

Evaluation of Growth Performance of Red Sokoto Goats Fed. Ensiled Mixture of *Ziziphus Mauritiana* Leaves and *Pennisetum Pedicellatum*

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Abstract

An experiment was carried out to evaluate the effect of replacing groundnut hay with graded levels of ensiled mixture of *Ziziphus mauritiana* leaves (ZML) and *Pennisetum pedicellatum* (PP) on growth performance of Red Sokoto goats. Five diets designated as T1, T2, T3, T4 and T5 were formulated to form the basal diet. T1 contained only groundnut hay while T2, T3, T4 and T5 had 25, 50, 75 and 100% replacement levels of ensiled ZML and PP for GNH. Similarly, a supplement mix of 30% rushed maize, 40% cotton seed cake, 25% wheat offal and 5% cowpea husk was offered to the animals at 33% of daily ration. Twenty (20) Red Sokoto goats weighing between 18.66 and 21.01kg were randomly allotted to the five diets in replicates of four in a completely randomized design. Data on daily feed intake, weight gain and feed conversion ratio were collected. Results showed a significant influence of ensiled ZML + PP in daily feed intake daily weight gain, total weight gain and feed conversion ratio among diets. The results showed that goats on T5 (622.18g) had significantly ($P<0.05$) higher DFI which was comparable with T4 (607.44g), T3 (584.77g) and T1 (564.33g) than those fed diet T2 (548.02g). Similarly, daily weight gain was higher ($P<0.05$) in goats fed diet T5 (118.73g) and T4 (106.25g) which did not differ from those fed diet T3 (93.11g) but lower on T1 (87.09g) and T2 (85.36g) which were the same. Feed conversion ratio significantly ($P<0.05$) better on T4 (5.72) and T5 (5.24) which compared favourably with T2 (6.42) and T3 (6.28) than on T1 (6.47). It was therefore concluded that a mixture of ensiled *Ziziphus mauritiana* leaves and *Pennisetum pedicellatum* can completely replace groundnut hay as basal diet with improved growth performance.

Keywords: *Silage, Ziziphus mauritiana, Pennisetum pedicellatum, growth performance, Red Sokoto goats.*

Introduction

Nigeria, particularly the Northern part, has the potential to meet its animal protein requirement from ruminant animal production. According to the 2011 National Agricultural Sample Survey, the country has a total of 19.5 million cattle, 72.5 million goats, 41.3 million sheep and 28,000 camels (Aruwayo *et al.*, 2019). However, the quantity of meat produced from these animals and that from other livestock species has not been able to satisfy the national demand (Inyeinyang and Ukpong, 2019). Nutrition has universally been recognized as the major constraint to livestock productivity especially in Africa.

During the wet season ruminants feed on natural grasses and legumes but during the dry season these forages become scarce and animals are left at the mercy of dry, fibrous, less palatable, less digestible, and nutritionally-deficient crop residues. Feed alone accounts for 60 – 80% of the total cost of livestock production (Wang *et al.*, 2022). Sustainable and effective ruminant production requires the use of supplementary feed such as cereal grains, oil seed meals and their by-products to augment nutrient supply of basal diets. However, these feed ingredients are rather expensive and not within the reach of a poor farmer. This situation (lack of adequate quantity and quality of ruminant feeds) and the effort of producers to meet their animals' feed requirements has been the cause of incessant conflicts between farmers and herders across the entire West African countries (Bello and Abdullahi, 2021).

In order to stem this problem, the feeding value/quality of our available feed resources should be improved for dry season ruminant feeding. This could be done by processing the abundantly available herbage and green fodder into silage. Silage is the material produced by controlled fermentation, under anaerobic conditions, of chopped crop residues or forages with high moisture contents (Neil *et al.*, 2022). The process helps

to preserve the nutrients therein which would otherwise be lost after drying.

Dry season feeding of ruminant animals has continued to be a major constraint to effective animal production in Northern Nigeria. This is due to the low quantity and quality of feed resources available at that period which is as result of factors which include erratic pattern of rainfall, global warming, depletion of soil fertility, increasing level of insecurity and high cost of inorganic fertilizer among others. In order to achieve food security in the north and Nigeria at large, concerted efforts need to be made to ensure that livestock, ruminants in particular, have adequate supply of nutritious feed resources year round. One formidable way of attaining this is through the processing, storage and feeding of goats a mixture of ensiled *Ziziphus mauritiana* leaves and *Pennisetum pedicellatum*. Available literature related to this technique is currently limited. This study is therefore designed to bridge this gap.

Materials and Methods

Study Area

The study was conducted at the Ruminant Livestock Farm, Federal Polytechnic, Damaturu. Damaturu is within the GPS location of Latitude: 11° 44' 49.1856" N and Longitude: 11° 57' 58.2912" E. Situated in the semi-arid region of Nigeria, the area is characterized by a tropical continental climate with a short wet season (June – August) and a long dry season (October – May). The mean annual temperature varies from 14.4 to 43°C while the average annual rainfall is about 560mm. (Weather Spark, 2021).

Experimental Animals and their Management

The experimental animals (20 Red Sokoto goats) weighing between 18.66 and 21.01kg each, were purchased from the Damaturu Sunday market, Yobe State. They were managed intensively in a well ventilated pen

and tattered 2 metres apart. Before the feeding trial, goats were quarantined for 2 weeks, dewormed and treated against ecto-parasites using Ivermectin® injection at 1ml/40kg.

The animals were given an intramuscular injection of oxytetracycline at a dosage rate of 1ml/10kg live weight. Routine management practices were carried out to ensure that animals were properly fed, and were in proper hygienic condition.

Source of Test Materials and other Feed Ingredients.

Fresh *Ziziphus mauritiana* leaves at the shrub's flowering stage and *Pennisetum pedicellatum* at bloom stage were collected from the Polytechnic's arable land. Other feed ingredients for the formulation of concentrate supplement which include; Cowpea husk, wheat offal, cotton seed cake, maize and salt lick were procured from the Damaturu Sunday market.

Ensiling of Mixture of *Ziziphus mauritiana* leaves and *Pennisetum pedicellatum*

After collection, ZML and PP was chopped into 2-3 cm length cuts, wilted for 24 hours and ensiled using Purdue Improved Cowpea Storage (PICS) bags. During the process, 1.5 kg of each material was introduced into the bag, molasses solution sprinkled and the material compacted using a wooden pestle. This process was repeated until the bag was filled to 90% capacity. Thereafter, the open end was tied to ensure that the bag remained air-tight. The bags were stored in a safe place away from rodents for a period of 30 days to complete the silage making process.

Formulation of Experimental Diets

Five diets (T1, T2, T3, T4 and T5) were compounded to form the basal diet and a

concentrate supplement mix of 30% rushed maize, 40% cotton seed cake, 25% wheat offal and 5% cowpea husk, was also be prepared.

Experimental Design and Feeding

The goats were assigned to five experimental diets in replicates of four in a completely randomized design (CRD). Feeding was done at 2% body weight/head/day (BW/H/D) basal diet supplemented with concentrate mix at 1% BWH/D for a period of 80 days. Clean drinking water was also provided *ad libitum*.

Data Collection

At the beginning of the study, the goats were weighed individually to determine their initial weights, and thereafter on weekly basis, to determine weight change. Daily feed intake was computed from the difference between feed offered and that of left-over retrieved after a 24 hrs. period.

Chemical Analysis

Samples of the experimental diets were analysed for proximate composition according to the official method of analysis (AOAC, 2005).

Data Analysis

All data collected was subjected to analysis of variance (ANOVA) using the statistical software SPSS v. 25. Difference between treatment means was compared using the Duncan's Multiple Range Test (DMRT) (Duncan, 1955).

Results and Discussion

The T1 was made up 100% groundnut hay, replaced at 25, 50, 75 and 100% levels by ensiled mixture of ZML and PP in T2, T3, T4 and T5 respectively as presented in the table 1 below.

Table 1: Composition of Experimental Diets and Levels of Concentrate Mix Fed to Red Sokoto Goats

Diet	Levels				
	T1	T2	T3	T4	T5
Basal diet	0%	25%	50%	75%	100%
	(ZML&PP)	(ZML&PP)	(ZML&PP)	(ZML&PP)	(ZML&PP)
Concentrate (%)	33	33	33	33	33

ZML&PP = *Ziziphus mauritiana* leaves and *Pennisetum pedicellatum*

The results for growth performance of Red Sokoto goats fed ensiled Mixture of *Ziziphus Mauritiana* Leaves and *Pennisetum Pedicellatum* is presented in Table 2. Except for initial weight, all parameters studies showed a significant ($P < 0.05$) effect of diet. Goats on T5 (622.18g) had significantly ($P < 0.05$) higher DFI which was comparable with T4 (607.44g), T3 (584.77g) and T1 (564.33g) than those fed diet T2 (548.02g). These values are comparable with $440 \pm 0.58 - 636 \pm 0.45$ g reported by Ali *et al.* (2018) in Bati breed of goats fed sun-dried *Ziziphus spina-christi* leaves, but higher than $440 - 435$ g for *Pennisetum pedicellatum* in sheep (Mengistu *et al.* 2012). Similarly, daily weight gain was higher ($P < 0.05$) in goats fed diet T5 (118.73g) and T4 (106.25g) which did not differ from those fed diet T3 (93.11g) but lower on T1 (87.09g) and T2 (85.36g) which were the same. These values are within the

range of $31.4 \pm 0.4 - 190.0$ g obtained by Ansha *et al.* (2018) in local breeds of goats. Final body weight was higher on T4 (29.60kg) and T5 (29.07kg) which were the same than on T1 (26.02 kg) and T2 (25.51 which were also the same. However, goats fed diet T3 (27.17kg) compared favourably with those on other diets. In the same vein, total weight change was higher on T5 (9.50kg) and T4 (8.59kg) which were the same and similar to T3 (7.45kg) than on T1 (6.97kg) and T4 (6.85kg) which were also the same. Feed conversion ratio significantly ($P < 0.05$) better on T4 (5.72) and T5 (5.24) which compared favourably with T2 (6.42) and T3 (6.28) than on T1 (6.47). It was therefore concluded that a mixture of ensiled *Ziziphus mauritiana* leaves and *Pennisetum pedicellatum* can completely replace groundnut hay as basal diet in Red Sokoto goats with improved growth performance.

Table 2: Growth Performance of Goats Fed Ensiled Mixture of *Ziziphus Mauritiana* Leaves and *Pennisetum Pedicellatum*

Index	Diet					SEM
	T1	T2	T3	T4	T5	
Initial body weight (kg)	19.05	18.66	19.72	21.01	19.57	0.98 ^{NS}
Daily feed intake (g)	564.33 ^{ab}	548.02 ^b	584.77 ^{ab}	607.44 ^{ab}	622.18 ^a	17.06 [*]
Daily weight gain (g)	87.09 ^b	85.36 ^b	93.11 ^{ab}	106.25 ^a	118.73 ^a	5.29 [*]
Final body weight (kg)	26.02 ^b	25.51 ^b	27.17 ^{ab}	29.60 ^a	29.07 ^a	0.92 [*]
Body weight change (kg)	6.97 ^b	6.85 ^b	7.45 ^{ab}	8.59 ^a	9.50 ^a	0.42 [*]
Feed conversion ratio	6.47 ^c	6.42 ^{ab}	6.28 ^{ab}	5.72 ^a	5.24 ^a	0.24 [*]

a,b, = Means on the same row with different manuscripts differ significantly. * significant @ $P < 0.05$, SEM = Standard Error of Mean, NS = Not significant.

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Conclusion

Based on the findings of this research work, it was concluded that a mixture of ensiled *Ziziphus mauritiana* leaves and *Pennisetum pedicellatum* can completely replace groundnut hay as basal diet with improved growth performance.

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