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REPLACEMENT VALUES OF TREATED *Senna obtusifolia* LEAF MEAL FOR *Moringa oleifera* LEAF MEAL IN THE DIETS OF GROWING YANKASA SHEEP

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ABSTRACT

A 90-day experiment was conducted to evaluate the response of twenty growing Yankasa sheep. Five diets, fed to 5 groups of 4 animals, in a completely randomized design, was formulated with Moringa oleifera leaf meal (MOLM) partially or completely replacing sundried (SSO) or ensiled Senna obtusifolia (ESO) leaf meal. The two ingredients collectively constituted 50% of the diets: 1 (50% MOLM), 2 (25% SSO25%MOLM), 3 (50% SSO), 4 (25% ESO/ 25%MOLM) and 5 (50% ESO). Results shows voluntary dry matter intake (DMI), crude protein intake (CPI) and crude fibre intake (CFI) of sheep was not significantly different among the treatments. However, daily weight gain was significantly ($P<0.05$) higher for animals fed diet 1 (99.35 g/day) than other diets. The haemoglobin (Hb), packed cell volume (PCV), white blood cells (WBC), mean corpuscular volume (MCV) and red blood cells (RBC) differed significantly ($P<0.01$) across the treatments. Also, Potassium (K+) and Chlorine (Cl-) were different ($P<0.01$) among treatments. Crude protein (CPD) and crude fibre (CFD) digestibility was significantly ($P<0.01$) higher for animals fed solely MOLM in diets (65.12 vs 51.51%) and lower for those on SSO/MOLM and SSO diets. It is concluded that sundried or ensiled Senna obtusifolia leaf meal could partially or completely replace Moringa oleifera leaf meal in diets with good performance in terms of nutrient intake, digestibility and weight gains.

Keywords: Yankasa, Moringa, *Senna obtusifolia*, Ensile, Blood, Sheep.

INTRODUCTION

The feeding of a balanced diet to the population is an ever increasing challenge that consequently increases pressure to scientist, policy makers and even farmers that produce crops and livestock (Abubakar, 1998). In most instances, farmers rely on the use of crop residues and low-quality standing hay for feeding animals (Sarwatt *et al*., 2002). However, these crop residues are low in nitrogen and high in ligno cellulose (Arora and Sharma, 2009), which leads to low digestibility and low voluntary intake. Consequently, the energy and nitrogen intakes of animals raised on these feeds cannot maintain adequate levels of performance. All these lead to low growth, poor reproductive performance and low milk yield.

Improvements can be made possible by advancing in fields of nutrition and management. Nutritional progresses can be obtained when concentrates are supplemented (Nurfeta, 2010), however, supplements are scarce and expensive (Gebregiorgis *et al*., 2011) and as such alternative protein sources must be obtained.

Moringa oleifera, which is commonly referred to as *Zogale* in Hausa language, is a member of the Moringaceae family that grows throughout the tropics (Makkar and Becker, 1996). It is a

small tree of about 7–12m in height with thick grey bark, sweet-smelling white flowers and long green pods (Makkar and Becker, 1997). The fruits, seeds, leaves and flowers are eaten as nutritious vegetables especially in Northern Nigeria. It has been described as a multipurpose tree of economic importance (Al-Masri, 2003) which has several industrial and medicinal uses (Aregheore, 2002). The leaves are rich in carotene, iron and ascorbic acid, while the pods are a good source of leucine (Makkar and Becker, 1996, 1997). Wide variations in the nutritional value of Moringa leaves were reported in literature. Oduro *et al*. (2008) reported a crude protein value of 27.51%, crude fibre 19.25%, crude fat 2.23%, ash content 7.13%, and the calorific value of1296 kJ/g. On the other hand, Sánchez-Machado *et al.* (2010) reported crude protein value of 22.42%, ash 14.60%, lipid 4.96% and crude fibre of 30.97%.

Senna obtusifolia known as *Tafasa* in Hausa Language (Freedman, 1997) on the other hand, is also a leguminous browse plant that is found in warm moist part of the tropics. It has pinnate pairs of leaves, with opposite leaflets that are ovate, oblong and oblique at the base. The yellow-coloured flowers are bearded in the axel of the leaves. *Senna obtusifolia* has many traditional, ethno-herbalogical and medicinal properties (Kim *et al.*, 1998). It acts as a nerve tonic, as a liver stimulant, mild laxative and also as a heart tonic. The herb helps the body in maintaining the normal level of cholesterol. Its paste is used for treating skin ailments and also for getting rid of chronic diseases. However, the presence of various anti-nutritional factors like trypsin inhibitors, polyphenols, saponins and haemagglutinins (Siruguri *et al*., 2009) makes *Senna obtusifolia* utilization for animal feeding difficult. Ayissiwede *et al*. (2011) reported Senna leaves to have a crude protein value of 27.4%, crude fibre of 16.8%, 3.8% of ether extract, ash 15.2%, and 2050.47kcal/kg of metabolizable energy. Senna is cheaply available in most parts of Northern Nigeria.

The ever increasing scarcity of animal feed resources, particularly during the dry season and the persistent efforts to find drought resistant plants that can substitute scarce and expensive ingredients, continues to be an interesting area of research especially in the tropics. Excellent results have been obtained when Moringa is fed to Livestock (Mendieta-Araica *et al*., 2011, Olugbemi *et al*., 2011, Onu *et al*., 2011). However, like most leguminous concentrates, it is not readily available. The use of *Senna obtusifolia* will reduce the production cost of sheep due to its availability while using *Moringa oleifera* will enhance nutrition since its level of crude protein is optimum for the utilization of rumen microorganisms (Aderinboye *et al*., 2011). The specific objective of the study is to determine the effects of replacing *Moringa oleifera* leaf meal with sundried and ensiled *Senna obtusifolia* on nutrient intake, digestibility, growth performance, feed efficiency and haemato-biochemical parameters of Yankasa sheep.

MATERIALS AND METHODS

Experimental site

The experiment was carried out it the small ruminant farm of the Department of Animal Science, Bayero University, Kano state, Nigeria. Kano is located in the North-Western part of Nigeria at latitude 12°3'N and longitude 8°32'E with an average temperature of 26.2 °C with warmest temperature being 38°C in April and the coolest temperature being 13°C in January and December. The state also receives an average of 873 mm of precipitation annually. The months with the driest weather are January and December. Mean relative humidity for an average year is recorded as 31.1% (KNARDA, 2008).

Experimental Animals and Management

The experiment lasted for a period of 90 days. The animals were housed in well ventilated, concrete floored pens with facilities for feeding and drinking. The pens which have a space of about $2m^2$ each were disinfected with Izal before arrival of the animals. The animals were allowed to adapt to confinement for 14 days before the beginning of study. On the second day of arrival, Diazintol was hand bathed on the rams to guard against ectoparasites. They were also treated with Oxytetran – a long acting broad spectrum antibiotics to guard against internal parasites. Feed and water were offered ad lib and total intake was adjusted based on previous day's intake. Quantity consumed each day was measured by weighing refusals the next day before fresh feed and water are provided.

Twenty growing Yankasa rams between 1 and 2 years old were randomly allocated to the five dietary treatments (4 per treatment) in a completely randomized design (Steel and Torrie, 1980). The animals were weighed before the commencement of the experiment and then weekly thereafter.

Experimental Diets and Preparation

Both the *Senna obtusifolia* and *Moringa oleifera* plants used for the preparation of experimental diets were harvested from various locations in Kano. The leaves and succulent stalks were harvested prior to the flowering stage and air-dried under shade. Part of *Senna obtusifolia* leaves was sundried for 48 hours and termed as sundried *Senna obtusifolia* (SSO). Ensiled *Senna obtusifolia* (ESO) was prepared using broiler litter and dried Senna leaves. It was prepared by thoroughly mixing 100 kg of sundried *Senna obtusifolia* (SSO) with 20 kg of broiler litter and 100 kg of water was used to soak the mixture and then placed in an air tight plastic container for 21 days. After the process of ensilage, the material were sundried for 48 hours. Both the SSO and ESO were finely ground using a hammer mill and thoroughly mixed in each diet to prevent selective eating. Five diets (16% CP) were formulated in which SSO and ESO leaf meal substituted *Moringa oleifera* (MOLM) leaf meal at 0, 25 and 50% levels such that the two ingredients collectively constituted 50% of the diet. This is shown in Table 1.

Data Collection

Feed intake, water intake and weight gain was determined. Experimental diets were subjected to proximate analysis and the dry matter (DM) and crude protein (CP) content were analyzed according to the methods of AOAC (1990).The feed conversion efficiency was also calculated. In the final week of the experiment, faeces were collected from the animals for digestibility studies. Two animals per treatment (a total of 12) were equipped with harness bags for collection of faeces. Animals were maintained on their respective diets and allowed a 14- day adjustment period with the harness before faecal collection was started. The faeces was pooled together for each animal, sub-sampled and oven dried for 48 hours then the dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE) and ash were analyzed according to methods of AOAC (1990).

Table 1: Ingredient composition of experimental diets

Ingredient	Treatments				
	1 MOLM	2 SSO/MOLM	3 SSO	4 ESO/MOLM	5 ESO
GH	19.76	26.20	36.58	15.61	12.12
MB	27.74	22.30	10.92	31.89	35.38
MOLM	50.00	25.00	-	25.00	-
SSO	-	25.00	50.00	-	-
ESO	-	-	-	25.00	50.00
BM	2.00	2.00	2.00	2.00	2.00
Salt	0.50	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00	100.00

SSO- Sundried *Senna obtusifolia* ESO- Ensiled *Senna obtusifolia* , GH - Groundnut Haulms
MB- Maize Bran , BM- Bone Meal, MOLM- *Moringa oleifera* Leaf Meal , SO- *Senna obtusifolia*

On the last day of the experiment, blood was withdrawn from the jugular vein of the 10 rams, 2 from each treatment. Twenty samples were collected early in the morning and were then put in 10 ml vacutainer tubes. Serum was obtained by centrifugation and serum samples were stored in a deep freezer at -20°C until analyzed. Ten samples were put in tubes containing ethylene diamine tetraacetic acid (EDTA) to prevent clotting, and then kept frozen at -20°C until analyzed for haematological contents by centrifuging at 2500 rpm for 15 minutes (Salem and Makkar, 2009). The haemogloblin (Hb) concentration, total white blood cells (WBC), red blood cells (RBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin concentration (MCHC), mean haemoglobin concentration (MHC), packed cell volume (PCV) were determined using the Haematocrit blood analyzer (Muhammad *et al*., 2011).

Ten samples were put in empty tubes and immediately kept in flasks containing ice blocks and taken to the laboratory for chemical analysis. Serum electrolytes were determined by atomic absorption spectroscopy as reported by Adejumo and Onifade (2005), and serum metabolites assayed by standard calorimetric method using Sigma kits (Harris, 1995; Moss and Henderson, 1999; Igene and Iboh, 2004). The calcium (Ca^{2+}), urea, sodium (Na^{+}), potassium (K^{+}), chlorine (Cl^{-}), hydro carbonate (HCO_3) and creatinine (Cr-) content of the blood were measured.

Data Analysis

Data collected was subjected to Analysis of Variance (ANOVA) method as described by Steel and Torrie (1980) by using general linear model procedure of SAS (1994). Where significant differences exist between the means, Least Significant differences were used to separate the means.

RESULTS AND DISCUSSION

Proximate Composition of Ingredients

Table 2 shows the proximate composition of ingredients used in the study. The results revealed that sundried *Senna obtusifolia* leaves contained more dry matter (96.53%) than ensiled *Senna obtusifolia*. The dry matter (DM) value of Moringa leaves in this study (96.22%) was higher than the values reported by Olugbemi *et al.* (2011) and Mutayoba *et al.* (2011). They reported DM values of 93.7% and 87.20%, respectively. However, the crude protein value reported by Olugbemi *et al.* (2010) was higher (27.44%) than the value obtained in this study (21.78%). Mutayoba *et al.* (2011) also reported much higher (30.65%) crude protein in *Moringa oleifera* leaves. The crude protein value (20.30%) was also lower than the values (27.4%) reported by Ayyisiwede *et al*. (2011). These differences may not be unconnected with variations in the geographical locations of the growth and development or stage of maturity of the plants. Crude fibre of the ingredients has the following values: 26.18, 24.10, 16.50, 15.82 and 19.80 for groundnut haulms, maize bran, sundried *Senna obtusifolia*, ensiled *Senna obtusifolia* and *Moringa oleifera* respectively. Ether extract content for the ingredients was 2.77, 3.46, 3.87, 4.72 and 5.63% for groundnut haulms, maize bran, sundried *Senna obtusifolia*, ensiled *Senna obtusifolia* and *Moringa oleifera* respectively. Ash content values ranges from 7.70% for *Moringa oleifera* to 15.00% for sundried *Senna obtusifolia.* Indeed, Cassia leaves are poor in EE, but well supplied in CF and ash, this is in agreement with Ayyisiwede *et al*. (2011).

Feed and Growth Performance

Table 3 shows the performance characteristics of Yankasa rams fed with sundried and ensiled *Senna obtusifolia* and *Moringa oleifera*. The dry matter intake of rams fed all treatment diets was not significantly different. It ranges from 753.45 g/day for SSO diet to 824.73 g/day for the MOLM diet.

Table 2: Proximate composition of ingredients used in the experiment

Ingredients	DM	CP	CF	EE	ASH	NFE
Groundnut Haulms	94.62	13.32	26.18	2.77	9.44	42.91
Maize Bran	89.95	8.97	24.10	3.46	14.71	38.71
Sundried *Senna obtusifolia*	96.53	20.30	16.50	3.87	15.00	40.86
Ensiled *Senna obtusifolia*	93.07	22.42	15.82	4.72	13.91	36.20
Moringa oleifera	96.22	21.78	19.80	5.63	7.70	41.91

DM=Dry Matter Intake; CP= Crude Protein; CF= Crude Fiber; EE= Ether Extract; NFE = Nitrogen Free Extract.

The OMI values were significantly different ($p < 0.01$) where the MOLM diet (417.49 g/day) and ESO diet (408.67 g/day) differ from SSO/MOLM, SSO and ESO/MOLM diet with 395.75, 378.98 and 394.29 g/day respectively. Both the CPI and CFI values recorded in the study were not significantly different between treatments. There were no differences in initial weight observed between the diets. The overall means are 14.75, 18.60, 14.28, 13.68 and 14.10 kg for the MOLM, SSO/MOLM, SSO, ESO/MOLM and ESO treatments respectively. The results of

the final weight also indicate no differences between means with SSO/MOLM (24.18 Kg) and MOLM (22.40 Kg) varying with SSO, ESO/MOLM and ESO diets having 20.75, 20.33 and 20.43 Kg respectively. However, there is an association between diets 1 and 3, 4, 5 diets. The feed conversion ratio (FCR) for the treatment groups are 8.30, 11.05, 8.97, 9.21 and 9.85 for 1, 2, 3, 4 and 5 respectively. The FCR between the means differs significantly ($p<0.05$) with treatment 2 (SSO/MOLM) having the least efficiency.

Treatment 2 (SSO/MOLM) had the lowest total weight gained (5.58Kg) and daily weight gained (72.47 g/day). The SSO/MOLM diet means differ significantly ($p<0.01$) both at the total weight gained and the daily weight gained means. This difference could be attributed to the presence of anti-nutritional factors and processing methods as observed by (Makkar, 2003) who stated that feed containing various levels of anti-nutritional factors can be rendered unavailable for rumen micro flora (Waghorn *et al*., 1999) thereby decreasing the animals' production and reproductive performance. The feed conversion ratio (FCR) for the treatment groups are 8.30, 11.05, 8.97, 9.21 and 9.85 for 1, 2, 3, 4 and 5 respectively. The FCR between the means differs significantly ($P<0.01$) with treatment 2 (SSO/MOLM) having the least efficiency. According to the result, animals on treatment 1 (MOLM) performed better than animals on the remaining diets, thus average daily weight gain was higher in treatment 1 than all other diets.

Haematology

The haematological values of Yankasa rams fed sundried or ensiled *Senna obtusifolia* and *Moringa oleifera* in diets is shown in Table 4. The Hb, PCV, WBC, MCV and RBC values were significantly different ($P<0.01$) while MCHC and MCH concentrations are similar between treatments.

Table 3: Performance characteristics of rams fed sundried /ensiled *Senna obtusifolia* and *Moringa oleifera*

Parameters	1	2	3	4	5		
	MOLM	SCT/MOLM	SCT	ECT/MOLM	ECT	SEM	LS
DMI (g/day)	824.73	800.76	753.45	795.61	809.36	22.35	NS
OMI (g/day)	417.49^{a}	395.75^{b}	378.98^{c}	394.29^{b}	408.67^{a}	3.31	*
CPI (g/day)	121.15	128.86	106.96	132.25	120.62	12.13	NS
CFI (g/day)	205.84	183.78	178.99	182.85	192.66	16.24	NS
Initial Weight (kg)	14.75	18.60	14.28	13.68	14.10	4.89	NS
Final Weight (kg)	22.40	24.18	20.75	20.33	20.43	3.98	NS
Total Gain (kg)	7.65^{a}	5.58^{c}	6.47^{b}	6.65^{b}	6.33^{b}	0.46	*
DWG (g)	99.35^{a}	72.47^{c}	74.03^{c}	86.36^{b}	82.21^{b}	2.47	*
FCR g intake/ g gain	8.30^{c}	11.05^{a}	10.18^{a}	9.21^{b}	9.85^{ab}	0.45	*

$^{a, b, c}$ = means in the same row with different superscripts are significant (= P<0.05);*
NS= Not significant; g/day = gram per day; DMI=Dry Matter Intake; OMI= Organic Matter Intake; CPI= Crude Protein Intake; CFI= Crude Fiber Intake; DWG= Daily Weight Gain; MO= Moringa oleifera; SSO =Sundried Senna obtusifolia; ESO= Ensiled Senna obtusifolia; SEM= Standard Error of Means; LS= Level of Significance

Table 4: Haematological profile of Yankasa rams fed sundried /ensiled *Senna obtusifolia* and *Moringa oleifera* diets

Parameter	1 MOLM	2 SSO/MOLM	3 SSO	4 ESO/MOLM	5 ESO	SEM	LS
Hb (g/dl)	10.25^{a}	10.05^{a}	14.85^{b}	10.43^{a}	8.23^{a}	2.51	**
PCV (%)	12.63^{b}	22.00^{a}	15.40^{b}	22.13^{a}	19.95^{a}	5.75	**
WBC($X10^{6}$µl)	9.70^{b}	10.60^{b}	18.50^{a}	9.08^{b}	10.08^{b}	4.40	**
MCH (pg)	13.30	14.30	11.15	14.95	14.75	3.46	NS
MCHC (g/dl)	40.70	44.33	36.05	47.43	47.30	11.00	NS
MCV(fl)	32.50^{b}	32.25^{b}	23.25^{a}	31.75^{b}	30.18^{b}	7.81	**
RBC($X10^{6}$µl)	7.78^{a}	6.21^{a}	5.04^{b}	6.98^{a}	5.51^{b}	1.84	**

*$^{a, b, c}$ = means in the same row with different superscripts are significant (**=P<0.01);*
NS= Not significant; Hb= Haemoglobin; PCV= Packed Cell Volume;
WBC= White Blood Cells; MCH=Mean Corpuscular Haemoglobin;
MCHC= Mean Corpuscular Haemoglobin Concentration;
MCV= Mean Corpuscular Volume; RBC= Red Blood Cells;
MOLM= Moringa Oleifera Leaf Meal; SSO =Sundried Senna obtusifolia;
ESO= Ensiled Senna obtusifolia; SEM= Standard Error of Means; LS= Level of Significance

The observation made in the present study is probably due to the difference in composition of the diets given to the animals. The mean values of Hb show highest mean values in SSO diet (14.85 g/dl) and least in the ESO diet (8.23 g/dl). The PCV values were higher for the SSO/MOLM (22.13%) diet and least for the MOLM diet (12.63%). Total white blood cells values ranged between 9.08 to 18.50 x 10^{6} µl. The MCV and RBC values were lower for the SSO diet (23.25 fl and 5.04 x10^{6} µl respectively) and highest for the MOLM diet (32.50fl and 7.78x10^{3} µl respectively). The Hb values obtained in this study are within the normal range reported by Garba and Abubakar (2010) who reported Hb values 8.65-10.75 g/dl, though the SSO diet had a value of 14.85 g/dl probably due to the presence of anti-nutritional factors in Cassia leaves. The PCV values (12.63-22.13%) were below the normal range (27.0% - 45.0%) reported for sheep by Banerjee (2007). The RBC values (5.51-7.78 x 10^{6}µl) were also lower than the values reported by Campbell *et al* (2003) who reported a range of (9 -11) x 10^{6}µl. WBC values obtained ranged from 9.08 X10^{6}µl for the ESO/MOLM diet to the 18.50 X10^{6}µl for the SSO diet. These were within range as reported by Addass *et al*. (2010). However, the MCV values (23.25 – 32.50 fl) were above the range reported by Addass *et al*. (2010). The difference in values observed could be due to age and sex difference of animals (Egbe-Nwiyi *et al*., 2000, Addass *et al*. 2010).

Blood Chemistry

Table 5 shows the values of serum electrolytes of Yankasa rams fed sundried/ensiled *Senna obtusifolia* and *Moringa oleifera* diets. There was a significant difference (P<0.01) in potassium (K^{+}) and chlorine (Cl^{-}) levels, while urea, calcium (Ca^{2+}), sodium (Na^{+}), hydrocarbonate (HCO_3)

and creatine (Cr^-) levels in the blood of the rams were not significantly different across all treatments.

Furthermore on Table 5, Urea values obtained were much higher than range of 8-20 mg/dl reported by Banerjee (2007).This could probably be due to detoxification effect of the liver and kidney (Sathyamoorthy *et al*., 1981). Potassium levels ranged from 3.75-5.90 mEq/l which is within the range reported by Galip (2006). The animals on ESO diet recorded the highest level of potassium (5.90mEq/l) and also recorded the lowest level of chlorine (75.50 Meq/l). Creatinine values are low, indicative of good protein and amino acid metabolism (Gray and Howorth, 1980).

Digestibility

The effects of sundried/ensiled *Senna obtusifolia* and *Moringa oleifera* diets on digestible nutrients of Yankasa rams is shown in Table 6. The dry matter digestibility (DMD) and organic matter digestibility (OMD) was not affected by dietary treatments while the crude protein digestibility (CPD) and crude fiber digestibility (CFD) were significantly ($P<0.01$) different between treatments. Digestible DM was higher for animals fed MOLM (81.45%) and lowest for those on SSO (80.76%).Similarly, the OMD values recorded for the SSO are lowest (87.75%) though no significant difference exists between the treatments. The difference in digestibility values could be attributed to the difference in crude fiber among the experimental diets, which corroborates the findings of Huhtanen *et al*., (2009). Furthermore, the CPD values differed ($P<0.01$) among the treatments, with values ranging from 50.38% for rams fed SSO/MO to 65.12% for those on MOLM diet.

Table 5: Blood chemistry of Yankasa rams fed sundried /ensiled *Senna obtusifolia* and *Moringa oleifera* diets

Parameter	1 MOLM	2 SSO/MOLM	3 SSO	4 ESO/MOLM	5 ESO	SEM	LS
Ca^{2+}(mg/dl)	8.80	9.03	7.60	8.53	9.40	1.85	NS
Urea (mg/dl)	53.00	51.00	55.75	53.75	43.50	14.06	NS
Na^+(mEq/l)	153.50^a	142.75^b	131.00^b	138.50^b	128.25^b	29.28	NS
K^+ (mEq/l)	5.30^b	4.00^a	3.75^a	4.53^a	5.90^b	1.21	**
Cl^- (mEq/l)	92.00^b	99.00^b	99.50^b	105.00^b	75.50^a	22.99	**
HCO_3 (mEq/l)	21.00	23.50	21.50	20.50	18.5	6.01	NS
Cr^- (mg/dl)	0.30	0.30	0.30	0.30	0.30	0.16	NS

*^{a,b,c} Means in the same row with different superscripts are significant (** = P<0.01); NS= Not significant; MOLM= Moringa oleifera Leaf Meal; SSO =Sundried Senna obtusifolia; ESO= Ensiled Senna obtusifolia; SEM= Standard Error of Means; LS= Level of Significance*

Table 6: Effect of Sun drying or Ensiling *Senna obtusifolia* and *Moringa oleifera* on Digestibility of Yankasa rams (%)

	1	2	3	4	5		
Parameter	MOLM	SSO/MOLM	SSO	ESO/MOLM	ESO	SEM	LS
DMD	81.45	81.22	80.76	81.24	81.31	1.83	NS
OMD	90.45	90.23	87.75	89.03	90.77	2.15	NS
CPD	65.12^{a}	50.38^{c}	51.75^{c}	59.71^{b}	58.73^{b}	1.25	**
CFD	51.51^{a}	43.33^{b}	45.08^{b}	54.13^{a}	44.53^{b}	2.06	**

*$^{a, b, c}$ = means in the same row with different superscripts are significant (** = P<0.01);*
NS= Not significant; DMD=Dry Matter Digestibility; OMD= Organic Matter Digestibility; CPD= Crude Protein Digestibility; CFD= Crude Fiber Digestibility; DWG= Daily Weight Gain; MOLM= Moringa Oleifera Leaf Meal; SSO =Sundried Senna obtusifolia; ESO= Ensiled Senna obtusifolia; SEM= Standard Error of Means; LS= Level of Significance

The study investigated the possibility of getting a suitable replacement of Moringa, which is known to be an excellent feed ingredient. However, getting an ingredient that is as good as Moringa, requires such ingredient to be readily available and easily processed. In this experiment, the use of sundried or ensiled *Senna obtusifolia* was explored and good results were obtained.

CONCLUSION

It is concluded that some hematology and blood serum electrolytes values obtained are equivalent to values recorded elsewhere. Where there were fluctuations recorded, it could probably have been due to undetected minor infections, age or sex differences and weather extremities. Sundried or ensiled *Senna obtusifolia* leaf meal could partially or completely replace *Moringa oleifera* leaf meal in diets with good performance in terms of nutrient intake and digestibility and weight gains.

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