

Performance and digestibility by Uda rams fed concentrate diets containing graded levels of camel's foot pod meal (CFPM)

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Abstract

The study was conducted to investigate the performance of Uda rams fed concentrate diets containing graded levels of Camel's foot pod meal (CFPM). Sixteen (16) entire male Uda rams with an average initial weight of 30 ± 0.0 kg were allotted into four (4) dietary treatments in a Complete Randomized Design. Four (4) experimental concentrate diets were compounded with CFPM replacing soya bean meal at 0, 20, 40 and 60% levels of inclusion representing diets 1, 2, 3 and 4, respectively. The concentrate diets were offered to the animals at 1.50% of their body weight and concentrate feeding was adjusted on weekly body weight basis while rice straws were served ad libitum as basal diet. At the end of the 12 weeks feeding trial, a digestibility trial was conducted which lasted 21 days using three animals from each treatment. Parameters measured were dry matter intake, live weight changes, feed to gain ratio and nutrients digestibility. Results showed that the organic matter content of the diet containing 40% CFPM was highest compared to other diets. There was no significant difference ($p > 0.05$) in dry matter intake and live weight changes among the treatments. The dry matter intake was higher in treatment 2 (993.02g) than in treatment 1 (932.32g) likewise the live weight changes was higher in treatment 4 (36.25kg) than treatment 1 (34.00kg). The feed to gain ratio ranged from 17.62 in treatment 4 to 25.42 in treatment 2. Nutrients digestibility increased with increasing level of CFPM in the diets. The DM, CP and ash digestibility were higher ($p > 0.05$) in treatment 4 compared to the control treatment while the ADL was also higher ($p < 0.05$) in treatment 4 than the control treatment. The optimum weight gain (36.25kg) and efficient utilization (17.92) was achieved at 60% inclusion level of CFMP. Therefore, *Piliostigma reticulatum* pods can serve as a potential fodder feed resource for ruminant fattening programme.

Keywords: Performance, Uda rams, Camel's foot pods, concentrate diets

Introduction

The potentials of trees and shrubs as alternative fodder resources in ruminant nutrition especially during the dry season of the year when the scarcity of feed to ruminant is aggravated was discovered long ago by nomadic herdsman. Recently, importance of trees and shrubs as alternative fodder resources in ruminant nutrition has attracted the attention of researchers worldwide. Several indigenous and exotic browse species have been

investigated and evaluated for inclusion in ruminant feeding system in Nigeria (Fadiyimu *et al.*, 2011). Small ruminants can utilize a wide range of feed resources. The bulk of their feed, however, comes from forages as they are primarily considered to be forage consumers (Mason *et al.*, 1991). Good forage supplied the most economical feed for ruminants and with the increase in the cost of feed grains, forage has become more important as a feed resource since it reduces the cost of

production (Mason *et al.*, 1991). However, during the dry months of the year, the quantity and quality of edible biomass is severely limiting. The deteriorating grazing conditions and increased rising cost of concentrate ingredients such as soya bean meal, groundnut cake, wheat offal etc affect small ruminant production in Nigeria (Dayo *et al.*, 2009). This has led to the search for alternative feed resources over the past decades especially the use of tropical browse plants as source of nutrients for ruminant animals (Okoli *et al.*, 2007). One way of solving the problem of inadequate feed supply to ruminants is to utilize alternative feed resources particularly those that are not useful to Man. The fodder value of browse plants (leaves, twigs and fruits) is often superior to herbaceous plants particularly in the case of grass species (Fadiyimu *et al.*, 2011). Tropical forage legumes offer a considerable potential to alleviate and compliment the low feeding value of natural pastures and crop residues. However, some agro forestry species that were previously neglected are now being valued in Nigeria (Aleto and Omodara, 1994). One of these valuable forages is *Piliostigma reticulatum* which is commonly known as Camel's foot. Camel's foot is plentiful in the savanna region of Nigeria (Muftau *et al.*, 2018) where several tones of the pods are wasted annually (Akin-Osanaiye *et al.*, 2009). The nutritional contents of Camel's foot pods obtained in Kebbi State have recently been investigated (Muftau *et al.*, 2019), on the average; the crude protein is about 9.79%, ether extract: 8.97%, ash: 4.25%, NDF and ADL is about 57.73% and 24.70% respectively. Despite the growing interest of *P. reticulatum* pods in animal feeding in Sahelian countries (Yelemou *et al.*, 2009), studies on intensive feeding values were missing in the study area. Therefore, the

present study was designed to assess the fodder value of Camel's foot pod meal at graded levels on the growth performance of Uda rams in Kebbi State

Materials and methods

Experimental location

The study was conducted at the Livestock Teaching and Research Farm, of Kebbi State University of Science and Technology, Aliero. The farm is located within the campus of the University around the zoological structure.

Aliero LGA is located in Kebbi state of Nigeria and lies at latitude 12°16'44 N and longitude 4° 27' 6 E of the Equator. The annual temperature varies considerable but usually ranges between 26° to 38°C occurring between April to June, while the mean annual rainfall is about 500mm-650mm occurring between April and September. The relative humidity ranges from 21-47% and 51-79% during the dry and rainy seasons respectively. The town has the largest onion market in Northwest Nigeria. The predominant ethnic group of the area is Hausa (KARDA, 2006).

Experimental animals and their management

Sixteen (16) entire male Uda rams with an average weight of 30±0.0kg were housed in an individually pen measuring 2m x 1m which were previously cleaned and disinfected with Izal solution. The animals were group fed for a period of two weeks and balanced for weight at the commencement of the experiment. The rams were dewormed with anthelmintic (ivomec) and administered antibiotics (oxytetracycline) as a prophylactic measure.

Experimental diets preparation and feeding procedure

Harvested Camel's foot pods were sun dried and milled; four experimental concentrate diets were compounded with CFPM

replacing soya bean meal at 0, 20, 40 and 60% levels of inclusion as treatment 1, 2, 3 and 4 respectively. Rice straws were served as basal diet. Completely Randomized Design (CRD) as outlined by Gomez and Gomez (1984) was used in this experiment with four animals allocated as group to four experimental diets in the feeding trial. Each group of four animals were assigned to one of the experimental diets and fed at 1.5% of their body weight for 12 weeks. The animals were weighed weekly between 8.00am and 9.00am for the period of the experiment and therefore concentrate feeding was adjusted on weekly body weight basis. The basal diet and water were offered *ad libitum* to each animal for 12 weeks.

Experimental design and data analysis

Completely Randomized Design (CRD) as outlined by Gomez and Gomez. (1984) was used in this experiment. Daily record of feed intake (concentrates and basal) and weekly body weight gain were taken throughout the 12 weeks of the feeding trial. Feed to gain ratio was calculated from the ratio of the total feed intake per day to average daily weight gain, representative samples of the four experimental feeds and faeces were analyzed for chemical composition as

outlined by AOAC (2000). All data were subjected to analysis of variance using Statistical Analysis System SPSS .20 (2007). Treatment means were compared using the Duncan Multiple Range Test (DMRT)

Digestibility trial

The last 7 days of the experimental period were used for collection of faeces with the use of harness bags. The animals were fed the same experimental diets used in the feeding trial. During the 7 days, record of daily feed intake and the total faecal output from each animal was kept. Faecal samples (200g) were oven dried for dry matter at 80°C for dry matter determination and then stored for subsequent chemical analyses to determine the nutrients digestibility.

Results and discussion

The proximate composition of the experimental diet and nutrients intake by Uda rams fed experimental diets are presented in Tables 1 and 2. There is relative increase in the dry matter content as the level of CFPM inclusion increase with treatment 4 having the highest value (91.67%) and the least was obtained in treatment 2 (90.30%).

Table 1: Proximate composition of experimental diets (%)

Parameters	Treatments			
	1 (0%)	2 (20%)	3 (40%)	4 (60%)
Organic matter	84.33	84.30	86.17	85.67
Dry Matter	90.83	90.30	90.67	91.67
Crude Protein	18.35	18.70	19.05	19.49
Crude Fibre	21.30	23.50	25.00	27.11
Ether Extract	8.00	8.50	9.00	7.00
Nitrogen Free Extract	46.23	44.91	43.86	42.65
Ash	6.5	6.0	4.5	6.0
Neutral Detergent Fibre	34.16	35.30	36.53	37.55
Acid Detergent Fibre	25.10	28.32	29.25	30.74
Acid Detergent Lignin	11.14	12.11	13.01	13.81

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The crude protein levels of the diets in this work ranges from 18.35% in treatment 1 and to 19.49% in treatment 4. These values were higher than 11% CP as reported by Church (1978) and Gatenby (2002) required for fattening lambs weighing between 30 to 55kg. The highest levels of the CP in the diets may be due to high CP level of CFPM (8.01%). The high level of CP could have influenced the higher feed intake of the experimental diets which was observed across the treatments. This finding agreed with the study of Chriyan *et al.* (1997) who reported that high CP and low CF levels increases voluntary feed intake. The slight increase contents of CF, NDF, ADF and ADL of the diets might be due to the higher CF of CFPM (37.57%). The results follow that of Ganovoski and Ivanov (1982) who reported 22% to 25% CF for ruminants. Njidda (2011) reported that semi-arid browse plants are generally high in fiber and their inclusion in diets tends to increase their fiber level. The oil content of the CFPM could have been responsible for the higher ether extract across the diets. The nitrogen free extract values ranged from 42.65% in treatment 4 to 46.23% in treatment 1. This results support the work of Rogosic *et al.* (2006) who observed that the average intake of a diet and the efficiency of its utilization are largely determined by the relative balance of its energy and the essential nutrients absorbed by animals.

The total feed intake was higher in treatment 4 with 60% of CFPM than the control diet with 0% CFPM. The low energy level in diet 4, higher crude protein and the palatability of CFPM could be responsible for the higher feed intake. Babayemi (2007) reported that higher acceptability of forage by goats could be linked with high CP content of the forage. Shehata and Nour (1986) reported that concentrate fed with rice straw has a superior feeding value than concentrate fed alone. The total dry matter intake was lower in the control diet than the other treatments. The decrease in the dry matter intake in the control diet might be attributed to the substitution effect of CFPM indicating increased palatability to the rams. The increase in the DM intake in treatments 2 to 4 could be as a result of the inclusion of CFPM in the diets which is in agreement with the report of Abdurrahman *et al.* (2015) that the pods and leaves of Camel's foot are highly consumed by small ruminants during the dry season. Adamu *et al.* (2013) also reported that *Faidherbia albida* pods enhance goat total DM intake and overall animal performance when offered as a supplement in a complete diet. DM intake is an important factor in the utilization of feed by ruminants and also a critical determinant of energy and performance in small ruminants (Devent *et al.*, 2000).

Table 2: Nutrients intake by fattened Uda rams fed experimental diets

Parameters (%)	Treatments				SEM
	1 (0%)	2 (20%)	3 (40%)	4 (60%)	
Organic matter	786.23	837.12	822.02	829.78	20.51
Dry matter	846.83	896.70	864.95	887.90	24.61
Crude Protein	171.08	185.69	181.73	188.78	12.13
Protein efficiency	0.20 ^{ab}	0.19 ^b	0.24 ^{ab}	0.26 ^a	0.18
Crude Fibre	198.58 ^b	233.36 ^{ab}	238.49 ^{ab}	262.58 ^a	55.95
Ether Extract	74.59	84.41	85.86	67.80	6.75
Nitrogen Free Extract	431.01	445.96	418.40	413.11	16.55
Ash	60.60 ^a	55.94 ^a	41.95 ^b	55.94 ^a	1.31
Neutral Detergent Fibre	318.48 ^b	350.54 ^a	348.48 ^a	363.70 ^a	6.14
Acid Detergent Fibre	234.01	281.22	279.03	297.74	18.73
Acid Detergent Lignin	103.86 ^b	120.25 ^{ab}	124.11 ^{ab}	133.76 ^a	7.21

ab: means on the same row followed by the same superscripts were not significantly (p<0.05) different

Table 3 shows the performance characteristics of Uda rams fed experimental diets. The final body weight was higher ($p>0.05$) in treatment 4 than the other treatments. The higher value for live weight gain of the animals was in line with the work of Njarui *et al.* (2003) who reported that the average daily weight gain for goats fed glycine and leucaena forage and natural pasture were significantly ($p<0.05$) higher than for goats fed on basal diet only. In another study by Abdulrazak *et al.* (1996) improved weight gains were recorded when steers in a maize stover basal diet were offered legumes supplement. The higher weight gain obtained in treatment 4 is an indication that CFPM could be used for

the feeding of sheep. There were significant ($p<0.05$) differences in the feed to gain ratio of animals across the treatments. The results revealed the ability of animals on diet 4 to convert the feed consumed to weight gain. The highest feed intake recorded for animals on diet 4 is consistent with the report of Morgan and Lewis (1961) which stated that the voluntary feed intake of any animals is a primary determinant of the nutritional status of the feed and productivity of the animal. Similarly, Nour (1986) reported that lambs maintained on ration containing treated and untreated rice straws and silage improved in feed consumption, daily live weight gain and efficiency of feed utilization.

Table 3: Performance characteristics of Uda rams fed experimental diets

Parameters (%)	Treatments				SEM
	1 (0%)	2 (20%)	3 (40%)	4 (60%)	
Initial body. Wt. (kg)	30.25	31.13	31.38	31.25	0.91
Final body. Wt. (kg)	34.00	34.75	35.95	36.25	3.45
Av. Daily gain (g)	44.64 ^{ab}	43.10 ^b	54.40 ^{ab}	59.52 ^a	4.68
Av. Wt. Gain (kg)	3.75	3.62	4.57	5.00	0.81
Concentrate intake (g/day)	492.03	506.56	513.86	509.82	82.72
Rice straw intake (g/day)	539.05	589.14	541.96	558.64	52.27
Total Feed intake (g/day)	1031.08	1095.70	1055.82	1066.44	23.93
Feed gain ratio	23.10 ^{ab}	25.42 ^a	19.41 ^b	17.92 ^c	1.34
Dry Matter intake (conc.)	446.91	462.49	465.92	465.42	23.93
Dry Matter intake(rice .st)	485.41	530.52	488.03	503.06	52.07
Total Dry Matter intake	932.32	993.02	953.95	968.58	25.09
Dry matter intake as % body weight	2.74	2.88	2.64	2.68	0.47

abc: means on the same row followed by the same superscripts were not significantly ($p<0.05$) different

Table 4 shows the nutrients digestibility of fattened rams fed diets containing graded levels of CFPM. The dry matter digestibility of the control diets was similar with the other diets. The relatively decreasing DM with increasing CFPM level in the diets may be attributed to increasing content of the fibre fractions in the diet. Bakshi and Wadhwa (2004) reported that high NDF and ADL depress DM intake and DM digestibility. Minson

(1990) reported that lignin is bound to all plant cell walls and is a significant limiting factor in their digestion in the rumen. The increasing crude protein digestibility with increasing level of CFPM in the diets could be due to presence of condensed tannins in CFPM (Muftau, 2018). According to Wada *et al.* (2016) condensed tannins at low level bind the dietary protein, thus preventing it from ruminal degradation and thus enhance its availability for enzymatic digestion and

utilization by the animal tissues. This observation is consistent with the work of Giri *et al.* (2000) and Aregbeore (2009) who affirmed that digestibility of nutrients varies with nutrient composition of a diet. The crude fibre digestibility values obtained in this study agreed with the range of 63.3-78.4% obtained by Olorunnisomo and Ososanya (2002) who fed maize offal

and sorghum brewers grain as supplement to WAD goats. The ash digestibility values obtained in this work was in the same trend with the work of Ososanya *et al.* (2013) when dwarf sheep were fed corncob and cowpea husk based diets. The results of the digestibility from this study reflect a higher degree of utilization as a result of the inclusion level of CFPM in the diets.

Table 4: Nutrient digestibility of the fattened rams fed experimental diets

Parameters (%)	Treatments				SEM
	1 (0%)	2 (20%)	3 (40%)	4 (60%)	
Dry Matter	89.83	90.33	89.67	90.45	3.60
Crude Protein	87.39	91.71	93.35	95.06	9.43
Ether Extract	76.05	83.00	84.41	72.38	5.50
Crude Fibre	69.00	70.56	71.46	70.52	5.99
Nitrogen Free Extract	89.39	86.35	84.67	75.54	6.43
Ash	58.03 ^b	63.27 ^b	75.32 ^a	77.60 ^a	2.38
Neutral Detergent Fibre	33.05	30.01	29.53	29.30	4.35
Acid Detergent Fibre	28.25	39.27	32.42	30.65	6.62
Acid Detergent Lignin	27.59 ^b	35.10 ^{ab}	47.50 ^a	46.37 ^a	4.21

ab: means on the same row followed by the same superscripts were not significantly (p<0.05) different

Conclusion

The study showed that Camel's foot pod meal (CFPM) can be used to replace conventional ruminant feed supplement such as soybean meal. Nutrients digestibility increased with increasing level of CFPM in the diets. The optimum weight gain and efficient utilization was achieved in treatment 4 at 60% inclusion level of CFMP. Inclusion of CFPM at 60% in a total mixed ration improves the nutrients intake of the experimental animals. Therefore, *Piliostigma reticulatum* pods can serve as a potential fodder feed resource for ruminant fattening programme.

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