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Effect of Cassava Root Sieviate with Groundnut Husk Supplementation on Rumen Microbial Load and Nutrient Digestibility of Goats

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Abstract
The study assesses the impact of cassava root sievate (CRS) with groundnut husk supplementation on rumen microbial load and nutrient digestibility of goats. Sixteen West African dwarf male goats with a mean weight of 5.00 ± 0.42kg were randomly assigned to four treatment diets with four goats per treatments in a completely randomized design. The four prepared treatment diets were B_1 (80% guinea grass that served as the control group), B_2 (50% guinea grass, 27% CRS and 3% groundnut husk), B_3 (50% guinea grass, 23% CRS and 7% groundnut husk) and B_4 (50% guinea grass, 19% CRS and 11% groundnut husk). Concentrate diet of 20% was added to all the treatment diets. The result of the study showed that rumen protozoa (5.99×10^6 cfu/g) was significantly ($p< 0.05$) higher in B_1 ,while rumen temperature (39.01^0C), bacteria (7.23×10^6 cfu/g) with fungi (6.56×10^6 c fu/g) and total digestible nutrient (78.03%) were significantly ($p< 0.05$) higher in B_2 than those in B_1, B_3 and B_4. No significant ($p> 0.05$) difference was observed in rumen pH among the treatment diets. It can be concluded that 50% guinea grass, 27% CRS, 3% groundnut husk and 20% concentrate diet has the potential to enhance rumen microbial load and improved total digestible nutrient in goats.

Keywords: By-products, rumen microorganisms, digestibility, goats

Introduction

Global consumption of ruminant products has consistently increased over the years and the trend is expected to continue. Much of this increase in the demand for ruminants industry in Nigeria is having a profound effect on the demand for ruminant feeds by livestock farmers. Thus, ruminant production is affected by the inadequate supply of feeds in terms of quantity and quality most especially during the dry season (Okoruwa, 2015). Fibrous feeds such as poor quality mixture of grasses cannot maintain goat production when feeds are scarce. To improve on this condition, goats consuming forages with less than 7% crude protein will require supplementation to achieve maximum rumen microbial fermentation. Hence, supplementing forage with suitable alternative feeds such as agro by-products is important (Aikman *et al*., 2011).

Cassava root sievate and groundnut husk can be classified as some of these agro by \-products that can be used to solve the problem of feed scarcity in goats. Cassava root sievate represent about 15 – 17% of the tuber in weight and it can be used as energy source in ruminant feeds (Aderemi and Nworgu, 2007). The combination of cassava root sievate with groundnut husk as a supplement to forage in the diet of goats may solve the problem of feed scarcity in goat production. However, there is a paucity of information on the use of these by-products as a supplement to guinea grass.

Therefore, the objective of this study is to determine rumen microbial load and total digestible nutrient of goats fed cassava root sievate with groundnut husk supplement.

Materials and Methods

The experiment was conducted at Teaching and Research Farm, Ambrose Alli University, Ekpoma. Guinea grass, agro by-products with concentrate diet that comprised 50% wheat offal, 30% dried brewery grain, 18% maize sievate, 0.65% limestone, 0.35% bone meal, 0.50% salt and 0.50% vitamin premix were used for the diets. The four treatment diets were B_1 (80% guinea grass that served as the control group), B_2 (50% guinea grass, 27% cassava root sievate and 3% groundnut husk), B_3 (50% guinea grass, 23% cassava root sievate and 7% groundnut husk) and B_4 (50% guinea grass, 19% cassava root sievate and 11% groundnut husk). Concentrate diet of 20% was added to all the experimental diets.

Sixteen growing West African dwarf male goats, age between 5 – 6months old with an average live weight of 5.00 ± 0.42kg were allotted to the four treatment diets with four animals per treatment in a completely randomized design. The experimental diets were offered to goats twice daily at about 8:00 am and 4:00 pm with free access to clean water. The trial lasted for 84 days excluding the 14-days adjustment period. However, rumen liquor samples were obtained three hours post feeding once every two weeks from two goats per treatment throughout the study.

Thereafter, rumen parameters were analysis (Morison *et al*., 1990). At the end of the 10th week feeding trial, two goats from each treatment were used for the metabolic study.

Total Digestible Nutrient (TDN) was calculated using this formula.

TDN = Digestible crude protein + digestible crude fibre + 2.25 x Digestible ether extract + digestible nitrogen free extract

The experimental diets and faeces were analyses for proximate composition using the procedures of AOAC (1990).

Data generated from the study were subjected to analysis of variance and where significant difference occurred means were separated using Duncan's multiple range test (SAS, 2002).

Results and Discussion

Indicted in Table 1 is the proximate composition of the experimental diets of goats, while table 2 showed the rumen microbial load and total digestible nutrient of goats fed experimental diets. Rumen temperature (38.43 & 39.01^{0}C) was significantly ($p< 0.05$) highest in goats on diet B_2 than other diets. The trend at which temperature rises in rumen following feeds ingestion has been reported (Okoruwa, 2015) to be due to the evolution of heat from feed fermentation process. Microbial yield in the rumen is very important, being an index of the amount of microbial protein made available to ruminant daily (Morrison *et al*., 1990).

Table 1: Proximate composition (%DM) of the experimental diets.

	Treatment Diets			
Parameters	1	2	3	4
Dry matter	79.86	91.34	89.75	86.03
Crude protein	10.76	10.29	10.38	10.47
Ether extract	3.72	3.84	3.65	3.46
Ash	8.52	8.96	8.66	8.37
Crude fibre	27.40	23.92	25.28	26.64
Nitrogen free extract	41.24	45.12	44.28	43.42

Table 2: Rumen microbial load and total digestible nutrient of goats fed experimental diets

	Treatment Diets				
Parameters	B_1	B_2	B_3	B_4	SEM ±
Rumen pH	6.82	6.58	6.63	6.75	0.12
Rumen Temperature (^{0}C)	38.43^b	39.01^a	38.75^b	38.64^b	0.68
Total protozoa (x 10^6 cfu/g)	5.99^a	4.34^b	4.58^b	4.77^b	0.43
Total bacteria (x 10^6 cfu/g)	6.25^b	7.23^a	6.76^b	6.51^b	0.21
Total fungi (x 10^6 cfu/g)	4.03^b	6.56^a	6.22^a	4.89^b	0.09
Total digestible nutrient (%)	67.81^{dc}	78.03^a	75.28^b	70.66^c	1.02

^{a,b,c,d} means on the same row with different superscripts differ significantly ($p < 0.05$)

The higher rumen protozoa value recorded in goats on B_1 (5.99 x 10^6cfu/g) compared with test diets (Table 2) could probably lead to energy wastages in the goats. Okoruwa (2015) reported that higher protozoa fermentation give acetate that led to energy wastage. Rumen fungi disrupt lignified tissues in stems and their activity results in a weakened residue more amendable to physical degradation (Aikman *et al.,* 2011). This weakening might probably allow plant digesta to be easily broken apart during goat's rumination and facilitated higher ($p< 0.05$) population of bacteria and fungi flow in diet B_2 (7.23 x 10^6 & 6.56 x 10^6 cfu/g) than other treatment diets (Table 2). The TDN that ranged between 68.81 and 78.03% was significantly ($p< 0.05$) higher in B_2 compared with B_1, B_2 and B_4. This could be an indication of better proportion of nutrients in the diet that was appropriate for the enhancement of rumen microbial activity in goats on the diet B_2

Conclusion

It is said from the results of the study that 50% guinea grass, 27% cassava root sievate, 3% groundnut husk and 20% concentrate diet had a positive effect on rumen microbial load and total digestible nutrient in goats than other treatment diets.

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