Nig. J. Anim. Prod. 2017, 44(5): 239 - 243
Nigerian Journal of Animal Production
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Sour sop (*Annona muricata* L) leaf meal enhanced growth of West African Dwarf goats

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Abstract

Apart from the use of sour sop (Annona muricata) as food crop, the leaves, seeds and many of the plant parts are used in traditional medicine for treatment of kidney problems, fever with antispasmodic, antidysenteric, and parasiticidal activity. Thus, a 63 day study was conducted to evaluate the feed potentials and effect of sour sop (Annona muricata) leaf meal (AMLM) on growth performance of West African dwarf (WAD) weaned goats. Nine (9) WAD goats were grouped into three and assigned diets containing 0%, 10%, and 20% Annona leaf meal. Formulated feeds were offered at 3% of body weight in the morning and gmelina leaves later in the day. Feed intake was recorded daily while weight gain was taken weekly and feed conversion ratio was calculated to determine growth performance. Proximate composition of the leaf meal was determined according AOAC, (2000). The result showed high metabolisable energy, dry matter, ash, and crude fiber of 2563.5Kcal/Kg, 93.91%, 10.62% and 16.20% respectively, moderate level of nitrogen free extract (42.39%) and crude protein (20.41%) which is an indication that Annona muricata leaf meal could be a suitable feedstuff for ruminant animals. The performance results showed that feed intake was significantly higher in group 1(0%AMLM) and lower in group 3(20%AMLM). However, no significant (P>0.05) differences were observed among the groups on weight gain and feed conversion ratio proving that the diet treatment had no significant effect on the goats. Therefore, Annona muricata leaf meal could be an alternative to high-cost goat nutrition without compromising growth performance.

Key words: sour sop, leaf meal, goat, growth performance, enhanced

Introduction

Livestock production is a very important part of agricultural sector in many tropical countries, representing up to 40% of the agricultural gross domestic products (Steinfeld *et al.*, 2006). Goat is one of the important domestic animals primarily owned by small-holder farmers and pastoralist, which significantly contribute to the economy and food supply of the poorest sectors of the society (Tolera*et al.*, 2016).

The tropics is characterized with seasonal shortage in the quality and quantity of forage from natural pasture which has continuously led to low productivity in goat industry of the peasant farmers, who cannot afford the cost of forage conservation (Ukanwoko and Ironkwe, 2012). To optimize production, goats fed grasses and roughages are supplemented with concentrates which has also increased the cost of production. Use of cheaper, lesser known and unconventional feed supplements may represent the low-cost route to improved animal performance.

In this regard, many attempts have been made to evaluate the chemical composition and nutritional potentials of some common legumes and browse plants as feed materials (Akinsoyinu and Onwuka, 1988; Oduguwa *et al*., 1997). Alternative feed

resources with potentials include *Mimosa invisa* (Nwogu and Fapohunda, 2002), *Tephrosia candida* (Odedire and Babayemi, 2008) and *Tithonia diversifolis* (Odunsi *et al.*,1996).

Sour-sop (*Annona muricata)* commonly known as custard apple is a tropical fruit bearing tree *of* the Annonacea family, widely cultivated for its edible fruits and is often becoming naturalized beyond their native range of tropical America and Africa. The leaves are glossy, dark and generally evergreen; it's highly adaptable to all weather conditions. Apart from its use as food crop, the leaves, seeds and many of the plant parts of *Annona muricata* are used in traditional medicine for treatment of kidney problems, fever with antispasmodic, antidysenteric, and parasiticidal activity (Orwa *et al.*, 2009).

Sour sop leaves were reported to contain 89% dry matter, 11% moisture, 25% crude protein, 15% ash, 22% crude fiber, 21% fat, 17% carbohydrate (Usunobun *et al.*, 2015). Phytochemicals present in *Annona muricata* leaves include flavonoids, alkaloids, cardiac glycosides, tannins, triterpenoid, saponins and reducing sugars. These phytochemicals and nutrient compositions could be of nutritional, clinical and veterinary relevance in livestock production. This study was undertaken to determine the nutrient composition of sour sop leaves and its effect as feed resource on growth performance of West African dwarf goats.

Materials and Methods

The study was conducted at the sheep and goat unit of Federal College of Agriculture Ishiagu, Ebonyi State. Sour sop leaves were sourced within the college premises and were identified at Ebonyi State University herbarium. The leaves were air-dried and milled, proximate analysis was carried out at Michael Okpara University of Agriculture, Unmudike. Three experimental diets were formulated to meet the nutrient need of weaner goats, Aduku (1999) using maize offal, wheat offal, cassava peel, palm kernel cake, bone meal and table salt. The sour sop leaf meal was included at 0%, 10% and 20% forming the treatments used in the study.

Nine (9) weaner goats of 4-5 months of age and average weight of 9.69±1.9 were grouped into three groups of three animals each and housed in concrete-floored pens. The animals were treated with ivermectine and oxytetracycline at the onset of the study against worm infestation and microbial infections. Each group of animals was assigned a diet treatment as indicated above for 63 days; the goats were weighed initially and weekly thereafter. Formulated feed was offered every morning at 3% of their body weight and remnants were weighed later to determine feed intake. Gmelina leaves were also offered at noon as forage, while fresh water was made available all through. Initial body weight, Final body weight, Body weight gain, Daily feed intake and Feed conversion ratio were determined.

Data Analysis

Data collected from the study were subjected to analysis of Variance in gross linear model and means were separated with Duncan's multiple range test at $p>0.05$(SAS, 1998).

Table 1: Gross Composition of the experimental diets (g/100g DM)

Ingredients	0%AMLM	10%AMLM	20%AMLM
Annona murica	0.00	10.00	20.00
Cassava peel	36.00	36.00	39.00
Wheat offal	18.00	15.00	11.00
Maize offal	23.00	19.00	15.00
Palm kernel cake	20.00	17.00	12.00
Bone meal	2.00	2.00	2.00
Common salt	1.00	1.00	1.00
Vitamin premix	0.30	0.30	0.30
Total	**100**	**100**	**100**
Calculated Nutrients			
Crude Protein	11.00	12.00	12.63
Crude fibre	10.00	11.00	12.00
TDN	90.60	90.03	89.45

TDN: total digestible nutrient

Results and Discussion

The result of proximate analysis of *Annona Muricata* leaf meal on dry matter basis revealed high dry matter, low moisture which indicates good nutrient profile of the leaf meal and shelf life in terms of storage; high crude protein makes it a suitable material since protein is an expensive nutrient in animal feeds. Low ether extract also point to its suitability and keeping quality while high crude fiber makes it a suitable feed for ruminants since they can well utilize fiber sources. High Ash indicates availability of minerals which are essential for life, nitrogen free extract, translates to Energy which is crucial in animal's life. From the result (Table 2), sour sop leaf is a potential feed ingredient for ruminants.

Table 2: Proximate Composition of *Annona muricata* Leaf Meal

PARAMETERS	AMLM
Dry matter	93.91
Moisture content	6.09
Crude protein	20.39
Ether extract	4.31
Crude fibre	16.20
Ash	10.62
Nitrogen free extract (NFE)	42.39
Total Digestible Energy	87.04

The result of growth performance of West African dwarf Goats fed *Annona muricata* is shown in Table 3. The result indicated significant differences ($p<0.05$) in the Initial and final weight of the goats with the highest values in 20% AMLM (11466.7g and 12647.0g), and lowest values in 0% AMLM (7.67 and 9.39kg). However these differences were not attributed to treatment effect. Feed intake was significantly higher in 0% AMLM and lowest in 20% AMLM indicating the degree of acceptability of the various feeds which declined with the inclusion of sour sop leaf meal. Feed intake has been observes to be governed by some factors such as dietary crude protein, palatability, gut fill, body fat and health factors (Ukanwoko and Ironkwe, 2012). This is true as the sour sop diets had better crude protein than the control diet; also the

goats were observed avoiding the leaf particles that were not well milled suggesting the leaf was not palatable probably due to its characteristic odour or taste. Nevertheless, there was no significant difference in the weight gain and the feed conversion ratio, which implies that though the animals ate little of diets 2 and 3, it had sufficient nutrients to support growth performance. Therefore the feed had a positive significant effect on the growth of goats, suggesting that sour sop leaves can be used successfully as low-cost feed material in goat diets.

Table 3: Growth Performance of West African Dwarf Goats fed *Annona Muricata* Leaf Meal

PARAMETERS	0%AMLM	10%AMLM	20%AMLM	SEM	p. value
Initial body weight(g)	7.67[b]	9.93[ab]	11.47[a]	0.38	0.02
Final weight(g)	9.39[b]	11.48[ab]	12.65[a]	0.52	0.11
Weight gain(g)	1.72	1.55	1.18	0.28	0.73
Total feed intake(g)	13.43[a]	9.89[b]	7.39[c]	0.87	<0.001
average daily feed intake(g)	0.72[a]	0.53[b]	0.40[c]	0.04	<0.001
feed conversion ratio	8.22	5.23	6.54	0.66	0.25

[a, b, c] means in the row with different superscripts are significantly different ($p<0.05$)
AMLM = *Annona muricata* leaf meal

Conclusion

The study of the proximate composition of sour sop leaf meal showed high nutrient composition which was also tested as feed stuff for goats up to 30% of the leaf meal in the diets. The result revealed no negative effect on growth performance even with reduced feed intake. Hence sour sop leaves can be successfully used in goat feeding to improve animals' performance.

Acknowledgements

The authors wish to thank the farm manager, Mr. Onwujiariri E. and the head of sheep and goat unit Mr. Onyeneke N. for allowing free access to the animals used in this study.

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Received: 2nd September, 2017
Accepted: 30th November, 2017