RUMEN PARAMETERS OF WEST AFRICAN DWARF GOATS FED CASSAVA PEELS-CASSAVA FOLIAGE CONCENTRATE SUPPLEMENTS

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ABSTRACT
The study was conducted to evaluate the effects of supplementing cassava peels-cassava foliage concentrate on rumen parameters of grazing West African Dwarf goats on rumen parameters. Twenty growing (20) West African Dwarf bucks aged 5-7months with an average body weight of 5.05±0.02kg were used in a completely randomized (CRD) experiment. The goats were randomly assigned to one of the five dietary treatments prepared from processed cassava peels and cassava foliage in different ratios of 100:0 (diet 1), 50:50 (diet 2), 60:40 (diet 3), 70:30 (diet 4) and 80:20 (diet 5). Data collected were subjected to analysis of variance (ANOVA). The result obtained indicated that all components of volatile fatty acids were significantly influenced ($P<0.05$) by dietary treatments apart from pH. The study revealed that supplementing cassava peels and cassava foliage as energy and protein source has no deleterious effect on the rumen parameters of experimental goats but can boost their potentials to enhance better rumen ecology for optimum performance and productivity of the animals.
Keywords: Cassava; foliage; goats; parameters; rumen.

INTRODUCTION

Goats as one of the ruminant animals serve as an important component of animal genetic resources. They provide important products for man in many parts of the world. In developed countries goats are valued mainly for their milk, fiber, and meat; while in the developing countries, they are valued mainly for meat, milk, fiber, and skins according to Devendra, and Solaiman (2001). However, quantity and quality of valuable and profitable products often obtained from goats are often not sufficient. This is as a result of the facts that feeds being offered to the animals are deficient in adequate nutrient in quality and quantity. Natural forage which forms the major supply of nutrient to the animals in the wet season often decline in nutritive content as a result of seasonal fluctuation and prolong period of dryness, thereby, grass becomes dry and of low nutritive value during the dry season leading to a marked decrease in voluntary intake and digestibility (Adebayo *et al.,* 2017). Ruminant stocks raised in the region where adequate feeds are unavailable, therefore, usually tend to reflect reduced productivity in terms of quality and quantity of obtainable products (Bamikole and Babayemi 2008). As a result of the foregoing, there is need for supplementing diets of goats with agro industrial by-products and farm wastes with good nutrient potentials such as cassava peels and cassava foliage to improve rumen ecology and activities of the host animals. Therefore, this study was conducted to determine rumen parameters of West African Dwarf goats fed cassava peels-cassava foliage concentrate supplements.

MATERIALS AND METHODS

The experiment was carried out at the Sheep and Goat Unit of Department of Animal Production, Prince Abubakar Audu University Anyigba, Kogi State, Anyigba. Anyigba is located in the derived Savannah of Nigeria on Latitude 7^0 15' and 7^0 29'N of the equator and Longitude 7^0 11' and 7^0 32' of Greenwich Meridian (Ifatimehin *et al*., 2006). Fresh cassava peels (CP), free from stumps were collected and grated before being subjected to hydraulic press for dewatering. The dewatered peels were then pulverized and sieved to obtain the coarse mash, which was then sun-dried for 2-3 days before being loaded into bags for feeding animals (Ajagbe *et al*, 2019). Cassava foliage (CSF) was harvested fresh and sundried until the leaves became brittle for milling before incorporation into the feed. Twenty growing West African Dwarf bucks aged 5-7months with an average body weight of 5.05±0.02kg were obtained within Anyigba town for 60 days feeding trial. They were housed semi-intensively in well-ventilated wooden cages in the pens. Prophylactic treatment were given to all the goats, they were dewormed and vaccinated against peste des petits ruminants (PPR). Treatment against ecto parasite was done with the use of amitrax solution. Multivitamin was administered to boost appetite. The goats were allowed to undergo 14 days acclimation period before data collection commenced. Thereafter, the goats were randomly assigned to five treatments with four replicates in a Completely Randomized Design (CRD). 100% CP was allotted to T1 (control), 50% CP+50% CSF (diet 1), 60% CP +40% CSF (diet 2), 70% CP +30% CSF (diet 3) and 80% CP+20% CSF (diet 4) respectively. Concentrate supplements were fed daily on 5% body weight after 5-6 hour grazing around the university farm.

Rumen Fluid Collection and Analysis

Rumen liquor samples (20mls) from each goat were collected from two animals per treatment at the end of the feeding trial with the use of stomach tube into sample bottles as described by (Wanapat and Khampa, 2007). Rumen pH of each sample was determined immediately after collection using the Jenway pH meter, model 3150 and immediately stored in the freezer at 5^0C prior to analysis. Collected samples ofrume n liquor were strained through four layers of cheese cloth. Thereafter, sample of the filtrate was then acidified with 1ml of a 5% (v/v) orthophosporic acid solution and stored frozen in the airtight plastic bottle container for determination of volatile fatty acid concentration and its fractions. Individual short chain volatile fatty acid (SCFA) was determined using gas chromatography after thawing; an aliquot of 1.6mL was prepared with 0.4Ml OF 25% metaphosphoric acid (4:1) and centrifuged for 20mins at lower temperature of about 4ºC. The supernatant was used to determine short chain fatty acids according to the method of (Abo zeid *et al*., 2017).

Statistical Analysis

Data collected were subjected to one way analysis of variance (ANOVA) (SPSS 20). The Mean separations were compared using Duncan's Multiple Range Test.

RESULTS

Nutrient Composition of Experimental Diets

Table 1 shows nutrient composition of supplementary diets, dry matter ranged from 89.16% to 90.95% with diet 5 having the highest value. Crude protein was higher (15.35%) in diet 2 than other treatments. Crude fibre ranged from 4.45% to 8.09% while ether extract was higher in diet 2 (2.69%) and lower in the control diet (0.82%). Values of ash content ranged between 2.50% and 2.88% while nitrogen free extract was higher in control diet (86.53%) and lower in diet 2 (70.97%).

Table 1: Proximate Composition of Cassava Peels-Cassava Foliage Concentrate Supplements (%).

Nutrients	**100:0**	**50:50**	**60:40**	**70:30**	**80:20**
Dry matter	89.16	90.05	89.88	89.69	90.95
Organic matter	86.66	87.17	87.08	86.96	88.30
Crude protein	5.27	15.35	13.33	11.32	9.30
Crude fibre	4.45	8.09	7.37	6.64	5.90
Ether extract	0.82	2.69	2.31	1.94	1.57
Ash	2.50	2.88	2.80	2.73	2.65
Nitrogen free extract	86.12	70.99	74.19	77.37	80.58

Rumen parameters of Growing West African Dwarf Goats fed Cassava Peels-Cassava Foliage Concentrate Supplements

Table 2 indicates rumen parameters of growing West African Dwarf goats fed cassava feel cassava foliage concentrate diets. All parameters examined were significantly (P<0.05) influenced by dietary groups apart from pH. Lactic acid significantly (P<0.05) ranged between 39.35mol/100ml and 40.20mol/100ml. Acetic acid was significantly (P<0.05) higher in diet 5 while butyric acid was significantly (P<0.05) higher for diet 5 aside from the control group. Values obtained for propionic acid indicated similar values for diets 2, 3, 4 and 5. Observed values for butyric acid were between 18.42mol/100ml and 19.40mol/100ml. These values indicated significantly (P<0.05) higher value for control group than other dietary groups.

Table 2: Rumen parameters of WAD goats fed cassava peels-cassava foliage concentrate supplements

Parameters	100:0	50:50	60:40	70:30	80:20	SEM	LOS
pH	6.43	6.66	6.26	6.60	6.15	0.10	NS
Lactic acid (%)	39.65^b	40.20^a	39.35^b	40.12^a	40.18^a	0.18	*
Acetic acid (%)	15.16^a	14.28^b	14.41^b	14.16^b	14.29^b	0.19	*
Propionic acid (%)	19.05^a	18.82^b	18.42^b	18.56^b	19.40^a	0.22	*
Butyric acid (%)	23.45^a	22.44^b	22.37^b	22.41^b	22.30^b	0.18	*

a, b, c, d, means with different superscripts on the same row are significantly different (P < 0.05), SEM = Standard Error of mean, LOS = Level of Significance

DISCUSSION

The rumen pH showed that the values were within the normal range for ruminant animal. Petrovski (2017) reported a pH range between 6 and 7 for normal function of the rumen ecology while Kobayashi *et al*., (2008)

reported that the rumen pH has to be maintained above 6.0 in order to maintain rumen fibrolytic activities. Chanjula *et al*, (2007) stated that ruminal pH is partly regulated by the ammonia concentration in the rumen fluid and its variation may be explained by the urea entering the rumen and being hydrolyzed by microbial ureases to carbon dioxide (Co_2). Lactic acid is known to be formed as an intermediate product but is fermented to acetic and propionic acid. Mckenzie *et al.,* (2004) opined that lactic acid might constitute a considerable proportion of the dry matter intake of the animals; the ration may still be efficiently utilized for production of meat and milk. Observed value of lactic acid indicates that appreciable quantities of digestible carbohydrate were available for the experimental animals for efficient metabolism and utilization. Values of acetic acid obtained were lower than other short chain fatty acids this is in harmony with the report of Widiawati and Thalib (2009) which state that feedstuffs resulting in increased production of acetic acid will promote increased methane and carbon dioxide production. The values of propionic and butyric acids obtained in this study were in contrast to 13.02-21.51% and 9.83-12.85% respectively as reported by Okoruwa (2015) for rams fed avocado peels, orange peels and guinea grass. Variations in the values obtained might be associated to the different feed materials used in different trials conducted.

CONCLUSION

Based on the results obtained from this study, cassava peels and cassava foliage used as supplementary energy and protein sources in this study have the potentials to enhance better rumen ecology for optimum performance and productivity of goats.

RECOMMENDATION

From the results garnered from this study, supplementation of processed cassava peel-cassava foliage concentrates up to 80:20 poses no deleterious effects to the rumen ecology of the goats rather it is a potential feed resource for ruminant during period of feed scarcity.

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