Advances in Life Science and Technology
ISSN 2224-7181 (Paper) ISSN 2225-062X (Online)
Vol.35, 2015

Effect of *Moringa oleifera* Supplementation on Acceptability and Nutrient Utilization of Goats Fed Mango Seed Kernels.

*M. I. Okoruwa[1], .E. Omoragbon[1] .A. Obiku[2]
1, Department of Animal Science, Ambrose Alli University, P.M.B. 14, Ekpoma, Nigeria
2, Department of Animal Science, Edo - State College of Agriculture, Iguoriakhi, Edo State, Nigeria

Abstract
Twenty four growing goats with mean body weight of 8.00 ± 0.45kg were fed mango seed kernel meals with Moringa oleifera supplementation on to asses their acceptability and energy with nitrogen utilization. Goats were assigned to three dietary treatments in a completely randomized design with eight goats per treatment. The three compared treatment diets were: A (45% of raw mango seed kernel), B (45% of soaked mango seed kernel) and C (45% of parboiled mango seed kernel). Concentrate of 45% was added to each of the experimental diet, while each goat received 8 grams of Moringa oleifera as supplement in their respective diets. The results indicated that, diet A was significantly ($P < 0.05$) highest in gross energy intake (15.23MJ/kg), faecal energy output (4.59MJ/kg), total energy output (6.25MJ/kg) and faecal nitrogen output (4.02g/day) compared to diets B and C. Mean dry matter intake (3.09kgDM), coefficient of preference (3.98), digestible energy intake (12.22MJ/kg), metabolizable energy intake (11.01MJ/kg), nitrogen balance (12.37g/day) and nitrogen retention (81.17%) were significantly ($p < 0.05$) best in diet C compared to other treatment diets. Significant difference ($P > 0.05$) did not occur in nitrogen intake and urinary nitrogen output among the treatment diets. It was concluded that parboiled mango seed kernels and concentrate with Moringa oleifera supplementation (diet C) has the potential to improve acceptability and enhance energy with nitrogen utilization for goats.
Keywords: Mango seed, *Moringa oleifera*, acceptability, nutrient utilization, goats.

INTRODUCTION

Ruminants are very important sector of livestock that provide invaluable sources of employment, income and food security to large segments of population in the world. Goats constitute very important part of ruminant livestock sub - sector in the Nigerian agricultural economy. They are one of the most important domesticated small ruminants with a population of 29.2 million in Nigeria (Ukanwoko *et al.*, 2009). Goats also play significant role in the nutrition of most Nigerian, as they offer the cheapest sources of domestically provided meat in Nigeria. Thus, the potential of goat production in alleviating low animal protein intake by man in developing nation need no emphasis (Ilori *et al.*, 2013).

The shortage of good quality feeds needed to sustain goat production, especially during the off - season has been the major challenge to small ruminant livestock industry in Nigeria. Forages being the primary and most economically source of nutrient for goats, decline rapidly in quality during dry season and result to poor goat performance and nutritional stress. The escalating high cost of conventional feedstuffs due to stiff competition for their use by man and other livestock have worsen the situation of feeds shortage for goats with concomitant increase in cost of their products. The development of alternative feedstuffs in goat nutrition will continue to receive attention in Nigeria as long as the feed sources continue to be scarce and expensive. Hence, it has become imperative therefore to turn attention to the exploitation of non-conventional feeds particularly those that are locally available.

Mango seed kernel is one of such unconventional feedstuffs that can be used in feeding goats. Though mango seed is poor in protein content, they are considered as valuable energy feedstuff because of their richness in oil (6 – 16%DM) and starch (40 – 50%) content and ruminants can tolerate concentrates with up to 50% of mango seed kernels without adverse effects on the animals (Sanon and Kanwe, 2010). The seed kernel is fairly rich in tannin which progressively lead to reduction in growth rate and less efficient in feeds utilization when included as major component in the diet of livestock (Moore, 2004). Olabanji *et al.* (2010) reported that mango seed kernel feeding value decline rapidly in acceptability and nutrient utilization, if the tannin content is not reduced or totally removed. Thus, the techniques aimed at reduction of tannin in mango seed kernel improve its utilization in livestock.

Moringa oleifera is a vegetable tree, that is extremely nutritious with many potentials. The leaf powder is loaded with nutrient which contain healthy protein and anti oxidant that serves as dietary supplement to livestock (Bamishaiye *et al.*, 2013). Though the use of mango seed kernel has been successfully investigated in livestock, there is still a paucity of information describing the use of *Moringa oleifera* as supplement to mango seed kernel in goat feeds. Thus the objective of this study is the effect of *Moringa oleifera* supplementation on acceptability and nutrient utilization of goats fed mango seed kernels.

MATERIALS AND METHODS

Study Location: The experiment was carried out at the Teaching and Research Farm, Ambrose Alli University, Ekpoma, Nigeria. Ekpoma is located in the Northern East of Edo state (Long. 6.09^{0}E and Lat. 6.42^{0}N) Nigeria. The area is characterised by long rainfall pattern that begins in April and end in October, while the short period of dry season last from October to March. The mean annual rainfall and temperature of the area are about 1556mm and 30^{0}C respectively.

Experimental Diets: Mango seeds were collected from mango plantation vicinity around Ekpoma. They were washed, cut opened and scopped out the kernels before they were divided into three fractions. The first fraction was raw sundried mango seed kernel (RMSK), the second fraction was soaked (3hours) in water at room temperature before sundried the mango seed kernel (SMSK). The third fraction was parboiled (at 100^{0}C for 10minutes) before sundried the mango seed kernel (PMSK). Thereafter, the three fractions were crushed separately into meal before used. Formulated concentrate that comprised the following: 50% brewer's dry grain, 35% wheat offal, 10% rice bran, 1.50% vitamin, 2.00% bone meal, 1.00% limestone and 0.50% salt with calculated 16.15% crude protein and 1930.50Kcal/kg metabolizable energy was used in combination with differently processed mango seed kernels. *Moringa oleifera* leaves that serve as supplement were obtained from the plant and sundried. The dried leaves were milled into a meal using a hammer – mill to pass through a sieve of 0.05mm to reduce selection when mix with diets.

The three experimental diets prepared were the differently processed mango seed kernel which include; A (45% of RMSK), B (45% of SMSK) and C (45% of PMSK). However, concentrate diet of 55% was added to each of the experimental diet. The experimental diets were offered at the rate of 5% (dry matter basis) of their body weight after the free choice intake. Each animal also received 8 grams of *Moringa oleifera* leaves meal as supplement in their respective diets.

Experimental Animals, Feeding and Management: twenty four (24) growing West African Dwarf (WAD) goats aged between 8 – 9 months with a mean body weight of 8.45kg were purchased from an open livestock market at Ekpoma. They were balanced for weight and randomly allotted to the three (3) dietary treatments (A, B and C) with eight (8) animals each per treatment. Hence, each treatment was replicated eight (8) times. The experimental design for the study was the completely randomized design.

The experimental pens were cleaned and disinfected before the arrival of goats. On arrival, the goats were given anti-stress and prophylactic treatments against the common viral and bacterial diseases. They were dewormed and bathed to eliminate endoparasite and ectoparasites. The animals were housed individually in an open – sided, well ventilated pens. Feeding of animals that lasted for 12 weeks was preceded by 2 weeks of acclimatization. The experimental diets were offered once daily in the morning at about 8.00am. The animals had free access to fresh water and salt lick daily.

Acceptability Study: The twenty four (24) growing WAD goats were used to evaluate the free choice intake of the three compared experimental diets. An open pen that had been designed to accommodate twenty five to thirty goats was used. The floor of the pen was covered with wood shavings to a depth of 5cm for the absorption of urine and faeces. In triplicates 5kg each of the experimental diets were placed in strategic locations in feeder troughs measuring 2m x 5m. The goats were allowed to feed from 8.00am to 4:00pm daily for 14 days. Consumption was measured by deducting leftovers from the amount of the feed offered. The diet preferred was assessed from the coefficient of preference (COP) value, calculated from the ratio between the intakes for the individual diet divided by the average intake of the three diets (Babayemi, 2007). Therefore, diet was inferred to be relatively acceptable provided the coefficient of preference was greater than a unity.

Nutrient Utilization Study: Six (6) WAD goats randomly selected from each treatment (totally 18) were used to carry out nutrient utilization study. The goats were housed in individual metabolic cages with slated floors adapted for faecal and urine collection. Goats were fed with their weighed treatment diets for the last 7-day after 7-day adjustment period of metabolic cages.

The quantity of feeds offered which represented the fraction of the quantity of the feed offered to each goat per day and the leftover which represented the one that was not consumed were weighed daily. The weight difference between them was recorded and taken as the feed intake. Daily faecal and urine samples were also weighed. Sub-samples of the faecal were dried, bulked together and stored in the desiccator while the sub-samples of the urine were stored in sample bottles and frozen until they were required for analysis.

Heat combustion of feeds, faeces and urine were determined using an adiabatic bomb calorimeter. Digestible energy (DE) and metabolizable energy (ME) intake per animal were determined from the energy content of the feeds intake (gross energy) and the amount of energy in faeces, urine and methane. The amount of energy loss through methane was set at 5% of the gross energy intake (CSIRO, 2001).

Nitrogen balances by the goats were calculated as the difference between nitrogen intake and nitrogen excreted from faeces and urine. Nitrogen retention percentage was computed from nitrogen balance expressed as a percentage of nitrogen intakes.

Chemical and Statistical Analyses: Samples of differently processed mango seed kernels, concentrate diet and *Moringa oleifera* leaves were analysed for proximate composition using the procedures of AOAC (1990). Faecal and urine samples were also analysed for nitrogen content using the same method of AOAC (1990).

Data obtained from energy and nitrogen utilization parameters were subjected to analysis of variance (ANOVA) to determine the significance of treatment effects following the methods described by SAS (1999). Significant differences between means were separated by Duncan Multiple Range Test.

RESULTS AND DISCUSSION

Table 1.Chemical composition (%DM) of differently processed mango seed kernel, concentrate diet and *Moringa oleifera* leaves**.**

Parameters	RMSK	SMSK	PMSK	CONCENTRATE	MOL
Dry Matter	90.56	89.76	92.06	83.96	86.79
Crude Protein	5.90	6.15	7.20	16.15	17.01
Crude Fibre	0.89	1.00	1.04	14.25	10.11
Ether Extract	5.46	5.00	4.60	1.14	2.14
Ash	2.25	2.30	2.69	7.89	7.93
Nitrogen Free Extract	76.06	75.31	76.53	44.53	49.60

RMSK = Raw sundried mango seed kernel
SMSK = Soaked sundried mango seed kernel
PMSK = Parboiled sundried mango seed kernel
MOL = *Moringa oleifera* leaves

The proximate composition of differently processed mango seed kernel, concentrate and *Moringa oleifera* leaves are shown in Table 1. The results indicated that PMSK (92.06%) had the highest dry matter content, while concentrate (83.96%) was the lowest. The differences could be due to the feeds that were characteristically different in dry matter content. Crude protein content that ranged from 5.90% to 17.01% was highest in MOL and lowest in RMSK. The highest crude protein content obtained in MOL could probably due to the concentration of protein content in the moringa leaves. The crude fibre content that ranged between 0.89% in RMSK and 14.25% in concentrate was generally low in processed mango seed kernels. This could be as a result of complete removal of the testa (the translucent covering) of the mango seed kernels at dehulling. The higher values of ether extract obtained in processed mango seed kernels (RMSK 5.46%, SMSK 5.00% and PMSK 4.60%) compared to concentrate 1.14% and MOL 2.14% could probably due to the concentration of fat content of the mango seed kernels. Values for concentrate (7.89%) and MOL (7.93%) were higher in ash content than RMSK (2.25%), SMSK (2.30%) and PMSK (2.69%). This low values obtained in processed mango seed kernel could be reflected to flushing of soluble fraction of the kernel and the mineral content of the kernel mineral content of the mango seed kernel. Nitrogen free extract values of 76.06, 75.31, 76.53, 44.53 and 49.60% were obtained for RMSK, SMSK, PMSK, concentrate and MOL respectively. The similar and higher nitrogen free extract values observed in processed mango seed kernel indicated their higher starchy meal with energy content. However, the proximate composition of processed mango seed kernels and *Moringa oleifera* leaves used in this study were similar to the reported values of Olabanji *et al*. (2010) and Tatiana *et al*. (2013) respectively.

Table 2.Mean dry matter intake (MDI/kgDM) and coefficient of preference (COP) by goats fed Mango seed kernels supplemented with Moringa leaves

Diet	Acceptability Days									
	2		4		7		10		14	
A (RMSK + Concentrate)	0.62	0.81	0.71	0.89	0.97	0.99	1.19	1.06	1.32	1.30
B (SMSK + Concentrate)	1.02	1.00	1.69	1.12	1.97	1.87	2.06	2.01	2.68	2.78
C (PMSK + Concentrate)	2.01	1.63	2.23	1.92	2.34	2.21	2.56	3.01	3.09	3.98

RMSK = Raw sundried mango seed kernel
SMSK = Soaked sundried mango seed kernel
PMSK = Parboiled sundried mango seed kernel
MOL = *Moringa oleifera* leaves

The mean dry matter intake (MDI/kgDM) and coefficient of preference (COP) by goats fed experimental diets are presented in Table 2. Several reports (Babayemi *et al*., 2009, Ilori, *et al*., 2013) indicated that direct intake of feeds by animals through the use of cafeteria technique remains one of the authentic methods

of assessing the nutritive value of ruminant feeds. Though this cafeteria method has been used to access the acceptability of different dietary inclusion of Baobab by goats (Ilori *et al*., 2013) but not in differently processed mango seed kernel meals.

However, the free choice intake of differently processed mango seed kernel meals used in this study, were generally accepted by goats. Though, diet A (RMSK + concentrate) was rejected in the first seven days of the acceptability study. This observed initial displeasure and less preference showed by goats on diet A at the onset of the acceptability study before later accepted could probably due to the palatability, residual anti-nutritive factors and rate of fermentation of the potentially digestible diet. This is in conformity with the report of some researchers (Sanon *et al*., 2013; Odunsi, 2005) that the nature of feed and high percentage of residual anti nutritional factors in feed reduced the palatability and have inverse effect on intake of mango seed kernel meal by animals. The free choice intakes of SMSK + concentrate and PMSk + concentrate by goats were noticed to be increasingly in trend with the continuous supply of feeds to the fourteen day. This might be as a result of the goats getting use to the feeds and the less tannin content reduced by processing method of the feeds that would have reduced the bitterness and increased the palatability of the feeds. This agrees with the findings of Garba *et al*. (2010) that the physical structure, palatability and degree of residual anti-nutritional factors of feed are most important factors that influence preference for feed intake. Babayemi (2007) further suggests that animal's preference for feed swings in relation with instant over an elongated examination periods.

Moreover, at the end of acceptability study, it was observed that PMSK + concentrate had the highest mean dry matter intake (3.09kgDM), followed by SMSK + concentrate (2.68kgDM) before RMSK + concentrate (1.32kgDM). More also, diet C (PMSK + concentrate) showed the highest coefficient of preference of 3.98 compared to diets B (SMSK + concentrate) and A (RMSK + concentrate) that had 2.78 and 1.30 respectively. The lesser preference for diets A and B compared with diet C could be attributed to the processing methods. Thus, diet C seemed to have been preferred by goats, hence they showed more willingness to consume the feed more than others. This is supported by the report of Babayemi *et al*. (2009) that much longer time is essential in carrying out preference studies for ruminants, there by paving ways for adjustment.

Presented in Table 3 is the energy utilization (MJ/kg) of goats fed experimental diets. Energy utilization by ruminants has been reported by Johnson *et al*. (2003) to play an important role in determining the energy available for animal performance. Gross energy intake was significantly ($p < 0.05$) highest in diet A (15.23 MJ/kg) compared to diets B (14.65MJ/kg) and C (14.37MJ/kg). The difference could be as a result of different

Table 3.Nutrient utilization of goats fed mango seed kernels supplemented with *Moringa oleifera* leaves

	Diets			
Parameters	A	B	C	SEM ±
Energy utilization (MJ/kg)				
Gross energy intake	15.23[a]	14.65[b]	14.37[b]	0.16
Faecal energy output	4.59[a]	2.89[b]	2.15[b]	0.03
Total energy output	6.25[a]	4.22[b]	3.36[b]	0.04
Digestible energy intake	10.64[b]	11.76[a]	12.22[a]	0.29
Metabolizable energy intake	8.98[b]	10.43[a]	11.01[a]	0.31
Nitrogen utilization (g/day)				
Nitrogen intake	14.65	15.04	15.24	0.52
Faecal nitrogen output	4.02[a]	2.52[b]	2.46[b]	0.04
Urinary nitrogen output	0.62	0.81	0.41	0.01
Nitrogen balance	10.01[c]	11.71[b]	12.37[a]	0.43
Nitrogen retention (%)	68.33[c]	77.86[b]	81.17[a]	0.69

[a,b,c,] means along the same row with different superscripts are significantly ($P < 0.05$) different from each other

Processing methods of the mango seed kernels. This observation was contrary to the report of Noblet and Van Milgen (2004) who reported that daily energy intake remains relatively constant across diets irrespective of the intake with different energy densities. The faecal and total energy output values for goats were not significantly ($P < 0.05$) different between diet B (2.89 and 4.22 MJ/kg) and C (12.15 and 3.36 MJ/kg), but diet A (4.59 and 6.25MJ/kg) was significantly ($P < 0.05$) higher than diets B and C. The imbalance levels of nutrient utilization caused by inhibitory effects of residual anti-nutritional factors of mango seed kernels could have accounted for such difference observed. This is in consonance with the earlier report of Sanon and Kanwe (2010) that increase in level of tannin in mango seed kernels has a negative effect on nutrient utilization and influence high faecal energy output in animals. However, the total energy output obtained in goats on diet A could also be as a result of higher energy loss through methane gas. This is in conformity with the report of Babayemi and Bamikole (2006) that methane production in the rumen has a negative correlation with energy utilization in ruminants.

Digestible and metabolizable energy intake values were significantly higher ($P < 0.05$) in goats on diet C (12.22 and 11.01 MJ/kg) and B (11.76 and 10.43MJ/kg) compared with goats on diet A (10.64 and 8.98MJ/kg). The low values for digestible and metabolizable energy observed in goats on diet A could probably be explained by high energy loss through faecal and total energy output that attributed to improper energy utilization by the goats. Johnson *et al*. (2013) reported that high total energy output has a direct effect on metaoblizable energy intake in ruminants.

Table 3 also shows nitrogen utilization of goats fed experimental diets. Nitrogen intake values of 14.65, 15.04 and 15.24g/day were for diets A, B and C respectively. No significant ($P > 0.05$) difference was observed between treatment effects. This might be a reflection of protein content in the treatment diets. Faecal nitrogen output was significantly ($P < 0.05$) higher in diet A (4.02g/day) compared to diets B (2.52g/day) or C (2.46g/day). The higher value for faecal nitrogen output observed in diet A could be traced to the amount of unfermented nitrogen ingestion in the gastro intestinal tract which reduced the digestibility of the diet and influence higher faecal nitrogen output. The urinary nitrogen output values that ranged from 0.41g/day for diet C to 0.81g/day in diet B was not significantly ($P > 0.05$) differed between dietary treatments. The non differences could probably due to the less concentration of ammonia content in the rumen which was later converted to urea and excreted. This is in line with the findings of Ososanya (2010) who reported that nitrogen excreted in urine will depend on urea recycling and the efficiency utilization of ammonia produced in the rumen by microbial protein synthesis.

Nitrogen balance and retention were reported (Olorunnisomo, 2010) to be the proportion of nitrogen utilised by ruminants from the total nitrogen intake for body processes. Thus, the more the nitrogen consumed and digested, the more the nitrogen retained and vice versa. However, nitrogen balance and retention were significantly ($P < 0.05$) highest in diet C (12.37 and 81.17g/day) and lowest in diet A (10.01 and 68.33g/day). The highest nitrogen balance and retention for goats in diet C could be attributed to the relatively high degree of protein content contributed by the mango seed kernels. This suggests that parboiled mango seed kernel in diet C was well utilized and efficiently used as fermentable nitrogen source for microbial growth in the rumen which promoted higher positive nitrogen balance and retention than raw and soaked mango seed kernel meals in diets A and B respectively.

CONCLUSION

From the result obtained in this study, it was concluded that feeding of differently processed mango seed kernels supplemented with *Moringa oleifera* to goats could be served as feeds to improve goat performance most especially during the off season.

However, mean dry matter intake with coefficient of preference and nutrient utilization improvement were more pronounced in goats fed parboiled mango seed kernel meal with concentrate (diet C) without any inverse effect on their performance response.

REFERENCES

AOAC (1990). Official methods of Analysis (Association of official Analytical Chemists), 14th edition, Washington DC. Pp. 141

Babayemi, O. J. (2007). *In Vitro* fermentation characteristics and acceptability by West African Dwarf goats of some dry season forages *African Journal of Biotechnology.* 6(10): 1260 – 1265

Babayemi, O. J. And Bamikole, M. A. (2006). Effect of *tephrosia candida* DC leaf and its mixtures with guinea grass on *in vitro* fermentation changes as feed for ruminants in Nigeria. *Pastistan Journal of Nutrition.* 5(1): 14 – 18

Babayemi, O. J., Otukoya, F. K., Familade, F. O and Daodu, M. O., (2009). Assessment of nutritive value of bovine liquor and urea treated corn straw and corn-cobs as feed for the West African Dwarf sheep and goats. *Nigerian Journal of Animal Production.* 36(2): 313 – 324

Bamushaiye, E. I., Olayemi, E. F. and Bamshaiye, O. M. (2013). Proximate and phytochemical composition of *Moringa oleifera* leaves at three stages of maturation. *Advance Journal of Food Science and Technology.* 3(4): 233 – 242

Common Wealth Scientific and Industrial Research Organisation (CSIRO, 2001). *Testing sheep for methane production.* Science image, CSIRO Division, GA 1334

Garba. Y., Mohammed, A. S., Muhammemd, I. R. And Nasiru, A. (2010). Intake and nutrient digestibility by Yankasa rams fed graded levels of *Guiera semegalensis* as a complete diet. *Proceeding of 35th Conference of Nigerian Society of Animal Production. University of Ibadan. Nigeria.* Pg 514 – 517

Ilori, H. B., Salami, S. A., Majoka, M. A. and Okunlola D. O (2013). Acceptability and nutrient digestibility of West African Dwarf goat fed different dietary inclusion of Baobab (*Adansonia digitata*). *ISOR Journal of Agriculture and Veterinary Science.* 6(3) 22 – 26.

Johnson, D. E, Ferrell, C. L and Jenkins, T. G. (2003). The history of energy efficiency research: where have we

been and where are we going. *Journal of Animal Science* 55: 1190 – 1199

Moore, L. M. (2004). Mango (*Mangifera indica*) plant guide. USDA. National resource conservation services. National Plant Data Team

Noblet, J. And Van Milgen. J. (2004). Energy value of pig feeds: Effect of pig body weight and energy evaluation system. *Journal of Animal Science,* 82: E229 – E238

Odunsi, A. A. (2005). Response of laying hens and growing broilers to the dietary inclusion of mango (*Mangifera indica*) seed kernel meal. *Tropical Animal Health Production* 37(2): 139 – 150

Olabanji, R. O., Amao, O. A., Shittu, M. D., Aderinola, A. O. and Tona, G. O. (2010). Evaluation of processed mango seed kernel meal on nutrient digestibility of growing rabbits. *Proceeding of 35th Annual Conference of Nigerian Society for Animal Production. Univerisyt of Ibadan. Nigeria Pp 275 – 277*

Olorunnisomo, O. A. (2010). Utilization of raw, cooked or fermented cassava – urea meal in a total diet for growing ewe – lambs. *Nigerian Journal of Animal Production.* 37(2): 237 – 246

Ososanya, T. O (2010). Effect of varying levels of broiler litter on growth performance and nutrient digestibility of West African Dwarf Lanbs. *Nigeria Journal of Animals Science:* 12: 123 – 128

Sanon, H. and Kanwe A. Z. (2010). Valorisation of mango peels and seed kernels in animals feeding: nutritional value and voluntary feed in take by sheep. *Advance Animal Bioscience:* 1(2): 445 – 446

Sanoon, H., Kanwe, A. B., Millogo. A. and Ledin I. (2013). Chemical cinmposition, digestibility and voluntary feed intake of mango residues by sheep. *Tropical Animal Health Production.* 45(2): 665 – 669

SAS (1991). Statistical Analysis system. SAS user's guide. Cary NY SAS Institute.

Tatiana, M., Filomena, N., Emilia, M., Florinda. F., Ralfaele. C., Laura. M., Adelaide, B. A. And Vincenzo, F. (2013). Chemical composition and biological activity of the essential oil from leaves of *Moringa oleifera* Lam. Cultivated in Mozambique. *Molecules Journal.* 18(9): 10989 – 11000

Ukanwoko, A. I., Ibeawuchi, J. A., Ukakchukwu, S. N. (2009). Growth performance and carcass characteristics of West African Dwarf Goats fed cassava a leaf meal based diet. *Proceeding of 34th Annual conference of Nigeria Society for Animal Production. University of Uyo.* Pp 476 – 479.

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:
http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/ All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Academic conference: http://www.iiste.org/conference/upcoming-conferences-call-for-paper/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digtial Library , NewJour, Google Scholar