Gonzalez- Montana et tal 2020). Animals cannot store cobalt mineral in appreciable quantity and have to depend on regular supply through dietary intake. Since there is no

other physiological role for cobalt in animals than for the synthesis of vitamin B_{12}, any sign of cobalt deficiency is a direct expression of vitamin B_{12} deficiency (Jose- Ramiro Gonzalez- Montana et tal 2020)

MATERIALS AND METHODS

Housing and pre-experimental treatments

Metabolism cages were constructed with wood to house the experimental animals. Each sheep was housed in a 1 x 0.6m^2 compartment. Feeders and drinkers were washed and disinfected using disinfectant. The animals shall be treated against endo-parasites with Albendazole and oxytetracycline L.A prior to the commencement of the experiment.

Dietary Ingredients

The palm kernel cake were obtained from an agro- industries that process palm oil.

Cassava waste consisting of cassava peels with thin layer of cassava pulp was collected from gari processing industry and sun-dried for 4 to 5 days. The sun drying process reduced moisture content and prevented fungal growth during storage. The cassava waste was milled in a hammer mill to pass through a 0.2mm sieve. The processed cassava waste was put in jute sacks and stored. Rice waste used is a combination of rice husk and rice bran, as obtained from rice milling mills. The rice waste was put in sacks and stored properly. Bone meal and table salt were bought from a feed mill, while cobalt chloride salt was bought from a chemical shop

Animals and Dietary Treatments

Sixteen (16) weanling lambs of 5-8 months old with an average initial body weight of 9.27 ± 2.94kg were divided into four groups, balanced for weights and assigned randomly to four treatments. Each animal shall represent a replicate. Dietary treatment consist of palm kernel cake at two inclusion levels, in a cassava waste based concentrate diet that was fed with or without 1ppm cobalt supplement. The resulting treatment diets were:

A= Low inclusion level of palm kernel cake (7.74%) without cobalt supplement.

B= Low inclusion level of palm kernel cake (7.74%) with 1ppm cobalt supplement.

C= High inclusion level of palm kernel cake (37.53%) without cobalt supplement

D= High inclusion level of palm kernel cake (37.53%) with cobalt supplement

Animals were fed at 3% of their body weights which allowed for feed refusals in all the treatment groups. Feeds shall be offered at 0800 and 1400 hrs daily after being mixed with 5 drops of water to reduce dustiness. Clean drinking was made available to each lamb free choice throughout the period of 56 days growth and digestibility trial

Collections of Data

Animal were weighed prior to feeding on the first day and subsequently at two week intervals. Accurate record of daily feed intake shall be prepared for each lamb from the amounts of daily feed offered and feed refusals during two separate collection periods of days 23-28 and 51-56.

Total feaces and urine produced by the individual lambs during each of the collection periods shall be measured and recorded. Urine shall be collected into plastic buckets wetted with 98% (v/v) H_2S0_4. Representative samples (10%) of the feeds, feaces and urine were kept on each animal. Feed and feacal samples were oven dried at 60 ^{0}C for 48 hours, sub- sampled and stored separately for each animal in air-tight plastic bottles. Urine samples were kept under refrigeration in air-tight plastic jars containing 5ml, 98% (v/v) H_2S0_4.

Chemical and Statistical Analyses

Feeds and feaces shall be analyzed for dry matter, crude protein, and crude fiber using the AOAC (1990) procedures. Urine nitrogen shall be determined by the micro khjedah (AOAC 1990) method. Serum total protein, urea nitrogen shall be measured using the Biuret and Urease methods respectively. Thiocyanate concentration of the serum and urine samples were estimated by spectrophotometric method . Data were analysed as in a 2x2 factorial designed experiment using ANOVA . Treatment mean where there was significant difference, they were sepatated using Duncan's multiple range test.

RESULTS AND DISCUSSION

Treatment Group A has a low inclusion level of palm kernel cake **without** cobalt mineral supplement. Treatment Group B has a low inclusion level of palm kernel cake **with** cobalt mineral supplement. Treatment Group C has a high inclusion level of palm kernel cake **without** cobalt mineral supplement. And Treatment Group D has a high inclusion level of palm kernel cake **with** cobalt mineral supplement. In all the result the treatment group D has a highest values. The weight gain in 56 days of research is 26.09kg and for treatment

group C is 23.72kg. Also the feed efficiency ratio, total dry matter intake, total crude protein intake and total crude fibre intake have high value for the 56 days research. In the table 3.2 and 3.3, below results on digestibility and nitrogen metabolism were also high. The result showed that the when sheep are fed a diet with palm kernel meal with high inclusion level of cobalt mineral supplement has positive effect on the sheep.

Table 3.1 Effects of treatment on some performance characteristics in sheep

Parameter	A	B	C	D	SEM
Mean initial live weigt(Kg)	11.27	11.80	14.3	13	6.47
Mean final live weight (Kg)	18.82	16.89	38.02	39.09	2.14
Mean live weight gain (Kg)	7.55[a]	5.09[a]	23.72[b]	26.09[b]	1.99
Feed efficiency ratio gain/ feed	0.85	0.090	0.082	0.16	0.014
Total dry matter intake (g/day)	315	321	329	347	18.85
Total crude protein intake DM (g/day)	24[a]	22.25[a]	48.75[b]	40.25[b]	3.33
Total crude fibre intake DM (g/day)	42.45[ab]	38.3[a]	52.6[b]	51.92[b]	3.99

Table 3.2 Effects of treatments on Apparent dry matter and nutrient digestibility(%)

Parameter	A	B	C	D	SEM	significance
Dry matter	66[a]	67[a]	69[a]	69[a]	2.96	NS
Crude Protein	71[a]	66[a]	72[a]	72[a]	3.58	NS
Crude Fibre	38[a]	47[a]	56[b]	54[b]	2.79	S

In Table 3.2 for the dry matter and crude protein digestibility there was no significant difference between all the treatment ($P < 0.05$) . But for crude fibre there was no significant difference between diet A and B ($P < 0.05$). Also there was no significant difference between diet C and ($P > 0.05$).

Table 3.3 Effects of treatments on Nitrogen Metabolism in sheep

Parameter	A	B	C	D	SEM
Average Nitrogen intake (g/day)	7.05[a]	6.2[a]	13.82[b]	12.95[b]	0.15
Average feacal Nitrogen (g/day)	4	3.5	8.7	7.4	3.0
Average urinary Nitrogen (g/day)	0.55[ac]	0.30[a]	1.12[b]	0.85[bc]	0.12
Average Nitrogen Retention (g/day)	2.5[a]	2.4[a]	4.0[b]	4.7[b]	0.42

The average nitrogen Retention (g/day), there was no significant difference between diet A and B ($P > 0.05$) Also there was no significant difference between diet C and D ($P > 0.05$)..

CONCLUSION AND RECOMMENDATION

The result of this research showed that giving the sheep palm kernel meal at a high inclusion level with cobalt mineral supplement cause the following;

An increase in live weight gain and feed efficiency ratio in the sheep.

An increase in dry matter crude protein and crude fibre intake.

An increase in digestibility of crude protein and crude fibre

The present research work showed that dietary cobalt mineral supplement has caused a significant improvement in the sheep fed cassava peeling waste based diets at a high level of inclusion of palm kernel meal and cobalt mineral supplement. Farmers are advised in using the cassava peeling waste to feed lamb it better to supplement with palm kernel cake and cobalt mineral supplement for the optimal growth of the lamb especially during the dry season when the fresh forages are scarce. (Jose- Ramiro Gonzalez- Montana et tal 2020)

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