THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE

Performance of Yankasa Rams Fed Maize Stover as Basal Diet Supplemented with Different Compositions of Molasses-Urea Blocks

Nyako, H. D.
Associate Professor, Department of Animal Science and Range Management,
Modibbo Adama University of Technology Yola, Adamawa State, Nigeria
Anthony S.
Principal Livestock Officer, Ministry of Livestock and Normadic Settlement Yola, Adamawa State, Nigeria
Malgwi, I. H.
Personal Research Assistant, Department of Animal Science, University of Maiduguri, Borno State, Nigeria
Yahya M. M.
Lecturer, Department of Animal Science and Range Management,
Modibbo Adama University of Technology, Yola, Adamawa State, Nigeria
Aminu I. M.
Chief Lecturer, Departments of Animal Production, Taraba State College of Agriculture, Jalingo, Nigeria
Tijani I.
M.Sc. Student, Department of Animal Science, University of Maiduguri, Borno State, Nigeria
Tukur I. S.
Chief Lecturer, Departments of Animal Health, Taraba State College of Agriculture, Jalingo, Nigeria
Ajiji I.
Department of Animal Health and Production, Plateau State College of Agirculture, Jos, Plateau State, Nigeria
Mohammed I. D.
Professor, Department of Animal Science, University of Maiduguri, Maiduguri, Borno State, Nigeria

Abstract:
Sixty (60) days of feeding trial was done to determine the effects of different formulations of molasses-urea blocks as supplements on performance of Yankasa rams fed maize stover as basal diet. 12 growing Yankasa rams aged between 9-12 months with average weight of were subjected to four (4) dietary treatments consisting of three (3) replicates per treatments. The four treatments were, T1 (Maize stover alone), T2 (molasses 36%, rice offal 43%, urea 5%, cement 7% salt 9% and basal diet)), T3 (molasses 26%, rice offal 43%, urea 15%, cement 9% salt 7% and basal diet) and T4 (Molasses 40%, rice offal 39%, urea 10%, cement 4% salt 7% and basal diet). The highest dry matter intake was recorded in T2 (780.67g/h/day) while the lowest was recorded in T4 (531mg/h/day) with significant (P<0.05) difference between treatments. T2 has the highest water intake value with 3.16 liters while the lowest was recorded in T1 2.64 liters. Better feed conversion ratio and highest daily weight gain was obtained among rams in T2 (17.32g/day) with significant difference (P<0.05) between treatments. The result shows higher concentration of Ammonia (mg/mol) in T4 (9.97mg/100ml), and the lowest was recorded in T1 (14.95mg/100ml). The study reveals that rams supplemented with T2(molasses 36%, rice offal 43%, urea 15%, cement 9% and salt 7%) generally gave a significantly (P<0.05) higher performance in terms of dry matter intake and live weight gain. The blood parameters falls within acceptable range, thus it is safe to feed the said blocks to Yankasa rams. The cost of feeding molasses – urea blocks as feed supplement to Yankasa rams as maintenance diet was observed to be relatively cheaper especially when grasses are not available.

Keywords: *Basal diet, Molases, Performance, Urea, Yankasa rams, Supplemented, Stover.*

1. Introduction

In the humid and sub humid regions of Nigeria, sheep and goat production are an integral part of the farming system with livestock providing additional income to smallholder crop-livestock farmers (Isah and OkkufiDipo, 2014). Generally, productivity of most of the animals is below their genetic potential due to inadequate nutrition, poor management and prevalence of diseases. The small holder flocks graze freely without constant shepherding and the labor input is very low. Most farmers offer supplemented feed such as house hold wastes, agro-industrial waste, crop residues and tree fodders to their animals. These low quality roughages are frequently low in protein, energy, minerals and vitamins (Isah and OkkufiDipo, 2014). The use of multi-nutrient blocks as supplement to animals on poor quality straws during the dry season have positive effects on ruminants grazing natural pastures Mubi *et al.*, (2013). According to the authors the blocks increase feed intake, live weight gain, nutrient digestibility and reduce cost of production and utilization. Agro industrial by-products and crop residues are the cheapest and most commonly available supplementary feeds in this locality especially during harvesting season (Dzowela, 1986). With Urea-Molasses Mineral Block, ruminants can make better use of low quality forages, agricultural by-products and crop residues and other non-conventional feed resources Isah and OkkufiDipo (2014). The objectives of the study was to determine dry matter intake, growth rate, rumen ammonia concentration, and cost of producing urea-molasses blocks as feed supplement to Yankasa rams.

2. Materials and Methods

2.1. Location of the Study

The research was conducted in the Ministry for livestock Production and Nomadic Settlement located in Yola-North Local Government Area of Adamawa State, Nigeria. It lies within the Northern Guinea Savanna between latitude 7^oN and 11^oN and longitude 11^oE and 14^oE of the Equator. The region normally experience a maximum temperature of 40^oC in the month of February and as low as 15^oC within the months of November to January. The temperature varies within the state where temperature of about 26.7^oC in the southern part with relative humidity of 20 - 30% recorded within the month of January to March and 80 % relative humidity between the months of August and September (Adebayo and Tukur, 1999).

2.2. Preparation of Molasses-Urea Block

The materials that were used for the preparation of molasses-urea blocks included molasses a by-product of sugar cane after the extraction of sugar from the sugar factory. The molasses was obtained from Savannah Sugar Company Numan, Adamawa-Nigeria; urea, salt and cement were purchased from a local market. Rice offal which is one of the major materials was obtained from rice mills. One wooden mold with dimensions of 22 x 19 x 15 cm, was also constructed, weighing scales used for the weighing of ingredients diet and animals. A graduated cylinder was used to measure the quantity of water consumed by each animal. The blocks were manufactured using the cool process (Sansoucy and Aarts, 1986). The ingredients were mixed properly in the following order i.e. molasses, cement, urea, salt and rice offal. After the mixture was properly mixed it was gently poured into wooden mold up to brim level. The formulated block was allowed to stay for about two (2) weeks in order to set and solidify. The hardness of the blocks were principally affected by the quantity of molasses and urea in the mixture, thus high level of molasses and urea tend to decrease solidification (Sansoucy and Aarts, 1986).

2.3. Experimental Diets

Maize Stover was collected after crop harvest and it was dried and chopped to a size of 3cm length. The Stover was packed into a 100 kg bag and stored for subsequent feeding to the rams. The Stover was fed as basal diet, while the three (3) different formulations of blocks served as supplements. The treatments were as follows:

T_1**:** Maize Stover alone,(i.e. no supplement)

T_2**:** Maize Stover (basal diet) and Block which comprised of molasses 36%, rice offal 43%, and urea 5%, cement 7% and salt 9%.

T_3: Maize Stover (basal diet) and Block which comprised of molasses 26%, rice offal 43%, and urea 15%, cement 9% and salt 7%.

T_4: Maize Stover (basal diet) and Block which comprised of molasses 40%, rice offal 39%, and urea 10%, cement 4% and salt 7%.

The basal diet, formulated blocks and water were given to the animals *ad –libithum*

2.4. Feeding of Experimental Animals

Three (3) animals were placed in each treatment as indicated (T_1. T_2, T_3 and T_4 respectively), the animals were adopted for 2 weeks. Maize Stover was placed inside feeding trough while the blocks prepared were given to each individual animal and the blocks were replaced anytime it was exhausted by each animal. The feeding trial was for a period of 60 days. The basal diet and the supplements were weighed in the morning at 8.00am before given to each animal and then at 4.00pm. The following morning, the left over feed was weighed and recorded. Water was measured using a 100 ml cylindrical flask before giving to each animal, the quantity left was also measured before fresh allocation was made, the amount of water consumed was also recoded.

2.5. Digestibility (in – vivo technique)

This involves feeding the rams with experimental diets to determine their digestibility. The formula for calculating in – vivo digestibility of feed is follows:-

$$\%\ \text{Digestibility} = \frac{\%\ \text{Nutrient of feed} - \%\ \text{Nutrient of faeces}}{\%\ \text{Nutrient of feed}} \times 100$$

After the feeding trial period was completed, three (3) rams were confined in metabolic crates and fed four treatments. The rams were fed with experimental diets and water *ad-libithum* for a period of 14 days to get adapted to the feed and environment also for rumen microbes to get adjusted to the feed. After the adaptation period, faeces from each animal were collected for 21 days (McDonald *et al.*, 1998). After collection the faeces was weighed and properly sun-dried Ten (10%) of sub samples of the faeces was taken to laboratory for proximate analysis to determine the percentage of nutrients in each sample. The calculation of percentage digestibility was done using the formula given above. The proximate analysis was done according to AOAC (2004).

2.6. Parameters Measured

The following parameters were taken during the course of the experiment:-

i. The daily dry matter intake was recorded first thing in the morning each day and the left over was recorded before fresh feed was offered.
ii. The weight changes were recorded by weighing each animal on weekly basis i.e. present week subtracted from previous week and recorded.
iii. Nutrient digestibility was conducted
iv. The cost of feeding molasses-urea blocks as supplement was determined.

2.7. Statistical Analysis

The data collected were subjected to analysis of variance (ANOVA) in a Complete Randomized Block Design and means were compared using Duncan's Multiple Range Test (Duncan, 1955).

3. Results and Discussion

Nutrients	**Treatments**			
	T_1	T_2	T_3	T_4
DM (%)	81.00	89.50	92.00	89.50
CP	1.80	13.60	12.50	13.60
CF	36.00	11.00	10.00	10.00
Ash	8.00	25.50	21.50	7.50
NFE	34.90	38.90	41.70	53.90
Lipids	0.50	0.50	0.50	4.00

Table 1: Chemical Composition of the Experimental Diets

The proximate composition of all the treatments is presented on table 1. The percentage dry matter content of the blocks ranged from 81.00 – 92.00 %DM. This is slightly below the range 93.80 - 95.60 %DM reported by Dzidiya *et al.*, (2015) who used potash, wood ash, egg shell salt and locust bean pulp. Treatment T_3 recorded highest (92.00 %DM) while treatment T1 recorded least (81.00 %DM). T_1 recorded the least %CP of about 1.8 %CP in the study was lower than 5.4% reported by Nour *et al.*, (1987). The %DM, %NFE and %EE too followed the same pattern, but the ash content seems to be similar to that reported by Nour *et al.*, (1987). The %CF of maize Stover in this study was higher than 33.2% reported by Nour*et al.*, (1987). The CP of all the treatments (molasses-urea blocks) in this study was lower than that reported by Onwuka (1999).

Parameters	**Treatments**				
	T_1	T_2	T_3	T_4	LSD
Initial live weight (kg)	20.67	21.06	21.00	21.05	5.58
Final live weight (kg)	18.00	22.00	21.25	20.25	7.56
Weight gain (kg)	-2.33	0.97	0.25	-0.80	3.74
Daily weight gain (g/d)	-47. 67	17.32	4.46	-14.28	43.76*
Daily mean basal intake(g)	546.23	474.67	456.41	370.40	157.3
Daily mean block intake(g)	0.00	306.00	198.00	161.10	98.72
Total mean daily DMI(g)	546.23	780.67	654.41	531.50	173.80*
Feed conversion ratio (FCR)	-498.33	45.30	146.72	-33.22	63.27
Water intake l/h/d	2.64	3.16	3.03	2.79	1.99
* = Significant at P < 0.05.					

Table 2: Performance of Yankasa Rams Fed Different Formulations of Molasses-Urea Blocks

The results of dry matter intake of Yankasa rams fed maize stover as basal feed supplemented with multi-nutrient blocks during the dry season are presented in Table 2. The dry matter intake of the basal diet was 546.23g, 474.67, 456.41 and 370.40g for T1, T2 T3 and T4 for the control and supplemented diets, respectively. There was a significant (P<0.05) difference between the supplemented groups and the control. The daily block intake was 0.00g/h/day, 306.0g/h/day,198.0g/h/day and 161.10g/h/day for the control and supplemented diets, respectively. The mean daily block intake in this research was lower than the 400 g recommended by the Food and Fertilizer Technology Centre, FFTC (2006). The total daily dry matter intake was 546.23g/h/day, 780.67g/h/day,654.41g/h/day and 531.50g/h/day for the control and supplemented groups (T_1, T_2, T_3 and T_4 respectively). The DMI (g/ head/ day) ranges from 531.50g – 780.67g/h/d and the highest was recorded in T_2 (780.67g/h/d) and the lowest was in T_4 (531.50g/h/d). The basal diet intake increased with increasing level of supplementation. Previous researchers opined that multi-nutrient blocks improved the efficiency of utilization of poor quality roughages and improved animal performance Mubi *et al*., (2011). Similarly, an increase in dry matter intake as a result of supplementation was also previously reported by Mubi *et al*., (2013) that supplementation with multi-nutrient blocks significantly ($p<0.05$) increased the intake of the basal diet. It provided a high potential for improving the utilization efficiency. The block provides an almost continuous supply of nutrients which is usually deficient in straws that limit fibre digestion in the rumen. Previous authors reported a dry matter intake of 1,760g/h/day was recorded in Yankasa sheep that were supplemented with molasses as against 1,530g/h/day that had no molasses Mubi *et al., (*2013). The inclusion of urea in mold blocks increased DMI as was observed in T_2 and T_3 which were affected by quantity of urea 10%, salt 9% in T_2 and urea 15% in T_3. The inclusion of urea is within tolerable level and that was why rams consumed more in T_2 as compared to T_3 and T_4, (Onwuka, 1999). It was as a result of inclusion of urea as supplement in the formulation of the blocks that stimulated the intake of the basal diet; this agrees with previous reports that an increase of straw consumption supplemented ranges between 25% to 30% Sansaucy and Aarts (1986). The authors further opined that the rate of supplement consumption might have been influenced by the level of urea and salt in the diet which was within tolerable level of 10 – 15% Sansaucy and Aarts (1986). The daily water intake ranges from 2.64 l/h/d to 3.16 l/h/d and the highest was recorded in T_2 (3.16 l/h/d) and the lowest in T1 (2.64l/h/d). The result obtained in this study fall within the range as reported by ARC (1984), for water intake in rams under varying environmental temperatures. The values in this study are however higher than 1.5 to 2.01 l/day/head as reported by Adegbola and Obioha (1984) for West African Dwarf sheep. When water intake was expressed by total feed intake, a lower intake was recorded in T_1 compared to the rest of the treatments. This study however suggested that the higher the feed intake, the higher will be the water intake. The water intake was greatly influenced by the amount of supplement consumed by the animals and this influence might probably be due to the amount of urea consumed by the animals, thus the more the supplement consumed the more the water intake (Elfouley and Leng, 1987). The average daily live weight gain showed significant ($P<0.05$) difference among the treatments and it was influenced by the amount of supplement consumed by the rams; this agrees with Hossain *et al.,* (2003) that supplementation influenced daily live weight gain of rams. The daily live weight gain recorded in T2 (17.32g) was lower than 21.0g/h/day revealed by Mubi *et al., (*2011) when the authors fed multi-nutrient blocks with molasses. Similarly, Tien and Bayer (2004), reported that supplementation increased growth performance in lambs. The findings of this study also showed that T2 recorded the highest daily live weight gain and that the higher live weight gain might be due to the presence of higher dietary nitrogen (CP). This implies positive response of the experimental animals to the diet. Urea provides fermentable nitrogen which is made available to the rumen microbes and utilized by the animals and thus led to an increase in the intake of feed up to 45%, it also increased the digestion of the diet up to 20% (Campling *et al*., 1960), and this had a promotional effect in weight gain of rams. An increased in daily mean live weight gain(kg) as a result of supplementation was previously reported by Mubi *et al., (*2013), a 0.15 kg/h/day was obtained in those sheep that were supplemented with molasses as against 0.13 kg/h/day, without molasses. A drop in live weight was recorded in T1 and T4; the T1 was as a result of deficiency of nutrients in diet (T1) that is control. Previous report by Onwuka (1999), revealed that poor quality roughage lack energy, nitrogen, minerals and vitamins which might have led to drop in live weight. A similar drop in daily live weight was recorded in T4, where the rate of mineral block consumed was not proportional to the quantity of dry matter consumed and this was supported by previous reports of El-fouley and Leng (1987) that a positive linear relationship between rates of blocks consumed and the quantity of straw consumed by sheep. The quantity of urea mineral block consumed was not promotional to the quantity of roughage consumed hence led to the drop in live weight changes. Feed conversion ratio shows that supplementation in T_2 resulted to a better utilization of feed followed by treatment three (T_3). The pattern of FCR agrees with Ganje and Bromker (1990) which shows increased level of feed conversion with corresponded increased in sources of crude protein and energy. The lower the value of FCR, the more the efficiency the feed is converted to meat in sheep, Smeaton *et al*., (2003). This can be observed in the molasses-urea blocks formulated where the inclusion of urea as a source of fermentable nitrogen and molasses as source of energy influenced the weight gain of rams (Campling *et al.*, 1960). Dry matter digestibility (DMD) table shows the highest DMD was obtained in T_2 while the lowest was in T_1. The dry matter digestibility values in rams fed molasses –urea blocks reveals that supplementation do not really affect digestibility across treatments. This agrees with report of Adams *et al.,* (1995) that ammonia or supplementation has no effect on dry matter digestibility but tended to increase digestibility of the diet. Molasses-urea blocks contain urea as source of nitrogen for the microbes and this is mostly the source of ammonia in the diet. From analysis the ammonia content in the molasses-urea block falls within the range 55.5 – 70.9 mg/100ml which is the acceptable requirements for the rumen microbes to function, (Leng, 1994). The highest crude protein digestibility was observed in T_2 (91.97%) while the lowest was recorded in T_1 (78.96%). The results obtained in this study were within the range reported by Yahaya *et al.,* (2001) that supplementation increases CP digestibility. The molasses-urea block formulation in T_2 had 89.5DM and 13.6CP as compared to T_1 with 81%DM and 1.8%CP and this agreed with the report by Yahaya *et al,* (2001) that the quantity of the available nutrient in the supplement greatly influenced the digestibility. The results show that T_2 has the highest value of 28.39% and the lowest value was recorded in T_1 (10.32%). This result agrees with Owen (1993) who reported increased crude fibre digestibility with supplementation. This can be observed in the formulation of $T_{2,}$ T_3 and T_4 as compared to T_1 where supplementation reduced fibre content in all the treatments except in T_1. From table 3 the nitrogen free extract digestibility ranges from T_4 (65.37%) to T_1 (31.29%). The value of NFE digestibility tends to increased with the incorporation of molasses protein supplementation as reported by Ibrahim (2007). The composition in T_2, T_3 and T_4 shows a higher percentage of molasses and urea as compared to T_1 no supplementation and that might have contributed to the higher figures (NFE) digestibility.

Parameters	Treatments				
	T_1	T_2	T_3	T_4	LSD
Dry matter %	11.22	67.01	59,46	30.09	2.679**
Crude protein	78.96	91.97	87.73	90.31	0.1708*
Lipid/Fat	96.22	97.23	96.53	96.87	6.909**
Fibre	10.32	28.39	18.87	21.89	2.094**
Ash	55.44	54.87	59.56	51.66	1.6418*
NFE	31.29	44.47	36.57	65.37	8.7156*

Table 3: Nutrient Digestibility of Yankasa Rams Fed Different Formulation of Molasses-Urea Blocks
*** = Highly significant at P< 0.01, * = Significant at P < 0.05.*

4. Conclusion

The results obtained revealed a significant difference (P<0.05) in mean dry matter intake with T2 (780g/h/day), being the highest. A significant difference (P<0.05) in daily weight gain was recorded between treatments where T2 (17.32g/h/day) was the highest, while T1 (-47.67g/h/day) had a drop in weight, -2.33kg/head which is the lowest. T2 had the highest water intake of 3.16l/h/day while the lowest of 2.64l/h/day was recorded in T1 (control). The supplementation can be described as maintenance ration for rams during the dry season because natural grasses will not be available in enough quantity to sustain animals, and about. The result obtained in this research showed that molasses-urea blocks can be effectively used as maintenance ration for rams during the dry season. Crop residues like maize stover are readily available in the field after harvest and they are sometimes poorly utilized by small ruminants because of their low palatability and acceptability. Small ruminants Farmers can therefore effectively combine these residues with supplements like molasses-urea blocks to at least prevent animals from losing weight during the dry season. These residues can be chopped and stored for use for a very long time.

5. Recommendations

Based on the result of this study, molasses-urea blocks formulated with 36% molasses, 43% rice offal, 5% urea, 7% cement and 5% salt can effectively be used as feed supplement to maize stover as a basal diet for Yankasa rams and likewise other small ruminants during the dry season when there is little or no valuable feeds (especially grasses) on the field. The production cost of molasses-urea blocks is cheaper based on the cost benefit analysis of the product. The data obtained from this study can be used for small ruminant animal production in the semi-arid region of Nigeria and extension officers can disseminate knowledge to farmers at various levels in their domain.

6. References

i. Adams, A.M., Adam, I.F, Olomiyo, S.A.S, Alawa, C.B.J. and O.S. Mamidu (1995). Effects of Urea and Cotton seed Supplementation on the Utilization of Sorghum Stover by Sheep. Nigerian Journal of Animal Production 23(2):42-52.
ii. Adebayo A.N and Tukur, A.L. (1999) Climate I: Sunshine,Temperature Evaporation and Relative Humidity. Adamawa State in Maps, Paraclete Publishers. Pp 20-22.
iii. Adegbola T. A and Obioha F.C. (1984) Water intake and Excretion of West African Dwarf Sheep in Southern Nigeria. Journal of Animal Production Research. Pp 85-97
iv. AOAC (2004). Association of Official Analytical Chemist Virginia, USA.14th Edition Washington D. C.
v. ARC (1984). Agricultural Research Council.The Nutrient Requirements of Ruminant Livestock Supplements No. 1. Commonwealth Agric. Bureau Fouha, Raya, UK.p.45
vi. Campling R.C., Frear M., and Balch, C.C. (1960). Factors Affecting the Voluntary Intake of Food by Cows.The Effects of Urea on the Voluntary Intake of Straw. Britain Journal of Nutrition 16 Pp 115-124.
vii. Duncan D. B. (1955). Multiple Range and Multiple F-tests Biometrics II 1-42.
viii. Dzidiya, M.B., Malgwi, I.H., Nyako, H.D., Mohammed, I.D., Yahya, M.M., and Abbaya, H.Y. (2015). Multi–Mineral Block Formulation and Production Using Locally Available Feed Ingredients in Semi – Arid Region of Nigeria. IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) e-ISSN: 2319-2380, p-ISSN: 2319-2372.Volume 8, Issue 7 Ver. II (July. 2015), PP 41-47 www.iosrjournals.org
ix. Dzowela B. H. (1987). Efforts to Enhance Maize Stover Utilization for Small Holder Livestock Production in Malawi D. A. Proceedings of Workshop on Agricultural by-products as Livestock Feeds in Africa held in Ryali Hotel, Malawi. ILCA Adisa Ababa. Pp. 27-36
x. EL-Fouley H.A., and Leng R. A. (1986). Manipulation of Rumen Fermentation to Enhance Microbial Protein Synthesis from V.P.N Supplementation. Extended Synopsis of International Symposium on use of Nuclear Techniques in Studies of Animal Production and Health in different Environments I.A.E Vienna Austra.Pp 170-171
xi. Esanu, I. (2004). Comparative Evaluation of Raw and Urea Toasted Velvet Bean (Mucunapulces), for Broiler Chicks Animal Feeds in Tropics FAO Rome, Italy. Extended of International Symposium on Use of Nuclear Techniques in Studies of Animal Production and Health in Dih Environments IAE$ Vienna Austrapp 170 -171

xii. FFTC (2006). Food And Fertilizer Technology Centre; Urea Molasses Mineral Block Supplement For Ruminants: Philippines Council For Agric, and Natural Research and Development(PCARRD), Los Bonus, Laguna, 4030, The Philippines.

xiii. Ganje A. and Bromker C. (1990). Ruminal Physiology, Digestion, Metabolism, Growth and Reproduction.Willing ford Oxfordshire Uk.

xiv. Hossain, M.E., Shahjala M., Khan M.J., and Bhuiya A. A. (2013). Effect of Dietary Energy Supplementation on Feed Intake, Growth and Reproductive Performance of Sheep Under Grazing Condition. Pakistan J, of Nutrition 2(3):148-152.

xv. Ibrahim, B.G. (2007). Supplementary Feeding of Cowpea Vines to Yankasa Sheep Offered a Basal diet of Guinea Grass. J. Arid zone.

xvi. Isa,O.A. and Okkufi Dipo (2014). Effect of Various Protein Sources in Urea-Molasses Feed Blocks on Chemical Constituents and In Vitro Fermentation for Ruminants. Nigerian J. Anim.Sci.2014, 16(2): 272-279.

xvii. Leng, R.A., (1994). Incorporation of Ammonia by the Cellulolytic Ruminants Bacteria. British Journal of Nutrition, vol. 72, Pp 679-699.

xviii. McDonald P. Edwards R.A Green HalghJ.E.D and Morgan C.A.1998), Animal Nutrition 5th Edition Pearson Education Ltd UK.Pp 142-176.

xix. Mubi, A.A., Kibon, A. and Mohammed, I.D. (2011). Effects of Multi-nutrient Blocks Supplementation on the Performance of Grazing Yankasa Sheep in the Wet Season of Guinea Savanna Region of Nigeria. Intl.J. Sustain. Agric. 3(3):103-106.2011.

xx. Mubi,A.A., Mohammed, I.D., and Kibon, A. (2013). Effects of Multi-nutrient Blocks Supplementation on the Performance of Yankasa Sheep fed with basal diet of rice straw in the dry season of Guinea Savanna Region of Nigeria. Scholars Research Library. Arch Appl. Sci. Res., 2013.,5(4):172-178..www. scholars research library.com.

xxi. Nour A.M., Abou A.A.R, and Mabrouka A. (1987), The optimum Levels of Rouging in Diets for Sheep. African Research Network for Agricbyproducts(ARNAB) Proceedings of Workshop held at the University of Alexandra Egypt ILCA Adisa Ababa Ethiopia.

xxii. Onwuka, C.F.I (1999). Molasses- Urea blocks as Supplementary Feed Resources for Ruminants. Arch, Zootech Journal No 48: Pp 89-94

xxiii. Owen, S. (1993). Upgrading Crop Residues for Effective Utilization by Ruminant. Livestock Production Journal. UK Pp 33-35.

xxiv. Sansaucy.R., and Aarts G., (1986). Molasses – Urea Block as Multi-nutrient Supplements for Ruminants in various Condition. FAO Rome Italy Corporate Documents Pp 78-79.

xxv. Siulapwa N. J. and Simukoko H. (2001).Status of Crop Residues and Agro-industrial by-products as Supplementary Animal Feeds in Zambia- A review, School of Veterinary Medicine, Department of Biomedical Sciences, University of Zambia.P.O. BOX 32379. Lusaka, Zambia.

xxvi. Smeaton D.C. McGoven L.T., Scott M.L., Tevit, H.R., Cameroun, C.A. (2003). Survival of Invitro-produced Cattle Transfer to Weaning. Proceedings of New Zealand Society of Animal Production, Vol: 63, Pp 57-60.

xxvii. Tien D.V. and Bayer A.C. (2004).Growth Performance of Lambs in Phangyang Vietnam: Effects of a Dietary Supplement Containing Prickly Pear Cactus. Tropical Animal Health Publication, Springer Netherlands 0049, pages 237-554

xxviii. Vendura, B., and Zamura, U. (1970). Thiamine Activity in the Rumen U.T.A Foundation Journal of Animal Science. Pp 1-12.

xxix. Yahaya, M.S., Kimure, A., Harai, J., and Nguya, H.V. (2001). Technology Effect of Length of Ensiling on Silo Degradation and Digestibility of Structural Carbohydrates of Lucerne and Orchard Grass Animal Feed Science and. Vol 92, pp 141-148