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PERFORMANCE OF CALVES FED WITH HAY, SILAGE AND BROWSE PLANT AS FEED SUPPLEMENT DURING THE DRY SEASON

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Abstract: The experiment to evaluate the performance of grazing calves (N'dama x White Fulani) supplemented with guinea grass – stylo hay and silage and browse plant – *Leucaena leucocephala* leaves in the late dry season between January and March, 2009 at Teaching and Research Farm of the University of Agriculture, Abeokuta. Twelve calves were randomly grouped into four comprising of the hay, silage, browse plant and the control without supplement. The feeding trial lasted for 10 weeks with data collected on feed intake, weight gain and haematological parameters. The highest crude protein intake (165.0g) was obtained from animals fed with *Leucaena leucocephala* supplement, which was not significantly higher than those of the animals fed with silage (159.10g). While, the significantly ($P<0.05$) least crude protein intake (70.7g) was in animals fed with hay supplement. The animals gained more weight when fed with *Leucaena leucocephala* (214.29g/day) than when fed with silage (185.71g/day) with the least, when fed with hay (157.14g/day), although, insignificantly ($P>0.05$). In conclusion, animals fed browse plant supplement had higher performance than the other feeds.

Keywords: calves, hay, silage, browse plant, dry season

1. Introduction:

Apparently, nutrition is probably the most important factor limiting the productivity of animal in the humid zone of Nigeria especially during the dry seasons. There are predictable period of forage quantity and quality limitation in the tropics and sub tropics. However, these differential periods are primarily the result of seasonal changes in temperature and rainfall. Forage conservation basically aims to obtain at low cost a stable product for animal feeding and with minimum loss of nutritive value. Deterioration due to internal chemical changes and external microbial action of cut herbage could be prevented by dehydration or acidification. Humphreys (1987) suggested that the purpose of storage conservation is to enhance the efficiency of animal production by using excess forage during peak growth period to reduce declines in production weight loss and mortality during peak period of pasture deficit in the temperate countries, hay and silage making are accepted practices of forage conservation. Several approaches to the provision of conserved forage to provide feed for livestock at a time after primary period of growth of plants. Deferred grazing which is a system where a certain part of the pasture area is preserved in the wet season to be fed at a later date when feed is in short supply. Kalmbacher (1987), emphasized the limitation of declining forage quality of conserved standing forage. Stock piling of forage commonly used in some areas often implies additional input such as application of nitrogen fertilizer late in the growing season to enhance the quality or quantity of the nature staining forage. Harvest, either grazing or cutting, of early wet season production can improve quality but reduce the amount of stockpiled forage. Hence, the aim of this research is to determine

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the performance of calves fed with supplementation of hay, silage and browse plant (*Leuceana leucocephala*) and hay baled with UNAAB fabricated baler during the dry season.

2. Materials and methods:

The study was conducted at the college of Animal Science and Livestock production (COLANIM) farm, University of Agriculture Abeokuta (UNAAB), Ogun state Nigeria. Twelve N'dama and White Fulani breeds calves with pre-trial weight of between 89-112kg were used for this study kept in a well ventilated feeding pen. The animal were allowed for adaption period of one week during when they were maintained on the test supplements after grazing. The animals were allocated to four (4) treatments namely: hay (T1), silage (T2), *L. leucocephala* (T3) and Natural pasture (T4) and control – grazing without supplements. The treatments were replicated three times. The experiment took place from July 2008 to March 2009. The experimental design was a Completely Randomised Design (CRD).

To monitor the growth pattern of the animal in response to the experimental treatment, pre-experimental body weight of the animal were taken after which the animal were weighed every forth nightly to determine their weight changes. Feed given per animal on daily basis were recorded and feed leftover every morning were weighed and recorded for each animal per pen to compute the intake on daily basis. The animal were fed 2% of their body weight. Blood samples were collected from each of the animals. 2ml of blood was drawn from each animal using hypodermic needle and injected into bottles containing EDTA (ethylene, diamine, tetra- acetate) to prevent clotting. The samples were labeled and transported to the laboratory for chemical analysis. The blood collection was carried out twice (at the beginning and end of the study). Dried sample of the feed were analysis for crude protein (A.O.A.C., 1990). Crude fibre fraction (i.e. Neutral detergent fibre, Acid detergent fibre and Acid detergent lignin) were also determined using (Van Soest, 1985) procedure. The blood sample were analysed for Red blood cell, blood glucose, total protein urea, potassium, calcium, sodium, phosphorus and chlorine.

2.1. Statistical *Analysis:*

The data were subjected to one way analysis of variance (ANOVA) and significantly different ($P<0.5$) means were separated using Duncan's Multiple Range Test (Duncan. 1995).

3. Results and discussion

The results of the chemical composition of the experimental diets were presented in table 1. The highest CP (19.18%) were recorded in silage supplement and the least (10.18%) was recorded in hay supplement. The highest (13.60%) for EE were recorded in the L. leucocephala leaves while the least (9.60%) was recorded in hay supplement and was significantly different ay ($p>0.05$). The Ash content of the experimental diets were found to be high in hay (17.35%) and low in *L. leucocephala* leaves (10.80%), these value were higher than the value (6.73%) recorded was highest by (AOAC,1990), could be as a result of the leaves maturity and the part of the plant used for analysis. NDF content of the experimental diet was high in hay (72.47%) and least in silage (66.03%). The NDF is a measure of the plant cell wall content shown as percent, the higher the NDF content, the less hay animal will eat (Wright *et al*., 2004). The ADF content of the experimental diets were recorded to be highest in hay (54.06%) which is a measure of the fibre concentration. As the ADF increases digestibility and nutrient availability decreases (Wright *et al*., 2004) while the least were shown in the *L. leucocephala* leaves (33.31%) which was contrary to the result obtained by Geiger *et al*. (1994) with ADF value of 17.1%. The ADL content of the experimental diets were significantly different ($P<0.05$) with the highest Cellulose and Hemicellulose were significantly different at ($P<0.05$) having high values in hay (45.42% and 18.42%) and least in *L. leucocephala* leaves (37.13%) and (20.57%) respectively. The cellulose content of the hay diet is in line with (Osuji *et al*., 1993) which indicate that the hemicellulose was related to the dry matter loss.

Table1: Chemical composition of feed fed to grazing calves

Parameter (%)	Hay	Silage	LL	Natural pasture	SEM
CP	10.1^{c}	19.8^{a}	18.00^{b}	18.96^{a}	0.13
EE	9.60^{d}	12.90^{b}	13.60^{a}	11.90^{c}	0.04

ASH	17.35[a]	11.80[c]	10.80[d]	14.30[b]	0.05
NDF	72.35[a]	66.03[d]	70.44[c]	72.06[b]	0.05
ADF	54.06[a]	38.02[c]	33.31[a]	48.31[b]	0.00
ADL	8.64[b]	75.2[c]	12.74[a]	5.59[d]	0.00
Hemicellulose	18.42[b]	28.00[b]	37.13[a]	23.75[c]	0.05
Cellulose	45.32[a]	3c0.50[c]	20.59[d]	b42.72	0.01

[abcd] means on the same row difference superscript which are significantly different (P<0.05)

CP = Crude protein. EE= Ether extract NDF –Neutral detergent fibre, ADL = Lignin, LL= *L. leucocephala* leaves

From table 2, the CP intake of the experimental animals were significantly different at (P<0.05). it was high in leucaena leaves (165.60g/kg) which was high compared with values (25.38g/kg) from (Jones, 1979), these may be due to environmental differences and the least was recorded in the hay diet (70.70g/kg). For the Ether Extract intake of the experimental animal, the highest were recorded in *L. leucocephala* leaves (125.10g/kg) and least in hay (94.00g/kg). The hay has the highest value (170.00g/kg) for Ash intake of experimental animals and it was high enough to increase the total mineral intake of the animals while the least was recorded in the silage (97.90g/kg), and the diet were significantly different at (P<0.05) the NDF and ADF were of the same trend with the hay diet having the highest value. The NDF intake of the hay diet were recorded to be high (70.01g/kg) which may be due to the maturity level of the pasture plants used and the more the fibre contents the more unpalatable it will become. Wright *et al*. (2004) and the least were recorded in the silage (54.81g/kg) where the intake were significantly different at (P<0.05). ADF intake was high in hay (52.97g/kg) and low in *L. leucocephala* leaves (30.64g/kg). The ADL intake of diets were high in *L. leucocephala* leaves (11.71g/kg) which was low compared to the value (19.5g/kg) from AOAC, (2005) which concluded that increased level of diet high in lignin decreases digestibility and intake and the least was found in silage (6.24g/kg). The intake of Hemicellulose by the experimental animal were recorded to be highest in *L. leucocephala* leaves (34.16g/kg) and least in hay (18.04g/kg) and the intake were significantly different at (P<0.05). For cellulose intake were recorded to be high in the hay supplement (45.80g/kg) while the least was in the *L. leucocephala* leaves supplement (15.93g/kg) which was in range with (AOAC,2005), with the cellulose intake in *L. leucocephala* leaves as (15.80g/kg) and these shows that the diet were significantly different at (P<0.05).

The final weight gain grazing calves supplemented with silage (104.00kg) was high at (P<0.05) and least was found in grazing calves supplemented with *L. leucocephala* leaves (94.00kg). The average weight gain were highest in grazing calves supplemented with silage and least in grazing calves supplemented with hay. These differences were however not significantly different at (P<0.05), this implies that the supplementation does not have effect on the growth of the calves. The average daily weight gain of the experimental animals were significantly different at (P<0.05) which recorded the highest in calves fed L. leucocephala leaves (214.29g) and least in calves fed with hay (157.14g) (Table 3).

Table 2; Nutrient intake of grazing calves fed with experimental diet

Parameter (g/kg)	Hay	Silage	LL	SEM
CP	70.70[b]	159.10[a]	165.60[a]	10.59
EE	94.00[c]	107.00[b]	125.10[a]	1.83
ASH	170.00[a]	97.90[b]	99.30[b]	1.71
NDF	70.01[a]	54.81[c]	64.80[b]	0.39
ADF	52.97[a]	35.55[b]	30.64[c]	0.00
ADL	7.17[b]	6.24[c]	11.71[a]	0.01
Hemicellulose	18.04[c]	23.26[b]	34.16[a]	0.39
Cellulose	45.80[a]	25.31[b]	18.93c	0.00

[abcd] means on the same row difference superscript which are significantly different (P<0.05)

CP = Crude protein. EE= Ether extract NDF –Neutral detergent fibre, ADL = Lignin, LL= L.leucocephala leaves

Table 3: Performance characteristic of calves fed with the experimental diets

Parameter	Hay	Silage	LL	SEM
Initial weight gain (kg)	85.00[ab]	91.00[a]	79.00[b]	1.05
Final weight gain (kg)	96.00[b]	104.00[a]	94.00	1.04
Average weight gain (kg)	11.00	13.00	15.00	1.14

Average daily weight gain (kg)	157.14	185.71	214.29	16.27

[abcd] means on the same row with difference superscript which are significant different (P<0.05)

LL = L leucocephala leaves SEM = Standard error of mean

Table 4 shows the final RBC level in the blood of the calves on silage supplements were high at (P<0.05) than calves fed with hay and *L. leucocephala* leaves but were similar to calves without supplements. The highest blood glucose level was in calves fed with silage supplement (69.77mg/dl) while the least was recorded in the blood of calves fed *L. leucocephala* leaves (62.33mg/dl). The glucose in the blood of animal is an important source of energy and metabolic intermediate which was in line with Galliot (1995). Calcium contents in the blood of the calves' functions with the bone of the animals to be make it firm and strong. The highest calcium level was in calves fed with hay diet (33.11mg/dl) and least in calves fed with *L. leucocephala leaves* (14.52mg/dl) which were significantly different at (P<0.05). The highest phosphorus level was in animals fed hay diet (9.14mg/dl) and least in calves fed with *L. leucocephala* leaves (1.67mg/dl). Phosphorus in the blood the animals is important mineral element to the structure and function of the body and it helps in the function of cell membrane. For the highest final sodium level was in animals fed silage (147.00 Mmol/dl) and least in calves fed *L. leucocephala* leaves (143.00 Mmol/dl). Sodium is crucial for maintaining the health of every cell in the animal system (Spears, 2006).

In conclusion, the best performance in terms of CP, EE, hemicellulose and feed intake as well as the blood parameters of the calves was when they were fed with *L. leucecophala* leaves as supplement. The performance of calves fed silage was next to those fed *L. Leucecophala* leaves. The implication of this is that conserving feed in form of silage can also be encouraged especially if there are constraints for planting *L. leucocephala*.

Table 4: Blood biochemical constituent of calves fed the experimental diets

Parameters	Hay	Silage	LL	Natural pasture	SEM
RBC (10^{12}) Initial	8.33[c]	9.10[b]	8.33[c]	1.44[a]	0.07
Final	9.34[b]	11.44[a]	9.45[b]	10.97[a]	0.12
Glu(mg/dl) Initial	58.47[b]	63.87[a]	51.00[c]	59.67[b]	0.29
Final	66.54[b]	69.77[a]	62.33[b]	64.15[b]	0.63
Tpr (mg/dl) Initial	62.87[b]	32.27[d]	46.87[c]	65.66[a]	0.10
Final	66.76[b]	46.22[d]	51.52[c]	69.66[a]	0.22
Ca (mg/dl) Initial	28.66[a]	11.33[c]	8.93[b]	18.47[b]	0.08
Final	25.37[b]	15.81[c]	14.52[c]	33.11[a]	0.29
P(mg/dl) Initial	8.63[a]	1.47[c]	1.37[c]	7.33[b]	0.02
Final	9.14[a]	1.85[b]	1.67[b]	9.09[a]	0.04
Na(Mmol/dl)Initial	141.00[a]	140.00[a]	136.00[a]	138.00[a]	1.66
Final	145.00[a]	147.000[a]	143.00[a]	146.00[a]	1.67
K(Mmol/dl) Initial	4.90[a]	5.20[ab]	5.60[a]	4.87[b]	0.06
Final	10.57[a]	9.92[ab]	9.35[b]	10.54[a]	0.11
Cl(Mmol/dl)Initial	102.00	100.67	100.00	100.00	1.87
Final	108.00	109.00	103.67	107.67	1.71
Urea(Mmol/dl)Initial	25.43	23.99	29.57	23.85	0.85
Final	40.30[a]	30.47[b]	32.50[b]	29.25[b]	0.68

[abcd] means on the same row with difference superscript which are significantly different (P<0.05)

RBC = Red Blood Cell, Tpr = Total protein, Ca =Calcuim, Na =Sodium K = potassium, CL = Chlorine, P = Phosphorus

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