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Growth Performance and Carcass Characteristics of West African Dwarf Bucks Fed Different Forms of Processed Guinea Grass (*Panicum Maximum*)

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Abstract

An experiment was conducted to determine the growth performance and carcass characteristics of West African Dwarf bucks fed different types of processed *Panicum maximum*. Twelve West African Dwarf bucks aged between 6 and 8 months with initial mean weight of 7.26kg were intensively managed for 56 days. The experimental diets are wilted *Panicum maximum*, fresh *Panicum maximum*, ensiled *Panicum maximum* and *Panicum maximum* Hay designated as T_1, T_2, T_3, and T_4, respectively. The results revealed that goats placed on wilted *Panicum maximum* (T_1) (135.18g/day) and hay, (T_4) (139.29g/day) were similar in respect to concentrate intake. Forage intake showed significant ($P<0.05$) differences. Goats fed wilted Panicum (T_1) (607.78g/day) and fresh *Panicum maximum* (T_2) (634.46g/day) had similar intake but differed from goats placed on ensiled *Panicum maximum* (T_3) and hay *Panicum maximum* (T_4). Daily dry matter intake (DMI) differed ($P<0.05$) significantly among treatments. Total daily feed intake of goats on wilted *Panicum maximum* (T_1) (42.96g/day) and fresh *Panicum maximum* (T_2) (759.80g/day) were similar and differed from total daily feed intake of goats placed on ensiled *Panicum maximum* (564.28g/day) and Hay *Panicum maximum* 484g/day. Goats fed wilted *Panicum maximum* produced higher value of live weight which did not differ ($P>0.05$) from other treatments. Bucks on fresh *Panicum maximum* (T_2) had higher value of bled weight (7.40kg) but did not significantly differ ($P>0.05$). Heavier dressed weight (35.62) was recorded by goats fed wilted *Panicum maximum* (T_1) but did not significantly differ ($P>0.05$) from other treatments. Dressing percentages, thigh, loin, internal organs and bone

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to lean ratio were not significantly different (P>0.05) from each other. The use of *Panicum maximum* in any form has no effect on conversion of forage into meat and formation of any part.

Introduction

Small ruminants form an integral part in the livestock economy production system in Nigeria.[1] They provide animal protein, fibre and skin, food security and a stable household income. They also have whole range of advantage over large ruminants in terms of adaptation to and interaction with the environment. This suggests the relative importance of goats within the livestock economy.

In Nigeria, goats are significant in the socio-economic life of the people as they contribute about 35% of the animal meat supply[2] This figure may be higher if the animals processed in slaughter houses for which records are not available are included[2] In most tropical countries, ruminant animals are maintained on native pastures and other feed resources as their main source of nutrients.[3] Hence, the use of pasture grass has been advocated for small ruminants.

However, the dry season feeding of ruminants especially goats in Nigeria has always been a challenge to farmers since good quality pastures are scarce, hence, performance of these animals are seriously impaired. The situation becomes worst during this period as animals are unable to meet their protein and energy from available poor quality herbage with consequent marked weight loss and reduced productivity of goats.[4] Hence, the need to process this feed resource to ensure the availability of feed all year round and prevent loss of weight associated with seasonality of forage. *Panicum maximum* (Guinea grass) is one of the most naturally occurring grasses in the tropics and subtropics of Africa which has high yield and regenerating ability. They are very responsive to nitrogenous fertilizer and highly palatable to livestock at all stages of growth which makes it one of the best fodder grasses.[5]

Silage and hay can be prepared from guinea grass. It can also be used in cut and carry system of feeding.[6] reported that guinea grass can be managed as long-term grass if is consistently grazed .It regrows to 2.5 leaves/ tillers during the rest period. Good quality silage can be obtained during pre-flowering stage which can be made into silage and hay.[6] Processing of grasses into hay and silage have been identified as a cheap way of ensuring feed availability without season.

Dried forages can be used as hay for ruminants. Silage is the most succulent feed produced as a result of controlled fermentation of fresh forage when stored in an air tight container under anaerobic condition. Silage can be stored for months or years and can be used when required.[7]

Silage making involve cutting grass at pre-flowering stage and legumes at initial flowering. This is the stage when the plants abound in protein, carbohydrates and mineral salt and vitamins. The plant cut were ensiled quickly, packed in a tight plastic bag and sealed appropriately to avoid pocket of air.[8] This review article therefore is based on using different forms of processed *Panicum maximum* on the performance and carcass characteristics of West African dwarf bucks.

Materials and Method

Experimental Site

The experiment was carried out at the goat unit of the Teaching and Research farm of the Department of Animal Science, Akwa Ibom State University, Obio Akpa Campus. The area lies between latitude 4°30ˈN and 5°30ˈN and longitudes 7°30ˈE and 8°00ˈE of the Greenwich Meridian. The area is in the humid tropical region, characterized by two seasons, rainy and dry, which last respectively from March to November and from November to March. Other climatic parameters are; heavy rainfall of 2000-2500mm in the wet season, annual temperature range of 24°C-30°C, and relative humidity range of 75-79%.[9]

Experimental Animals and Management

Twelve[12] West Africa Dwarf bucks of age between 6 and 8 months with mean initial weight of 7.26kg were used. The animals were bought from rural small holder farmers within Obio Akpa village in Akwa Ibom State. They were given anti-stress on arrival and were housed in a concrete floored pen with open sides covered with thick wire mesh for ventilation.

The bucks were quarantined for a period of 14 days, and were fed silage, fresh fodder, wilted fodder and hay in addition to concentrates. Long acting antibiotic (Oxytetracycline HCL 20%) injection was administered intravenously and repeated after four days to take care of any infection that may arise. One bolus of albendazole was administered orally to each animal for the control of endo-parasites and ivomectin injection at 2ml/goat which was administered for the treatment and prevention of both ecto and endo parasites. Vaccination was done against kata or peste des petits ruminants (PPR).

At the beginning of the experiment, the animals were allotted to different treatments after balancing for weight in each treatment in a Complete Randomized Design (CRD) experiment.

Clean water was given *ad-libitum* on a daily basis for 56 days.

Experimental Diet

The experimental diet was basically *Panicum maximum*. This was offered to the animals in different forms *viz*: wilted, cut and carry (fresh), silage and hay, designated as T_1, T_2, T_3 and T_4 respectively.

Hay Preparation

Panicum maximum forage was cut around the University vicinity at pre-flowering stage, chopped at 3cm long, sundried for 3 days, bailed and stored for the experiment.

Silage Preparation

The grass was cut at pre-flowering stage chopped at about 3cm in length, loaded in a black plastic bag and pressed to ensure compaction and then sealed to ensure air tight or anaerobic conditions for 21 days. After 21 days, the ensiled materials were opened and samples were analyzed for proximate fractions. Black plastic bags or pressed bag method employed by[10] was adopted for silage preparation.

Wilted Forage

Panicum maximum was cut and wilted for 48 hours under room temperature 25°C and used for the experiment.

Data Collection

Data on voluntary feed intake was recorded every morning for each animal by subtracting feed refusals from the amount given on the previous day. Data emanated from the experiment was used to calculate weight gain, average daily weight gain and feed conversion ratio for 56 days.

Carcass Evaluation

A total of eight goats comprising two goats per treatment,were randomly selected,starved for 24 hours and then used for carcass evaluation.The animals were severed through the jogular. They were hung upside down to allow proper removal of blood .Carcass evaluation was carried out for the meat cuts.

Table 1: Composition of the Basal Diets

	T_1	T_2	T_3	T_4
PKC	30	30	30	30
BDG	37.5	37.5	37.5	37.5
WO	30	30	30	30
BM	2	2	2	2
Salt	0.5	0.5	0.5	0.5
Total	100	100	100	100
Calculated Protein	17.4	17.4	17.4	17.4
Calculated Energy($Kcal^{-1}$/Kg)	2072.5	2072.5	2072.5	2072.5

T_1 = Wilted *Panicum maximum*; T_2= Fresh (Cut and carry) *Panicum maximum*;
T_3 = Ensiled *Panicum maximum*; T_4= *Panicum maximum* hay.

Statistical Analysis

The data collected were subjected to analysis of variance procedures. Significant means were separated using Duncan Multiple Range Test.[11]

Results and Discussion

The growth performance of goats fed the experimental diets is shown in Table 3. Final body weights were 8.94Kg, 8.67Kg, 7.90Kg, 7.48Kg for goats fed wilted *Panicum maximum*(T_1), Fresh *Panicum maximum* (T_2), Ensiled *Panicum maximum* (T_3) and *Panicum maximum* hay (T_4) respectively. There were no significant differences (P>0.05) among the treatments. Mean daily concentrate intake showed significant differences (P<0.05) among treatments. Goats placed on wilted *Panicum maximum* (T_1) (135.18g/day) and *Panicum maximum* hay (T_4) (139.29g/day) were similar in concentrate intake. Goats fed ensiled *Panicum maximum* (T_3) (167.32g/day) had higher value of concentrate intake. The observed intake were lower than the range (525.14-546.26g/day) reported by.[12] Goats fed wilted *Panicum maximum* (T_1) (607.78g/day) and fresh *Panicum maximum* (T_2) (634.46g/day) had similar intake but differed from goats placed on ensiled *Panicum maximum* (T_3) and *Panicum maximum* hay (T_4).

Daily dry matter intake (DMI) differed (P<0.05) significantly among treatments. Dry matter intake

Table 2: Proximate Composition of Experimental Diets

Nutrients	T_1	T_2	T_3	T_4	Conc.	SEM
DM (%)	52.48^{c}	30.4^{d}	23.45^{e}	95.86^{a}	86.06^{b}	1.04
CP (%)	13.10^{bc}	13.81^{b}	12.31^{cd}	11.38^{a}	20.94^{a}	0.36
CF (%)	4.55^{b}	4.44^{b}	4.44^{b}	4.61^{b}	6.58^{a}	0.36
EE (%)	4.60^{a}	5.24^{a}	4.44^{a}	1.46^{b}	1.09^{b}	0.4
Ash	6.52^{b}	7.34^{b}	6.43^{b}	6.82^{b}	9.83^{a}	0.35
NFE	75.29^{a}	74.66^{a}	72.39^{a}	75.73^{a}	61.56^{b}	1.13
Energy (Kca/Kg)	375.90^{ab}	377.70^{a}	370.77^{ab}	361.55^{ab}	339.81^{b}	9.59

^{abcde} means on the same row with different superscripts are significantly different (P<0.05).

T_1 = Wilted *Panicum maximum*; T_2 = Fresh (Cut and carry) *Panicum maximum*;

T_3 = Ensiled *Panicum maximum*; T_4 = *Panicum maximum* hay; SEM = Std error of mean.

Table 3: Growth Performance of Goats Fed Different Forms of Processed *Panicum maximum*

Parameters	T_1	T_2	T_3	T_4	SEM
Initial body Wt (Kg)	7.72	7.5	7.14	6.67	0.76
Final body Wt (Kg)	8.94	8.67	7.9	7.48	0.78
Daily Concentrate Intake (g/day)	135.18^{ab}	125.34^{b}	167.32^{a}	139.29^{ab}	0.57
Daily Forage intake (g/day)	607.78^{a}	634.46^{a}	396.96^{b}	345.18^{b}	1.54
Total Daily Feed intake (g/day)	742.96^{a}	759.80^{a}	564.28^{b}	484.47^{c}	3.37
Daily weight gain (g/day)	21.78	20.89	13.57	14.46	3.49
FCR	34.11	36.37	41.58	33.5	10.09

^{abc} means on the same row with different superscripts are significantly different (P<0.05).

T_1 = Wilted *Panicum maximum*; T_2= Fresh (Cut and carry) *Panicum maximum*;

T_3 = Ensiled *Panicum maximum*; T_4= *Panicum maximum*; SEM = Std error of mean.

of goat on wilted *Panicum maximum* and Fresh *Panicum maximum* were similar and differed from DMI of goats placed on ensiled Panicum and Panicum hay. The dry matter intake values observed were higher than the ranges 235.00-388.82g/day and 265.10-333.24g/day.[13]

Daily weight gain did not significantly differ (P>0.05) among treatments. The heavier weight gain was observed in goats fed wilted *Panicum maximum* (T_1). The values obtained in this study were lower than that reported by[14] who reported a range of 31.27g-42.26g for WAD goats. The heavier weight gain of goats fed wilted *Panicum maximum* (T_1) may be due to high DMI and better feed utilization.

Feed conversion ratios did not show significant differences (P>0.05) among treatments. The feed conversion ratios of goats except for goats on ensiled *Panicum maximum* (T_3) have agreed with study of[15] who reported the range of 25.25-36.52. The feed conversion ratio exhibited by goats fed wilted *Panicum maximum* (T_1) could be attributed to higher feed utilization.

Carcass characteristics of goats fed the experimental diets is presented in Table 4. The live weight at slaughter were 7.85Kg, 7.70Kg, 5.40Kg and 6.20Kg for goats placed on wilted *Panicum maximum* (T_1), Fresh *Panicum maximum* (T_2), Ensiled *Panicum maximum* (T_3) and *Panicum maximum* hay (T_4) respectively. Goats fed wilted *Panicum maximum* produced higher value of live weight which did not differ (P>0.05) from other treatments. For bled weight, goat on fresh *Panicum maximum* (T_2) have higher value (7.40Kg) compared to 6.90Kg, 5.15 and 5.85Kg for treatment 1,3, and 4 respectively. Bled weight did not show significant difference (P>0.05).

Table 4: Carcass Yield of WAD Bucks Fed Different Processed Forms of *Panicum maximum* Treatments

Parameters	T_1	T_2	T_3	T_4	SEM
Live Wt (Kg)	7.85	7.7	5	6.2	0.96
Bled Wt (Kg)	6.9	7.4	5.15	5.85	0.95
Dressed Wt (Kg)	2.8	2.71	1.75	2.14	0.46
Dressing %	35.62	35.43	32.08	34.63	1.79
Shoulder (g)	640.37	530.29	410.15	452	1.06
Thigh (g)	547.71	597.76	360	530	1.45
Loin (g)	575.26	445.23	345.12	365	1.46
Sets (g)	575.41ab	690.00a	380.19b	437.00ab	1.02
Ends (g)	425.22	420.11	240.35	390	0.95
Diaphragm (g)	50.2	30.16	15.11	35.31	0.35
Head (g)	600	750	600	595	4.56
Skin (g)	550	630	500	450	2.63
Feet (g)	250	250	300	250	1.12
Full gut (Kg)	2.15	2.6	1.72	2.45	0.47
Empty gut (Kg)	0.53	0.75	0.55	0.72	0.2
Liver (g)	120	132.5	97.5	107.5	0.49
Heart (g)	35	35	32.5	37.5	0.24
Spleen (g)	10	15	15	12.5	0.31
Lung (g)	60.00a	72.50a	35.00b	77.50a	0.38
Bone to Lean Ratio	0.39	0.33	0.63	0.43	0.2

[abc] means on the same row with different superscripts are significantly different (P<0.05).

T_1 = Wilted *Panicum maximum*; T_2 = Fresh (Cut and carry) *Panicum maximum*;

T_3 = Ensiled *Panicum maximum*; T_4 = *Panicum maximum* hay; SEM = Std error of mean.

Heavier dressed weight was produced by goats fed wilted *Panicum maximum* but did not significantly differ (P>0.05) from other treatments. The dressed weights obtained were lower than the range (3.86-4.65Kg) reported by.[16] Higher value was obtained in goats placed on wilted *Panicum maximum* (T_1) closely followed by goats fed fresh *Panicum maximum*, the least dressing percentage was observed in goats fed ensiled *Panicum maximum*. Values obtained were in agreement with the reports of.[16] Goats fed wilted Panicum (640.37g) had the highest value of shoulder; the least was produced by goat on ensiled *Panicum maximum* (410.15g). Thigh of goats fed fresh *Panicum maximum* weighed heavier, and the least weight was produced by goat on ensiled *Panicum maximum* (360.00g). There were significant differences (P<0.05) for weight of sets. Goats fed wilted Panicum (T_1) (575.41g) and Panicum hay (T_4) (437.00g) produced similar weight of sets. The highest value (1064.00) was obtained by goats fed fresh *Panicum maximum*. The values obtained were higher than that obtained by[15] who reported 365-478g for WAD goats fed bambara nut based diets. Highest and least values of ends were obtained by goats fed wilted (T_1) *Panicum maximum* and ensiled (T_2) Panicum respectively. The offals were not significantly (P>0.05) different. Fresh *Panicum maximum* (T_2) (630.00g) produced heavier weight of skin (630.00g). The least weight of skin was observed in goats fed *Panicum maximum* hay (T_4). The weight of skin obtained fell below the range (9.73-13.14%) reported for goats fed pigeon-pea cassava peel meal for WAD goats fed pigeon pea-cassava peel based diets.[17]

Heavier weight of full gut was observed in goats fed fresh *Panicum maximum* (T_2) (2.60Kg), the least weight was obtained by goats fed ensiled *Panicum maximum* (T_3) (1.72Kg). These values were higher than those obtained by.[17] Gut content may constitute up to 20%of the liveweight of goats depending on how long the animal was fasted before slaughter.[13] The result revealed that goat fed with any form of preserved forage does not have effect on its dressing percentage and formation of any body part. Lungs weight for all treatments were similar except for goats fed ensiled *Panicum maximum* which differed (P<0.05) significantly. The appreciable bone to lean ratio was obtained by goats fed fresh. *Panicum maximum* (T_2). The range 0.33-0.47 fed above the range (0.28-0.35) reported by.[18] The result showed that *Panicum maximum* preserved in any form have no effect on the conversion of forage into meat.

Conclusion

The use of processed *Panicum maximum* in any form has no negative effect in the conversion of forage into meat and formation of any body part. The best performance of WAD goats placed on wilted and fresh *Panicum maximum* in terms of dry matter intake and weight gain makes it a diet of choice for fattening and reproduction. In line with the results from this research, the following inferences were made;

Wilted and fresh *Panicum maximum* are recommended for fattening and reproduction of West African Dwarf goat production.

Panicum maximum processed as silage and hay can be used in combination as maintenance ration for WAD goats in the tropics.

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Conflict of Interest

Authors declare no conflict of interest.

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